INPUT METHODOLOGIES (ELECTRICITY DISTRIBUTION AND GAS PIPELINE SERVICES)

REASONS PAPER
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This document contains an extract of the cost of capital sections (Chapter 6 and Appendix H) only

COMMERCE COMMISSION

CHAPTER 6:   COST OF CAPITAL

6.1   Introduction

6.1.1   Section 52T(1)(a)(i) requires the IMs relating to a particular good or service to include, to the extent applicable under the relevant type of regulation, an IM for the cost of capital. This chapter summarises the IM for estimating the cost of capital, its key parameters, and the reasoning which underpins the cost of capital IM.

An IM for estimating the cost of capital

6.1.2   The IM sets out how the Commission is to estimate a cost of capital for regulated services. The cost of capital is the financial return investors require from an investment given its risk. Investors have choices, and will not invest in an asset unless the expected return is at least as good as that they would expect to get from a different investment of similar risk. The cost of capital is an estimate of that rate of return.

6.1.3   There are two main types of capital: debt and equity capital. Both have a cost. For debt, it is the future interest payments. For equity, it is the expectation of dividend payments by the firm, and where profits are retained and reinvested, the expectation of larger dividend payments by the firm some time in the future. The cost of capital reflects the cost of debt and the cost of equity, and the respective portion of each that is used to fund the investment.

6.1.4   The cost of capital, in particular the cost of equity, cannot be observed directly.[286] Rather it must be estimated from the available data using a number of tools and techniques. This is not a simple task. The available tools are imperfect, the data can be hard to obtain or unreliable, and can change over time. Older data can be re-interpreted in new ways; newer data may call into question previous assumptions. The cost of capital is forward-looking. That is, it reflects expectations of the returns required in the future, which cannot be observed in advance.

6.1.5   In estimating the cost of capital, there are also choices around the analytical models to be used, over the level of each parameter, and around the estimate of the cost of capital to be applied under the different regulatory instruments. The estimation of a cost of capital is not a mechanical task. To determine the methodology for estimating the cost of capital, and to assure itself that the estimate is reasonable and meets the Part 4 Purpose and the purpose statements for information disclosure regulation and price-quality regulation, the Commission has had to exercise a degree of judgement over these matters. The Commission has carefully considered the effect of a number of choices individually and in combination. The Commission has used its IM to estimate the cost of capital based on current market conditions. It has then tested the resulting estimate of the cost of capital against a range of market information to ensure the IM is reasonable and commercially realistic, in the context of how the cost of capital is to be applied in regulation under Part 4.

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[286]   The cost of equity, expressed as a rate of return, is the discount rate implicit in the price at which equity can be raised (given the investors' expectations of future cash flows which they will derive or have claim to). This discount rate cannot be directly observed or calculated because the investors' true expectations cannot be directly observed.

Application of the IM

6.1.6   The cost of capital IM specifies how the cost of capital will be determined. The cost of capital varies between different services. Those regulated suppliers that supply more than one type of regulated service will have a cost of capital for each service.

6.1.7   The cost of capital IM does not specify the cost of capital for a regulated service directly. Rather, it sets out the methodology for determining the cost of capital for each service. Some parts of the IM specify values for certain parameters, such as tax rates, while other parts specify a methodology for obtaining estimates where information is constantly changing, such as interest rates.

6.1.8   The cost of capital as set out in the IM comprises two parts. The first and most significant component is the weighted average cost of capital (WACC). The WACC is determined for each regulated service and applies to all regulated suppliers of that service. The second component is the term credit spread differential, which is treated as a separate component because it will apply to qualifying firms only. Although it is conceptually a component of the cost of capital, for the purposes of this IM it is treated as an adjustment to cash flows (under information disclosure and DPP) and an allowable building block revenue (under CPP).

6.1.9   The IM will be used to produce estimates of the cost of capital for regulated services. The estimate of the cost of capital will be used to assess the profitability of regulated suppliers and as an input in setting price-quality paths.

Overview of IM and structure of this chapter

6.1.10   There are many complex, technical issues in developing a methodology for determining the cost of capital. Rather than addressing all of these issues fully in this chapter, these issues are discussed in detail in Appendix H to this document, which should be read together with this chapter. Similarly, detailed references to sources are set out in Appendix H and are kept to a minimum in this chapter.

6.1.11   Table 6.1 sets out the components of the IM for the cost of capital for all regulated suppliers, and indicates where in this paper each component is discussed.

Table 6.1   Overview of IM for the Cost of Capital for EDBs and GPBs

Approach in IM	Where discussed
The cost of capital is an estimate of firms' WACC which reflects the cost of debt and the cost of equity used to fund investment. A different WACC will apply in respect of the supply of regulated services by EDBs and GPBs.	Sections 6.1, H1, H2
The Commission will publish annually for all regulated suppliers: • a mid-point estimate of the five year post-tax WACC and vanilla WACC to apply under information disclosure regulation; and • an estimate of the five year vanilla WACC at the 75th percentile to apply in setting DPPs and CPPs under default/customised price-quality regulation. Three and four year equivalent estimates of the vanilla WACC at the 75th percentile will also be published as required for CPPs, and estimated WACC ranges for the 25th to the 75th percentiles for both the post-tax WACC and the vanilla WACC will be published to inform interested persons.	Sections 6.7, H14

Approach in IM	Where discussed
The methodology for estimating a vanilla WACC is: *cost of debt × leverage + cost of equity × (1- leverage)* The methodology for estimating a post-tax WACC is: *cost of debt (after corporate tax) × leverage + cost of equity × (1- leverage)*	Sections 6.7, H2
For all regulated suppliers, the cost of debt is estimated as: *risk free rate + debt premium + debt issuance costs*	Sections 6.3, H2
• the risk free rate is estimated by the Commission as part of publishing annual WACCs for all regulated suppliers. The risk free rate is estimated from the observed market yield to maturity of benchmark vanilla New Zealand Government NZ$ denominated nominal bonds with a term to maturity that matches the term of the regulatory period (typically five years);	Sections 6.3, H4, H14
• the debt premium is also estimated by the Commission as part of publishing annual WACCs for all regulated suppliers as the difference between the risk free rate and the yield on publicly traded corporate bonds for EDBs and GPBs with a S&P long-term credit rating of BBB+ and a term to maturity which matches the regulatory period (typically five years); and	Sections 6.3, H5, H14
• debt issuance costs are 35 basis points (0.35%) p.a.	Sections 6.3, H5
A separate term credit spread differential allowance is calculated for qualifying suppliers reflecting the additional costs associated with holding a longer-term debt portfolio. The term credit spread differential is used to adjust cash flows in ID and DPP regulation and is applied to allowable revenue calculations in CPP regulation. Qualifying suppliers are suppliers which have a debt portfolio with a weighted average original tenor exceeding the length of the regulatory period.	Sections 6.1, 6.3, H6
Cost of equity is estimated using the simplified Brennan-Lally CAPM as: *risk free rate × (1- investor tax rate) + equity beta × TAMRP*	Sections 6.4, 6.5, H2
• the risk free rate is the same as for the cost of debt;	Section 6.3
• the equity beta for EDBs and Transpower is 0.61 and for GPBs is 0.79, derived from:	Sections 6.5, H8
o an asset beta for EDBs of 0.34 and for GPBs of 0.44; and	Sections 6.5, H8
o leverage of 44% for EDBs and GPBs;	Sections 6.6, H3
• the investor tax rate is the maximum prescribed investor tax rate under the PIE tax regime, which is 30% until 30 September 2010 and 28% thereafter. Changes in the prescribed rate will flow through to future WACC estimates automatically; and	Sections 6.5, H10
• the TAMRP is 7.5% until 30 June 2011 and 7% thereafter. The TAMRP is expressed as a five-year composite rate (to match the term of the regulatory period), hence the TAMRP estimated for the five year period which commences on 1 July 2010 is 7.1% and for the five year period which commences on 1 July 2011 is 7%.	Sections 6.5, H7

Approach in IM	Where discussed
The corporate tax rate is 30% up until the end of the 2011 tax year, and 28% thereafter. Changes in the corporate tax rate will flow through to future post-tax WACC estimates automatically.	Sections 6.5, H10
To incentivise efficient investment in regulated services (given the possibility of error in estimating the WACC) the WACC to apply for DPPs and CPPs is specified as the 75th percentile estimate of the WACC.	Sections 6.7, H11
The Commission has compared the estimated WACCs under the IM against a range of other financial and economic information in order to check that the application of the cost of capital IM produces commercially realistic estimates of WACC for EDBs and GPBs.	Sections 6.8. H13

6.1.12   The rest of this chapter is structured as follows:

- Section 6.2 discusses the key considerations the Commission has had regard to in setting the IM;

- Section 6.3 discusses the cost of debt, with technical detail on the risk-free rate, debt premium and debt issuance costs, and the term credit spread differential discussed in separate sections of Appendix H;

- Section 6.4 discusses the model for estimating the cost of equity;

- Section 6.5 applies the preferred model for estimating the cost of equity. Technical detail on the tax-adjusted market risk premium, asset and equity betas, debt betas, and tax, are discussed in separate sections of Appendix H;

- Section 6.6 discusses leverage;

- Section 6.7 discusses the estimation of a WACC range; and

- Section 6.8 describes how the Commission tested the estimates of the cost of capital produced by the cost of capital IM to ensure they are reasonable.

6.1.13   Three further appendices to this paper discuss the overall approach and framework for estimating the cost of capital; the treatment of asymmetric risks; and the application of the cost of capital IM.

6.2   Key Considerations in Determining the Cost of Capital IM

6.2.1   In setting the cost of capital IM the Commission considered the Part 4 Purpose. The Part 4 Purpose is to promote long-term benefit of consumers by promoting outcomes consistent with outcomes produced in workably competitive markets. The cost of capital IM seeks to ensure expectations are for a normal rate of return similar to that expected in workably competitive markets for activities of comparable risk, such that the Part 4 Purpose is met.

Insights from workably competitive markets

6.2.2   The cost of capital is the expected rate of return that will attract investment. It is the expected rate of return at which investors are willing to invest, because this expected return is as good as they can get from the range of investment choices with similar risk. Investors can hold a range of investments to limit their risks through diversification. To well-diversified investors, only the risks that affect all investments matter; the risks specific to just one investment can be expected to offset one another and are therefore of little consequence. The return they seek reflects the effect of each investment on the risk of the overall portfolio, not the risk of a single investment viewed in isolation.

6.2.3   The actual rate of return may differ to the expected return. Market and economic developments will tend to differ from the expected course of events, and factors such as a successful or unsuccessful new product, decisive or indecisive management actions, or effective or ineffective competitors may result in better or worse than expected returns. However, where a business faces workable or effective competition, a period of returns above the cost of capital cannot be expected to last. The supplier which is earning returns above the cost of capital can attract capital to expand and at the same time other suppliers, eager to maintain their market share and to maximise their own profits, compete hard to catch up. Active and discriminating consumers seek the best deal they can, wherever they can. Through a combination of these processes the superior returns can be expected to erode, and actual returns trend towards a normal rate of return – the cost of capital.

6.2.4   Returns in excess of the cost of capital, are a signal for new investment to occur. In workably competitive markets, investors actively seek new opportunities to invest. In particular, such investors seek opportunities where the expected returns are in excess of the cost of capital. This new investment may be by an existing supplier or by new suppliers, and this new investment increases the supply of services into the markets for the services thus placing downward pressure on returns. Conversely, where expected returns are lower than the cost of capital, some suppliers may exit the industry and invest elsewhere, rather than continue to supply services where the returns are too low.

6.2.5   Firms in workably competitive markets are price-takers not price makers. In such markets, firms cannot expect to earn returns above the cost of capital for an extended period. Nor can firms expect to dictate to the market what the rate of return will be. A firm pricing its product on the basis of its own excessive (i.e. inefficient) estimate of the cost of capital will lose sales and profits to competitors. In workably competitive markets, the price of products is determined by the cost of capital for suppliers in general, not by the cost of capital for an individual supplier. This is particularly relevant where a supplier has constraints on its capital structure. These constraints may elevate the estimated cost of capital for such suppliers above the cost of capital at which less constrained suppliers can access capital. A supplier which sets prices based on a higher estimate of its cost of capital than the actual cost at which capital is available in an industry cannot expect consumers to pay these higher prices. In workably competitive markets, inefficient costs (of capital or otherwise) are borne by the supplier, not the consumer.

6.2.6   Firms in workably competitive markets continue to innovate and invest as this offers the prospect of improved returns, even if the benefits are eventually competed away. And investors remain willing to invest so long as the returns are as good as those available from comparable investments elsewhere.

6.2.7   In summary, a key outcome from workably competitive markets is that it is the market's view of the cost of capital that matters, not the cost of capital specific to one producer, or a producer's view of the cost of capital. Further, where investors choose to have a diversified portfolio of returns, they care principally about how an investment contributes to the risk of their overall portfolio, rather than the specific risks which affect a single investment (as that can be diversified away).

Developing a robust cost of capital methodology

6.2.8   The Commission has taken a number of steps to develop a robust and workable methodology to estimate the cost of capital. In addition to the rounds of consultation outlined in Chapter 1 and Appendix A (which included a two day workshop specific to the cost of capital), these steps included:

- seeking independent expert advice on the cost of capital from a Cost of Capital Expert Panel (described in Chapter 1 at paragraphs 1.4.18 - 1.4.25);

- consideration of the published literature on cost of capital issues; and

- testing the Commission's conclusions on the level of individual parameters, and its estimate of the overall WACC, against a range of financial and economic information.

6.2.9   The results of that extensive programme of work, and extensive consultation process, is summarised in this chapter and the IM Determinations.

6.3   The Cost of Debt

6.3.1   Debt is a source of capital for many firms. The cost of debt to a firm can be expressed as the sum of the risk-free rate – the rate at which the New Zealand Government can borrow – and the additional debt premium above the risk-free rate the firm must pay due to a lender's assessment of the firm's risk of default compared to the risk-free rate. The IM also includes an allowance for the costs of issuing debt. So the cost of debt is as follows:

Cost of debt = risk-free rate + debt premium + debt issuance costs

6.3.2   Each component is discussed in turn below.

Risk-free rate

6.3.3   A risk-free rate is the rate of interest expected when there is no risk of default. Debt issued by the New Zealand Government and denominated in New Zealand dollars is considered to be free of default risk. The rate of interest on Government issued debt can generally be readily observed from the trading on the debt market.

6.3.4 The cost of capital is an input into DPPs and CPPs. To ensure the cost of capital is consistent with the period of application of the regulatory instrument in which it will be applied, the term of the risk-free rate must be the same as the regulatory period. For most applications, this means a term of five years, though a three year or four year term will be required where a CPP applicant seeks a three or four year CPP.

6.3.5 The risk-free rate may either increase with term or decrease with term. When the risk-free rate declines with term, there is said to be an 'inverse yield curve'. New Zealand has had an inverse yield curve for significant periods in the past. At present New Zealand has a 'positive yield curve'. That is, Government bonds with a longer term to maturity have a higher yield than Government bonds with a shorter term to maturity (for example, 10 years versus five years). Higher long-term rates may be due to the uncertainty about future short-term rates or an expectation that future rates will rise, or uncertainty about the future inflation and thus the real return on Government bonds.

6.3.6 With a positive yield curve, (as New Zealand currently has) it is in the interests of suppliers for the estimates of the cost of capital to be based on a longer term rate, but the opposite would be the case when there is an inverse yield curve.

6.3.7 The term of the risk-free rate should match the regulatory period because if the term of the risk-free rate is longer than the regulatory period and there is a positive yield curve, regulated suppliers will be compensated for risks they do not bear. Conversely, if there is an inverse yield curve, regulated suppliers will be under-compensated if the term of the risk-free rate is longer than the regulatory period.

6.3.8 Submissions from a number of suppliers sought a term that was longer than the regulatory period (for example, a 10 year term). In essence, the arguments were that:

- regulated supplier's assets had a long life and firms generally seek to finance such assets with longer maturity debt (that is, longer than the regulatory period); and

- some firms have issued a portion of their debt with a maturity exceeding five years to manage their re-financing risks. [287]

6.3.9 Therefore, according to submissions from suppliers, the term of the risk-free rate and debt premium which matches the regulatory period is too short and would under compensate suppliers. However, these submissions overlook: (i) the ability of regulated suppliers to reset prices at the end of the regulatory period to compensate for changes in risk-free rates; and (ii) the widespread use of interest rate swaps. These are now discussed.

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[287] Based on data received from regulated suppliers during 2009, the Commission estimates only three of the 32 responding regulated suppliers had debt portfolios with an average original term to maturity which exceeded five years. In the 2010 survey, five of the 29 responding regulated suppliers had debt portfolios with an average original term to maturity which exceeded five years.

The power to reset prices

6.3.10   Regulated suppliers can reset their prices at the end of each regulatory period to reflect, among other things, changes in the risk-free rate if this has altered the cost of capital. Through the regular resetting of prices the uncertainty over the level of long-term interest rates is borne by users, rather than suppliers. Accordingly, suppliers' prices should not reflect a premium for the uncertainty of risk-free rates beyond the length of the pricing period.

6.3.11   The cost of capital IM provides for changes in risk-free rates and the debt premium to be reflected in updated estimates of the cost of capital. For suppliers subject to a DPP or CPP (or an IPP) this will occur at the start of each new regulatory period for each new DPP or CPP.

*The availability of interest rate swaps*

6.3.12   Firms have a mix of debt maturities to manage re-financing risk, including issuing long-term debt. This spreads a firm's re-financing requirements over a longer period and reduces the amount of debt that needs to be re-financed in any one year. Reducing re-financing risks has benefits for consumers, but long-term debt typically has a greater cost than medium or short-term debt.

6.3.13   The use of fixed-rate long maturity debt would, in the absence of a swap market, fix a firm's interest rate for the term of the loan, say 10 years.[288] But many firms do not want their interest rate fixed for 10 years, especially when the rate of interest on shorter-term debt is typically lower. Therefore the firm will use an interest rate swap, typically at the same time as the debt finance is raised, to shorten the period for which their interest rate is fixed. This can result in a lower rate of interest – the trade-off being that the firm does not know what interest rates will be at the time of the re-pricing.

6.3.14   The use of interest rate swaps allows the firm to choose the interest rate re-pricing period it faces, independently of the maturity date of the debt. For example, Transpower explained at the Cost of Capital Workshop that its target interest rate re-pricing period was 2 years, even though it raises debt capital with a longer maturity.

6.3.15   Interest rate swaps are widely used. This was evidenced in the information on debt profiles that the Commission obtained from regulated suppliers. Specifically, this showed that regulated suppliers were using swaps extensively to shorten their interest rate repricing periods.

6.3.16   Figure 6.1 compares the weighted average original tenor for regulated suppliers' debt with the weighted average interest rate re-pricing period for that debt.[289] The chart illustrates that due to the use of interest rate swaps, suppliers' choice of interest rate re-pricing period is independent of the tenor of the debt. Firms with long maturity debt had chosen interest rate re-pricing periods that were significantly shorter. No firm had an average interest rate re-pricing period which exceeded five years (even if the tenor of their debt was longer).

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[288]   A small number of New Zealand firms have issued bonds with floating rates of interest.
[289]   Tenor refers to the original term to maturity of a tranche of issued debt.

Figure 6.1　　Regulated Suppliers' Debt Portfolios: Tenor vs. Interest Rate Repricing Period (2010)
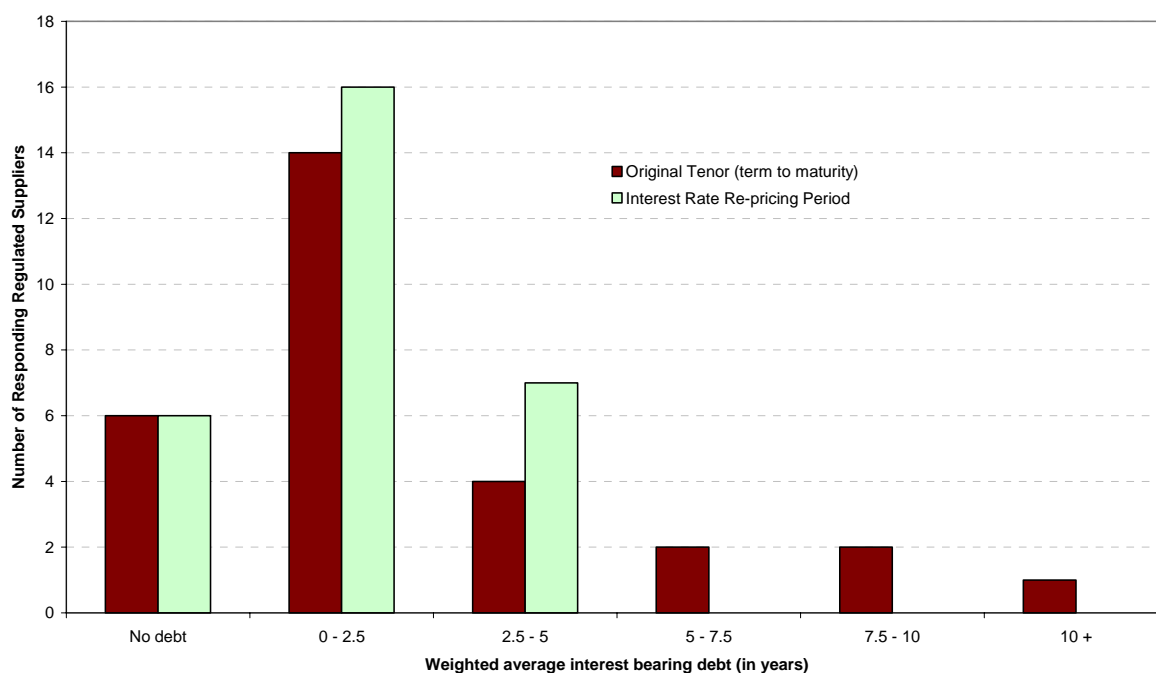
6.3.17　The data on the actual interest rate re-pricing faced by regulated suppliers illustrates regulated suppliers' ability to use swaps to alter their interest rate re-pricing period, and to set it to a term consistent with or shorter than the regulatory period. As such, it is inappropriate to set the term of the risk-free rate longer that the term of the regulatory period (and that it should not be set at 10 years). That is, doing so would (assuming a positive yield curve) over-compensate suppliers as they would receive a (higher) risk-free rate in their regulatory cost of capital when their actual interest costs have been re-priced to a much shorter term (lower rate) by the use of interest rate swaps.[290]

6.3.18　A number of New Zealand monopoly suppliers who are free to determine their own prices use a term for the risk-free rate which matches the pricing period, when estimating their own cost of capital. For example, Airways Corporation uses a five year risk-free rate in its estimate of its cost of capital[291] and a number of airports (e.g. Hamilton, AIAL, CIAL[292]) adopt a five year term for the risk-free rate in their estimates of the cost of capital, which corresponds with the length of their pricing agreements.

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[290]　The cost of entering an interest rate swap is included in the term credit spread differential allowance in respect of long-term debt. (See Appendix H6).

[291]　Airways Corporation, *Pricing Proposal 2009/10 Air Navigation Service Charges for Aircraft 5 Tonnes and under Supporting Information Pack,* at p.2. Airways Corporation, *Statement of Corporate Intent 2010/11 – 2012/13*, at p.11.

[292]　Hamilton International Airport, *Landing Charges Pricing Methodology*, March 2008, at p.15. Auckland International Airport Limited, *Identified Airport Activities Disclosure Financial Statements for the year ended 30 June 2009*, at p. 42. Christchurch International Airport Limited, *Disclosure Financial Statements for the year ended 30 June 2009*, at p. 42.

6.3.19   The risk free rate of return is estimated by the Commission as part of publishing annual WACCs for all regulated suppliers.

6.3.20   A more detailed discussion of issues around the risk-free rate is included in Appendix H4.
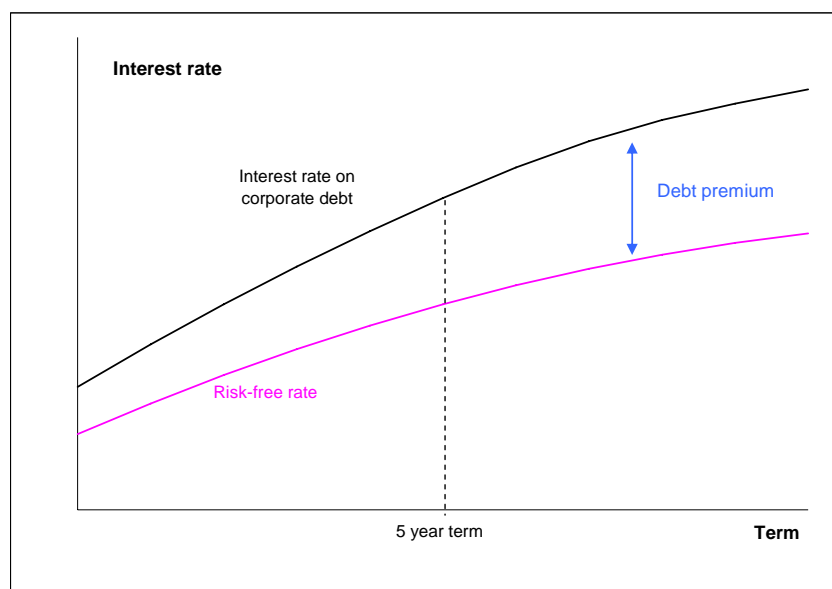
Debt premium

6.3.21   The second component of the cost of debt, which is added to the risk-free rate, is the debt premium. The debt premium reflects the additional risk an investor is exposed to when lending to a borrower other than the government. The size of the debt premium principally depends on the creditworthiness of the borrower, but also reflects the inferior liquidity of corporate bonds relative to Government bonds. Financially strong firms can borrow at a lower debt premium than weaker firms or financially distressed firms.

6.3.22   There are potentially significant costs and risks to consumers if a supplier becomes financially distressed. For example, a supplier in financial distress may curtail maintenance spending or reduce or defer efficient investment in network assets. This, in turn, may adversely affect the quality and reliability of service experienced by consumers. Excessive levels of debt are not in the long-term interests of consumers.

6.3.23   Credit ratings are an indication of a borrower's creditworthiness. The higher the rating, the lesser the assessed likelihood of default. A notional rating is specified as if suppliers' actual credit-ratings were used, they would have an incentive to increase gearing with adverse implications for consumers.

6.3.24   Standard & Poors minimum long-term credit rating to be considered investment grade is BBB-. The Commission considers the debt premium should be estimated by reference to a bond with a Standard & Poors' long-term credit rating of BBB+ (or equivalent rating from another recognised agency). A Standard & Poors long-term credit rating of BBB+ is sufficiently high to ensure there is an adequate buffer against the possibility that economic downturns or shocks can lead to financial distress, whilst providing regulated suppliers with some flexibility over the level of gearing and the choice of debt instruments.

6.3.25   New Zealand has only a limited number of bonds that are publicly traded. This can make it difficult to estimate accurately the debt premium for an EDB or GPB with a credit rating of BBB+ and a remaining term to maturity of five years. The IM Determination allows the Commission to consider a wider range of credit ratings and issuers than just BBB+ rated bonds issued by an EDB or GPB, when estimating the debt premium. This is discussed more fully in Appendix H5.

6.3.26   The debt premium is estimated by the Commission as part of publishing annual WACCs for all regulated suppliers.

The greater debt premium on long-maturity debt

6.3.27   The debt premium always increases with the original term to maturity (even if there is a negative yield curve). The increase in the debt premium as term increases is illustrated in Figure 6.2 below. The risk-free rate is shown as the lower line in the

graph, while the debt premium is the gap between the total cost of debt (the top line) and the risk-free rate.

Figure 6.2 The Relationship Between the Debt Premium and Term

6.3.28 As discussed above, firms use interest rate swaps to shorten the interest rate re-pricing period of the risk-free part of the interest rate on long-term debt. However, the greater debt premium on long-term debt cannot be economically removed through the swap market in the way the risk-free rate can be swapped. That is, the greater debt premium on longer-term debt continues to be borne by the firm.

6.3.29 Some suppliers have issued some debt with an original term to maturity that is longer than the regulatory period, for example, to manage refinancing risk. The Commission has surveyed regulated firms to see how many firms have a debt portfolio which, on average, exceeds the term of the regulatory period. Of the 29 regulated suppliers which responded to the Commission's request for information, the Commission estimates that only five (including Transpower, Vector and Powerco) have a debt portfolio whose weighted average tenor exceeds five years.

6.3.30 Where a supplier has a debt portfolio with a long average tenor, consumers benefit from the reduced refinancing risk and thus it is appropriate to recognise that part of the higher cost of issuing longer maturity debt cannot be removed through the swap market. Therefore, the cost of capital IM provides an allowance that recognises the incremental debt premium on longer term debt and the cost of executing an interest rate swap to shorten the re-pricing period of the long-term debt.

6.3.31 This allowance (called the term credit spread differential) will only apply where a supplier's debt portfolio has a weighted average tenor exceeding the length of the regulatory period. For suppliers whose debt portfolio has a weighted average tenor which is less than the length of the regulatory period, the allowance will not apply.

For such suppliers, a debt premium based on the term of the regulatory period is sufficient.[293]

6.3.32 This allowance will not be added to the estimate of the weighted average cost of capital (which will apply to all suppliers of services regulated under Part 4); rather the allowance will be added separately as an allowable cost (along with operating costs, depreciation etc) for qualifying suppliers only. The mechanics of how this allowance will apply in practice are explained in Appendix H6.

6.3.33 The practical effect of the term credit spread differential, in conjunction with a term for the risk-free rate and debt premium which matches the regulatory period, is to ensure suppliers are appropriately compensated including where greater debt premium is incurred due to the issue of long-term debt. It ensures suppliers are not overcompensated for risks and costs they do not incur (which would occur if the term of the risk-free rate and debt premium was greater than the term of the regulatory period).

6.3.34 The term credit spread differential is a practical way of recognising and compensating for the actual debt premium and swap costs incurred on long-term debt by some but not all suppliers, whilst ensuring the cost of capital is not overstated.

6.3.35 A more detailed discussion about the debt premium, including points raised in submissions and the Commission's response to these points, is included in Appendix H5. The term credit spread differential allowance is discussed in Appendix H6.

Debt issuance costs

6.3.36 Firms incur costs when raising new debt. These costs are not reflected in the debt premium but are an inherent cost of raising the debt finance needed to support an ongoing business. The Commission considers these costs should be included in the cost of capital for regulated suppliers.

6.3.37 Different forms of debt have different issuance costs. The Commission's estimate of the cost of issuing debt is based on the cost of issuing publicly-traded bonds, as this is the only publicly-available data.

6.3.38 The Draft Reasons Paper proposed an allowance of 0.30% per annum for a public issue of five year bonds, which was based on prior Commission decisions and a 1995 US estimate of debt issuance costs. Submissions from suppliers on the Draft Reasons Paper included more up-to-date data on the costs of issuing public bonds in New Zealand. Notwithstanding some issues with the quality of this data, the Commission considers this information does provide an improved basis for estimating the level of issue costs, and has increased the allowance for issue costs on publicly issued bonds to 0.35% per annum.

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[293] This could be seen as concessional for such suppliers since their actual debt tenor is less than the term of the regulatory period (and debt premiums rise with term). However, it is for each supplier to determine the average tenor of its debt portfolio. The Commission does not want to incentivise regulated suppliers to increase their refinancing risk by relying more heavily on shorter term debt.

6.3.39   The Commission considers this is a generous allowance for the costs of raising debt
          funding, as many regulated suppliers make extensive use of bank loans which would
          generally have an all-up cost below the all-up cost of public bond issues (though
          bank debt may have more onerous covenants). It is also greater (as a percentage)
          than the levels allowed by overseas regulators but the Commission considers this is
          justified by the smaller relative debt issues by New Zealand's regulated suppliers
          which may result in issue costs being a larger percentage of the debt amount.

6.3.40   In 2010 the Commission undertook a confidential survey on aspects of regulated
          suppliers' debt portfolios. The results of this survey indicate that the average debt
          issuance cost for publicly traded bonds was 0.22% per annum. This implies the
          0.35% per annum allowance for debt issuance costs in the IM is appropriate, if not
          generous in favour of suppliers.

6.3.41   Further detail on the level of debt issuance costs, including points raised in
          submissions and the Commission's response to these points, is included in Appendix
          H5. The appendix also includes a discussion on how regulated suppliers use swaps,
          and access offshore debt markets at a cost comparable with the all-up estimate of
          debt premium under the IM.

6.4   The Cost of Equity – The Choice of Model

6.4.1   The difficulties in estimating the cost of equity are greater than in estimating the cost
          of debt. The cost of equity, and most of its components, cannot be directly
          observed, but have to be estimated based on an analytical model. The choice of a
          model for determining the cost of equity is discussed in this section. Then the inputs
          for the preferred model have to be estimated. This is addressed in Section 6.5

6.4.2   The cost of equity is higher than the cost of debt as equity holders take more risk
          than debt holders (taking account of the different taxation treatments that may
          apply). There is a significant variation in risk between firms in different sectors of
          the economy. EDBs and Transpower, provide essential services with very stable
          demand, face limited substitutes and no, or limited, competition. Users have to use
          these services, they have very limited choices and very little bargaining power.
          More crucially, in regard to estimating the cost of equity, such firms may be less
          affected than the average firm by general cycles in economic activity. In that case,
          and run properly, such firms face significantly lower systematic risk than the
          average New Zealand firm. The expected return on equity in electricity lines
          businesses is much lower than for a typical or average company.

6.4.3   GPBs do have substitutes for their services and their services are not as essential to
          most users as electricity is. Accordingly the cost of equity for GPBs is likely to be
          more affected by market-wide factors than for EDBs and Transpower, but still below
          the market average.

The Capital Asset Pricing Model

6.4.4   There are a number of methods to estimate the cost of equity including the Capital
          Asset Pricing Model (CAPM), the dividend growth model and the Fama-French

three factor model. Of these, the CAPM is the most commonly used and most widely accepted methodology in investment analysis.

6.4.5   The use of the dividend growth model and the Fama-French three factor model to estimate the cost of equity is discussed in Appendix H2. These models have not gained the level of acceptance for estimating the cost of capital that the CAPM has. The Fama-French model is also criticised for its weak theoretical foundations, the possibility its results are due to chance; and the weak statistical significance of the factors included in the model. Its use in an Australian regulatory context was recently considered but firmly rejected by the AER.[294]

6.4.6   The dividend growth model is used by a number of US regulators but its use is best suited to listed firms as it requires a share price, good forecasts of dividend growth, and the method is only appropriate for stable, mature firms. Most New Zealand regulated firms are not listed, and there is a general lack of information required to reliably and confidently use the dividend growth model in a regulatory context.[295]

6.4.7   The CAPM was first developed in the early 1960s. The CAPM proposes that the cost of equity can be modelled as comprising a risk free component and a premium for risk. Under the CAPM, the size of the premium for risk increases in line with increases in the firm's exposure to systematic risk (with a measure of this risk which is referred to as beta). Systematic risk refers to market-wide risks which affect all risky investments. Non-systematic risk refers to risks which affect an individual company.

6.4.8   Globally, there is very widespread acceptance and use of the CAPM to estimate the cost of equity. In New Zealand, there is almost exclusive use of CAPM to estimate the cost of equity. The CAPM is:

- taught in undergraduate courses and texts;

- used by advisors and analysts in the market in estimating the cost of capital for firms;

- used in independent appraisal reports on takeovers; e.g. recent uses are Abano and NZ Farming Systems;

- used by many companies in estimating their cost of capital for consulting on pricing or disclosing regulatory returns; and

- used by The Treasury in estimating the Cost of Capital for Crown Entities and State-Owned Enterprises.

6.4.9   Other models to estimate the cost of equity have not achieved any significant degree of usage or acceptance in practice in New Zealand.

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[294]   AER, *Jemena Gas Networks, Access arrangement proposal for the NSW gas markets Final decision*, 1 July 2010- 30 June 2015, pp.108-172. A summary of the AER's conclusions are set out in paragraph H2.26.

[295]   Use of the dividend growth model to estimate the cost of equity is further discussed in paragraphs H2.28 to H2.30.

6.4.10   While the theory underpinning the CAPM is seen as intuitive and appealing, like all economic models the CAPM has its limitations. Like any model it contains a number of simplifying assumptions that may not hold in practice such as that there are no restrictions on short-selling, markets are frictionless, and investors may borrow or lend unlimited amounts at the risk-free rate.[296]

6.4.11   Another criticism of the CAPM is its poor performance in empirical tests. The CAPM forecasts returns from a stock to increase in a linear relationship to increases in beta (i.e. systematic risk). In some *ex post* tests of the CAPM, returns show a flatter line than CAPM has projected. That is, returns do not reflect variations in beta as strongly as expected. Use of the CAPM may therefore understate the cost of equity for low beta stocks, and overstate the cost of equity for high beta stocks. Possible explanations for this are that CAPM may exclude some variables that may help to explain the actual returns shown by stocks. For example, studies have suggested a large number of potential explanatory variables including relative firm size, book to market values, and share price momentum.

6.4.12   There are, however, a range of possible explanations for the results from the empirical tests. For example, the results may reflect the serious methodological problems that exist in undertaking robust tests of the CAPM,[297] or the difficulty of correctly observing the market portfolio.

6.4.13   Notwithstanding the criticisms of the CAPM, it is used extensively by regulators to estimate the cost of equity. The recent Independent Pricing and Regulatory Tribunal (IPART) review notes that all Australian regulators currently use the CAPM.[298] Use of CAPM is required under the Australian National Electricity Rules (which have the force of law and govern the operation of the Australian National Electricity Market). The CAPM is also used extensively in regulatory decisions in Ireland, UK and other parts of Europe, and is sometimes used as a cross-check in the United States (where the dividend growth model is generally preferred).

6.4.14   The CAPM has been used by the Commission since Decision 207 (1988) to estimate the cost of equity under the Commerce Act. The use of the CAPM was considered and accepted by the New Zealand High Court in the Auckland Bulk Gas Users case. In its judgment in that case the High Court described the CAPM as "a sensible theory, logically rigorous and consistent with accepted and acceptable economic thinking".[299] The Court stated that the CAPM:

> …is a simple concept, fundamental to financial theory, providing a positive relationship between the perceived or estimated risk and the required rate of return. We believe it is a satisfactory model and an appropriate method to calculate the capital cost for pricing purposes. We think that the Commission was entitled to make use of that methodology to the exclusion of other particular formulas in making its pricing decision.[300]

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[296]   Copeland, T., Weston, J., and Shastri K., *Financial Theory and Corporate Policy* 4th Edition, Pearson Education, 2005, chapter 6.

[297]   See for example the discussion in paragraph H2.22.

[298]   IPART, Alternative approaches to the determination of the cost of equity, November 2009. IPART oversees regulation of the water, gas, electricity and public transport industries in New South Wales.

[299]   *Auckland Bulk Gas Users v Commerce Commission* [1990] 1 NZLR 448, p.467.

[300]   *Auckland Bulk Gas Users v Commerce Commission* [1990] 1 NZLR 448, p.467.

6.4.15   The Cost of Capital Expert Panel also considered how best to estimate the cost of equity. All members of the panel recommended the use of the CAPM (in one form or another).[301]

6.4.16   The IM uses the CAPM for the following reasons:

- it enjoys almost universal use and acceptance by New Zealand companies, practitioners and analysts;

- it has been used consistently by regulators in New Zealand, Australia, UK and Europe;

- there is no consensus as to what model is better than the CAPM;

- no other model enjoys even a fraction of the support in practice that the CAPM enjoys; and

- there is still extensive ongoing debate about the theoretical basis of the other models, and there are difficulties in sourcing reliable data for these other models.

Simplified Brennan-Lally CAPM

6.4.17   The CAPM was developed by Sharpe, Lintner and Mossin during the early 1960s. The classical version of the CAPM assumes that all forms of investment income are equally taxed, and therefore that both dividends and capital gains are not taxed more favourably than interest. Since then a number of variations to the CAPM have been developed which incorporate different taxation considerations including the Officer CAPM in relation to the Australian taxation system and the Brennan-Lally CAPM in relation to the New Zealand taxation system. A different variant, the International CAPM, takes into account international investors.

6.4.18   The Brennan-Lally CAPM (Lally's adaptation for New Zealand circumstances of a CAPM model elaborated by Brennan) was developed to reflect New Zealand's taxation system. Specifically, it recognises the presence of imputation credits and the general absence of taxes on capital gains.[302] There is an extended form of the Brennan-Lally CAPM and a simplified version, but it is the simplified Brennan-Lally CAPM that has become the dominant form of the CAPM in use in New Zealand. Indeed, in New Zealand the term simplified Brennan-Lally CAPM has become largely synonymous with the generic term CAPM, and the terms are frequently used interchangeably. It is reasonably rare to find a CAPM-based estimate of the cost of equity in New Zealand that does not rely on the simplified Brennan-Lally CAPM.

6.4.19   In the New Zealand context, the simplified Brennan-Lally CAPM has generally been used by the Commission in prior cost of capital decisions. The reasons for

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[301]   Professor Myers recommended the classical CAPM, Associate Professor Lally recommended the simplified Brennan-Lally CAPM, while Professor Franks recommended the use of both of these models and the International CAPM.

[302]   The dividend imputation system lets companies pass on to their shareholders credits for the New Zealand income tax paid by the company. This means that shareholders get the benefit of the income tax the company has paid.

preferring the simplified Brennan-Lally CAPM in the IM rather than other CAPMs
are:

- the assumptions of the simplified Brennan-Lally CAPM are consistent with the
  New Zealand tax system, whereas the assumptions of other CAPMs are not.
  For example, the classical Sharpe-Lintner CAPM does not adjust for the effect
  of imputation credits and assumes the same rate of taxation on dividends as on
  capital gains. This is not representative of the New Zealand system of
  taxation. Professor Franks notes the UK used a similar model to the simplified
  Brennan-Lally CAPM when it had a tax imputation regime that was similar to
  New Zealand's;[303]

- the simplified Brennan-Lally CAPM is very widely used and accepted in
  New Zealand, including by companies, investment analysts, practitioners,
  independent takeover appraisal reports, and advisors, and is the preferred
  method for estimating the cost of capital in New Zealand;

- the continued use of the simplified Brennan-Lally CAPM was strongly
  supported at the Cost of Capital Workshop;[304] and

- the continued use of the simplified Brennan-Lally CAPM was supported by
  most submissions on the Draft Reasons Paper, though submissions from
  suppliers often sought an allowance for model and parameter error.

Ad hoc allowance for model error

6.4.20   A number of submissions sought an *ad hoc* allowance for model error. In general,
the argument was that an *ad hoc* adjustment should be made to the estimate of the
cost of equity produced by the simplified Brennan-Lally CAPM to allow for the
possibility that the cost of equity may be understated, especially on low beta stocks.

6.4.21   The fundamental difficulty with making *ad hoc* adjustments is that it is necessary to
know why an adjustment is required, to assess whether it is justified (in the context
of a particular industry, and to ensure consistency with the legislation) and what the
size of the adjustment should be.

6.4.22   Associate Professor John Handley provided the following advice to the AER (on a
similar issue):

> Contrary to the view of the JIA/CEG, the fact that we don't have a clear explanation for
> the empirical results is of critical importance. In short, if there was a problem with the
> model (and again, the analysis of Roll suggests that this is not necessarily the case) then
> we would need to know exactly what that problem was before we could consider
> making any adjustments to the model's output. Further and as mentioned in my previous
> report, in this case, the most appropriate way to proceed would be to completely replace
> the Sharpe CAPM with an appropriate alternative asset pricing model. Simply making
> an ad hoc adjustment to the CAPM determined rate of return as suggested by CEG

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[303]   Franks, J., Lally M., & Myers S, Recommendations to the New Zealand Commerce Commission on an Appropriate
Cost of Capital Methodology, 2008, p. 11.

[304]   Commerce Commission, *Cost of Capital Workshop Transcript*, 12-13 November 2009, pp. 38-40. After the workshop,
Vector noted that "[h]istorically the Commission has adopted the simplified Brennan-Lally CAPM. It was evident
from the workshop that there was little dispute that this is an acceptable approach to use." Vector, *Cross Submission to
Commerce Commission on the Weighted Average Cost of Capital Workshop,* 2 December 2009, p. 7.

(albeit to tie it back to their empirical results) would by definition be arbitrary and therefore could not be justified. Unless one knows first, whether there is a problem and second, what is the source of the problem then one cannot possibly come up with an appropriate "solution".[305]

6.4.23   There are a number of other objections to making *ad hoc* adjustments:

- there are multiple competing models and explanations for the empirical results and no consensus on how these are to be interpreted. The Commission, therefore, cannot determine a robust or defensible basis for when an adjustment is required, how large it should be, and potentially in which direction it should go;

- there is no evidence that practitioners make explicit allowances for model error when estimating a firm's cost of capital in non-regulatory contexts;

- there is no evidence before the Commission that regulated suppliers themselves, or their advisers, make any such *ad hoc* adjustment for model error when estimating the cost of equity in non-regulatory contexts;[306]

- the Commission has never made *ad hoc* allowances for model error previously and has not been made aware that any other regulators have done so; and

- some of the possible adjustments concern variables such as the relative size of firms, or a firm's market value relative to its book value. These variables are firm-specific, whereas the IM seeks to estimate the efficient industry cost of capital.

6.4.24   The Commission does not consider it is appropriate to make ad hoc adjustments for model error, and the IM does not provide for any *ad hoc* adjustments for model error.

Specific submissions in support of an ad hoc allowance for model error

6.4.25   A number of submissions argued that the Commission was wrong to rely solely on the simplified Brennan-Lally CAPM. These submissions argued that an ad hoc allowance should be made to the cost of equity estimated using the simplified Brennan-Lally CAPM to allow for the possibility that it may understate the cost of equity on low beta stocks. For example:

- CRA, on behalf of Unison Networks, argued for a small company premium;[307]

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[305]   Handley, J., Further Comments on the Sharpe CAPM, Report Prepared for the Australian Energy Regulator, 16 March 2009, p. 6.

[306]   Some firms may set higher hurdle rates of return for new investments that are above the estimated cost of capital. This may be done for a number of reasons, including to offset the risk that the forecast cash-flows from a new investment may reflect an over-optimistic view of its potential success. High hurdle rates for new projects are not, in the Commission's view, evidence that an explicit allowance has been made for model error in using CAPM to estimate the cost of capital. Further, even if a firm sets higher hurdle rates for new projects, the expected return for the company is determined by its estimated WACC, not the hurdle rates.

[307]   Charles River Associates, *Regulated Returns for Australian and New Zealand Electricity Distribution*, 15 August 2010. A report on behalf of Unison, pp.5-14.

- Professor Grundy, on behalf of Vector, proposed the use of the Black CAPM;[308] and

- a number of submissions noted that the assumption in the simplified Brennan-Lally CAPM that investors fully value imputation credits was not true in practice, so the estimates of cost of capital may be understated as a result.

6.4.26   Each of these suggestions is discussed in turn.

Small company premium

6.4.27   CRA, on behalf of Unison Networks, noted certain empirical studies that show that the actual returns on US companies with smaller market capitalisations may be greater than for companies with larger market capitalisations. This implies that use of the CAPM (which takes no account of company size) may understate the expected return for companies with small market capitalisations. CRA propose an additional premium to the cost of capital for regulated suppliers based on their relative size.

6.4.28   The Commission disagrees with this approach. First, it has not been conclusively established that smaller companies do have a higher cost of capital than implied by the CAPM because a number of studies have failed to find the so-called small cap effect. In recent advice to the Commission for Energy Regulation (Ireland) on the small company premium, Europe Economics observed that there is "scant evidence that there is any small companies premium to explain", [309] that "for the period since 1981, there appears to be no small companies premium", [310] and "the use of a small companies premium is incompatible with the broad thrust of modern corporate finance theory".[311]

6.4.29   Second, even if there is a small company premium it is not clear that this is relevant under Part 4 of the Act. As discussed in paragraphs 6.2.2 to 6.2.7, the focus on outcomes in workably competitive markets requires a focus on the efficient cost of capital, over time, for an industry. Firms which incur higher costs, by not increasing their market capitalisation, cannot expect to recover these costs from consumers in workably competitive markets. Accordingly, and consistent with the Part 4 Purpose, they should not expect to recover these costs in markets regulated under Part 4 either.

Black CAPM

6.4.30   Professor Grundy and CEG challenged the use of the simplified Brennan-Lally CAPM. After reviewing the weaknesses of the Sharpe-Lintner CAPM, Professor Grundy asserts that the Black CAPM better fits the empirical data, and that use of

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[308]   Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital, Attachment: Grundy B. The Calculation of the Cost of Capital: a report prepared for Vector Limited,* 13 August 2010.

[309]   Europe Economics, *Report for the Commission for Energy Regulation, Cost of Capital for Transmission Asset Owner, Transmission System Owner, Distribution System Operator*, 11 June 2010, Appendix 1, p.3.

[310]   Europe Economics, *Report for the Commission for Energy Regulation, Cost of Capital for Transmission Asset Owner, Transmission System Owner, Distribution System Operator*, 11 June 2010, Appendix 1, p.1.

[311]   Europe Economics, *Report for the Commission for Energy Regulation, Cost of Capital for Transmission Asset Owner, Transmission System Owner, Distribution System Operator*, 11 June 2010, Appendix 1, p.3.

the Black CAPM would produce much higher estimates of the cost of equity for low beta firms.

6.4.31   However, despite devoting 12 pages of his 18 page submission critiquing the Sharpe-Lintner CAPM, it is notable that Professor Grundy's submission:

- offers no evidence of the superiority of the Black CAPM, other than asserting that it better fits the data;

- contains no critique of the assumptions of the Black CAPM (despite Black himself calling one of the key assumptions in the Black CAPM "unrealistic")[312] nor does it address the criticisms of bias in a number of empirical tests of the CAPM that is made by Pettengill, Sundaram, & Mathur;[313]

- does not refer to any empirical support for the Black model or note its mixed performance in empirical tests; and,

- perhaps most critically, does not discuss why, despite being developed 35 years ago, the Black CAPM still enjoys no popular support. The Commission is not aware of any advisor or company in New Zealand that uses the Black CAPM – which is similar to the conclusion the AER drew recently. Nor is there any evidence that Vector, on whose behalf Professor Grundy submitted, actually uses the Black CAPM itself. If the Black CAPM is a better predictor of the cost of equity (for New Zealand firms), it could be expected to be much more widely used than it is.

In the Commission's view, Professor Grundy's submission considerably overstates the level of support for the Black CAPM.

6.4.32   In short, there is no compelling evidence before the Commission that the Black CAPM is a better predictor of the cost of equity, such that the results of an established and generally used and accepted model (the simplified Brennan-Lally CAPM) should be replaced or adjusted with the results from a model that is not established, and that is not used in practice either by market participants or other regulators.

International investors and the value of imputation credits

6.4.33   A third line of submissions calling for an adjustment to the results from the simplified Brennan-Lally CAPM concerns its assumption, like that of the classical Sharpe-Lintner CAPM, of a segregated domestic market. That is, the simplified Brennan-Lally CAPM assumes all investors are resident shareholders and can use

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[312]   Black, F., Capital market equilibrium with restricted borrowing, *Journal of Business*, 1972 (45) p.444, p. 446.

[313]   G. Pettengill, S Sundaram, & I. Mathur, The Conditional Relation between Beta and Returns, *Journal of Financial and Quantitative Analysis*, Vol. 30, No, 1 Mar 1995, pp. 101-116. Pettengill et al argue that many prior empirical tests are biased against the CAPM as they fail to adjust for the conditional relationship between actual returns and beta. Adjusting for this bias, Pettengill et al find a strong positive relationship between beta and returns. Their work spawned a significant number of subsequent studies, the results of which were also more supportive of the CAPM than previous studies, and in particular that there was a strong relationship between beta and returns.

the imputation credits paid with dividends. A number of submitters noted that this assumption was unrealistic given the high level of international ownership in New Zealand generally. Submitters argued that this implied the simplified Brennan-Lally CAPM may therefore underestimate the cost of capital on the grounds that international investors would require a higher return than domestic investors since the international investors cannot use the imputation credits distributed by New Zealand companies.

6.4.34 The Commission considers that domestic and international investors have different perspectives on a number of components of the cost of capital, not just how imputation credits are valued. In particular, international investors hold different portfolios and perceive the relative risk of New Zealand investments differently to domestic investors. For international investors, the risk of New Zealand firms is measured against the range of investments they have access to. New Zealand firms may well represent a diversification opportunity from the perspective of such investors. In that case, investment in New Zealand firms would not add as much systematic risk and could in this sense be less risky than if evaluated only in the context of other New Zealand firms.[314]

6.4.35 The simplified Brennan-Lally CAPM was designed to focus on New Zealand resident shareholders. To consider the position of international investors a different CAPM model is required, such as the International CAPM. The International CAPM takes into account that international investors hold a very different market portfolio to New Zealand investors, and may face a different market risk premium, beta and risk-free rate to New Zealand investors. It is far from clear that this will produce a higher estimate of the cost of equity. Indeed the available evidence suggests that it is more likely that use of an International CAPM will produce lower estimates of the cost of equity than a domestic CAPM would estimate.[315] That is, use of a domestic CAPM (such as the simplified Brennan-Lally CAPM) is therefore more likely to be generous in favour of New Zealand suppliers, than the use of an international variant of the CAPM. In previous advice to the Commission on electricity lines businesses, Dr Lally sought to quantify the potential bias from use of a domestic CAPM rather than an international variant.[316] He concluded that the cost of equity using a domestic CAPM (simplified Brennan-Lally CAPM) was about 0.7% higher than if an International CAPM was used.[317]

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[314] There is strong support for this conclusion in the literature. See, for example: Stulz, R., Globalization of equity markets and the cost of capital, Paper prepared for the SBF/NYSE Conference on Global Equity Markets, Feb 1999, Table 1. Perold, A., The Capital Asset Pricing Model, The Journal of Economic Perspectives, Vol. 18 No. 3, 2004, pp.3-24.

[315] See, for example, the argument of Dr Lally (in Lally, M., *The cost of capital for regulated entities, Report Prepared for the Queensland Competition Authority*, February 2004, pp.27-32) and in the Expert Panel report (Franks, J., Lally M., & Myers S, *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology*, 2008), at p. 11. And see also, for example, Stulz, R., Globalization and the cost of capital: The Case of Nestle*, European Financial Management*, 1995, pp.30-38; Errunza, V., and Miller, D., Market segmentation and the cost of capital in International Equity Markets. *Journal of Financial and Quantitative Analysis*, Vol. 35, December 2000, pp.577-600; Errunza, V., and Miller, D., Market segmentation and the cost of capital in International Equity Markets. *Journal of Financial and Quantitative Analysis*, Vol. 35, December 2000, pp.577-600.

[316] Lally, M., *The Weighted Average Cost of Capital for Electricity Lines Businesses*, September 2005, pp.63-66.

[317] Lally, M., *The Weighted Average Cost of Capital for Electricity Lines Businesses*, September 2005, p.66. Assuming an asset beta of 0.50, and 40% leverage, the domestic CAPM increased the WACC by about 1% over the international CAPM.

Conclusion on choice of model for estimating the cost of equity

6.4.36   The Commission considers the simplified Brennan-Lally CAPM is the best model for estimating the cost of equity in New Zealand. Like other models it has its imperfections. However, the simplified Brennan-Lally CAPM enjoys such widespread support, and competing models such limited support, that there is currently no credible alternative.

6.4.37   The Commission acknowledges that the results of a number of empirical tests imply that the CAPM may understate the returns on low beta stocks. This possibility is acknowledged also by the Cost of Capital Expert Panel. However, there are a number of possible explanations for the results of the empirical tests, no better model is available, and there is no reliable basis for determining the size or direction of any adjustment for model error that may be required. Nor is there any evidence that New Zealand market participants make an allowance for model error when using the simplified Brennan-Lally CAPM to estimate the cost of equity for New Zealand firms. In short, the evidence is not sufficient to justify making a specific ad hoc adjustment to compensate for the possibility of model error.

6.4.38   To address a number of uncertainties over the true cost of capital, the IM requires the Commission to estimate a range for the cost of capital and to use an estimate of the cost of capital above the mid-point of this range when setting price-quality paths (this is discussed in paragraphs 6.7.3 to 6.7.12 below and in Appendix H11). Further, the Commission's estimate of the cost of capital using the IM is checked for reasonableness against a range of other information, and the Commission concludes that its estimates produced using the simplified Brennan-Lally CAPM are reasonable and commercially realistic. Appendix H13 discusses the reasonableness tests in detail.

6.4.39   The application of the simplified Brennan-Lally CAPM is discussed in the next section.

6.5   Cost of Equity – Applying the Simplified Brennan-Lally CAPM

6.5.1   Under the simplified Brennan-Lally CAPM, the expected cost of equity is a function of the risk-free rate (after tax) plus the equity beta multiplied by the Tax-adjusted Market Risk Premium (TAMRP).

Cost of equity = Risk-free rate x (1 - Investor tax rate) + Equity beta x TAMRP

6.5.2   The following section considers each component in turn.

The risk-free rate

6.5.3   The same term of the risk-free rate is adopted for the cost of equity that was used for the risk-free rate and the debt premium. This ensures consistency in estimating the cost of equity and the cost of debt. It also ensures the overall cost of capital is estimated on a basis consistent with the regulatory period to which it will be applied.

TAMRP

6.5.4   The market risk premium (MRP) represents the additional return, over and above the risk-free rate, that investors look for to compensate them for the risk of holding a

portfolio of average risk (more precisely the market portfolio which is the average risk portfolio).

6.5.5   Under the simplified Brennan-Lally CAPM, the MRP is adjusted for tax faced by the investor on equity returns (hence, tax adjusted MRP, or TAMRP). The TAMRP can be derived from the MRP. Consistent with the use of a five year term for the risk-free rate in the CAPM, the Commission also uses a five year risk-free rate when estimating the TAMRP.

6.5.6   The TAMRP is a forward looking concept which cannot be directly observed. A number of approaches can be used to estimate the TAMRP. These approaches include:

- studies of historic returns on shares relative to the risk-free rate;

- surveys of investors that ask them to state their expected rate of return for the overall market; and

- empirical estimates of the MRP from share prices and expected dividends.

6.5.7   In setting a value of the TAMRP, the Commission has considered a range of information sources. The most common approach to estimation of the TAMRP is to use historic returns on the market. While *ex post* returns have fluctuated significantly over time, regulators and practitioners have typically used or placed weight on estimates over long periods of time.[318]

6.5.8   There is debate as to whether historical premiums are accurate predictors of future premiums. A number of prominent finance experts have argued that future rates of return will be less than that experienced historically.[319] Surveys of investors can provide an indication of the premium that investors will look for in the future. However, surveys can be unreliable as respondents can, for example, interpret questions in different ways.

6.5.9   The Commission has considered a range of information, including both forecast and historic estimates of the TAMRP. A range of such estimates is shown in the table below. The table evidences a wide range of estimates of the TAMRP. Both the mean and median are around 7%.

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[318]   Conceptually, over the long term, the occasions on which the premium of actual returns over the risk-free rate exceeds investors' expectations should be offset by the occasions on which that premium is below investors' expectations. So the average premium will therefore provide an estimate of the premium that on average investors look for.

[319]   See for example Dimson, E., March P. and Staunton M., *Triumph of the Optimists: 1001 Years of Global Investment Returns,* Princeton University Press, New Jersey, 2002; Dimson, E., March P. and Staunton M., Global Evidence on the Equity Risk Premium, *Journal of Applied Corporate Finance,* Vol. 14, 2003, pp. 27-38; and Arnott, R. and Bernstein P., What Risk Premium is 'Normal'?, *Financial Analysts Journal,* Vol. 58, No. 2, March/April 2002, pp. 64-85.

Table 6.2   Estimates of the TAMRP - Assuming a 5-year term (where possible) of the risk-free rate for 2010

Methodology	NZ	US	Other	All
Ibbotson *	7.27%	7.67%	7.50%	
Siegel *	6.40%	7.30%	6.60%	
Cornell	5.20%	6.80%		
Survey	8.20%	6.90%		
Median	6.84%	7.10%	7.05%	7.09%
Mean	6.77%	7.17%	7.05%	6.98%

* The Ibbotson estimate for "Other" and Siegel estimates in this table are for a 10-year risk-free rate term not a 5-year term. It is not possible to adjust the Ibbotson estimate for "Other" due to the lack of a suitable proxy. It is not possible to adjust the results from the Siegel method due to the lack of a term structure for inflation-proof bonds.

6.5.10   A number of submissions from suppliers called for a TAMRP of 7.5%. In support of this, submitters referred to an informal survey of attendees at the Cost of Capital Workshop where, at that time, most participants were using a TAMRP of 7.5% (responses ranged from 7% to 7.75% with one response of 9%).

6.5.11   The Commission does not consider this informal survey to be a good indicator of the TAMRP in New Zealand. In particular, the sample at the conference was very small, it was not randomly selected (most of the attendees were selected by regulated suppliers), and the attendees' views are not representative of the range of views on the prevailing TAMRP in New Zealand. For example, the informal survey excludes all of the major investment banks who are major players in raising debt and equity finance for many firms. New Zealand investment banks use TAMRP estimates ranging between 6.5% and 7.25% as shown in Table 6.3 below.

Table 6.3   TAMRP Estimates Used By Major New Zealand Investment Banks

Investment bank	TAMRP estimate used
Deutsche Bank / Craigs Investment Partners	6.5% (plus separate recognition for imputation credits)
Goldman Sachs	6.8%
Forsyth Barr	7%
UBS	7%
Macquarie Bank	7%
First NZ Capital	7.25% (uplifted from a normal 7% after the GFC)

6.5.12   Many New Zealand advisors that propose a 7.5% estimate of the TAMRP appear to rely on research on the New Zealand TAMRP undertaken by PwC. In a submission on behalf of ENA, PwC critiques the Commission's discussion of the TAMRP

estimate in the EDB Draft Reasons Paper, including that it relies on out-of-date information.[320]

6.5.13   PwC's publicly available research in support of its 7.5% estimate of the TAMRP is dated 2002. The Commission estimates that if this were updated for the subsequent performance of the New Zealand market, the estimate of the TAMRP would fall by approximately 0.5% to around 7%.[321]

6.5.14   The appropriate level of the TAMRP was considered also by the Commission's Cost of Capital Expert Panel. The panel recommended that the Commission retain its approach of examining both forward-looking and backward looking estimates, though the experts differed on the weight that should be given to each. The panel considered the Commission's proposed 7% estimate of the TAMRP to be reasonable. The Commission has used an estimate of 7% since 2003.

6.5.15   In light of all the information available to it, the Commission considers the best estimate of the likely future long-term TAMRP for the NZ market is 7%. This is because it:

- best reflects the range of evidence available, including both historical returns and expected future returns;

- is considered reasonable by the Cost of Capital Expert Panel; and

- is consistent with the range of TAMRP estimates used by New Zealand market participants, including New Zealand investment banks.

Impact of the GFC

6.5.16   In the Draft Reasons Paper the Commission proposed a temporary uplift of 0.5% to 7.5% in the TAMRP until June 2011 to reflect the effects on the premium for risk from the Global Financial Crisis (GFC). The Commission took this view on the basis of advice from the Cost of Capital Expert Panel that the MRP had likely increased as a result of the GFC.[322] However, as there was no good information on the amount or duration of any increase, the size and timing of the uplift was a judgement call by the Commission. Some, but not all, regulators in other countries also temporarily increased their MRP estimates.

6.5.17   Some submissions argued that the Commission was premature to conclude the GFC would end by June 2011. The Commission accepts that the effects of the GFC in terms of slow economic growth may last beyond June 2011, but with respect to the TAMRP the relevant issue is the GFC's effect on the size of the premium investors seek for holding risky assets. There is strong evidence that the increase in the TAMRP from the GFC was temporary and is reverting to normal (that is, around 7%). In particular the Commission notes:

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[320]   The Commission comments on other issues raised by PwC regarding the TAMRP are in Appendix H7.

[321]   This is discussed at paragraph H7.73.

[322]   J. Franks, M. Lally, & S. Myers, *Recommendations to the New Zealand Commerce Commission on whether or not it should change its previous estimate of the tax-adjusted market risk premium as a result of the recent global financial crisis*, 14 April 2010.

- the New Zealand share market and global share markets have stabilised and are at levels well above their GFC-induced lows;

- the VIX, a key short-term indicator of investor risk aversion, has fallen significantly and is back to around its long-term trend levels;[323]

- the Australian Competition and Consumer Commission, which increased its MRP estimates after the GFC, has in recent decisions reverted back to its normal long-run estimate of the Australian MRP;[324]

- annual surveys of the level of MRP companies and analysts use in their CAPM models indicate a decline since the GFC;[325] and

- many New Zealand market participants did not increase their TAMRP estimates during or after the GFC (for example only one of the advisors at the Cost of Capital Workshop had increased its TAMRP estimate). Some New Zealand market participants have subsequently reduced the temporary increase they made to their TAMRP estimates during the GFC (e.g. First NZ Capital).

6.5.18   For the above reasons, the Commission concludes the best estimate of New Zealand's long-run TAMRP remains 7%, and that it is prudent and realistic to temporarily increase the estimated TAMRP to 7.5% but that this should end during 2011. The estimated TAMRP is expressed as a five-year composite rate. For the five-year period which commences on 1 July 2010, the TAMRP is 7.1% and for the five year period which commences on 1 July 2011 the TAMRP is 7%.

Asset betas

6.5.19   Beta is a measure of exposure to systematic risk. Systematic risk measures the extent to which the returns on a company fluctuate relative to the equity returns in the stock market as a whole. If an investment had no systematic risk (i.e. it would show no correlation with returns on the market), its equity beta would be zero.[326] If an investment in the equity of a company is of average risk, the equity beta will be 1. This means that the premium over the risk-free rate that equity investors expect will be the same as the average for the overall market (the TAMRP).

6.5.20   Beta is estimated empirically. As the cost of capital is intended to be forward-looking, forward-looking betas are required. As there is no reliable way to forecast asset betas, the Commission, like other analysts, assumes that historic beta estimates are indicative of future betas. Historic estimates of average betas are used as beta is expected to be relatively stable over time.

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[323]   VIX is the ticker symbol for the Chicago Board Options Exchange's Volatility Index. The VIX is a widely used measure of market expectations of near-term volatility conveyed by S&P 500 stock index option prices. Higher levels of the VIX indicate greater expected market volatility, while lower VIX levels indicate a more benign outlook.

[324]   See for example, ACCC , *Australian Postal Corporation 2010 Price Notification Decision*, May 2010, p. 80 and ACCC *Australian Rail Track Corporation Limited Hunter Valley Coal Network Access Undertaking*, Draft Decision March 2010, pp. 565-570.

[325]   See for example Fernandez, P, and del Campo, J., *Market Risk Premium used in 2010 by Analysts and Companies: a survey with 2,400 answers*, May 21 2010. In the survey reported in that paper three times as many respondents had reduced their MRP estimates in 2010 when compared to their estimates in 2009, than had increased their estimates (pp. 3-4, and 6-7).

[326]   The Commission is not aware of any company which has a beta of zero.

6.5.21   At the time of the Draft Reasons Paper the Commission estimated the asset beta of
0.34 for electricity businesses based on analysis of the monthly data over five years
for 54 US, UK, Australian and NZ electricity and gas companies. Since then, the
Commission has undertaken extensive further analysis of relevant asset betas. The
Commission's analysis is set out in more detail in Appendix H8. The Commission's
empirical analysis included:

- a wide range of sampling periods, using data over the period from 1990 to
  2010. This was to ensure the estimate of the asset beta was not due to a
  sampling period that was unrepresentative of the true beta. This assumes that
  the average beta for the industry is relatively stable;

- daily, weekly, and monthly frequency data. This was to ensure the estimate of
  the asset beta was not biased by the choice of sampling frequency;[327] and

- a large sample of 79 US, UK, Australian and NZ electricity and gas
  companies. Small companies were excluded to ensure any thin trading in their
 shares could not affect the estimates of the asset beta.

6.5.22   A summary of the results is shown in Figure 6.3 below. The additional analysis
produced an average asset beta of 0.28 using monthly data and 0.32 using weekly
data.[328] This confirms the Commission's original estimate of 0.34 included in the
Draft Reasons Papers for EDBs, GPBs, and Transpower is a reasonable estimate of
the asset beta. Indeed it indicates, based on the broader range of time periods that
were analysed, that an allowance of 0.34 is generous in favour of suppliers, and that
the asset beta estimate could be reduced to around 0.30. This would be in line with
the Commission's estimates in previous decisions. However, given the variability
in the estimates, and that beta cannot be estimated with precision, the Commission
considered the more prudent approach was to leave the estimate of the asset beta at
the level of 0.34 that was proposed in the Draft Reasons Paper.

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[327]   The advantage of shorter (e.g. daily) periods is that they provide more observations, and potentially increase the
statistical robustness of estimating beta. The disadvantage of shorter periods include that beta can be distorted if stocks
trade infrequently. Shorter periods are also further removed from the concept that is being estimated (i.e. how stocks
perform relative to significant market movements) and may therefore be misleading if share prices do not follow a
purely random walk.

[328]   The beta estimates using daily data were very similar to those using weekly data.

Figure 6.3   Comparable Companies Unadjusted Asset Betas
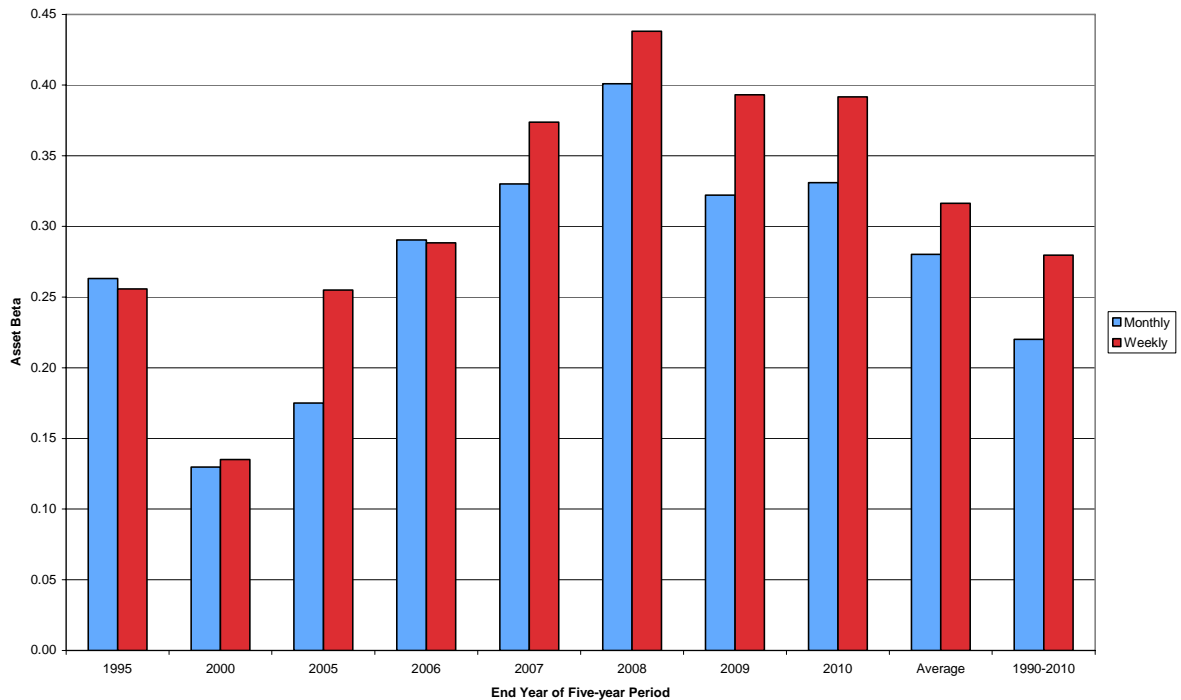
6.5.23   To assess the reasonableness of the asset beta estimate, the Commission has
         compared the results of its asset beta analysis across a range of estimates of the asset
         beta from other sources. The results of this comparison are shown in Figure 6.4
         below.

**Figure 6.4   Comparison of Asset Beta Estimates for EDBs and Transpower with
                  Other Asset Beta Estimates**
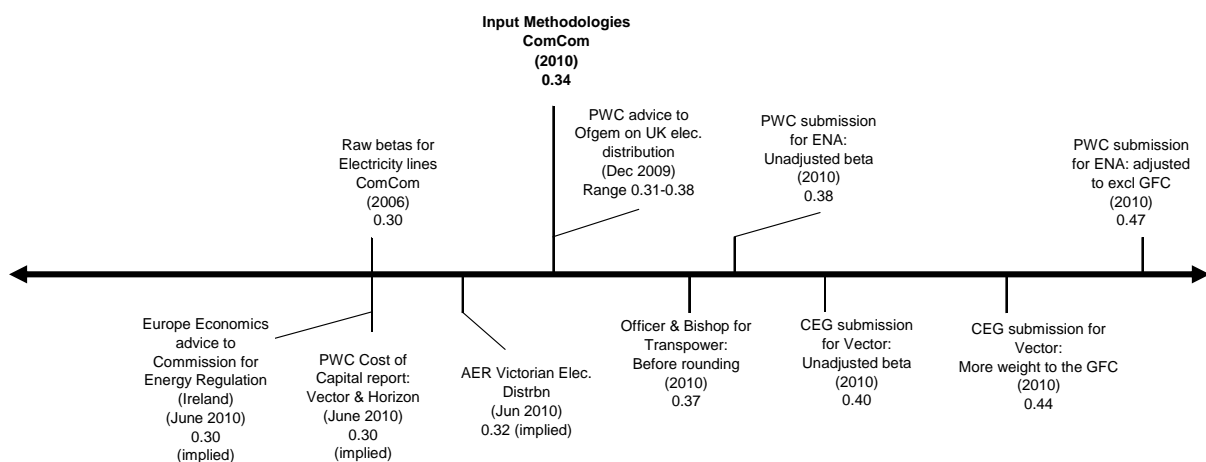
6.5.24   Figure 6.4 shows that despite the differing approaches to estimating beta, and the
         different periods analysed, most estimates of the asset beta for electricity distribution
         and transmission companies fell within a reasonably tight range of between 0.30 and
         0.40. A recent review by Europe Economics for the Commission for Energy

Regulation (Ireland) noted that the range of asset betas in previous Irish and UK regulatory decisions on energy utilities was between 0.20 and 0.41.[329] Figure 6.4 also shows that the Commission's 0.34 estimate of the asset beta for electricity distribution and transmission companies falls firmly within the range of comparable information, and indeed is near the middle of that range. This supports the Commission's view that its estimate is a reasonable estimate of the asset beta for EDBs and Transpower.

6.5.25 Some submissions asked the Commission to adjust its asset beta estimate in light of the effect of the GFC. PwC on behalf of ENA submitted that the Commission should exclude the period of the GFC when estimating the asset beta. PwC's analysis shows an increase in its estimate of the asset beta from 0.38 to 0.47 if the GFC period was excluded. The Commission notes, however, that in its advice to Ofgem on the cost of capital for the UK electricity distribution businesses (December 2009), PwC UK did not propose to exclude the period of the GFC when estimating the asset beta. Further, PwC did not exclude the period of the GFC when estimating the asset beta for airports in submissions to the Commission on the Airports Draft Reasons Paper.[330]

6.5.26 In stark contrast to PwC's submission to exclude the period of the GFC for EDBs, CEG on behalf of Vector submitted that the Commission should give greater weight to beta estimates during the GFC, as beta matters most to investors when risk is high. Taking this approach, CEG estimated an asset beta of 0.44 compared with CEG's unadjusted beta estimate of 0.40. In a subsequent submission on behalf of Vector, CEG submitted that the Commission should exclude the period of the "tech boom and wreck" period (circa 2000-2002) on the basis that it was unrepresentative.[331] The Commission cannot see on what principled basis one period of significant market volatility (the GFC) should be given greater weight, while another period (the dot com era) should be excluded as being 'unrepresentative'.

6.5.27 The Commission cannot reconcile the submissions from PwC and CEG as regards the appropriate treatment of the period of the GFC. The Commission does note that after PwC and CEG's adjustments, their resulting estimates of the asset beta are above the range of asset betas from the other sources noted in Figure 6.4 and above the range in previous UK and Irish regulatory decisions noted by Europe Economics.

6.5.28 The Commission's approach is to estimate beta over a range of periods, some of which include the GFC and those of which exclude it (i.e. accepting the fluctuations of the markets as they actually are), without taking a view on whether or not the effects of the GFC will continue or be repeated. Based on this analysis, the Commission set the asset beta for EDBs and Transpower at 0.34. While there is some evidence that asset betas showed some modest increases during the GFC, the asset betas were generally stable across the period.

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[329] Europe Economics, *Report for the Commission for Energy Regulation, Cost of Capital for Transmission Asset Owner, Transmission System Operator, Distribution System Operator*, 16 June 2010, p.93. The report also estimates the asset beta for a sample of European utilities, and concludes they range between 0.16 to 0.35 (p. 84).

[330] PwC, *Analysis of airport asset betas, Letter to New Zealand Airports Association*, 3 August 2010.

[331] CEG, *Review of updated input methodologies, A report for Vector*, November 2010, p.47.

6.5.29   When estimating the asset beta for GPBs in prior decisions, the Commission has added 0.10 to the raw asset beta estimated from comparable companies. This increment was intended to reflect GPB's perceived greater exposure to systematic risk. While the Commission considers there are theoretical reasons to expect a higher beta for gas, at least in New Zealand (relating to growth options, operating leverage, the nature of the product and the composition of customers), this was not evident in the Commission's empirical analysis of overseas data. This analysis tends to show slightly lower asset betas for gas companies. Given the theoretical argument for higher gas asset betas for New Zealand GPBs, the Commission retains the 0.10 uplift for GPBs. While this could be seen as a concession in favour of GPBs, and notwithstanding the submissions which encourage the Commission to limit the use of ad hoc adjustments, the IM provides for the uplift to continue. While the Commission uses empirical methods wherever possible, the Commission's approach is not mechanical. Rather the Commission weighs the empirical results against other considerations, and exercises its judgement to best estimate the cost of capital and satisfy the Part 4 Purpose. Accordingly, in the Commission's judgement, 0.10 uplift in the asset beta will continue to apply for GPBs, resulting in an adjusted asset beta for GPBs of 0.44.

6.5.30   In a previous energy decision the Commission added an increment to the empirically-estimated raw asset beta to allow for the potential effect of different regulatory regimes on observed asset betas. For the reasons set out in detail in Appendix H8, the Commission considered such an increment is no longer appropriate. This was discussed also in the EDB and GPB Draft Reasons Papers[332] and the lack of submissions on this issue suggests submitters accept the Commission's reasons.

6.5.31   As the average asset beta for a regulated service is expected to be relatively stable, the asset beta of 0.34 for EDBs and Transpower and 0.44 for GPBs will not be updated during the life of the IM Determination.

6.5.32   A more detailed discussion about asset and equity betas, including detail on how the Commission has estimated the betas, the reasons why the IM does not include an allowance for regulatory differences, and a discussion of points raised in submissions, is included in Appendix H8.

Taxes

6.5.33   The corporate tax rates used in calculating the cost of capital mirror the statutory tax rates. These are 30% until the end of the 2011 tax year (typically 31 March 2011), and 28% from then on. The IM Determination allows for any future changes in tax rates to flow through to the calculation of the cost of capital.

6.5.34   The investor tax rate has been set to reflect the maximum prescribed investor rate under the Portfolio Investment Entities (PIE) regime. This rate applies to investors other than those investors on lower personal tax rates. Under the PIE regime taxes on profits in a PIE are capped at the maximum prescribed investor rate which is 30% until 30 September 2010, and 28% beyond that. Those rates are therefore used in determining the investor tax rate.

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[332]   At paragraphs 6.9.49 to 6.9.124.

6.5.35   Tax situations specific to particular investors do not in principle affect the cost of capital. Taxes are borne by the individuals themselves not by the firms of which they are shareholders. Therefore the IM does not provide for the tax circumstances of individual investors (accumulated tax losses, inability to use imputation credits). This is consistent with the requirement that the cost of capital under Part 4 must be consistent with outcomes in workably competitive markets. As discussed in paragraphs 6.2.2 - 6.2.7, the cost of capital in workably competitive markets is that of an efficient industry cost of capital. An estimate that was based on the tax situation of individual companies or investors would not reflect the cost of capital in a workably competitive market.

6.5.36   A more detailed discussion on taxation issues is included in Appendix H10.

6.6   Leverage

6.6.1   Leverage refers to the mix of debt and equity capital that is used to fund an investment. Leverage is used in two places in estimating the cost of capital. One use is to re-lever the asset beta into an equity beta (and vice versa). The second use is to derive a weighted average cost of capital (WACC) from the estimates of the cost of debt and the cost of equity.

6.6.2   In a tax neutral world, leverage is generally understood not to affect a firm's WACC, since the cost of capital reflects the riskiness of the cash flows, rather than how these are divided up between equity and debt investors. When corporate tax is considered, the WACC is generally understood to decline with increases in leverage.[333] This is because interest costs are tax deductible to the firm but dividends are not.

6.6.3   When personal tax is considered some of the tax advantages of debt are reduced. The New Zealand dividend imputation credit regime allows firms to pass on to their shareholders a credit for the tax the company has already paid.

6.6.4   When the simplified Brennan-Lally CAPM is used to estimate the cost of equity (in conjunction with the simplified beta leveraging formula, i.e. debt beta is assumed to be zero), and the estimated cost of debt includes a positive debt premium, the resulting estimate of WACC increases as leverage increases.[334] The higher the value for the debt premium incorporated in the estimated cost of debt, the greater the effect on the resulting estimate of WACC as leverage increases.[335] This anomaly is being created by the analytical models used to estimate the WACC rather than simply reflecting unusual market conditions.

6.6.5   This positive relationship between leverage and the estimated cost of capital is a potentially serious anomaly as it is inconsistent with the behaviour of firms in workably competitive markets. That is, firms in workably competitive markets do issue debt and, so long as the debt levels are prudent, are considered to be acting

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[333]   This is the context normally set out in textbooks when discussing the use of the classical CAPM to estimate the cost of equity, as an input to estimating the WACC.

[334]   The debt premium itself is a function of leverage. That is, the debt premium would be expected to increase as leverage increases.

[335]   If the value for the debt premium incorporated in the estimated cost of debt is sufficiently high, the resulting estimate of WACC can increase as leverage increases, even if the cost of equity is estimated using the classical CAPM.

rationally when they do so. In regard to regulated suppliers this anomaly, if left uncorrected, would result in such suppliers obtaining an increase in the cost of capital if they were able to persuade the regulator to use higher leverage assumptions when applying the simplified Brennan-Lally CAPM. If the Commission were to regard the actual leverage of regulated suppliers as a relevant consideration in deciding on the leverage assumption, such suppliers would have an incentive to increase their leverage which could be detrimental to the long-term interests of consumers by raising the risk of bankruptcy.

6.6.6   The effect of leverage on the cost of capital can be substantial, as illustrated in Figure 6.5 below.

Figure 6.5   The Post-tax Cost of Capital Rises with Increases in Leverage under the Simplified Brennan-Lally CAPM[336]
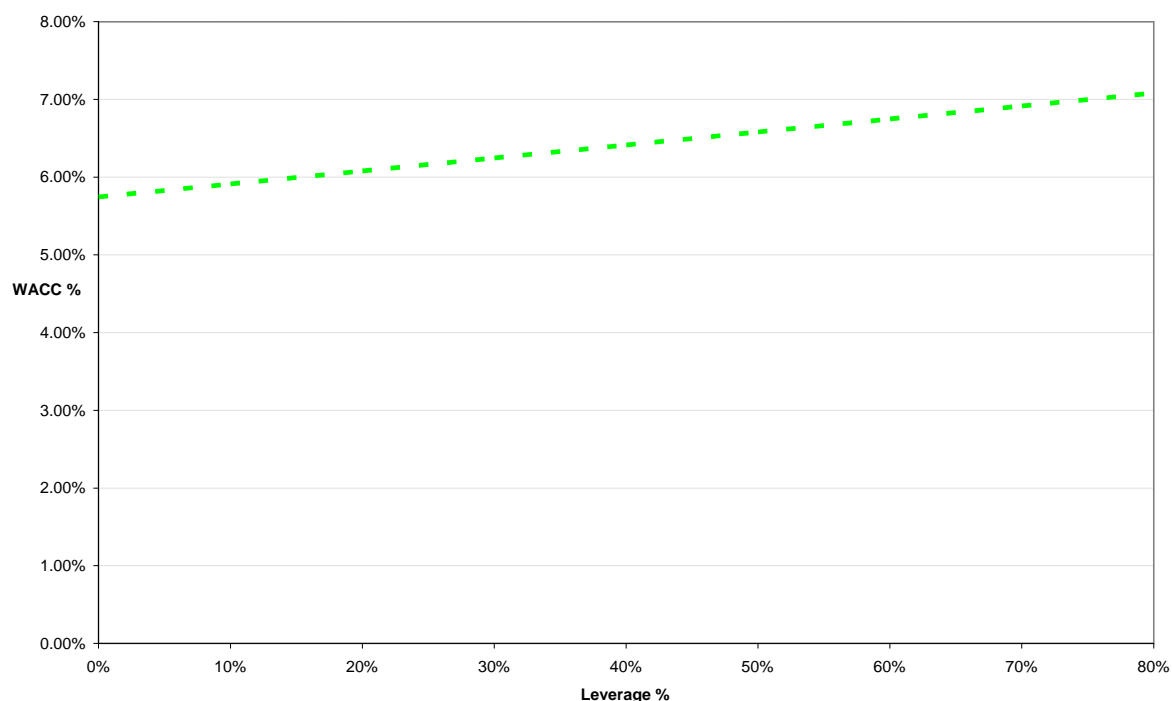
6.6.7   The situation is not unique to the simplified Brennan-Lally CAPM. A similar anomaly was noted by the UK Competition Commission in its most recent price-setting review of Heathrow. The UK Competition Commission used the classical CAPM.

> The key feature of these charts is the upward-sloping relationship that exists between a firm's gearing and its pre-tax cost of capital when one assumes a zero debt beta. This suggests that gearing up increases a firm's pre-tax cost of capital and therefore warrants the inclusion of a higher rate of return in price caps—something that can be seen explicitly in Table 1 at the beginning of this appendix where BAA's estimates for the pre-tax cost of capital at Heathrow increase with the use of a higher gearing figure, while estimates of the pre-tax cost of capital at Gatwick fall on the assumption of lower gearing.

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[336]   Assuming a risk-free rate of 4.64%, an all-up debt premium of 2.35% (including debt issuance costs of 0.35%), an asset beta of 0.34, a TAMRP of 7.1%, average investor tax rate of 28.2% and average corporate tax rate of 28.4%. These parameter values are consistent with the reasonableness tests the Commission has undertaken, see Appendix H13.

> We find this overall position difficult to reconcile with the observed behaviour of a range of firms in a broad sample of different industries. In the regulated sectors, the trend in recent years has been for firms to inject more debt into their capital structures on the apparent assumption that higher levels of gearing represent more efficient financing. Indeed, ADI has told us that its own decision to move BAA's gearing from around 34 per cent to more than double this figure would improve the efficiency of BAA's financing.
>
> Given this starting point, we do not accept the argument that higher levels of gearing produce a higher cost of capital. We do not believe that this is a credible characterization of the returns that investors require at different levels of gearing ....[337]

6.6.8   The Commission too would not want to set a higher cost of capital due to higher levels of gearing. To address this anomaly, the UK Competition Commission used debt betas.[338] The Draft Reasons Papers proposed to resolve this anomaly by setting a single notional level of leverage of 40% to apply to all services regulated under Part 4.

6.6.9   In adopting the 40% notional leverage assumption in the Draft Reasons Papers the Commission addressed the anomaly in the simplified Brennan-Lally CAPM which sees the cost of capital increasing with leverage. The Commission sought to protect consumers from the risks of suppliers increasing leverage (which would result in a higher cost of capital if actual leverage was provided for in the IM), as higher leverage increases the risk of financial distress, and this has potentially detrimental consequences for consumers.

6.6.10   PwC (for ENA and Telecom) submitted that there are other more technically correct ways to address the anomaly of the cost of capital increasing with leverage. The two options identified by PwC were to use the leverage level observed in the samples of comparator companies (that is, 17% for airports and 44% for EDBs, GPBs and Transpower) or to use non-zero debt betas. PwC submitted that the:

> "Commission is technically wrong to attempt to apply a single fixed leverage assumption to all regulated firms. If debt betas are to be excluded from the WACC analysis (which we concur with), then to be consistent the notional leverage used in the WACC estimation should be close to the average leverage of the comparator companies used to derive the (average) beta estimate. This is a fundamental requirement in order to be able to justify application of a "short cut" approach and thus ignore debt betas."[339]

6.6.11   The use of non-zero debt betas is theoretically sounder than using notional leverage as the use of non-zero debt betas would reduce or eliminate the extent to which the post-tax WACC estimate for each service varies with leverage.

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[337]   UK Competition Commission, *A report on the economic regulation of the London airports companies (Heathrow Airport Ltd and Gatwick Airport Ltd), Appendix F - Cost of Capital*, 28 September 2007, paragraphs 88-90, p. F23.

[338]   A debt beta measures the systematic risk associated with a firm's debt. A detailed discussion on debt betas is included in Appendix H9.

[339]   Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010. p. 8; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on Cost of Capital Material In the Commerce Commission's Draft Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13 August 2010, p. 10.

6.6.12   However, the Commission notes that most submissions continue to prefer the use of zero debt betas, that most regulators do not use debt betas (though a minority do)[340], and that the Commission has not used non-zero debt betas in the past. Further, there are practical difficulties in accurately estimating debt betas (but this is offset in part by the estimates available from regulatory decisions overseas, which are generally in the range of 0.1 to 0.2).

6.6.13   If the cost of capital IM specifies leverage for each regulated service in line with that observed for the respective sample of comparator companies (that is, 44% for EDBs, GPBs and Transpower), the cost of capital estimated and applied under Part 4 will be the same for those services, regardless of whether the debt beta is set at zero or at a level to make the estimated cost of capital invariant to leverage.

6.6.14   For these reasons, which are explained more fully in Appendix H3, the IM specifies leverage of 44% for EDBs, GPBs and Transpower, and does not incorporate the use of non-zero debt betas (since for these leverage levels the resulting WACC is the same for all values of debt beta).

6.6.15   Some submissions proposed that regulated suppliers' actual leverage should be used. For the reason outlined in paragraph 6.6.5 this is not appropriate. If actual leverage were used, non-zero debt betas would have to be used in the simplified Brennan-Lally CAPM to minimise the effect of leverage on the estimate of the cost of capital and ensure there are no incentives on suppliers to increase leverage (or propose increases in leverage that would exploit the anomaly in the model).

6.6.16   As the equity beta is calculated using leverage and an asset beta, a leverage of 44% applied to an asset beta for EDBs (and Transpower) of 0.34 and for GPBs of 0.44 results in an equity beta for EDBs (and Transpower) of 0.61 and for GPBs of 0.79. The asset beta, leverage and resulting equity beta will be fixed for the duration of the IM Determination.

6.7   Estimating a WACC Range

6.7.1   The weighted average cost of capital reflects the cost of debt and the cost of equity, given the mix of debt and equity. There is a post-tax WACC and a vanilla WACC. The former includes the after-tax cost of debt; the latter includes the cost of debt before tax, as shown in the following equations.

Post-tax WACC = Cost of debt (after tax) x Leverage + Cost of equity x (1 – Leverage)

Vanilla WACC = Cost of debt x Leverage + Cost of equity x (1 – Leverage)

6.7.2   Post-tax WACC estimates are more frequently used in New Zealand, and more easily understood by interested persons, than vanilla WACC estimates. However, the use of vanilla WACC estimates is consistent with the IM's approach to regulatory tax for DPPs and CPPs. Accordingly, vanilla WACC estimates will be

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[340]   Notably, the Queensland Competition Authority (see, for example, Queensland Competition Authority, *Gladstone Area Water Board: Investigation of Pricing Practices, Final Decision*, June 2010), pp.126-127. And see also the UK Competition Commission (UK), *A report on the economic regulation of the London airports companies (Heathrow Airport Ltd and Gatwick Airport Ltd), Appendix F - Cost of Capital*, paragraphs 88-90, 28 September 2007, pp. F21-F28.

applied when setting DPPs, CPPs, and IPPs, while both vanilla WACCs and post-tax WACCs will be estimated for the purposes of information disclosure regulation.

Estimating a WACC range

6.7.3   The WACC must be estimated since its components, for example, the cost of equity, cannot be observed directly. This raises the prospect of error since it is not possible to know the true cost of equity. To allow for this estimation error, it is usual practice to estimate a range for the WACC.

6.7.4   The Commission has previously used estimates of the standard errors of the components of the WACC, to estimate a standard error of the WACC. This can be used to estimate the distribution of the estimate of the WACC, for example, the 25th and 75th percentile estimate. This approach is consistent with the Commission's previous practice.

6.7.5   A wide variety of submissions were made on the approach to estimating a range. Some submissions called for the use of Monte Carlo simulations, others for the Commission to use its judgement to chose a point estimate of the WACC from a range of WACC estimates that reflected ranges for certain parameters. Some submissions criticised the Commission's approach as implying greater precision than was possible in practice. Other submissions took the Commission's approach and called for different values for particular parameter estimates and the addition of more variables to the analysis. In short, there was no consensus on what a better methodology of establishing a range would be. The Cost of Capital Expert Panel generally supported the Commission's statistical approach.

6.7.6   It is a matter of judgement as to which approach is best. The IM specifies the statistical approach since it provides greater transparency and predictability for suppliers and interested persons. This promotes certainty for suppliers and consumers in relation to regulatory rules, requirements and processes.

The estimated cost of capital for regulated suppliers

6.7.7   The parameters for estimating the cost of capital for EDBs, GPBs and electricity transmission are set out in Table 6.4 below. The values for leverage, debt issuance costs, the equity beta, and the TAMRP will be fixed by the Determination. Tax rates are linked to certain statutes and update as these change. The parameters for the risk-free rate and debt premium change over time. Using the estimates observed during the month of August 2010, these are estimated to be 4.64% and 2.0% respectively.

Table 6.4　　　Parameter Point Estimates and their Standard Error

Parameter	Point estimate	Standard error
Leverage	44%	0
Debt issuance costs	0.35%	0
Asset beta (EDB / Transpower)	0.34	0.13
Asset beta (GPB)	0.44	0.14
Tax-adjusted market risk premium*	7.1%	0.015
Average Corporate tax rate	28.4%	0
Average Investor tax rate	28.2%	
Risk-free rate (as at 1 Sept 2010)	4.64%	0
Debt premium (as at 1 Sept 2010)	2.00%	0.0015 (minimum)

* Includes a 0.5% uplift to TAMRP for one year.

6.7.8　This results in the estimates of WACC as set out below in Table 6.5 as at 1 September 2010.

Table 6.5　　　Estimated WACCs using the Parameters Specified in Table 6.4

Estimate of WACC	Transpower & EDBs	GPB
Vanilla WACC	7.37%	8.08%
Post-tax WACC	6.49%	7.21%

Selecting a WACC range

6.7.9　As well as being estimated for the purposes of information disclosure, WACC will be an input into the setting of default and customised price-quality paths for EDBs and GPBs and for the IPP for Transpower. An error in estimating the WACC could therefore result in a WACC that is above or below the true (but unobservable) cost of capital. Prices may therefore be incorrectly set, relative to the actual costs of providing regulated services. This may affect incentives to invest, and the ability to assess if excessive profits are being earned.

6.7.10　In balancing the risk between setting the WACC too high or too low, the Commission assessed the consequences of possible errors. The consequences depend on the regulatory context in which the estimate of the cost of capital is being used. In some regulatory contexts a cost of capital estimate below the midpoint might be considered, in other contexts the midpoint is appropriate, in other contexts a cost of capital estimate that is above the midpoint would be appropriate.

6.7.11　The Commission's choice over the precise percentile estimate of the WACC that is used for price-quality regulation is informed by a number of considerations such as:

- the Part 4 Purpose is to promote the long-term benefit of consumers, including:

- o ensuring suppliers of regulated services have incentives to invest and innovate (s.52A(1)(a)) and the potential long-term benefits to consumers from investment and innovation;

- o ensuring regulated suppliers are limited in their ability to extract excessive profits (s.52A(1)(d));

- the risk that the true (but unobservable) WACC is above the estimated mid-point WACC;

- the risk that CAPM and the simplified Brennan-Lally CAPM may under-estimate the returns on low beta stocks;

- the risk that the simplified Brennan-Lally CAPM may lead to higher estimates of the cost of capital than the International CAPM would for international investors, and that international investors are likely to be the marginal investors in the New Zealand markets; and

- the risk of error in estimating individual parameters of the simplified Brennan-Lally CAPM including the asset beta and the TAMRP.

6.7.12   Incentives for dynamic efficiency can have significant benefits for consumers over the long term, so it is important to preserve incentives to invest and innovate. Accordingly, this consideration has been given greater weight than limiting suppliers' ability to extract excessive profits. Weighing the arguments, and having regard to the Part 4 Purpose, and in particular, that there are incentives for EDBs, GPBs, and Transpower to invest and innovate, the Commission adopts the 75th percentile estimate of the cost of capital as the cost of capital for price-quality regulation.

6.7.13   The various cost of capital parameter values and estimates are used to determine a post-tax WACC estimate using the methodology set out in the IM Determination. The resulting WACC estimate is then compared against a range of other information to ensure it is commercially realistic. This assists in determining whether the process for estimating the WACC specified in the IM is reasonable.

6.7.14   Based on the parameter estimates in Table 6.4, Table 6.6 shows the resulting point estimates for the WACCs for EDBs, GPBs and Transpower.

Table 6.6   Estimated WACCs (as at Sept 2010)

Parameter	Transpower & EDBs	GPB
Vanilla WACC	7.37%	8.08%
Post-tax WACC	6.49%	7.21%
Vanilla WACC (75th percentile)	8.09%	8.90%
Post-tax WACC (75th percentile)	7.22%	8.03%

6.7.15   On its website the Commission will publish annually for EDBs, GPBs, and Transpower:

- a mid-point estimate of the five year post-tax WACC for the purposes of ID regulation; and

- an estimate of five year vanilla WACC at the 75th percentile to apply in setting price paths under DPP and CPP regulation (and for Transpower under IPP).

6.7.16   Three and four year equivalent estimates of vanilla WACC at the 75th percentile will also be published as required by CPP regulation, and estimated WACC ranges for the 25th to the 75th percentiles for both post-tax and vanilla WACC will be published to inform interested persons.

6.7.17   Further discussion on the WACC range is included in Appendix H11.

6.8   Does the Commission's Methodology Produce Commercially Realistic Estimates of the Cost of Capital?

6.8.1   The electricity line businesses are quintessential low risk businesses. They provide essential services, with very stable demand, face no real substitutes and no or limited competition. As providers of essential services, used 24 hours a day 365 days a year by virtually every consumer and business in the country, they have locked in users with no choices and little bargaining power. Such firms face significantly lower systematic risk than the average firm in the economy. Given their low systematic risk, equity investors in such companies would expect to earn a lower return on their investments, than in a more average company.

6.8.2   Figure 6.6 below compares the estimates of the post-tax WACCs for EDBs and Transpower against a range of other information. The reasonableness of the estimates for GPBs is discussed later, at paragraph 6.8.11. In particular:

- current New Zealand post-tax risk-free rates and post-tax cost of corporate debt;

- historic and forecast estimates of the returns achieved by New Zealand investors on an investment of average risk;

- previous New Zealand regulatory decisions, and recent regulatory decisions in the UK and Australia;

- external estimates of the post-tax WACC for similar businesses, including estimates from PwC and New Zealand investment banks; and

- an estimate of the cost of capital using the classical CAPM, as recommended by Professor Myers.

6.8.3   The current risk-free rate, corporate cost of debt, and the historic return on the New Zealand market can be estimated independently of the choice of model, CAPM or otherwise.

6.8.4   More detail on each of the data points in Figure 6.6 is included in Appendix H13.

6.8.5   As the 75th percentile estimate of the WACC will be applied under DPP and CPPs, the analysis focuses on that estimate made consistently with the IM. Further, as most comparative information is published on a post-tax basis, the analysis below uses the 75th percentile estimate of the post-tax WACC, as set out under the cost of capital IM.

6.8.6   The Commission's estimates of the post-tax WACC for EDBs and Transpower for application in setting price paths is reasonable since:

- it falls appropriately between the post-tax cost of debt and the cost of capital for the average New Zealand firm (based on historic and forecast estimates, and assuming 30% gearing). This is reasonable because:

     o   EDBs and Transpower have much lower exposure to risk than the average New Zealand firm. Accordingly, the cost of capital for these regulated suppliers can be expected to be well below the cost of capital for a New Zealand firm of average risk; and

     o   the cost of capital for an EDB or Transpower must be well above the cost of debt as the cost of capital includes the cost of equity (which is greater than the cost of debt);

- the Commission's estimates for EDBs and Transpower are very close to Ofgem's estimates of the cost of capital for the corresponding regulated firms in the UK;

- the Commission's estimates for EDBs and Transpower are above the cost of capital estimated by the self-regulating Air Navigation Service (part of Airways Corporation NZ), and similar (though generally above) the estimates implied in previous Commerce Commission decisions;

- the Commission's estimate is close to two recent independent estimates of the post-tax WACC for Transpower; and

- the Commission's estimates are above those estimated in PwC's most recent quarterly cost of capital report for Vector and Horizon.[341]

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[341]   PricewaterhouseCoopers publishes estimates for around 70 listed New Zealand companies on a quarterly basis and is publicly available on the internet at http://www.pwc.com/nz/en/cost-of-capital. The June 2010 report is the most recent available at the time this Paper was finalised.

Figure 6.6　　Testing the Reasonableness of the IM Estimates of the WACC Against Comparative Information

* = Updated for changes in risk-free rate and debt premium

Estimates made by the Commission are shown in blue, market information is shown in green, and estimates made by other parties are shown in red

Commerce Commission

6.8.7   The Commission's estimates are below those set in recent Australian decisions. The Commission has examined closely the differences between the AER's most recent estimate for Australian electricity distribution businesses and the estimate using the IM.[342] The differences in WACC estimates are due to differences in current monetary conditions and taxation laws (neither of which are determined by the regulator), and the choice over the term of the risk-free rate and debt premium which matches the regulatory period (rather than a 10 year term preferred by the AER). However, the AER acknowledges that a 10 year term over-compensates suppliers.[343] Also, the term credit spread allowance in the IM is not part of the WACC but it does compensate suppliers for the greater costs of issuing long-maturity debt.

6.8.8   For application in DPPs/CPPs, the IM uses the 75th percentile estimate of the WACC to ensure there are sufficient incentives to invest in regulated services for the long-term benefit of consumers. To achieve a similar objective, the AER uses a higher estimate of the equity beta than implied by its empirical estimate.[344] In terms of its impact on WACC, the approach used in the IM appears more generous than the AER's approach in this regard.[345]

6.8.9   The Commission's estimates for Transpower's and EDBs' cost of capital is also below the average cost of capital estimated for Vector in recent broker reports. This is reasonable and to be expected since:

•   the broker estimates are for all of Vector including its telecommunications, gas wholesaling, and metering businesses as well as the regulated services. The unregulated services would be expected to have a higher cost of capital; and

•   the broker estimates seek to estimate Vector's cost of capital over the life of its assets, and often use a 10 year risk-free rate which is higher than the current market average. On the other hand, the Commission's IM is specified for a five year regulatory period, and is explicitly linked to market interest rates.

6.8.10   Overall, the Commission considers this comparative information is consistent with its estimates. Therefore it strongly supports the Commission's conclusion that the cost of capital IM produces estimates of the cost of capital that are reasonable and commercially realistic. The use of commercially realistic estimates of the cost of capital under Part 4 regulation is important for ensuring that suppliers have incentives to invest and are limited in their ability to extract excessive profits.

6.8.11   The estimate of the WACC for GPBs under the IM is higher than for EDBs, reflecting the higher asset beta (systematic risk) the Commission considers GPBs face. There is limited comparative information on the WACC for New Zealand GPBs to test the IM estimates. Overseas regulators typically assume a similar WACC for electricity and gas pipeline services. This implies the New Zealand regime is favourable to New Zealand GPBs, but the Commission considers this is

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[342]   A more detailed discussion of the AER's decision is included from paragraph H13.32 of Appendix H13.

[343]   AER, *Electricity Transmission and distribution network service providers, Review of the weighted average cost of capital (WACC) parameters*, Final decision, May 2009, p.xviii and p.154.

[344]   AER, *Electricity Transmission and distribution network service providers, Review of the weighted average cost of capital (WACC) parameters*, Final decision, May 2009, pp.343-344.

[345]   See paragraphs H13.44 to H13.45.

appropriate given New Zealand GPBs likely face greater exposure to systematic risks than EDBs and Transpower.

Other potential reasonableness checks

6.8.12   Professor Myers and Professor Franks recommended the use of the Fama-French three-factor and the DCF model as reasonableness checks on CAPM estimates, "provided that necessary data are available and that the model's assumptions are reasonably satisfied" (p. 8). However, there is very little New Zealand data available to robustly estimate a cost of equity using these methods and no submission provided estimates of the cost of equity in New Zealand using these models. Therefore, the Commission does not consider that it is practical to use these models as reasonableness checks.

Information on reasonableness tests in submissions

6.8.13   Some submissions included a discussion of reasonableness and comparative information on the cost of capital. These are discussed in Appendix H13 from paragraphs H13.75 - H13.106. The Commission has considered these submissions but, for the reasons set out in Appendix H, the Commission does not consider that they provide reliable tests as to whether the IM estimates of WACC are reasonable.

Assessing the reasonableness of the WACC in its regulatory context

6.8.14   The reasonableness of the cost of capital IM cannot be considered in isolation from the regulatory context in which it is to be used. Two examples of the importance of considering the WACC in its broader regulatory context are discussed below.

6.8.15   For many suppliers that are subject to price-quality regulation, prices will be determined by a DPP, which may involve a starting price adjustment. However, it is not proposed that the cost of capital IM will directly and mechanistically set the prices under the DPP / starting price adjustment. While the starting price adjustments have yet to be decided, the Commission has, in its discussion paper, proposed that the WACC would be used in conjunction with an ROI band, and that the 75th percentile estimate of the vanilla WACC would form the mid-point of the band.[346] It is proposed that upwards and downwards adjustments to prices would only occur where the supplier's ROI falls outside of the ROI band, and the adjustment would only bring them to the band limit rather than the midpoint. The proposed ROI band, and its impact on prices, has been interpreted by some commentators as an increase in the effective regulatory WACC by the width of the band.[347] Consultation on the approach for starting price adjustments continues.

6.8.16   Second, the CPP regime enables regulated suppliers to choose when and whether to apply for a CPP, and to propose whether it should have a term of three, four or five years. A supplier choosing its own regulatory period is uncommon as in overseas jurisdictions suppliers cannot generally do this. The Commission will publish its estimate of the WACC that will apply for any CPP application, before the EDB or GPB applies for a CPP. Therefore when an EDB or GPB chooses to apply for a CPP, it will do so in full knowledge of what WACC would be used in setting the

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[346]   Commerce Commission, *Starting Price Adjustments for Default Price-Quality Paths Discussion Paper*, August 2010.

[347]   Goldman Sachs, *A regulatory win. ComCom seeking a Benign Outcome?*, 6 August 2010. The percentage increases refer to the Commission's worked examples in its discussion paper. See: Commerce Commission, *Starting Price Adjustments for Default Price-Quality Paths Discussion Paper*, August 2010.

CPP, and whether it implies an increase or decrease in prices. In short, these features of the CPP regime provide an opportunity for a regulated supplier to obtain a higher WACC (if interest rates and debt premiums have increased since DPP prices were last set), but without any commensurate risk of receiving a lower WACC.

6.8.17   The consideration of the cost of capital IM within the regulatory contexts in which it will be used further supports the reasonableness of the cost of capital IM. In summary, the way the DPP and CPP are determined in practice, provides a further buffer against the risks and consequences of a too low WACC being applied, and adversely impacting incentives to invest and innovate for the long term benefit of consumers.

APPENDIX H: COST OF CAPITAL

H1   The Framework for Determining the Cost of Capital IM

Overview of the decision-making framework

H1.1   For firms to make investments, they need to raise money ('capital'). There are two generic sources of capital: debt and equity.[802] In general terms, debt involves the firm promising to make specific payments to the debt provider, which are specified when the debt capital provider first provides the capital. In contrast, the firm in general makes only conditional, if any, promises to make specific payments to providers of equity. Equity providers have a degree of actual or potential control over the firm and expect to obtain a return from the success of the firm. Firms may raise debt capital by, for example, issuing bonds or borrowing from a bank. Firms may raise equity capital by, for example, issuing shares that may be traded on the stock exchange or by retaining earnings. Usually, debt eventually has to be repaid to the provider of debt capital, whereas equity does not have to be repaid to the provider of equity capital. Firms will almost always have some form of equity capital.

Key cost of capital concepts

H1.2   Raising either debt or equity capital involves a cost to the firm. In the case of debt capital, the cost is the return which the investor expects to obtain from the firm. It is a cost because the debt investor will only provide capital if the firm promises to provide this return, including a margin to compensate the investor for the possibility that the firm will not in fact meet its promise.

H1.3   The cost of equity is the return which the equity investor expects to obtain from the firm. In the case of equity, the firm does not promise the return but instead the investor decides what amount of capital they are prepared to provide in return for a share in the firm. Such a share entitles the investor (i.e. shareholder) to a corresponding proportion of dividends and other returns provided to shareholders. Therefore the cost of equity is conceptually the dilution of the existing shareholders' interest that results from raising equity capital, including the dilution (i.e. spreading of the claim to future cash flows over a larger capital investment) implicit in the retention of cash flow or in accounting terms retained earnings. Investors supplying capital will require that the price of the shares issued to them is such that the expected return is equal to the return they would expect to obtain on an alternative investment of equal risk. Their obtaining a share in future cash flows is at the expense of the other shareholders. The cost of capital reflects the cost of debt and the cost of equity, and the respective proportion of each that is used to fund the investment.

H1.4   The cost of equity capital to the firm is not directly observable. [803] The cost can however be deduced in a number of ways. As an illustration, one approach to estimating the cost of equity capital is to consider the average returns actually

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[802]   There are a variety of forms of both debt and equity capital.

[803]   The cost of equity, expressed as a rate of return, is the discount rate implicit in the price at which equity can be raised (given the investors' expectations of future cash flows which they will derive or have claim to). This discount rate cannot be directly observed or calculated because the investors' true expectations cannot be directly observed.

obtained by equity investors over a long time period (i.e. many years) and to assume that on average over this long time period the occasions on which the actual return exceeds the equity investors' expectations offset the occasions on which the actual return falls short of the equity investors' expectations. On this assumption the actual average return over the long time period will provide an estimate of equity investors' expected return, and that is the cost of equity capital.

H1.5   The total capital of a firm is the sum of the market value of the firm's debt and the market value of its equity. When the cost of debt capital is weighted by the proportion of debt capital to total capital, and the cost of equity capital is weighted by the proportion of equity capital to total capital the result is the 'Weighted Average Cost of Capital' or, in short, WACC or the 'cost of capital' to the firm. The cost of capital is expressed as a percentage of its total capital, i.e. as a rate of return.

H1.6   The simplest formulation of the cost of capital does not take explicit account of the tax deductibility of interest and is referred to as the 'vanilla' weighted average cost of capital. This is used in applications where the tax deductibility of interest is taken into account in cash flows. The vanilla formula is:

$$\textbf{Cost of capital} = \textbf{r}_d\textbf{L} + \textbf{r}_e\textbf{(1−L)}$$

where r_d is the cost of debt capital, r_e is the cost of equity capital, and L is the leverage ratio. The leverage ratio is the proportion that debt capital represents of the total capital (total capital is the sum of debt capital plus equity capital).[804]

Guidance from the Act – workably competitive markets

H1.7   As signalled in Chapter 2, the Commission has asked itself what guidance 'promoting outcomes consistent with outcomes produced in workably competitive markets' means for making its decisions on the cost of capital. The Commission has also considered whether, and if so how, each of the regulatory objectives in s 52A(1)(a)-(d) are relevant to the decision on cost of capital, and whether there are any practical constraints on the form of the cost of capital. The Commission has considered the inter-relationship between capital markets (which are highly competitive) where funding is raised, and product/service markets where the capital for the most part funds investment.

H1.8   Analysis of the factors determining firms' cost of capital in workably competitive capital markets suggests that the cost of capital is primarily related to the exposure to risk that cannot be avoided by diversifying i.e. by spreading investment across a variety of firms.[805] The risk which cannot be reduced by diversification is systematic risk.[806] This is the exposure to overall market movements i.e. the

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[804]   As WACC relates to expected market rates of return, in theory the *market* value of both debt capital and equity capital should be used in the calculation of the leverage ratio. However, in practice, calculating the market value of debt capital is difficult as most corporate debt is rarely traded. Fortunately, in the vast majority of cases in New Zealand the book value of debt capital is a reasonable proxy for the market value of debt capital. With respect to equity capital, the market value of equity capital will be available if the shares of the firm are listed on a stock exchange. If the shares are not listed, only the book value of equity capital will be available.

[805]   See Markowitz, H., Portfolio Selection, *Journal of Finance*, Vol. 7, No. 1, 1952, pp. 77-91; Tobin, J., Liquidity preference as behavior towards risk, *The Review of Economic Studies*, Vol. 25, 1958, pp. 65–86.

[806]   In the context of the cost of capital, it is useful to distinguish between two types of risk, systematic risk and unsystematic risk:

correlation of the movements in the value of the firm or asset to the total value of all assets. Most models of the cost of capital recognise that the higher a firm's level of exposure to systematic risk, the higher its cost of capital. This reflects a risk-reward trade-off, insofar as investing in firms where returns are likely to be more correlated with market returns, (i.e. investments exposed to more risk), will require higher expected returns. Unsystematic risk is not generally rewarded in workably competitive capital markets.[807]

The relationship between firms' returns in workably competitive markets and the cost of capital

H1.9   The cost of capital is the expected rate of return to be earned in the long-term for investment to occur. The expected rate of return must at least cover the cost of capital in order to attract the required investment funds.

H1.10   Assuming workably competitive capital markets, investors will be prepared to make capital available for firms to compete in supply of products and services whenever the expected return is at least as high as the cost of capital. In workably competitive product and services markets, firms are able to lower prices and/or improve quality while still meeting the expectations of their capital providers so long as their expected return is at least as high as the cost of capital. Thus if they are able to reduce their costs, there will be a tendency for prices to be reduced and/or quality to be improved until expected returns have fallen to the cost of capital.

H1.11   Actual returns will deviate from expected returns due to a wide range of unanticipated factors. By definition, the expected overall result of unanticipated factors over an extended period is that they cancel each other out. Thus in a workably competitive product or services market the expectation at any time looking into the future is that the average return over a long time period will tend to the cost of capital. The outturn observed in any particular case looking back into the past may of course differ from this expectation for a wide range of reasons.

Systematic risk reflects the extent to which an asset (or stock) participates in the fluctuations or movements in the overall market. Systematic risk of an asset (or stock) is therefore sometimes described as that component of risk that is 'correlated' with the overall market. Examples of systematic risks are the impact that changes in real GDP, inflation, currency movement, major technological advances and a recession have on the returns earned on an individual asset (or stock). The correlation of the returns on an asset with the value weighted return on all assets in the market is the asset's beta.

Unsystematic risk (or idiosyncratic specific asset risk) is the risk unique to a specific asset (or stock), and this component of the risk of an asset (or stock) is uncorrelated with general movements in the overall market. It includes the risks associated with an asset (or stock) that arise through increasing competition, changes to antitrust legislation, technological innovations, and geographic location. Empirical studies have generally found that the unsystematic or idiosyncratic risk will be eliminated (or diversified out of) through investors holding a sufficiently large portfolio of stocks. The unsystematic risk associated with an asset (or stock) is therefore also referred to as the 'diversifiable risk'. The risk that remains after diversification is the systematic risk, also referred to as the 'non-diversifiable' risk.

[807]   A key analytical basis of the pre-eminent cost of capital model, the CAPM, is that provided capital markets are competitive and efficient, equity investors will only expect to be compensated for bearing systematic risk. Rational investors could and would diversify away firm-specific risk, so such risk should not be priced by the market. (This result would hold to a first approximation provided capital markets are workably competitive.) The implication for regulators is that, when setting allowed rates of return, compensation should only be awarded to investors for bearing systematic risk.

Implications for estimating the cost of capital for EDB/GPB services under Part 4

<u>Cost of capital in the context of regulation</u>

H1.12   As discussed in Chapter 2 (see, for example, paragraph 2.6.28), the Commission considers that to enable regulated suppliers to raise capital, regulation should provide them with the expectation of earning at least a normal return in the long-term, i.e. they should expect to maintain their efficient financial capital.

H1.13   That said, when considering the concept of expecting to earn at least a normal rate of return in the long-term, it is important to have regard to two key clarifications. First, under default/customised price-quality regulation, the Commission is only seeking to align revenues to achieving at least normal returns in the long-term on an *ex ante* basis. Indeed, as noted in Chapter 2, incentive-based regulation might be expected, in principle, to result in *ex post* returns somewhat in excess of the cost of capital, as firms achieve efficiency savings during the regulatory period. Similarly, in allowing an appropriately risk-adjusted cost of capital, the Commission is allowing regulated firms to earn sufficient remuneration to compensate for risks associated with the adverse effects on the industry concerned of economic fluctuation that may arise in a particular regulatory control period. As such, any attempt to align returns to the cost of capital on an *ex post* basis could undermine the key incentive effects of the regulatory framework.

H1.14   Second, as outlined in greater detail below, due to the uncertainty and standard errors associated with the key parameters used in the estimation of the cost of capital, the Commission will identify a cost of capital range. If the Commission chooses a point estimate above the mid-point of the range, the overall return may reflect an allowance somewhat in excess of an expectation of a normal rate of return on an *ex ante* basis.

H1.15   In workably competitive markets, risks are allocated to the parties best able to bear them. As discussed above, an accurate estimate of firms' cost of capital needs to reflect their level of systematic risk exposure.

H1.16   In workably competitive markets where there are sunk costs and long-lived specialised infrastructure investments, suppliers can reduce the risk of not recovering their costs, through long-term contracting. Long-term contracts can potentially increase the likelihood of the supplier earning the required return on investment, while also protecting consumers from the exercise of market power after the contract is competitively awarded. Such contracts can reduce the supplier's exposure to systematic risk (i.e. correlation of returns to market returns).

H1.17   In markets where there is no or limited competition, suppliers have exclusive or almost exclusive dealings with customers as there are no or limited competitors for consumers to switch to. In the case of monopoly suppliers of regulated services, regulation ensures that these suppliers can expect to earn at least a normal return on their assets. This provides for a similar relationship to a long-term contract in a workably competitive market, although there may be an even stronger expectation of cost recovery for an essential facility monopoly supplier.

H1.18   In particular, for a monopoly supplier of regulated services there is likely to be an expectation of less variation in profitability as a result of any shock to the

economy,[808] as unlike a workably competitive market supplier, there is almost guaranteed demand for the service and little likelihood of any effective competition in the future. Therefore, there will potentially be lower risks associated with profitability and cost recovery than would arise in a workably competitive market with long-term contracts in place.

H1.19   For this reason the cost of capital in regulated services around the world is often observed to be lower than that of unregulated companies in competitive markets. However, there may also be some variability in the cost of capital amongst regulated services on the basis of the type of regulatory regime implemented.[809]

H1.20   For example, where the period between regulatory reviews is longer (e.g. price-cap regulation for a five-year period), regulated suppliers will potentially be exposed to greater variation in their expected returns compared with those regimes where more frequent regulatory reviews can occur and any costs are directly passed through (e.g. traditional US-style rate-of-return regulation). All other things being equal, in these circumstances, price-cap regulation with less frequent regulatory reviews, will lead to a higher cost of capital. In this case the benefits of less frequent regulatory reviews in encouraging improvement in efficiency is being valued as offsetting the higher cost of capital from the consumers perspective.

Cost of capital under Part 4

H1.21   Under Part 4, the Commission has set an IM for the estimation of the cost of capital for the purposes of monitoring and analysing information disclosed by the EDBs and GPBs. The Commission will also use these estimates for the purposes of price setting (through default and customised price-quality paths). The Commission has considered a range of analyses used by capital market practitioners to estimate the cost of capital. The Commission has also considered academic analyses of the factors relevant to the choice of which forms of analysis and corresponding models are appropriate for the purposes of Part 4. In reviewing these analyses, the Commission is mindful that the purpose of Part 4 is to promote the long term benefit of consumers by promoting outcomes consistent with those in workably competitive markets. The Commission notes that the models used by it are based on capital markets being workably competitive and are used by firms, and advisers to firms, in workably competitive markets. The Commission's choice of cost of capital model has been informed by advice from its Expert Panel[810] and the submissions received during the Commission's consultation on the cost of capital. The Commission has tested the results of its IM to ensure they are commercially realistic in light of the information on the expected returns on investments of comparable risk, and ensure that suppliers of regulated services have an incentive to innovate and invest.

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[808]   There is an argument that once it is known that a firm will be regulated, investors will expect that the beta of the firm to be lower than if it were not regulated. Regulation ensures that the firm cannot fully exploit its market power which in turn means that less of its customers are facing the point at which they would reduce their demand i.e. in practice give up their connection to the grid. The Commission's estimates of beta are based on a sample of comparative firms that includes regulated firms and so incorporate the effects of regulation.

[809]   Alexander, I., Mayer, C. and Weeds, H., Regulatory structure and risk: an international comparison, Policy research working paper 1698, *The World Bank*, December 1996, and Alexander, I., Estache, A., and Oliveri, A., A few things transport regulators should know about risk and the cost of capital, *Utilities Policy,* 9, 2000, pp. 1-13.

[810]   Franks, J., M. Lally and S. Myers, *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology*, Report prepared for the Commerce Commission, 18 December 2008, p. 6.

H1.22   In the context of default/customised price-quality regulation, the Commission uses the estimated cost of capital to determine the expected normal rate of return in the long-term for a regulated service. The expectation of a normal rate of return ensures there are incentives to invest as the returns offered from investing in the regulated service is similar to that offered by alternative investments of similar risk. In the context of information disclosure, the Commission uses its cost of capital estimates to provide a guide for normal returns that will assist interested parties in assessing if excessive returns are being earned and thereby assist in determining whether the purpose of Part 4 of the Act is being met.

H1.23   The regulatory challenge for the Commission is to determine an estimate of the cost of capital for the provision of regulated services that is consistent with the cost of capital faced by suppliers[811] in workably competitive markets, i.e. neither too high, nor too low, such that the objectives in s 52A(1)(a) to (d) are achieved.

H1.24   In the context of monitoring, if the cost of capital is set too low it might incorrectly suggest that a supplier of regulated services was not limited in its ability to extract excessive profits. If the supplier were to reduce prices as a response to such an incorrect indication of excessive profitability, this might prevent the supplier from attracting sufficient capital to undertake efficient investment. This would be inconsistent with s 52A(1)(a) of the Act. Equally, a cost of capital that is set too high would mask the regulated supplier's ability to extract excessive profits over the medium or long-term.[812] This would be inconsistent with s 52A(1)(d) of the Act.

H1.25   In the context of price control, if the cost of capital is set too low, regulated suppliers might have insufficient incentives to innovate and invest and might be unable to attract sufficient capital to undertake efficient investment, which would be inconsistent with s 52A(1)(a) of the Act. If the regulator sets the allowed rate of return too high, i.e. inappropriately above the rate of return of an investment of equal risk suppliers ability to extract excessive profits will not be limited, which would be inconsistent with s 52A(1)(d) of the Act.

Estimating the cost of capital

H1.26   The methodology for setting the cost of capital must ensure that the expected returns from investing in regulated services are similar to other investments of comparable risk, so regulated suppliers have incentives to innovate, invest and improve, and are limited in their ability to extract excessive profits.

H1.27   While neither the cost of debt nor the cost of equity are directly observable, the former can be more readily estimated than the latter. This is because the estimation of the cost of debt requires fewer assumptions and approximations than the estimation of the cost of equity. In addition, a number of models exist for estimating the cost of equity. The Commission must identify what it considers to be the most appropriate model to use.

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[811]   The cost of capital faced by suppliers in workably competitive markets is determined in the capital market which may be closer to a perfectly competitive market.

[812]   The Commission notes that, in the short-term, suppliers of regulated services may achieve above-normal profits if they outperform the objectives set by the regulator.

H1.28   Further, there are a number of parameters associated with the cost of debt and cost of equity that need assigned values when estimating the cost of capital. Some of these parameter estimates have measurement errors associated with them, i.e. there is uncertainty as to how well the estimated value represents the parameter's unobservable 'true' value.

H1.29   In estimating the cost of capital, the Commission recognises that this is an estimation process, which is likely to be imprecise. The aim of the Commission therefore is to estimate a cost of capital that, when applied under Part 4, promotes outcomes as regards to quality and pricing of the regulated services that are consistent with those produced in workably competitive markets.

H1.30   In regards to information disclosure, due to the imprecision of the cost of capital estimation, the Commission will estimate a range for the cost of capital. The Commission considers it may be preferable, in the context of setting price-quality paths for EDBs, GPBs, and Transpower, to err on the side of setting a rate that is likely to be favourable for the regulated supplier. That is, if a point estimate is required for these industries, a figure above the mid-point of the range may be used.

H1.31   The reason for the Commission adopting a cost of capital estimate that is above the mid-point for default/customised price-quality regulation, is that it considers the social costs associated with underestimation of the cost of capital in a regulatory setting involving constraining pricing to end users (as opposed to information disclosure applications and situations involving competition among suppliers), are likely to outweigh the short-term costs of overestimation (i.e. if the cost of capital is set too low, the incentives for suppliers to undertake efficient investments will be reduced, which would be inconsistent with the long-term benefit of consumers). That is, the Commission is acknowledging that where there is potentially a trade-off between dynamic efficiency (i.e. incentives to invest) and static allocative efficiency (i.e. higher short-term pricing), the Commission will always favour outcomes that promote dynamic efficiency. The reason is that dynamic efficiency promotes investment over time and ensures the longer term supply of the service, which thereby promotes the long-term benefit of consumers (consistent with outcomes in workably competitive markets).

Cost of capital across different types of regulated services

H1.32   When estimating the cost of capital for suppliers in a workably competitive market, a number of the parameter estimates, such as the risk-free rate and the tax-adjusted market risk premium, will be common across services regulated under Part 4 of the Act. To the extent that there are differences between the cost of capital estimates across services, sectors, or industries in workably competitive markets, this should reflect differences in the level of systematic risk that they face. Parameters that may differ across services, reflecting variability of returns or risk include the measure of systematic risk in the cost of equity (i.e. the beta estimates) and estimates of the debt premium.

H1.33   Therefore, cost of capital estimates across different types of regulated services, such
         as those provided by Airports, EDBs, GPBs and Transpower, reflect differences in
         the risk profiles associated with the supply of these services.[813]

H2   Overall Approach

The appropriate cost of capital framework

H2.1   The IM for the cost of capital framework requires that a vanilla cost of capital and
         post-tax cost of capital will be estimated for EDBs and GPBs for the purpose of
         information disclosure. For the purposes of default/customised price-quality
         regulation, the IM requires the Commission to apply a vanilla cost of capital only.

H2.2   The vanilla cost of capital will be determined as the expected cost of equity capital
         and the expected cost of debt capital, weighted by the respective proportion each
         represents of the total capital. The post-tax cost of capital will be determined as the
         expected cost of equity capital and the after tax expected cost of debt capital,
         weighted by the respective proportion each represents of the total capital. These are
         given by the following formulae:

$$\text{vanilla cost of capital} = r_d L + r_e(1-L)$$

$$\text{post-tax cost of capital} = r_d(1-T_c)L + r_e(1-L)$$

         where r_d is the cost of debt capital, r_e is the cost of equity capital, T_c is the corporate
         tax rate, and L is the leverage ratio. The leverage ratio is the proportion that debt
         capital represents of the total capital (total capital is the sum of debt capital plus
         equity capital).

H2.3   The framework for the cost of capital IM includes that:

         •   a vanilla WACC and post-tax WACC will be estimated for EDBs and GPBs
              for the purpose of information disclosure, and a vanilla WACC will be
              estimated for the purposes of default/customised price-quality regulation;

         •   the estimate of the expected cost of debt capital will be calculated as the risk-
              free rate plus the debt premium;

         •   debt issuance costs will be added on to the cost of debt;

         •   the estimate of the expected cost of equity capital is to be derived by using the
              simplified Brennan-Lally version of the CAPM;

         •   reasonableness testing against other versions of the CAPM will not be
              specified as part of the IM. However, the Commission has tested the estimates

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[813]   Further, where estimates for different regulatory instruments are taken at different times and over different periods (e.g.
         the CPP can apply for either a three, four or five year period), the estimates of the cost of capital will differ. This is
         consistent with the outcomes expected in workably competitive market where the cost of capital is estimated at
         different times and for different periods.

of the cost of capital using the IM, against estimates using the classical CAPM, and a range of other information;[814]

- a service-specific, rather than supplier-specific, cost of capital will be estimated for electricity distribution services (i.e. the same cost of capital will apply to all EDBs);

- a service-specific, rather than supplier-specific, cost of capital will be estimated for gas pipeline services (i.e. the same cost of capital will apply to all GPBs); and

- no adjustments will be made to the cost of capital for unsystematic or asymmetric risk, including real options.

Commission's reasons for the form of the WACC

H2.4   The WACC can be calculated on a vanilla or post-tax basis. In the case of a vanilla WACC, the corporate tax shield provided by debt capital is ignored in the WACC estimation, and firms are remunerated for their levered tax liabilities through a cash flow allowance. In the case of a post-tax cost of capital, the cost of debt is adjusted down by an interest tax deduction, and the company is remunerated for its un-levered tax liabilities through a cash flow allowance (i.e. the 'interest tax shield' is included).

H2.5   Submitters did not state any clear preference in terms of how suppliers should be remunerated for tax liabilities but stressed the need for consistency between the Commission's approach with regard to regulatory tax and the cost of capital.

H2.6   The IM's approach with regard to tax is consistent with the use of a vanilla WACC.[815] However, the Commission does acknowledge that a post-tax WACC is more readily understood by interested parties. Ensuring the WACC is understood by interested parties is particularly important in the context of information disclosure and to promote certainty.

H2.7   For these reasons, the IM requires estimation of both a post-tax and vanilla WACC for the purposes of information disclosure. The ID Determinations for EDBs and GPBs would need to include an adjustment to the interest tax shield (i.e. the notional deductible interest in the IM multiplied by the corporate tax rate) to ensure consistency with any post-tax WACC estimated in accordance with the IM. For the purposes of default/customised price-quality regulation, the IM estimates only the vanilla WACC.[816]

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[814]   This is discussed in section H13 Reasonableness checks on the cost of capital.

[815]   Commerce Commission, *IM Discussion Paper*, 19 June 2009, paragraph 8.29.

[816]   Use of a vanilla cost of capital is consistent with including tax as a separate building block, where the tax benefits associated with leverage are incorporated in the tax building block and not in the cost of capital. Including the tax benefits in the building blocks more accurately reflects the supplier's tax liabilities to the IRD. It therefore represents a more transparent approach.

Commission's reasons - estimating the cost of debt

Cost of debt

H2.8   The cost of debt (r_d) is the expected overall cost to the firm of borrowing. The
        standard practice in analysis of the cost of debt is to decompose the cost of debt into
        the two components. The two components are: the risk-free, the rate at which a debt
        issuer that was certain to meet its debt obligations would be able to borrow (for
        example, New Zealand dollar obligations of the New Zealand government), and the
        debt premium. The debt premium compensates the investor for the risk that the
        issuer in question may default, plus an allowance for the inferior liquidity of
        corporate bonds relative to government bonds.

H2.9   Firms incur fees and other costs when they raise debt capital. These costs are
        referred to as debt issuance costs. The IM recognises that fees and costs associated
        with prudent debt issuance and refinancing are legitimate expenses that are to be
        compensated.

H2.10   Thus, the cost of debt will be equal as follows:

        Cost of debt = risk-free rate + debt premium + debt issuance costs allowance

H2.11   Debt issuance costs can be accounted for either in the cash flows or as an addition to
        the cost of debt capital. The IM compensates firms for debt issuance costs in the
        form of a fixed addition to the cost of debt, rather than an allowance in cash flows,
        as it provides a greater degree of certainty to firms. It also promotes a greater degree
        of comparability across suppliers.

H2.12   The Commission's approach to estimating the risk-free rate, the debt premium and
        debt issuance costs are discussed sections H4 and H5 of this appendix respectively.

H2.13   The additional debt premium that firms incur on issuing long term debt is discussed
        in section H6.   The approach to estimating debt betas is discussed in section H9.

Commission's reasons - estimating the cost of equity

Cost of equity - appropriate model for estimating the cost of equity

Overview

H2.14   The cost of equity is the expected rate of return required by investors on equity
        capital that compensates them for the risk they bear and the time value of money,
        and the opportunities they forgo by committing funds to the firm. The cost of equity
        cannot be observed directly; it must be estimated.

H2.15   One of the most common economic models used to estimate the cost of equity is the
        CAPM (referred to as the classical CAPM), which was originally developed by
        Sharpe, Lintner and Mossin.[817] The Commission considers that there are two main
        alternative asset pricing models to the CAPM: the Fama-French three-factor

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[817]   See Sharpe, W., Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk, *Journal of Finance*,
        Vol. 19, No. 3, 1964, pp. 425–442; Lintner, J., The Valuation of Risky Assets and the Selection of Investments in
        Stock Portfolios and Capital Budgets, *Review of Economics and Statistics*, 47, 1965, pp. 13–37 and Mossin, J.,
        Equilibrium in a Capital Asset Market, *Econometrica*, Vol. 34, No. 4, 1966, pp. 768–783.

model;[818] and the group of models usually described as discounted cash flow (DCF) models. These models are discussed below.

The capital asset pricing model (CAPM)

H2.16   The CAPM is a single factor model that postulates a positive linear relationship between the expected return on an asset and the systematic risk associated with holding that asset. For a discussion of systematic (and unsystematic risk), please refer to paragraph H1.8.

H2.17   Under the assumptions on which the CAPM is based the cost of equity is decomposed into two components - the risk free rate plus the risk premium applicable to an individual stock. The risk premium is directly proportional to that stock's exposure to systematic risk, i.e. its beta.

H2.18   The CAPM is appealing because it identifies a single measure of risk and it is well-understood by analysts and commentators. The CAPM has received support from many regulators and academics as a reasonable model for estimating the regulated cost of capital.[819]

H2.19   Like all economic models, the CAPM has its limitations. For example, it contains a number of simplifying assumptions which may not hold in practice such as that there are no restrictions on short-selling, markets are frictionless, and investors may borrow or lend unlimited amounts at the risk-free rate.[820] Further, in some studies the actual returns of low-beta stocks appear to be higher than the CAPM's predictions, and the returns of high-beta stocks appear to be lower. A number of other economic factors have been shown to explain historical average returns better than the CAPM's beta in specific cases.[821]

H2.20   There are, however, a range of possible explanations for the results recorded in such empirical tests. For example, the results may reflect the serious methodological problems that exist in undertaking a robust test of the CAPM, including the difficulty of correctly observing the market portfolio.

H2.21   In their classic finance textbook, Copeland, Weston & Shastri note that there are many alternative explanations for the CAPM's performance in empirical tests and that a great deal of energy has been devoted to the empirical tests on how well the CAPM model fits the data.[822] They conclude, that "researchers have been working

[818]   Fama, E. F., French, K. R., Common Risk Factors in the Returns on Stocks and Bonds, *Journal of Financial Economics,* Vol. 33, No. 1, 1993, pp. 3–56.

[819]   See Myers, S. C., The Application of Finance Theory to Public Utility Rate Cases, *Bell Journal of Economics and Management Science*, Vol. 3, 1972, pp. 58–97 and Myers, S. C., On the Use of β in Regulatory Proceedings: A Comment, *Bell Journal of Economics and Management Science*, Vol. 3, 1972, pp. 622–627. Wright, S., Mason, R., Miles, D., *A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K.*, a Smithers & Co. Ltd. report to the OFT and U.K. economic regulators, 2003. IPART, IPART's weighted average cost of capital, Research - Final Decision, p. 2 and p. 13.

[820]   Copeland, T., Weston, J., and Shastri K., *Financial Theory and Corporate Policy* 4th Edition, Pearson Education, 2005, chapter 6.

[821]   See Grinblatt, M., Titman, S., *Financial Markets and Corporate Strategy*, 2nd edition, McGraw-Hill: New York, 2002, Section 5.40; and for surveys of the empirical evidence on the CAPM see Campbell, J. Y., Lo, A. W., MacKinlay, A. C., *The Econometrics of Financial Markets*, Princeton: New Jersey, 1997, pp. 211-217 and Jagannathan, R., Meier, I., Do We Need CAPM for Capital Budgeting?, *Financial Management*, Vol. 31, 2002, pp. 55–77.

[822]   Copeland, T., Weston, J., and Shastri K., *Financial Theory and Corporate Policy* 4th Edition, Pearson Education, 2005.

on tests of the CAPM for nearly 40 years, and no conclusive evidence has been published to date – the jury is still out".[823]

H2.22   An example of the methodological problems in robustly testing the CAPM is provided by Pettengill, Sundaram & Mathur (Pettengill et al.).[824] Pettengill et al. note that CAPM posits a positive relationship between beta and expected returns, but the relationship is conditional on the market excess returns when realised returns are used. That is, when the market excess returns are positive (negative), the relationship between returns and beta would be positive (negative). In other words, low beta stocks earn lower returns during up markets, but higher returns during down markets. Pettengill et al. argue that many prior empirical tests of the CAPM are biased against the CAPM as they fail to adjust for the conditional relationship between actual returns and beta. Adjusting for this bias, Pettengill et al. find a strong positive relationship between beta and returns. Their work spawned a significant number of subsequent studies the results of which were also more supportive of the CAPM than previous studies, and in particular that there was a strong relationship between beta and returns.

H2.23   Professor Myers observes that the CAPM's beta sometimes suffers from estimation errors so large that it can be difficult to draw any reliable conclusions; that the instability of beta over time can be problematic; and that the model does not seem to provide a comprehensive explanation of the risk-return relationship on either a theoretical or empirical level.[825] However, in his advice to the Commission, Professor Myers still recommends the use of the CAPM framework to estimate the cost of capital as it provides valuable insights.[826]

Alternative asset pricing models

H2.24   The Fama-French three-factor model adds two factors to the CAPM's market factor ('MRP'). These factors are a firm size factor (the return on small-firm stocks minus the return on large-firm stocks) and a book-to-market factor (the return on high book-to-market ratio stocks minus the return on low book-to-market ratio stocks). Each factor may represent a risk premium that contributes towards the overall risk premium of the asset.

H2.25   Fama and French assert that their simple three-factor model explains most of the risk premiums of stocks (the so-called anomalies of the CAPM) identified by these competing models.[827] However, the theoretical foundations of the Fama-French factors are less well-developed than that of the CAPM, and Fama and French have been criticised for 'data mining' — inferring the existence of relationships in the

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[823]   ibid, p.164.

[824]   G. Pettengill, S Sundaram, & I. Mathur, The Conditional Relation between Beta and Returns, *Journal of Financial and Quantitative Analysis, Vol. 30, No, 1 Mar 1995, pp. 101-116.*

[825]   Myers, S. C., On the Use of β in Regulatory Proceedings: A Comment, *Bell Journal of Economics and Management Science*, Vol. 3, 1972, pp. 622–627.

[826]   Franks, J., Lally, M. and Myers, S*., Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology*, Report prepared for the Commerce Commission, 18 December 2008, pp. 9-11.

[827]   Fama, E. F., French, K. R., Multifactor Explanations of Asset Pricing Anomalies, *Journal of Finance*, Vol. 51, 1996, pp. 55–84.

data that appear purely through chance.[828] Wright, Mason and Miles (Wright et al.) observe that the statistical significance of the factors themselves is dubious; there is little evidence that the historical risk premiums associated with these factors are significantly different from zero.[829] Furthermore, the reliability of the model may vary between countries; the model has typically been applied to US or UK data.

H2.26   A specific application of the Fama-French model was considered in detail by the AER in the Jemena Gas decision.[830] The AER concluded that:

- The Fama-French three-factor model was not well accepted by academics, financial market practitioners, nor regulators; [831]

- The Fama-French three-factor model is empirically driven, without a strong theoretical grounding;[832]

- The estimates produced by the Fama-French three-factor model "are not arrived at on a reasonable basis"; [833] and

- The Fama-French three-factor model "does not produce a better estimate or forecast than the CAPM of the cost of equity". [834]

H2.27   Finally, the availability of reliable size and book-to-market data may constrain the model's applicability to some New Zealand industries. Hence, the Fama-French three-factor model suffers from its own limitations.

DCF Models

H2.28   There are several forms of DCF models. The simplest of these is Gordon's constant dividend growth model, which says that the cost of equity capital on an equity security is the discount rate that equates the current stock price to the present value of the future stream of expected dividends, which are expected to grow in perpetuity at a constant rate.[835]

H2.29   DCF is routinely applied by US regulators, such as the Federal Energy Regulatory Commission ('FERC'), as the primary model for estimating firms' allowed return on equity.[836]

H2.30   There are a number of limitations with the DCF models:

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[828]   For examples see Campbell, J., Why Long Horizons? A Study of Power Against Persistent Alternatives, *Journal of Empirical Finance*, Vol. 8, 2001, pp. 459–491 and MacKinlay, A. C., Multifactor Models do not Explain Deviations from the CAPM, *Journal of Financial Economics*, Vol. 38, 1995, pp. 3–28.

[829]   Wright, S., Mason, R., Miles, D., *A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K.*, a Smith & Co. Ltd. report to the OFT and U.K. economic regulators, 2003, pp. 72-76.

[830]   AER, *Jemena Gas Networks, Access arrangement proposal for the NSW gas markets Final decision, 1 July 2010- 30 June 2015*, pp. 108-172.

[831]   ibid, pp. 108-172, pp. 119-134

[832]   ibid, pp.108-172, pp. 134-138.

[833]   ibid, pp. 108-172, p. 142.

[834]   ibid, pp. 108-172, p. 148.

[835]   Gordon, M., The Investment, Financing, and Valuation of the Corporation, Irwin: Homewood, 1962.

[836]   Gordon, K., Makholm, J. D., *Allowed Return on Equity in Canada and the United States: An Economic, Financial and Institutional Analysis*, NERA report, 2008.

- First, the informational requirements mean the standard model is only feasible for listed firms that pay dividends;

- Second, the constant growth assumption is only reasonable for stable, mature firms;

- Third, good forecasts of dividend growth are essential. In practice, forecasts of firms' earnings are used as a surrogate for the growth in dividends, so it is necessary to assume that earnings and dividends grow roughly in balance. It is also necessary to assume that forecasts do not systematically underestimate or overestimate earnings, and that growth forecasts are based on the same information that the market uses to value firms' stocks.[837] Presently, forecasts of earnings for some, but not many, New Zealand firms are available through the Institutional Brokers' Estimate System (IBES);

- Fourth, dividend growth forecasts, which are generally only available for the short-run, often exceed the long-run rate of economic growth. Cornell observes that, as a consequence of this empirical fact, and the constant growth model's assumption that the forecast growth rate applies in perpetuity, gives rise to the implausible result that the company will eventually engulf the entire economy.[838] Multistage models described in the Expert Panel report and by Cornell, seek to overcome this problem;[839] and

- Finally, the model relies on the assumption that financial markets are efficient and correctly value investments.[840] The empirical evidence on that question has been mixed, at best.

H2.31   There are many other asset pricing models apart from the three discussed here. Wright et al. survey several of these, including nonlinear, conditional, multifactor and intertemporal models. They conclude that each suffers from its own shortcomings, and in their view, "there is no one clear successor to the CAPM for practical cost of capital estimation".[841]

Estimating the cost of equity in practice

H2.32   The CAPM remains the most widely applied asset pricing model by both regulators and financial practitioners in New Zealand and throughout the world. In its previous regulatory decisions, the Commission has consistently applied a CAPM framework. All Australian regulators use the CAPM approach to estimate the cost of equity, it has been used also in the UK and Europe, while DCF has been applied by some US regulators (and CAPM is used as a cross-check in some instances).

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[837]   See Grinblatt, M., Titman, S., *Financial Markets and Corporate Strategy*, 2nd edition, McGraw-Hill: New York, 2002, pp. 388-390.

[838]   Cornell, B., The Equity Risk Premium: the Long-run Future of the Stock Market, Wiley: New York, 1999.

[839]   Franks, J., M. Lally and S. Myers, *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology*, Report prepared for the Commerce Commission, 18 December 2008; Cornell, B., *The Equity Risk Premium: the Long-run Future of the Stock Market*, Wiley: New York, 1999, Chapter 3.

[840]   Independent Regulators Group (IRG), *Regulatory Accounting — Principles of Implementation and Best Practice for WACC Calculation*, February, 2007, p. 19.

[841]   Wright, S., Mason, R., Miles, D., *A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K.*, a Smithers & Co. Ltd. report to the OFT and U.K. economic regulators, 2003, Chapter 3, p. 76.

H2.33   In the New Zealand context, the Commission has considered the regulatory cost of capital for the Telecommunication Service Obligation ('TSO') net cost calculations determination,[842] the Airports Inquiry,[843] in the Gas Control Inquiry,[844] the Electricity Inquiry into Unison,[845] and the Gas Authorisation.[846] In these decisions, the Commission has consistently applied a CAPM framework.

H2.34   The use of the CAPM was considered and accepted by the New Zealand High Court in the Auckland Bulk Gas Users case.[847] In its judgment in that case the High Court described the CAPM as "a sensible theory, logically rigorous and consistent with accepted and acceptable economic thinking". The court stated that the CAPM:

> …is a simple concept, fundamental to financial theory, providing a positive relationship between the perceived or estimated risk and the required rate of return. We believe it is a satisfactory model and an appropriate method to calculate the capital cost for pricing purposes. We think that the Commission was entitled to make use of that methodology to the exclusion of other particular formulas in making its pricing decision. [848]

Challenges to regulators' use of the CAPM

H2.35   Over the years, many regulators have been challenged on their reliance on CAPM through submissions. In doing so, many submitters rely on the empirical literature to justify adoption of a different method of estimating the cost of equity, notwithstanding that there is no conclusive evidence or consensus on how to interpret the empirical tests or what a better method may be.

H2.36   The issue was considered in detail by Wright, Mason and Miles (Wright et al.)[849] for the U.K. economic regulators[850] and the Office of Fair Trading. Wright et al. concluded that:[851]

> [t]he Capital Asset Pricing Model (CAPM) is (still) widely-used to estimate firms' costs of capital. There is considerable evidence of empirical shortcomings in the CAPM; but its clear theoretical foundations and simplicity contribute to its popularity.

H2.37   After reviewing some of the empirical research developments, Wright et al note:[852]

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[842]   Commerce Commission, Determination for TSO Instrument for Local Residential Service for period between 20 December 2001 and 30 June 2002, 17 December 2003, and every year with the latest being the Commerce Commission, Draft TSO Cost Calculation Determination for TSO Instrument for Local Residential Telephone Service for period between 1 July 2008 and 30 June 2009, 4 December 2009.

[843]   Commerce Commission, *Final report Part IV Inquiry into Airfield Activities at Auckland, Wellington and Christchurch International Airports*, 1 August 2002.

[844]   Commerce Commission, *Gas Control Inquiry*, Final Report, 29 November 2004 (Commerce Commission, Gas Control Inquiry).

[845]   Commerce Commission, *Electricity Distribution - Regulation of Electricity Lines Businesses Targeted Control Regime Intention to Declare Control Unison Networks Limited*, September 2005.

[846]   Commerce Commission, Gas Authorisation Decisions Paper, 30 October 2008.

[847]   *Auckland Bulk Gas Users v Commerce Commission* [1990] 1 NZLR 448, pp. 466-467.

[848]   *Auckland Bulk Gas Users v Commerce Commission* [1990] 1 NZLR 448, 467.

[849]   Wright, S., Mason, R., Miles, D., *A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K.*, a Smithers & Co. Ltd. report to the OFT and U.K. economic regulators, 2003, pp. 72-76; Smithers & Co. Ltd, A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK, Feb 13, 2003.

[850]   The U.K. economic regulators are The Civil Aviation Authority (CAA), Office of Water Services (OFWAT), Office of Gas and Electricity Markets (Ofgem), Office of Telecommunications (Oftel), Office of the Rail Regulator (ORR) and Office for the Regulation of Electricity and Gas (OFREG).

[851]   Wright, S., Mason, R., Miles, D., *A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K.*, a Smithers & Co. Ltd. report to the OFT and U.K. economic regulators, 2003, p. 75-76.

> In summary: the empirical shortcomings of the CAPM are known. Alternative models
> to address this issue have their own shortcomings - weak theoretical foundations and
> empirical challenges. In our view, there is no one clear successor to the CAPM for
> practical cost of capital estimation.

H2.38　The issue has also been addressed by a number of Australian regulators, including
the AER (2009 and 2010[853]), the QCA (2004) and most recently by IPART (Nov
2009, final Apr 2010[854]). All have continued to use the CAPM to estimate the cost
of equity.

H2.39　Notwithstanding the criticisms levelled at the model and its imperfections, for the
following reasons, the Commission retains the CAPM:

- it enjoys almost universal use and acceptance by New Zealand companies,
practitioners and analysts;

- it has been used consistently by regulators in New Zealand, Australia, the UK
and Europe;

- there is no consensus as to what model is better than the CAPM;

- no other model enjoys even a fraction of the support in practice that the CAPM
enjoys;

- there is still extensive ongoing debate about the theoretical basis of the other
models, and there are difficulties in sourcing reliable data for these other
models;

- the use of CAPM was upheld by the High Court in New Zealand;[855] and

- the Commission's Cost of Capital Expert Panel also considered how best to
estimate the cost of equity. All members of the panel recommended the use of
the CAPM (in one form or another).[856]

Submissions on use of the CAPM

H2.40　In submissions on the Revised Draft Cost of Capital Guidelines (RDG)[857] and IM
Discussion Paper[858] interested parties highlighted the CAPM's poor performance in
under (over) estimating the cost of equity for low (high) beta firms.[859] LECG for

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[852]　ibid, p. 76.

[853]　AER, *Electricity Transmission and Distribution Network Service Providers - Review of the Weighted Average Cost of
Capital (WACC) Parameters, Final Decision*, May 2009. AER, *Jemena Gas Networks, Access arrangement proposal
for the NSW gas markets Final decision, 1 July 2010- 30 June 2015*, pp.108-172.

[854]　IPART, *Alternative approaches to the determinations of the cost of equity – other industries discussion paper*,
November 2009, p. 18. IPART, *IPART's weighted average cost of capital, Research - Final Decision*, p. 2 and p. 13.

[855]　*Auckland Bulk Gas Users v Commerce Commission* [1990] 1 NZLR 448, pp. 466-467.

[856]　Professor Myers recommended the classical CAPM, Associate Professor Lally recommended the simplified Brennan-
Lally CAPM, while Professor Franks recommended the use of both of these models and the International CAPM.

[857]　Commerce Commission *Revised Draft Guidelines - The Commerce Commission's Approach to Estimating the Cost of
Capital*, 19 June 2009 (RDG).

[858]　Commerce Commission, *IM Discussion Paper*, 19 June 2009.

[859]　See for an example PricewaterhouseCoopers, *Submission to the Commerce Commission on the Revised Draft
Guidelines – The Commerce Commission's Approach to Estimating the Cost of Capital*, Report on behalf of 17 EDBs,
14 August 2009.

ENA cited evidence indicating that, when applied to New Zealand capital market data, the CAPM has been unable to detect any relationship between excess returns and beta. LECG also cited evidence that for New Zealand electricity lines and gas pipeline businesses the precision of CAPM-based cost of capital estimates were low.[860]

H2.41   PwC (for 17 EDBs) submitted that:[861]

> We acknowledge the practical difficulty in being able to estimate the parameters required by other models such as the International CAPM, the Dividend Discount (or DCF) model and the Fama-French three factor model. We therefore consider that the Classical and Brennan-Lally CAPMs are the most practical to apply in New Zealand at this time.

H2.42   During further consultation on the appropriate cost of capital for the IM the majority of the suppliers and users of regulated services recommended that for IMs the Commission should use a CAPM framework, instead of other estimation models (i.e. dividend discount model, Fama-French model), to estimate the cost of equity.

Conclusion - appropriate model for estimating the cost of equity
H2.43   The CAPM is the most widely understood and most widely used method for estimating the cost of equity in New Zealand, and by regulators in Australia, the UK, and Europe. Whilst alternative models exist, they are rarely used in practice (including in a regulatory context) and have their own shortcomings, including an extensive ongoing debate about their theoretical basis, and the difficulties in sourcing reliable data required by the other models. Due to its strong theoretical foundations, its simplicity and its greater acceptance, the CAPM is preferred by the Commission.

Cost of Equity - The form of the CAPM
Overview
H2.44   Since its initial development a number of variations of the CAPM model have been developed which incorporate different assumptions relating to the taxation of returns from debt and equity. The classical CAPM effectively assumes that personal taxes do not differ across forms of income, and as a result, these tax rates drop out of the model. It therefore does not adjust for the effect of any imputation credits attached to dividends, or reflect differences in tax rates in capital gains relative to dividends. It is therefore inconsistent with the New Zealand tax regime that permits the use of imputation credits to offset investor tax obligations in order to avoid double taxation (i.e. on company earnings, and then again on personal earnings), and generally imposes no capital gains tax.

H2.45   The 'Brennan-Lally CAPM' (and the simplified version of it) is an alternative to the classical CAPM that explicitly takes account of differing tax rates on different forms of income. Lally, and Cliffe and Marsden modified Brennan's model to adapt it to

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[860]   LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital*, Report for ENA, 11 August 2009, p. 10 (LECG for ENA, Comments on estimating the Cost of Capital).

[861]   PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, Report on Behalf of 17 EDBs, 2 December 2009, p. 7.

the New Zealand tax regime. The simplified version of the model considers only the effects of dividend imputation and assumes that capital gains are tax free.[862]

H2.46   The formula to calculate the cost of equity using the simplified Brennan-Lally CAPM is:

$$\mathbf{r_e = r_f(1\text{-}t_i) + \beta_e TAMRP}$$

where r_f is the risk-free rate, t_i is the investor tax rate on interest, B_e is the equity beta and TAMRP is the tax adjusted market risk premium.

H2.47   In Australia, the Officer Model was developed in relation to the Australian taxation system. A different CAPM variant, the International CAPM takes into account international investors.

H2.48   However, none of these models fully reflect market circumstances. In particular, the classical CAPM and simplified Brennan-Lally CAPM, and to some extent the Officer model, assume national capital markets are closed. The international CAPM assumes that capital markets are integrated but this model has difficulties in its application. [863]

H2.49   In practice, New Zealand capital markets are partially integrated in the sense that overseas investors play a large role. One implication of the presence of international investors is that not all imputation credits can be fully utilised since non-New Zealand taxpayers cannot obtain the full benefits of imputation.

H2.50   In this regard, Unison submitted that:[864]

> … the Commission should recognise that only a portion of investors in New Zealand's capital markets are able to utilise dividend imputation credits, i.e. rather than assuming 100% of investors are able to utilise imputation credits, the Commission should use an estimate of the actual proportion.

H2.51   The Commission notes that there are two alternatives to the classical CAPM and simplified Brennan Lally CAPM that attempt to take account of the partial integration of New Zealand with international markets. These alternatives are (i) the Officer model,[865] and (ii) the full (or not simplified) Brennan-Lally CAPM. The Officer model assumes interest and capital gains are subject to the same rate of tax and recognises that imputation credits may not be valued by all investors (such as international investors). The value placed on imputation credits by investors on average is known as the "gamma" parameter in the cost of capital calculation. The

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[862]   Lally, M., The CAPM under Dividend Imputation, *Pacific Accounting Review*, 4, 1992, pp. 31–44; Cliffe, C., and A. Marsden, The Effect of Dividend Imputation on Company Financing Decisions and the Cost of Capital in New Zealand, *Pacific Accounting Review*, 4, 1992, pp. 1–30; Brennan, M., Taxes, Market Valuation and Corporate Financial Policy, *National Tax Journal*, 23, 1970, pp. 417–27.

[863]   The Commission considers that the data requirements of the International CAPM (especially the requirement of a market risk premium that is suitable for more than one country) are too substantial for this model to be considered for practical use.

[864]   Unison, Appendix: Submission on Revised Draft Guidelines: The Commerce Commission's Approach to Estimating the Cost of Capital, 14 August 2009, p. 5 (Unison, Submission on Revised Draft Guidelines).

[865]   Officer, R. R., The cost of capital of a company under an imputation tax system, *Accounting & Finance*, Vol. 34, 1994, pp. 1-17.

main difference between the full and simplified version of the Brennan-Lally CAPM is that the former allows for differences in tax rates on interest, dividends and capital gains and for partial use of imputation credits.

H2.52   The Officer version of the CAPM model is widely used by regulators and finance practitioners in Australia.[866]   Due to this widespread adoption of the Officer framework over the past decade there have been numerous papers estimating the average utilisation rates of imputation credits in Australia. Despite the availability of estimates and data in Australia, there has still been considerable debate about the value of the gamma parameter that should be use in regulatory proceedings there.[867]

H2.53   In New Zealand, the same body of literature in relation to the utilisation rate of imputation credits does not appear to exist. In particular, the Commission is not aware of any up-to-date estimates of the utilisation rates of imputation credits for New Zealand. This in part seems to be due to the paucity of data that exists in New Zealand. Instead, applications of the Brennan-Lally CAPM in the New Zealand context typically use the simplified Brennan-Lally CAPM, rather than the Officer or the extended Brennan Lally CAPM to estimate the cost of capital.

H2.54   A number of submissions highlighted that some international investors, in particular, cannot utilise the imputation credits distributed with dividends.[868]   Therefore, the assumption in the simplified Brennan-Lally CAPM that imputation credits would be fully used is inappropriate. Those submissions contend that use of the simplified-Brennan-Lally CAPM may therefore understate the cost of equity.

H2.55   The Commission accepts that international investors are substantial investors in New Zealand, and with New Zealand's limited level of domestic savings, international investors are arguably the marginal investors. However, the position of international investors should not be looked at on a piecemeal basis as the differences between international investors and domestic investors is not limited just to the value placed on imputation credits. Rather, international investors face different risk-free rates, different market portfolios, and different views on risk (beta) as well as different tax considerations. A full consideration of these differences would require the use of an

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[866]   For example, the Australian Energy Regulator (AER), the Australian Competition and Consumer Commission (ACCC), Independent Pricing and Regulatory Tribunal of New South Wales (IPART) and Queensland Competition Authority (QCA). See Handley, J.C., *Further comments on the valuation of imputation credits, report prepared for the AER*, Final, 15 April 2009, p. 6. Also see Lally, M., Regulatory revenues and the choice of the CAPM: Australia versus New Zealand, *Australian Journal of Management*, Vol. 31, No. 2, December 2006, pp. 313-332, who compares the Officer version of the CAPM against the simplified Brennan-Lally CAPM and the standard Sharpe-Lintner-Mossin CAPM. Lally finds that which of the three models performs best depends on the utilisation rate of imputation credits.

[867]   See AER, *Final decision: Electricity transmission and distribution network service providers – Review of the weighted average coat of capital (WACC) parameters*, May 2009, pp. 393-469 (AER, Final Decision on WACC for Electricity); and Handley, J. C., *Further comments on the valuation of imputation credits*, Report prepared for the AER, 15 April 2009.

[868]   Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, 13 August 2010, pp. 29-30; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, pp. 30-32; Orion New Zealand Ltd, *Cross Submission on EDBs (Input Methodologies) Draft Determination and Reasons Paper*, Attachment: NERA, *The Cost of Equity: a report prepared for Orion New Zealand Ltd*, 2 September 2010, pp. 7-9.

international CAPM, reflecting estimates of the particular parameters that relate to international investors.

H2.56   This matter was discussed by the Expert Panel Report.[869] The advice from Dr Lally is that an international CAPM would tend to provide lower estimates of the cost of equity, than either the simplified Brennan-Lally CAPM or the classical CAPM. Professor Myers did not agree that use of the international CAPM would necessarily yield lower estimates than the simplified Brennan-Lally CAPM.[870] In support of Dr Lally's conclusion the Commission notes that there are a number of papers which conclude that the estimated cost of capital from an international perspective is lower than the estimated cost of capital from the perspective of domestic investors. These are noted in paragraphs 6.4.33 to 6.4.35.

H2.57   The Commission notes that some investors in EDBs and GPBs may not be able to use imputation credits fully either, for example, certain types of trusts. However the Commission considers that the ownership structure of regulated suppliers should not affect the choice of the framework used to estimate the cost of capital as the impact of ownership structure should fall on the owners not on consumers. That the impact of the ownership structure for certain firms would alter prices in the market, is inconsistent with outcomes in workably competitive markets.

H2.58   The only aspect that is relevant is the overall integration of the New Zealand market as a whole not whether individual entities choose to only access the lowest cost of capital structure available given the New Zealand markets' extent of integration. Furthermore, adopting different cost of capital assumptions based solely on ownership structure where there are a number of regulated service providers (particularly where the difference reflects public or private ownership) could potentially create perverse investment incentives. As a result, the Commission considers that it should adopt a single model, which focuses on domestic investors, when estimating suppliers' cost of equity. Given the body of research suggesting that international estimates of the cost of capital are lower than those from a purely domestic perspective, the adoption of a domestic CAPM (simplified Brennan-Lally CAPM) is more likely to advantage regulated suppliers than to disadvantage them.

Form of CAPM used in practice
H2.59   All Australian regulators currently use the Officer CAPM framework for estimating the cost of equity capital.[871] UK regulators typically use the classical CAPM framework as, in part, it is consistent with the UK tax regime.[872] Professor Franks in the Cost of Capital Expert Report notes that the UK had a partial imputation system

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[869]   Franks, J., Lally, M., Myers, S., *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology*, 18 Dec 2008, pp. 10-11.

[870]   ibid.

[871]   Similar to the simplified Brennan-Lally CAPM the Officer model explicitly takes account of imputation credits, but by contrast, assumes that capital gains are taxed at the same rate as interest in Australia. For example, see cost of capital decisions by the AER, ACCC, IPART and QCA.

[872]   Office of the Gas and Electricity Markets (Ofgem), Water Services Regulation Authority (Ofwat), Office of Communications (OFCOM), UK Competition Commission, Civil Aviation Authority (CAA) and Office of Rail Regulation (ORR) all use the classical CAPM framework.

in the late 1980s and early 1990s "… and most parties used a Brennan-Lally-type model."[873]

H2.60 Both the Australian and UK regulators have recently reviewed the use of the CAPM framework against alternative models but have decided not to depart from it as their principal tool to estimate suppliers' cost of equity.

H2.61 In its decisions in estimating the cost of equity capital, the Commission has consistently used the simplified Brennan-Lally CAPM[874] over the classical and Officer model. This has been done on the basis that this version of the CAPM better accounts for the investor tax regime operating in New Zealand than the classical CAPM (which does not allow for imputation credits) and the Officer model (which assumes interest and capital gains are equally taxed).[875] In the RDG and IM Discussion Paper, the Commission proposed continuing to use the simplified Brennan-Lally CAPM.

H2.62 At the Cost of Capital Workshop, participants from the suppliers of regulated services indicated that they use the simplified Brennan-Lally CAPM to calculate the cost of capital.[876]

Submissions on the form of the CAPM

H2.63 In a post-workshop submission Vector noted that "[h]istorically the Commission has adopted the simplified Brennan-Lally CAPM. It was evident from the conference that there was little dispute that this is an acceptable approach to use". In that submission Vector also submitted that there was no "persuasive evidence" to depart from the use of the simplified Brennan-Lally CAPM and that the Commission should not depart from it unless there was persuasive evidence to do so.[877]

H2.64 In submissions on the Draft Reasons paper, however, Vector submitted that it is not clear that the simplified Brennan-Lally CAPM is the strongest candidate method for estimating the cost of capital. Vector suggested further data and studies are required, and the Commission should review its choice of model within 18 months of the publication of the IMs.[878] However, the Commission considers a decision to undertake such a review would be inconsistent with the statutory purpose of input methodologies which is to "promote certainty for suppliers and consumers in relation to the rules, requirements and processes applying to regulation of services under this part".[879] However, if a substantially improved model was to be

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[873] Franks, J., Lally, M., Myers, S., *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology*, 18 Dec 2008, paragraph 31.

[874] The simplified Brennan-Lally CAPM has been used in cost of capital estimations by the Commission since 2002 (Commerce Commission, *Part IV Inquiry into Airfield Activities at Auckland, Wellington and Christchurch International Airports, Final report*, 1 August 2002).

[875] Sharpe, W., Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk, *Journal of Finance, 19*, 1964, pp. 425-42; Linter, J., The Valuation of Risky Assets and the Selection of Investments in Stock Portfolios and Capital Budgets, *Review of Economics and Statistics, 47*, 1965, pp. 13-37.

[876] Commerce Commission, *Cost of Capital Workshop Transcript*, 12-13 November 2009, pp. 38-40.

[877] Vector, *Cross Submission to Commerce Commission on the Weighted Average Cost of Capital Workshop*, 2 December 2009, pp. 7-8.

[878] Vector, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost Of Capital*, 13 August 2010, paragraph 120.

[879] Section 52R of the Act.

developed, and/or there was a significant change in the models used in practice in New Zealand to estimate the cost of capital, the Commission would need to consider whether the cost of capital IM would need to be amended. The Commission notes that Vector's most recent submission did not explain the apparent change in Vector's position on the suitability of the simplified Brennan-Lally CAPM, nor whether the model or models Vector itself uses have changed.

H2.65   ENA and LECG (for ENA) "… support[s] the model applied by the Commission, viz, the post-tax form of the CAPM" (that is, the simplified Brennan-Lally CAPM) noting that "… the post-tax form of the model attempts to address New Zealand's imputation tax structure."[880] Uniservices (for NZAA) agreed that the simplified Brennan-Lally version of the CAPM is an acceptable model for New Zealand under the assumptions of the dividend imputation tax regime.[881]

H2.66   Some submitters considered the Commission should use a number of approaches and models, rather than just the simplified Brennan-Lally CAPM. NERA for Orion[882] submitted that no single method of estimating the cost of equity should be relied upon exclusively, and that the Commission should inform itself of estimates from other models.[883]

H2.67   LECG did not support that approach. LECG's view was that:[884]

> … use of different models raises the question of how the different results obtained should be combined – a question that is unlikely to have a simple answer. Therefore, I agree with the Commission in continuing to follow the advice of its long standing expert adviser, Associate Professor Lally, to use only the post-tax form of the CAPM as the model for estimation of the cost of equity.

Leverage

H2.68   One of the shortcomings that the Commission is concerned about when estimating the cost of capital using the simplified Brennan-Lally CAPM to calculate the equity component of WACC is the relationship of the cost of capital with leverage, i.e. the proportion of debt capital relative to total (i.e. debt and equity) capital. It is normal to regard the use of leverage as a discretionary capital structure decision which

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[880]   Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, p. 1; Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: LECG, *Response to Commerce Commission's Draft Cost of Capital Input Methodology: a report prepared for the Electricity Networks Association*, 13 August 2010, p. 1.

[881]   NZ Airports Association, S*ubmission on Draft Information Disclosure Determination and Draft Reasons Paper*, Attachment: Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper - Report for NZAA*, 12 July 2010, p. 21.

[882]   Orion New Zealand Ltd, *Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determination and Reasons Paper*, Attachment: NERA, *The Cost of Equity: a report prepared for Orion New Zealand Ltd*, 2 September 2010, p. 3 and p. 23.

[883]   A similar point was made by Prime Infrastructure (Prime Infrastructure, *Submission on EDBs (Input Methodology) Reasons Paper, Cost of Capital - The Investor Perspective*, 13 August 2010, pp. 7-9) and Telecom (Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010).

[884]   Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: LECG, *Response to Commerce Commission's Draft Cost of Capital Input Methodology: a report prepared for the Electricity Networks Association*, 13 August 2010, p. 7.

implies that leverage is increased only where it would reduce or at least not increase the WACC. However, the cost of capital increases with leverage when using the simplified Brennan-Lally CAPM in conjunction with the simplified beta gearing model to calculate the equity component of WACC. If this relationship were true any use of debt would be contrary to the interest of the firm (and thus would not be in the interests of shareholders) and estimation of the cost of capital based on leverage other than zero would be an overestimate of the cost of capital that would correspond to an efficient capital structure.

H2.69   The Commission has been aware of the counterintuitive relationship between leverage and the cost of capital when applying the simplified Brennan-Lally CAPM in the past. However, it is only since the recent GFC and its associated increase in the debt premium, that this relationship has become so pronounced.

H2.70   Submitters generally agreed that the observation that New Zealand firms include debt in their capital structures indicates that their Boards and managements do not believe that leverage (at least up to a certain point) increases the cost of capital. One implication of concern to the Commission is that if the simplified Brennan-Lally CAPM were to be applied such that increases in the regulated firm's actual leverage would result in increases in their allowed cost of capital, that would result in an incentive for suppliers of regulated services to increase their leverage. That could well be detrimental to the long-term benefit of consumers to the extent that the risk of default by the supplier was increased with consequent adverse effects on consumers.

H2.71   The Commission recognises the significance of this aspect of the cost of capital when applying the simplified Brennan-Lally CAPM, and has sought to mitigate the effects thereof, at least to some extent, by adopting a level of notional leverage for each regulated service that reflects the sample of international firms that were analysed to estimate beta for the respective regulated service. This will be discussed in further detail in Section H3 on leverage.

Conclusion - Cost of Equity - The form of the CAPM

H2.72   The Commission acknowledges that one of the shortcomings of estimating the cost of capital by applying the simplified Brennan-Lally CAPM to calculate the equity component of WACC is its counterintuitive relationship between WAC and leverage that results. The cost of capital increases with leverage when the simplified Brennan-Lally CAPM is used to calculate the equity component of WACC.

H2.73   Nevertheless, the cost of capital IM uses the simplified Brennan-Lally CAPM to estimate the cost of equity capital. This is for three main reasons:

- First, it takes into account the effect of the New Zealand tax system whereby interest is taxable for investors but (in simplified terms) returns on equity are not double taxed (i.e. dividends are not taxable when received if corporate tax has been paid and no capital gains tax is levied on equity);[885]

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[885]   The New Zealand tax regime permits the use of imputation tax credits, attached to dividend payments, to offset the investor's tax obligations. When combined with most investors being exempt from tax on capital gains it results in equity returns being essentially tax free in the hands of the investor whilst interest income is not.

- Second, it has been adopted in previous regulatory determinations by the Commission,[886] and the New Zealand Treasury has endorsed the use of the simplified Brennan-Lally CAPM for estimating the cost of equity capital for Crown Entities and State-Owned Enterprises;[887] and

- Third, in New Zealand, the simplified Brennan-Lally CAPM is the most widely used approach to estimate the cost of equity capital - by equity analysts, by suppliers of regulated and unregulated services, and practitioners.[888]

H2.74   The Commission notes that the full Brennan-Lally and Officer versions of the CAPM could be used to reflect the fact that not all investors are able to access imputation credits. However, the Commission considers that the benefits of using these models are outweighed by the additional level of complication and data requirements they would impose. Further, they are not generally used in New Zealand to estimate the cost of equity capital.

H2.75   As noted, the Commission recognises the significance of the relationship between the cost of capital and leverage when applying the simplified Brennan-Lally CAPM to estimate the cost of equity. However it considers that the advantages of using this framework outweigh the disadvantages as long as the effects of the counterintuitive relationship between the cost of capital and leverage is mitigated by adopting a level of leverage that is based on the comparative firm sample. This will be discussed in further detail in this paper's section on leverage (Section H3).

H2.76   A number of participants at the Cost of Capital Workshop, and a number of submitters, proposed that the Commission should consider testing its estimates with the classical CAPM.

H2.77   The Commission recognises the limitations of the simplified Brennan-Lally CAPM and the merits of using alternative CAPMs to test the results from the simplified Brennan-Lally CAPM. However, formally including a requirement to undertake reasonableness tests in the IM would have created significant subjectivity and uncertainty. For example, the Commission would have to determine (a) the weight that would be accorded to each reasonableness test, (b) criteria outlining when to adjust its cost of equity estimate derived from the simplified Brennan-Lally CAPM in light of the results from the reasonableness tests, and (c) the degree of any resulting adjustment from the reasonableness tests. All three steps would require a significant degree of additional judgement and would have, most likely, to be considered on a case-by-case basis. For these reasons, the Commission considers that formally including reasonableness tests - and any associated adjustment process

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[886]   See Commerce Commission, *Gas Control Inquiry, Final Report*, 28 November 2004; Commerce Commission, *Gas Authorisation Decision Paper*, 30 October 2008; Commerce Commission, *Part IV Inquiry into Airfield Activities at Auckland, Wellington and Christchurch International Airports, Final report*, 1 August 2001 and any Commerce Commission TSO Decision Paper.

[887]   New Zealand Treasury, *Estimating the Cost of Capital for Crown Entities and State-Owned Enterprises*, A handbook prepared for the Treasury, 1997.

[888]   At the Cost of Capital Workshop Professor Bowman was the only person not to endorse the use of the simplified Brennan-Lally CAPM. Professor Bowman preferred the use of the Officer framework. PwC NZ publishes a quarterly cost of capital report that uses the Brennan-Lally CAPM. See http://www.pwc.com/nz/en/cost-of-capital/index.jhtml.

– in the IM would be inconsistent with the purpose of IMs of providing certainty to suppliers and consumers of regulated services.

H2.78   In reaching its view on the final cost of capital IM, the Commission has tested the estimates of the cost of capital from an application of the IM (using the simplified Brennan-Lally CAPM) against a range of other information including estimates of the cost of capital using the classical CAPM. The purpose of this testing is to ensure that the cost of capital IM produces commercially realistic estimates of the cost of capital that are adequate to ensure continuing investment in regulated services and that suppliers are limited in their ability to extract excessive profits.   These tests are further discussed in Section H13.

Ad hoc allowance for model error

H2.79   A number of submissions from suppliers on the draft reasons papers and draft determinations, submitted that the Commission was wrong to rely on the simplified Brennan-Lally CAPM and that the Commission should make an ad hoc allowance for model error.[889] These submissions argued that an ad hoc allowance should be made to the cost of equity estimated using the simplified Brennan-Lally CAPM (or the cost of capital) to allow for the possibility that the cost of equity on low beta stocks may have been understated. For example:

- CRA (for Unison) argued for a premium for small companies;[890]

- Professor Grundy (for Vector) argued for the use of the Black CAPM;[891]

- some submissions argued for more explicit consideration to be given to the cost of equity required by international investors since they are significant investors in New Zealand and unlike most New Zealand investors cannot use imputation credits.[892]

H2.80   For the reasons sets out in Section 6.4 of this paper, the Commission does not consider ad hoc adjustments for model error are justified generally or in response to the specific examples identified in submissions. Rather than repeat the Commission's analysis in this appendix, the reader is referred back to paragraphs 6.4.20 - 6.4.35.

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[889]   See, for example, Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, 13 August 2010, pp. 29-31. Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: LECG, *Response to Commerce Commission's Draft Cost of Capital Input Methodology: a report prepared for the Electricity Networks Association*, 13 August 2010, pp. 11-15. Powerco Limited, *Submission 2 in Response to Draft Input Methodology Decisions and Determination Cost of Capital*, 13 August 2010, pp. 9-11.

[890]   Unison Networks Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Charles River Associates, *Regulated Returns for Australian and New Zealand Electricity Distribution: a report prepared for Unison Networks Limited*, 15 August 2010.

[891]   Vector Limited, *Submission on EDBs and GPBs (Input Methodology) Draft Determination and Reasons Paper*, Attachment: B. D. Grundy, *The Calculation of the Cost of Capital - A report for Vector*, 13 August 2010.

[892]   Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, pp. 30-32.

Commission's reasons – service-specific versus supplier-specific cost of capital

H2.81   If suppliers of a regulated service have similar exposure to systematic risk—that is, if they have similar technology, scale, cost structures, exposure to macroeconomic factors and exposure to regulation—then the Commission should, in principle, apply a 'benchmark' or service-specific cost of capital for all suppliers of the regulated service.[893] On the other hand, if suppliers have a materially different exposure to systematic risk then the Commission should, in principle, apply a supplier-specific cost of capital for each supplier of the regulated service.

H2.82   Parameters in the cost of capital estimation that could be considered on a supplier-specific basis are (a) leverage, (b) debt premium, and (c) the equity (or asset) beta.[894] In making its decisions for electricity distribution services and gas pipeline services, the Commission considered each of these parameters individually and concluded that service-specific estimates would be more appropriate for each of them. The reasons for this are discussed in the relevant sections for each parameter.

H3   Leverage

Decision - leverage

H3.1   The IM specifies a service-wide notional leverage of 44% when estimating the cost of capital for EDBs, GPBs and Transpower.

Commission's reasons - leverage

Overview

H3.2   Leverage is the ratio of debt to total capital (i.e. debt plus equity). Leverage is used in the cost of capital estimation in two places: first, in order to calculate the capital structure weights in the cost of capital, and secondly, in the formula transforming asset betas to equity betas (and vice versa).

H3.3   There are three possible approaches to setting the leverage value for a type of service. These are:

- optimal leverage – where the cost of capital for a firm is minimised;

- actual leverage – the ratio of a firm's actual debt capital to the firm's actual debt plus equity capital (where market values are used); and

- notional leverage – the level consistent with a hypothetical representative supplier of a regulated service.

Leverage and firms' cost of capital - theoretical and practical considerations

H3.4   In theory, where there are no taxes and no bankruptcy costs or costs of financial distress apply, the market value of an investment is not affected by the relative proportions of debt and equity capital, i.e. leverage. In other words, leverage does

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[893]   In some sectors, the industry is made up of a single supplier. In such cases, the Commission may draw on evidence of comparable businesses both overseas and in other sectors in New Zealand to establish a suitable benchmark cost of capital for the firm.

[894]   The remaining cost of capital parameters such as the risk-free rate, the tax-adjusted market risk premium, and investor and corporate tax rates apply to all firms in the New Zealand economy equally.

not change the total amount of risk associated with the investment, or the cost of capital. Leverage just reallocates the existing risk between suppliers of debt capital and suppliers of equity capital. The cost of capital would be expected to be invariant to changes in leverage.[895]

H3.5   With the introduction of corporate taxes, firms can deduct interest on debt capital as an expense for tax purposes ('leverage tax shield'), but cannot deduct dividends on equity capital. Therefore, taking into account corporate taxes but not personal taxes, as leverage increases, the leverage tax shield increases. As a result the cost of capital declines as leverage increases.[896] Taking account of personal taxes, in New Zealand the effect of dividend imputation and no tax on capital gains redresses the tax advantage of debt described above.[897]

H3.6   Leverage also possesses a number of qualitative advantages that would be expected to lower the actual cost of capital or to benefit capital providers but cannot be incorporated into models of the cost of capital. These include the signalling value of debt in the presence of asymmetric information,[898] the reduction of underinvestment problems arising from the use of equity finance,[899] the reduction of agency costs due to the disciplinary effects of debt,[900] and the financial flexibility arising from debt.

H3.7   In practice, businesses would not include debt in their capital structure unless they believed that doing so would lead to the cost of capital remaining unchanged or decreasing, not increasing.

Leverage and the simplified Brennan-Lally CAPM

H3.8   When debt premiums are particularly high, estimates of WACC that incorporate CAPM estimates for the cost of equity component show WACC as increasing with leverage. This effect is amplified when using the simplified Brennan-Lally CAPM in conjunction with the simplified beta gearing model, as the WACC increases with a positive debt premium when using the simplified Brennan-Lally CAPM and more rapidly than when using the classical CAPM framework. This implies that the cost of capital is minimised when leverage is zero, and thus this would represent the optimal leverage. Using an example with assumed values for a number of parameters,[901] the magnitude of this anomaly in terms of changes in the post-tax

[895]   Modigliani, F., Miller, M. The Cost of Capital, Corporation Finance and the Theory of Investment, *American Economic Review,* Vol. 48, No. 3, 1958, pp. 261–297.

[896]   Modigliani, F., Miller, M., Corporate income taxes and the cost of capital: a correction, *American Economic Review,* Vol. 53, No. 3, 1963, pp. 433–443.

[897]   Not all equity investors in the New Zealand market can fully utilise imputation credits. In particular, international investors cannot utilise imputation credits. However, this does not mean such investors have a higher estimate of the cost of capital than domestic investors. This is discussed further at paragraphs 6.4.33 - 6.4.35.

[898]   Ross, S., The Determination of Financial Structure: The Incentive Signalling Approach, *Bell Journal of Economics*, Spring, 1977, pp. 23-40.

[899]   Myers, S., Majluf, N., Corporate Financing and Investment Decisions when Firms have Information that Investors do not Have, *Journal of Financial Economics*, Vol. 13, 1984, pp. 187-221.

[900]   Jensen, M., Meckling, W., Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure, *Journal of Financial Economics*, Vol. 3, 1976, pp. 305-360; Jensen, M., Agency Costs of Free Cash Flow, Corporate Finance and Takeovers, *American Economic Review*, Vol. 76, 1986, pp. 323-329.

[901]   This assumes a risk-free rate of 4.64%, a debt premium of 2.35% (including debt issuance cost of 0.35%), an asset beta of 0.34, a TAMRP of 7.1% (equivalent to an MRP of 5.8% for the classical CAPM), average investor tax rate of 28.2% and average corporate tax rate of 28.4%. For both WACC estimates the tax neutral formula for the effects of leverage

WACC is illustrated in Table H1 and Figure H1 below. This contrasts the post-tax WACC estimated using the simplified Brennan-Lally CAPM and the classical CAPM.

Table H1   Leverage and Post-tax WACC[902]

Leverage	Post-tax cost of capital estimated using the simplified Brennan-Lally CAPM	Post-tax cost of capital estimated using the classical CAPM
0%	5.75%	6.61%
20%	6.11%	6.71%
40%	6.43%	6.77%
60%	6.75%	6.83%

Figure H1   Leverage and the post-tax WACC estimated using the simplified Brennan-Lally CAPM versus the classical CAPM
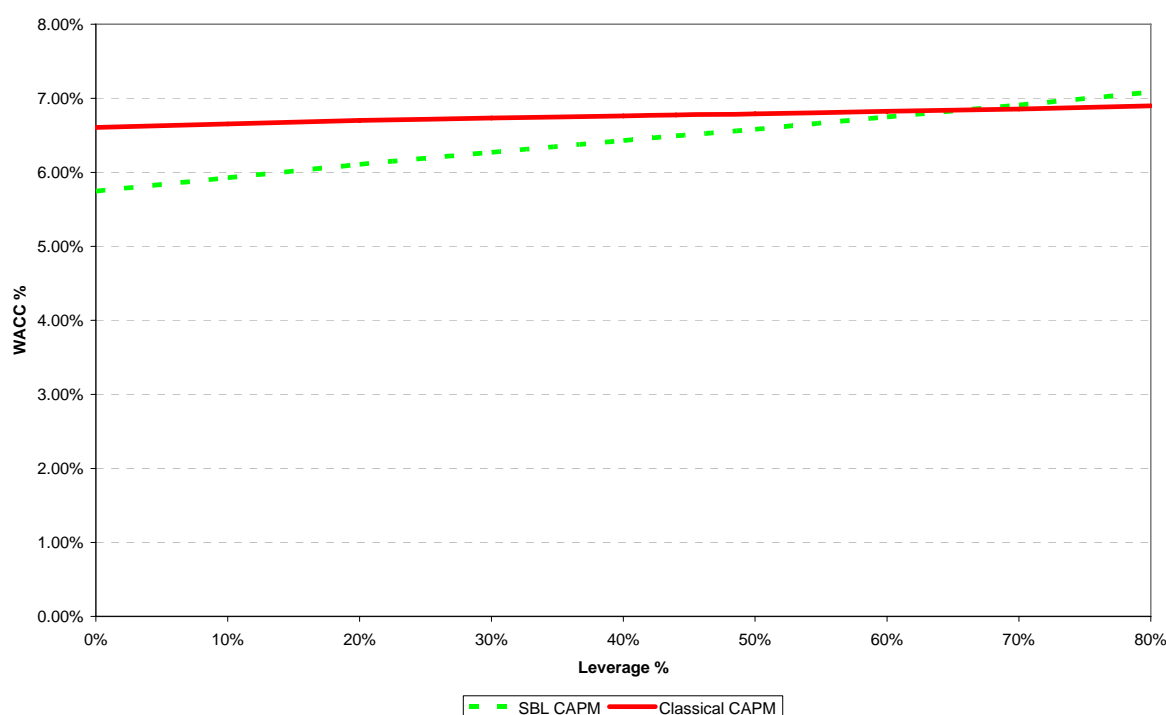
H3.9   The table and figure above illustrate how the post-tax WACC, estimated using the simplified Brennan-Lally CAPM for the cost of equity, increases as leverage increases, while holding all other parameters constant. The table shows that, using the simplified Brennan-Lally CAPM for the cost of equity, the post-tax WACC would be approximately 5.75% assuming zero leverage. The post-tax WACC would increase to 6.1% at an assumed leverage of 20%. At an assumed leverage of 60%, the post-tax WACC would be approximately 6.75%.

on betas has been used. These parameters values are consistent with the reasonableness tests the Commission has undertaken, (see Appendix H13).

[902]   The estimates in the table are mid-point estimates of the post-tax WACC.

H3.10   In contrast, the table and figure above illustrates how the post-tax WACC estimated using the classical CAPM for the cost of equity increases only marginally as leverage increases, while holding all other parameters constant. The Commission notes this increase in WACC with leverage, where the classical CAPM is used for the cost of equity, is an unconventional result which reflects the current very high debt premiums.

H3.11   This increase in the cost of capital with higher levels of leverage under the simplified Brennan-Lally CAPM for estimating the cost of equity:

•   is inconsistent with both capital structure theory and observed practice;

•   if incorporated in the cost of capital IM, would risk creating an incentive for suppliers of regulated services to increase their actual leverage in order to generate higher allowed rates of return or to propose higher benchmark leverage so as to receive a higher estimate of the cost of capital; and

•   can be large, particularly when debt premiums (which affect the cost of debt) are high.

H3.12   Where the simplified Brennan-Lally CAPM is used in the context of information disclosure or default/customised price-quality regulation, suppliers of regulated services have an incentive to assert that the notional leverage should be as high as possible. This is because, when estimating the cost of capital using the simplified Brennan-Lally CAPM to estimate the cost of equity, any increase in leverage will flow through into a higher allowed cost of capital.

H3.13   Similarly, if suppliers' allowed cost of capital is influenced by their actual leverage, with the allowed cost of capital being estimated from the simplified Brennan-Lally CAPM to estimate the cost of equity, suppliers have an incentive to increase their actual leverage in order to increase the allowed cost of capital. Suppliers would recognise that, although the allowed cost of capital has risen, the actual market cost of capital they face is likely to have remained unchanged.[903]

H3.14   This anomaly (of the cost of capital increasing with leverage) is not unique to the Commission's current development of IMs using the simplified Brennan-Lally CAPM. A similar anomaly with respect to the classical CAPM was noted by the UK Competition Commission in a recent price-setting review of Heathrow/Gatwick. The UK Competition Commission stated that:[904]

> The key feature of these charts is the upward-sloping relationship that exists between a firm's gearing and its pre-tax cost of capital when one assumes a zero debt beta. This suggests that gearing up increases a firm's pre-tax cost of capital and therefore warrants the inclusion of a higher rate of return in price caps—something that can be seen explicitly in Table 1 at the beginning of this appendix where BAA's estimates for the

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[903]   The Commission notes that the de-levering of the equity beta is based on the market value of the comparative firm sample. Therefore, to be consistent with the asset beta the re-levering should also be based on a market value leverage. As only three of the suppliers affected by Part 4 have market value data available to estimate the market value of leverage the use of actual leverage for each supplier will bias the cost of capital for the majority of the regulated suppliers that are covered by Part 4 as their actual leverage would be based on book values.

[904]   UK Competition Commission, *A report on the economic regulation of the London airports companies (Heathrow Airport Ltd and Gatwick Airport Ltd)*, Appendix F - Cost of Capital, 28 September 2007, paragraphs 88-90, p. F23.

> pre-tax cost of capital at Heathrow increase with the use of a higher gearing figure, while estimates of the pre-tax cost of capital at Gatwick fall on the assumption of lower gearing.
>
> We find this overall position difficult to reconcile with the observed behaviour of a range of firms in a broad sample of different industries. In the regulated sectors, the trend in recent years has been for firms to inject more debt into their capital structures on the apparent assumption that higher levels of gearing represent more efficient financing. Indeed, ADI has told us that its own decision to move BAA's gearing from around 34 per cent to more than double this figure would improve the efficiency of BAA's financing.
>
> Given this starting point, we do not accept the argument that higher levels of gearing produce a higher cost of capital. We do not believe that this is a credible characterization of the returns that investors require at different levels of gearing ….

H3.15   The Commission too would not want to set a higher cost of capital due to higher levels of leverage. To address this anomaly, the UK Competition Commission used debt betas.[905] The use of debt betas was generally not supported by submissions in New Zealand,[906] or the Expert Panel, although the Expert Panel recommended the Commission consider debt betas if they are significant.[907]

H3.16   At the Cost of Capital Workshop, representatives of the suppliers of regulated services recognised that the cost of capital increases with leverage under the

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[905]   A debt beta measures the systematic risk associated with a firm's debt. A detailed discussion on debt betas is included in the debt beta section (section H9).

[906]   Aurora Energy Limited, *Submission to the Commerce Commission on its Discussion Paper on Input Methodologies*, 14 August 2009, p.18; LECG for ENA, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital*, 11 August 2009, p. 18; LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital*, Report on behalf of NZAA, 31 July 2009, p. 27; Maui Development Limited, *Submission to the Commerce Commission on the Input Methodology Discussion Paper*, July 2009, pp. 19-20; NZ Airports, *Submission by NZ Airports Association on the Commerce Commission Input Methodologies Discussion Paper*, 31 July 2009, pp. 49-50; Powerco Limited, *Input Methodologies Discussion Paper*, 14 August 2009, p. 30; PwC, Revised Draft Guideline s- Submission to Commerce Commission, August 2009, Report on Behalf of Powerco, p. 26; PwC for 17 EDBs, Submission to the Commerce Commission on the Revised Draft Guidelines – The Commerce Commission's Approach to Estimating the Cost of Capital, 14 August 2009, pp. 11-12; Synergies Economic Consulting for Vector, Initial WACC Review, 13 August 2009, pp. 23-25; Synergies Economic Consulting for Vector, WACC Review Final, 31 August 2009, pp. 36-39; Telecom, Annex B: Submission on Commerce Commission Revised Draft Guidelines for estimating the Cost of Capital, August 2009; ENA, *Cross Submission on the Cost of Capital Workshop*, 2 December 2009, p. 9; Telecom Limited, *Post-workshop Submission on the Cost of Capital*, Attachment: PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, 2 December 2009, p. 12; Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital*, Report on Behalf of NZAA, 2 December 2009, p. 86; Electricity Networks Association, *Submission on EDBs (Input Methodology) Draft Determination and Reasons Paper*: Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital Parameter Estimates*, 13 August 2010, p. 56; Major Electricity Users' Group, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, Appendix; NZ Airports Association, *Submission on Draft Information Disclosure Determination and Draft Reasons Paper*, Attachment: Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper - Report for NZAA*, 12 July 2010, pp. 36-37; Auckland International Airport Limited, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, 3 August 2010, p. 12; Christchurch International Airport Limited, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, 3 August 2010, p. 4; NZ Airports Association, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, 3 August 2010, p. 39; NZ Airports Association, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, Attachment: *Uniservices, Comments on Air New Zealand's and Board of Airline Representatives New Zealand Incorporated's Submissions to the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper: report prepared for New Zealand Airports Association*, 3 August 2010, p. 16.

[907]   Franks, J., M. Lally and S. Myers, *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of capital Methodology*, December 2008, pp. 23-24.

simplified Brennan-Lally CAPM but were unconcerned by this. Representatives of consumers of regulated services argued that it was inappropriate to allow suppliers' cost of capital to increase with leverage. There was broad agreement that the positive relationship between leverage and cost of capital when applying the simplified Brennan-Lally CAPM would be counter-intuitive. The Commission sought clarification on this matter from Dr Lally.

Advice from Dr Lally

H3.17   In advice to the Commission, Dr Lally attributed the anomalous increase in the estimates of the cost of capital with increased leverage to the combined effects of the following on the estimate of the debt premium:[908]

- the assumption that the debt beta is zero;

- a liquidity premium within the cost of debt that has no counterpart within the cost of equity; and

- the use of the promised debt premium rather than the more conceptually correct expected debt premium which would be lower. (The higher the debt premium, the higher the increase in the cost of capital for any given increase in the level of leverage.)

H3.18   Dr Lally outlined that, if the simplified Brennan-Lally CAPM was used by the Commission, then it could adopt one of three options (all of which are further discussed below):[909]

- accepting the anomaly and continuing to use the simplified Brennan-Lally CAPM (status quo);[910]

- setting leverage equal to zero; and

- using a non-zero debt beta and defining the cost of debt as the expected yield plus an allowance for bankruptcy costs.

H3.19   Dr Lally considered that the policy to minimise the effect of the anomaly was far from clear and that measurement difficulties would seem to rule out the third option. Dr Lally concluded that:[911]

> When using the simplified Brennan-Lally CAPM in conjunction with the simplified beta gearing model, WACC … rises with leverage and therefore implies that leverage is undesirable. However, the use of debt by companies is typical. This implies that companies are acting irrationally or that there is some deficiency in the models used to estimate WACC. This paper shows that there are some deficiencies in the WACC model currently employed by the Commerce Commission, but these are not readily correctable, leaving the choice between the status quo (which overstates WACC) and a simple alternative in the form of setting WACC equal to the unlevered cost of capital

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[908]   Lally, M., *WACC and Leverage*, Report to the Commerce Commission, 17 November 2009, pp. 3-5.

[909]   Lally, M., *WACC and Leverage*, Report to the Commerce Commission, 17 November 2009, p. 5.

[910]   Dr Lally considered that this option would overestimate the cost of capital as the cost of debt would be improperly defined as the promised yield rather than as the expected yield plus an allowance for bankruptcy costs.

[911]   Lally, M., *WACC and Leverage*, Report to the Commerce Commission, 17 November 2009, p. 7.

(which would understate WACC). Choosing between these two options is a judgement matter for the Commission.

Possible solutions

H3.20   The Commission considers that the relationship between cost of capital and leverage when applying the simplified Brennan-Lally CAPM to estimate the cost of equity is a significant matter as the effect of leverage on the cost of capital estimate can be substantial (as illustrated in Table H1 and the accompanying discussion). Therefore, the Commission considers that accepting the anomaly is not an appropriate solution.

H3.21   In its IM Draft Reasons Papers the Commission identified an additional option, which was a variation of Dr Lally's option (i) above. This option is to use a notional leverage which attempts to choose the point where the model neither overstates nor understates the cost of capital. In order to ensure that the cost of capital estimate does not create perverse incentives when using the simplified Brennan-Lally CAPM, the Commission has considered the following options:

Option a   setting leverage equal to zero;

Option b   setting a notional leverage that either is fixed:

     i.   for all services regulated under Part 4 of the Act;

     ii.   for each service and is based on the average leverage of the comparative firms sample used to derive the asset beta estimate; and

Option c   using a non-zero debt beta.

These options are discussed below.

Option a: Setting a zero leverage

H3.22   An advantage of setting leverage equal to zero and using the simplified Brennan-Lally CAPM to estimate the expected cost of equity capital (and hence the cost of capital) is that the allowable regulatory rate of return would be invariant to the leverage choice of a supplier. This would avoid the incentive problems discussed in paragraphs H3.12 and H3.13. WACC being invariant to leverage also does not contradict capital structure theory in the way that WACC increasing with leverage at all levels of leverage does (see paragraphs H3.4 to H3.7).

H3.23   In submissions on the Revised Draft Guidelines and the draft IM, Ireland, Wallace & Associates (for MEUG) noted that if the simplified Brennan-Lally CAPM is used to estimate the cost of equity then the WACC is sensitive to leverage and is lowest when leverage is equal to zero. They submit that on efficiency grounds (i.e. the lowest cost of capital constitutes an appropriate benchmark), the best estimate of the efficient cost of capital structure for regulated suppliers, if the simplified Brennan-Lally CAPM is being used, is to assume zero leverage.[912]

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[912]   Major Electricity Users' Group, *Submission on Draft Input Methodologies and Draft Cost of Capital Guidelines*, Attachment: Ireland, Wallace & Associates Limited, *Submission on the Input Methodologies Discussion Paper: prepared for Major Electricity Users' Group*, 31 July 2009; Major Electricity Users' Group, *Cross-Submission on Draft Input Methodologies and Draft Cost of Capital Guidelines*, Attachment: *Ireland, Wallace & Associates Limited, Cross-Submission on the Input Methodologies Discussion Paper: prepared for Major Electricity Users' Group*, 3 September 2009; Major Electricity Users' Group, *Post-Workshop Submission on Cost of Capital Workshop*,

H3.24   AECT, ENA, Powerco, Telecom, PwC (for Telecom), Unison, Uniservices (for NZAA) and Vector all disagreed with the zero leverage assumption proposed by the submissions from Ireland, Wallace & Associates (for MEUG). [913] They submitted the zero leverage assumption is inappropriate, as it does not recognise that most infrastructure firms have debt in their capital structures and is inconsistent with workably competitive market outcomes, as debt financing (up to a point) is considered to lower WACC. These arguments generally imply that leverage reduces WACC in practice, but adoption of a non-zero leverage and the simplified Brennan-Lally CAPM would result in a higher WACC.

H3.25   ENA and PwC (for Telecom) have argued that a practical application of a simplified modelling setup (assuming a debt beta of zero) should not be allowed to be used as a theoretical framework for arguing for an extreme leverage assumption of zero leverage.[914]

H3.26   NZIER (for BARNZ) noted that setting leverage equal to zero was a logical position for the Commission but did not prefer this option. NZIER submitted that in balancing the relevant factors the IM should provide for a moderate benchmark leverage in each service.[915]

H3.27   Other considerations with a zero leverage assumption are that:

Attachment: *Ireland, Wallace & Associates Limited, Post-Workshop Submission on the Input Methodologies Cost of capital: prepared for Major Electricity Users' Group*, 2 December 2009; Major Electricity Users' Group, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Ireland, Wallace & Associates Limited, *Submission on the Cost of Capital*, 13 August 2010.

[913]   Auckland Energy Consumer Trust, *Post-Workshop Cross-Submission to Commerce Commission on Cost of Capital Workshop*, 2 December 2009, pp. 24-25; Electricity Networks Association, *Cross submission on the cost of capital workshops*, 2 December 2009, pp. 7-8; Powerco Limited, *Cross submission on Input Methodologies Discussion Paper*, 28 August 2009, p. 2; Telecom, *Cross Submission on the Revised Draft Guidelines for Estimating the Cost of Capital*, 28 August 2009, p. 5; Telecom Limited, *Post-workshop Submission on the Cost of Capital*, Attachment: PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, 2 December 2009, p. 10; Unison, *Cross submission on Input Methodologies*, 28 August 2009, p. 4; Vector, *Cross-submission to the Commerce Commission on Submissions on the Input Methodologies Discussion Paper*, 28 August 2009, pp. 8-9; Electricity Networks Association, *Cost of Capital Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determination and Reasons Paper*, 3 September 2010, p. 1; Electricity Networks Association, *Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determination and Reasons Paper*, Attachment: PwC Report, 3 September 2010, p. 3; Powerco Limited, *Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determination and Reasons Paper*, 31 August 2010, pp. 7-8; Unison Networks Ltd, *Cost of Capital Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determinations and Reasons Paper*, 2 September 2010, pp. 7-8; Vector Ltd, *Cost of Capital Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determinations and Reasons Paper*, 3 September 2010, pp. 4-7; NZ Airports Association, *Post-Workshop Submission on Input Methodologies Cost of Capital*, Attachment: Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of - Report for NZAA*, 2 December 2009, p. 87; NZ Airports Association, *Submission on Draft Information Disclosure Determination and Draft Reasons Paper*, Attachment: Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper - Report for NZAA*, 12 July 2010, pp. 23-25; NZ Airports Association, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, Attachment: Uniservices, *Comments on Air New Zealand's and Board of Airline Representatives New Zealand Incorporated's Submissions to the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper: report prepared for New Zealand Airports Association*, 3 August 2010, p. 15.

[914]   Electricity Networks Association, *Cross Submission on the Cost of Capital Workshop*, 2 December 2009, p. 8; Telecom Limited, *Post-workshop Submission on the Cost of Capital*, Attachment: PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, 2 December 2009, p. 10.

[915]   Board of Airline Representatives New Zealand Incorporated, *Post Workshop Submission on the Input Methodologies and Cost of Capital*, Attachment: The New Zealand Institute of Economic Research Incorporated, *Cost of Capital: prepared for the Board of Airline Representatives New Zealand Incorporated*, 28 November 2009, pp. 2-3.

- there is no regulatory precedent by overseas regulators or the Commission for setting leverage equal to zero;

- a leverage assumption of zero is not consistent with the observed behaviour of firms in workably competitive markets as they have debt;[916]

- Dr Lally advises that at zero leverage the result of using the model to estimate the cost of equity would tend to underestimate the true cost of capital;[917]and

- using zero leverage has implications for other parameters within the cost of capital framework, such as the equity beta.

H3.28   In summary, a zero level of leverage is the optimal leverage position under the simplified Brennan-Lally CAPM with an assumed debt beta of zero (i.e. the cost of capital is minimised at this point). However, with a more realistic value of the debt beta, this may no longer be the case. Further, zero leverage is inconsistent with practice, as suppliers' actual capital structure includes a portion of debt. Therefore, in the interests of maintaining a relationship with suppliers' actual capital structure, the Commission considers that the notional leverage should be greater than zero. If zero leverage was applied, and it was considered to be an underestimate of the cost of capital, then a margin would have to be added. There is presently no theoretical framework or precedent for estimating such a margin. A zero leverage assumption would also reduce the cost of capital to just the cost of equity capital. In addition, this assumption would set the equity beta equal to the asset beta when estimating the cost of equity.

Option b: Setting a notional leverage

H3.29   Adopting a positive 'notional' level of leverage would be preferable to adopting a zero leverage assumption. This would limit the adverse impact of the anomaly in the simplified Brennan-Lally CAPM, and maintain a relationship with suppliers' actual capital structure. The approach of using a notional level of leverage is consistent with:

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[916]   It has been suggested in the corporate finance literature that capital structure may reflect, among other things, (i) a desire to take advantage of tax benefits (Graham, J. R., Debt and the Marginal Tax Rate, *Journal of Financial Economics*, Vol. 41, 1996, pp. 41–73), (ii) a desire to mitigate free cash flow agency problems (Jensen, M. C., Agency Costs of Free Cash Flow, Corporate Finance and Takeovers, *American Economic Review*, Vol. 76, 1986, pp. 323–329), (iii) imperfect or incomplete capital markets (Rose, J. R., The Cost of Capital, Corporation Finance, and the Theory of Investment: Comment, *American Economic Review*, Vol. 49, 1959, pp. 638–639 and Modigliani, F., and Miller, M., Corporate income taxes and the cost of capital: a correction, *American Economic Review,* Vol. 53*,* No. 3, 1963, pp. 433–443), (iv) the prospective costs of financial distress or bankruptcy (Myers, S. C., The Capital Structure Puzzle, *Journal of Finance*, Vol. 39, 1984, pp. 575–592), (v) the availability of internal finance (Myers, S., and Majluf, N., Corporate Financing and Investment Decisions when Firms have Information that Investors do not Have, *Journal of Financial Economics*, Vol. 13, 1984, pp. 187–221), (vi) the nature of strategic interactions between competitors, suppliers and customers (Harris, M., and Raviv, A. The Theory of Capital Structure, *Journal of Finance*, Vol. 46, 1991, pp. 297–355), (vii) whether or not the firm is in the market for corporate control (Harris, M., Raviv, A., Corporate Control Contests and Capital Structure, *Journal of Financial Economics*, Vol. 20, 1988, pp. 55–86 and Stulz, R., Managerial control of voting rights: Financing policies and the market for corporate control, *Journal of Financial Economics*, Vol. 20, 1988, pp. 25-54), and (viii) the firm's growth prospects (Graham, J. R., How Big Are the Tax Benefits of Debt?, *Journal of Finance*, Vol. 55, 2000, pp. 1901–1941). As yet, there is no completely unified theory on the determinants of optimal capital structure (for regulated or unregulated firms).

[917]   See Lally, M., *WACC and Leverage*, Report to the Commerce Commission, 17 November 2009, pp. 5-6.

i.   the approach taken in previous Commission regulatory decisions, where a service specific notional leverage assumption for the regulatory service in question has been applied;

ii.   the approach taken by the majority of overseas regulators; and

iii.   the approach agreed to by most parties in their submissions on this matter.

i. Notional leverage set at the same level for all regulated services under Part 4

H3.30   In the Draft Reasons Papers the Commission adopted 'notional' leverage of 40% for all regulated services so as to limit the adverse impact of the anomaly in the simplified Brennan-Lally CAPM.[918]

H3.31   The Draft Reasons Papers discussed how the Commission could set the level of notional leverage for all services.[919] The Draft Reasons Papers noted that "[g]iven the variation of leverage levels among regulated suppliers, there is no one 'right' level of leverage".[920] It also explained that the Commission had adopted a notional leverage assumption in previous regulatory decisions, although these leverage assumptions differed between the regulated services. Therefore, applying a single level of notional leverage across all regulated services would require the exercise of judgement by the Commission.

H3.32   In setting a single notional leverage assumption the Commission sought to "balance the legitimate use of debt capital in the capital structure of suppliers of services regulated under Part 4 of the Act with the need to protect customers of the suppliers of these regulated services from the substantial consequences and costs if financial distress of a supplier of regulated services were to occur".[921]

H3.33   In setting the level of notional leverage for all regulated services, the Commission considered actual leverage for regulated firms in New Zealand and overseas, the level of leverage assumed in prior regulatory decisions in New Zealand (25%-40%) and the leverage assumption in regulatory decisions overseas. Ultimately, the Commission considered greatest informational value was from New Zealand regulatory precedent and adopted 40% as the estimate for the level of notional leverage. This estimate was consistent with the leverage assumed in previous Commission energy decisions, but at the top end of the range submitted by New Zealand airports. A number of submissions were received on the issue of leverage.

H3.34   Ireland, Wallace & Associates (for MEUG) submitted that the appropriate cost of capital model is the unlevered cost of capital which is indifferent to leverage, and that the Commission's proposed notional leverage approach achieves a cost of

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[918]   Commerce Commission, *Input Methodologies Airport Services, Draft Reasons Paper*, section 6.5, pp. 168-182; Commerce Commission, *Input Methodologies Electricity Distribution Services, Draft Reasons Paper*, section 6.5, pp. 224-238; Commerce Commission, *Input Methodologies Gas Pipeline Services, Draft Reasons Paper*, section 6.5, pp. 206-220.

[919]   Commerce Commission, *Input Methodologies Airport Services, Draft Reasons Paper*, paragraphs 6.5.40-6.5.61; Commerce Commission, *Input Methodologies Electricity Distribution Services, Draft Reasons Paper*, paragraphs 6.5.41-6.5.62, pp. 233-238; Commerce Commission, *Input Methodologies Gas Pipeline Services, Draft Reasons Paper*, paragraphs 6.5.41-6.5.62, pp. 215-220.

[920]   Commerce Commission, *Input Methodologies Airport Services, Draft Reasons Paper*, paragraph 6.5.40; Commerce Commission, *Input Methodologies Electricity Distribution Services, Draft Reasons Paper*, paragraphs 6.5.41, pp. 233; Commerce Commission, *Input Methodologies Gas Pipeline Services, Draft Reasons Paper*, paragraphs 6.5.41, p. 215.

[921]   Commerce Commission, *Input Methodologies Airport Services, Draft Reasons Paper*, paragraph 6.5.58.

capital which is indifferent to leverage but has elevated the cost of capital above that of the unlevered cost of capital. They submitted that the practical consequences are material and adverse for consumers.[922]

H3.35   PwC (for ENA and Telecom) submitted, in conjunction with a worked example to demonstrate, that the:[923, 924]

> Commission is technically wrong to attempt to apply a single fixed leverage assumption to all regulated firms. If debt betas are to be excluded from the WACC analysis (which we concur with), then to be consistent the notional leverage used in the WACC estimation should be close to the average leverage of the comparator companies used to derive the (average) beta estimate. This is a fundamental requirement in order to be able to justify application of a "short cut" approach and thus ignore debt betas.

H3.36   PwC considered that if the Commission were to apply a zero debt beta assumption and a leverage estimate that was lower than the leverage of the comparative firms sample used to derive the asset beta, this would result in an under-estimation of cost of capital for EDBs, GPBs and Transpower. The Commission notes that under this logic the reverse is also true for Airports (i.e. assuming 40% notional leverage will overstate the cost of capital for Airports).

H3.37   CEG (for Vector), ENA and Powerco made a similar point that the notional leverage assumption should be based on the sample of comparator suppliers.[925] Transpower submitted that as it was subject to IPP regulation there is no need to apply a service-

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[922]   Major Electricity Users' Group, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Ireland, Wallace & Associates Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses) Reasons Paper: prepared for Major Electricity Users' Group*, 13 August 2010, p. 2; Major Electricity Users' Group, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010; Major Electricity Users' Group, *Submission on EDBs (Input Methodology) Draft Determination and Reasons Paper*, *Appendix: MEUG comments on Pan Industry Input Methodology for Cost of Capital*, 13 August 2010, pp. 4-7.

[923]   Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010. p. 8; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on Cost of Capital Material In the Commerce Commission's Draft Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13 August 2010, p. 10.

[924]   PwC (and others) had made similar comments in other submissions during the consultation period on the IM and RDG. See PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, Report on Behalf of 17 EDBs, 2 December 2009, p. 10; PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, Report on Behalf of Telecom, 2 December 2009, pp. 9-11; PricewaterhouseCoopers, *Commerce Commission WACC Conference*, Report on Behalf of Powerco, 2 December 2009, pp. 14-15 Electricity Networks Association, *Cross Submission on the Cost of Capital Workshop*, 2 December 2009, pp. 7-8; Wellington Electricity, *Post-workshop submission for the Commerce Commission's cost of capital workshop, November 12 and 13, 2009*, 3 December 2009, pp. 8-10.

[925]   Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, pp. 32-35; Electricity Networks Association, *Cost of Capital Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determination and Reasons Paper*, 3 September 2010, p. 1; Powerco Limited, *Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determination and Reasons Paper*, 2 September 2010, p. 7.

wide notional leverage assumption and instead Transpower's actual forward-looking leverage should be used.[926]

H3.38   In its cross-submissions for ENA, PwC submitted that:[927]

> Should the Commission wish to set a regulatory WACC that is indifferent to leverage, the principled approach would be for the Commission to fix an industry-wide leverage assumption that is consistent with the observed leverage of the comparator companies used to derive the asset beta assumption. Failing this, the Commission will then need to re-consider introducing debt betas into the analysis.

H3.39   PwC preferred the use of a service-wide leverage assumption based on the leverage of the comparator firms to the use of non-zero debt betas.

H3.40   In adopting the 40% notional assumption, the Commission's key concern was to address the anomaly in the simplified Brennan-Lally CAPM which sees the cost of capital increasing with leverage. The Commission sought to protect consumers from the risks of suppliers increasing leverage, and thereby increasing the risk of financial distress, as this was inconsistent with the Part 4 purpose. As PwC has outlined, there are other ways to address the anomaly which are technically more correct.

H3.41   The option of setting a service-specific notional leverage is discussed below. The option of introducing debt betas is considered in the following section.

ii. Setting service-specific notional leverage based on leverage of the comparator companies

H3.42   Using a notional leverage assumption will remove the variation of the cost of capital due to changes in leverage. But, as discussed above, a number of submissions considered that if the Commission used a zero debt beta with a notional leverage assumption that was not consistent with the leverage of the comparative firms sample used to derive the asset beta, the Commission will be introducing an unnecessary bias into the cost of capital. As a result, submitters considered that the leverage assumption for a regulated service should be based on the average leverage of the associated comparative firms sample used in estimating the asset beta for that regulated service.

H3.43   Appendix H8 identifies the comparative firms sample and the process for choosing the comparative firms sample for EDBs, Transpower and GPBs. Table H2 displays the results of the individual firms' last five-year average (market value) leverage, which is consistent with the leverage used to estimate the asset beta. This results in an overall average leverage for the sample of 44%.

[926]   Transpower New Zealand Ltd., *Submission on Transpower (Input Methodologies) Draft Reasons Paper, Cost of Capital Decisions*, August 2010, p. 10.

[927]   Electricity Networks Association, *Cross-Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Cross-Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination 2010: a report prepared for Electricity Networks Association*, September 2010, p. 3.

Table H2 List of Comparable Firms and the Average Market Leverage for 2005-2010

Name	Average Leverage for 2005-2010
Horizon Energy	23%
Vector	56%
DUET	73%
Spark Infrastructure	50%
SP AusNet	46%
APA	59%
Envestra	71%
Hastings Diversified Utilities	35%
National Grid	48%
Allegheny Energy	39%
Allete	24%
Alliant Energy	32%
Ameren	43%
American Electric Power	48%
Avista Corp	51%
Black Hills	41%
Central Vermont Public Service	36%
CH Energy	34%
Cleco	34%
CMS Energy	67%
Consolidated Edison	43%
Constellation Energy	29%
Dominion Resources	41%
DPL	30%
DTE Energy	54%
Duke Energy	36%
Edison International	39%
El Paso Electric	39%
Empire District Electric	47%
Entergy	36%

Name	Average Leverage for 2005-2010
Exelon	24%
FirstEnergy	42%
Great Plains Energy	44%
Hawaiian Electric	21%
Idacorp	46%
Integrys Energy	43%
ITC Holdings	45%
MGE Energy	31%
NextEra Energy [formerly FPL Group]	39%
Northeast Utilities	52%
Northwestern Corp	43%
NSTAR	45%
NV Energy	59%
OGE Energy	37%
Pepco	55%
PG&E	42%
Pinnacle West	46%
PNM Resources	59%
PPL Corporation	35%
Progress Energy	47%
Public Service Enterprise	36%
Scana Corp	46%
Southern Corp	38%
Teco Energy Corp	50%
UIL Holdings Corp	41%
Unisource Energy Corp	61%
Unitil Corp	55%
Westar Energy	49%
Wisconsin Energy	46%
Xcel Energy	47%
AGL Resources	46%

Name	Average Leverage for 2005-2010
Atmos Energy Corp	49%
Centerpoint Energy	65%
Chesapeake Utilities Corp	35%
Laclede Group	41%
National Fuel Gas Co	22%
New Jersey Resources Corp	29%
Nicor Inc	33%
Nisource Inc	58%
Northwest Natural Gas Co	37%
Oneok Inc	55%
Piedmont Natural Gas Co	34%
Sempra Energy	31%
South Jersey Industries	33%
Southwest Gas Corp	52%
Spectra Energy Corp	40%
UGI Corp	40%
Vectren Corp	45%
WGL Holdings Inc	33%
Mean market leverage	**44%**

H3.44   Based on this analysis the notional leverage for EDBs, GPBs and Transpower should be 44%.

H3.45   Setting a service-wide notional leverage which reflects the average leverage of the sample of comparator firms, also reflects the differences in leverage which exist between EDBs, GPBS and the other regulated services.

Option c: Non-zero debt betas

H3.46   The use of non-zero debt betas is a third alternative to address the anomaly of WACC estimates rising with leverage. Both Dr Lally and PwC identified the use of a zero debt beta as a factor in the estimates of the cost of capital increasing with leverage.[928] The use of non-zero debt betas can reduce the impact of leverage on the estimate of the cost of capital. At a certain level, the use of debt betas could make the cost of capital invariant to leverage.

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[928]   A debt beta measures a firm's systematic risk associated with borrowing. That debt does have systematic risk is evidenced by the increases in debt premiums during the GFC. Debt betas are discussed further in Appendix H9.

H3.47   The use of a non-zero debt beta was discussed by a number of submitters during consultation on the IM.[929] However a majority of these submitters did not favour the use of debt betas. Many of these submitters emphasised the practical difficulties in estimating the debt beta. The difficulties of estimating the debt beta are discussed in the debt beta section (Appendix H9).

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[929]   Aurora Energy Limited, *Submission to the Commerce Commission on its Discussion Paper on Input Methodologies*, 14 August 2009, p.18; LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital*, Report on behalf of ENA, 11 August 2009, p. 18; LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital*, Report on behalf of NZAA, 31 July 2009, p. 27; Maui Development Limited, *Submission to the Commerce Commission on the Input Methodology Discussion Paper*, July 2009, pp. 19-20; NZ Airports, *Submission by NZ Airports Association on the Commerce Commission Input Methodologies Discussion Paper*, 31 July 2009, pp. 49-50; Powerco Limited, *Input Methodologies Discussion Paper*, 14 August 2009, p. 30; PricewaterhouseCoopers, *Revised Draft Guideline s- Submission to Commerce Commission, August 2009*, Report on Behalf of Powerco, p. 26; Telecom Limited, *Post-workshop Submission on the Cost of Capital*, Attachment: PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, 2 December 2009, pp. 9-11; PricewaterhouseCoopers, *Submission to the Commerce Commission on the Revised Draft Guidelines – The Commerce Commission's Approach to Estimating the Cost of Capital*, Report on behalf of 17 EDBs, 14 August 2009, pp. 11-12; PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, Report on Behalf of 17 EDBs, 2 December 2009, pp. 9-11; Synergies Economic Consulting. *Initial WACC Review*, Report prepared for Vector, 13 August 2009, pp. 23-25; Synergies Economic Consulting, *WACC Review Final*, Report prepared for Vector 31 August 2009, pp. 36-39; Telecom, *Annex B: Submission on Commerce Commission Revised Draft Guidelines for estimating the Cost of Capital*, August 2009; NZ Airports Association, *Submission on Draft Information Disclosure Determination and Draft Reasons Paper*, Attachment: Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper - Report for NZAA*, 12 July 2010, pp. 36-37; Auckland International Airport Limited, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, 3 August 2010, p. 12; Christchurch International Airport Limited, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, 3 August 2010, p. 4; NZ Airports Association, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, 3 August 2010, p. 39; NZ Airports Association, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, Attachment: Uniservices, *Comments on Air New Zealand's and Board of Airline Representatives New Zealand Incorporated's Submissions to the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper: report prepared for New Zealand Airports Association*, 3 August 2010, p. 16; Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010, p. 8 and p. 56; Major Electricity Users' Group, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers, 13 August 2010*, Appendix; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on Cost of Capital Material In the Commerce Commission's Draft Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13 August 2010, p. 10 and p. 53 ; PricewaterhouseCoopers, *Commerce Commission WACC Conference*, Report on Behalf of Powerco, 2 December 2009, pp. 14-15 Electricity Networks Association, *Cross Submission on the Cost of Capital Workshop*, 2 December 2009, pp. 7-8; Wellington Electricity, *Post-workshop submission for the Commerce Commission's cost of capital workshop, November 12 and 13, 2009*, 3 December 2009, pp. 8-10; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, pp. 32-35; Electricity Networks Association, *Cost of Capital Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determination and Reasons Paper*, 3 September 2010, p. 1; Powerco Limited, *Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determination and Reasons Paper*, 2 September 2010, p. 7; Transpower Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, p.11; *Transpower Limited, Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Officer R. and Bishop S., *Independent Review of Commerce Commission WACC proposals for Transpower*, 5 August 2010, pp. 22-24.

H3.48   Transpower and its experts Officer and Bishop favoured the use of debt betas in their
submissions on the EDBs Draft Reasons Paper.[930],[931] Officer and Bishop considered
the assumption that the beta of BBB+ debt was zero was unrealistic and would tend
to bias downwards the asset beta and the regulated cost of capital.

H3.49   On the issue of bias, the Commission notes that if the leverage of the individual
entities from the sample of comparative firms is used when de-levering the
respective entity's equity beta and the average leverage of the sample of comparative
firms is used in the re-levering of the average estimated asset beta, then the resulting
WACC estimate will not be biased (upwards or downwards) even if the debt beta is
set at zero. Alternatively, if the correct debt betas are consistently incorporated in
the de-levering process and the re-levering process, and the debt premium reflects
the expected yield and bankruptcy costs,[932] the resulting WACC too should not be
biased.

H3.50   Officer and Bishop asserted that the Commission should use a debt beta of 0.2 for
Transpower.[933]

H3.51   Although it is difficult to estimate the value of debt betas empirically, it is possible
to back-solve for the value of the debt beta that results in the cost of capital
becoming invariant to leverage. This is an approach that some practitioners in the
New Zealand capital markets (e.g. equity analysts, investment bankers and corporate
finance managers) have used in the past, to reflect the principle that the cost of
capital should be invariant to changes in leverage. This approach would allow the
observed leverage to be incorporated in the cost of capital estimate, without the level
of leverage having any net impact on the cost of capital estimate.

H3.52   Such an approach assumes that the observed debt premium is purely a reward for
systematic risk. However, Dr Lally advised the Commission that the positive
relationship between leverage and the cost of capital was not entirely due to
systematic risk, so flattening the line entirely may be inappropriate.[934]

H3.53   Dr Lally advised that even if the debt beta were estimated to accurately capture the
true systematic risk component of the debt premium, the cost of capital/leverage
relationship might still be positive. In his view, there is a liquidity premium for
corporate debt (for which there is no counterpart in the cost of equity) and debt
incurs bankruptcy costs, which increase as leverage does. Furthermore, Dr Lally

[930]   Transpower Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses
and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, p. 11; Transpower Limited,
*Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline
Businesses) Determinations and Draft Reasons Papers*, Attachment: Officer R. and Bishop S., *Independent Review of
Commerce Commission WACC proposals for Transpower*, 5 August 2010, pp. 22-24.

[931]   BARNZ did not favour the use of debt betas but noted that adopting an estimate of zero is extremely conservative and
highly favourable to the regulated suppliers. See Board of Airline Representatives New Zealand Inc, *Submission on
Commerce Commission Input Methodologies (Airport Services) Draft Reasons Paper and Draft Determination*, 12 July
2010, p. 18.

[932]   See Lally, M., *WACC and Leverage*, Report to the Commerce Commission, 17 November 2009.

[933]   Officer and Bishop estimated the debt beta to be 0.2. See Transpower Limited, *Submission on the Draft Input
Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and
Draft Reasons Papers*, Attachment: Officer R. and Bishop S., *Independent Review of Commerce Commission WACC
proposals for Transpower*, 5 August 2010, pp. 22-24.

[934]   Lally, M., *WACC and Leverage*, Report to the Commerce Commission, 17 November 2009.

recommended that if debt betas were used the Commission should define the cost of debt as the expected yield (not the promised yield) plus an allowance for bankruptcy costs. This raises additional estimation challenges.

H3.54   The use of a non-zero debt beta is theoretically the better approach to address the anomaly that increases in leverage can increase the cost of capital when using the CAPM framework. That is, the use of a non-zero debt beta can make the post-tax WACC estimate for each service less variant or invariant to leverage, as it should be. This would also ensure there is no incentive for regulated suppliers to increase leverage to exploit the anomaly.

Comparing Option B(ii) and Option C

H3.55   The Commission notes that technically the result from applying a service-wide notional leverage assumption based on leverage from the sample of comparative firms (Option B(ii)) and the use of a non-zero debt beta at the leverage from the sample of comparator firms (Option C) provide the same estimate of the post-tax WACC. This is demonstrated below.

H3.56   Table H3 and Figure H2 demonstrate the impact on the post-tax WACC estimated using the simplified Brennan-Lally CAPM, with debt betas of zero and 0.2 for EDBs.[935]

Table H3   Leverage, Debt Betas and the Post-tax WACC[936]

Leverage	Post-tax cost of capital estimated using a zero debt beta	Post-tax cost of capital estimated using a debt beta of 0.2
0%	5.75%	6.38%
20%	6.11%	6.45%
40%	6.43%	6.47%
44%	6.49%	6.49%
60%	6.75%	6.55%

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[935]   This assumes a risk-free rate of 4.64%, a debt premium of 2.35% (including debt issuance costs of 0.35%), an asset beta of 0.34 for a debt beta of zero, an asset beta of 0.43 (estimated using a debt beta of 0.2 in the de-levering process) for a debt beta of 0.2, a TAMRP of 7.1%, average investor tax rate of 28.2% and average corporate tax rate of 28.4%. These parameter values are consistent with the reasonableness tests the Commission has undertaken. See appendix H13.

[936]   The estimates in the table are mid-point estimates of the post-tax WACC.

Figure H2 Leverage and the post-tax WACC estimated for EDBs and Transpower, using the simplified Brennan-Lally CAPM and different values for the debt beta.
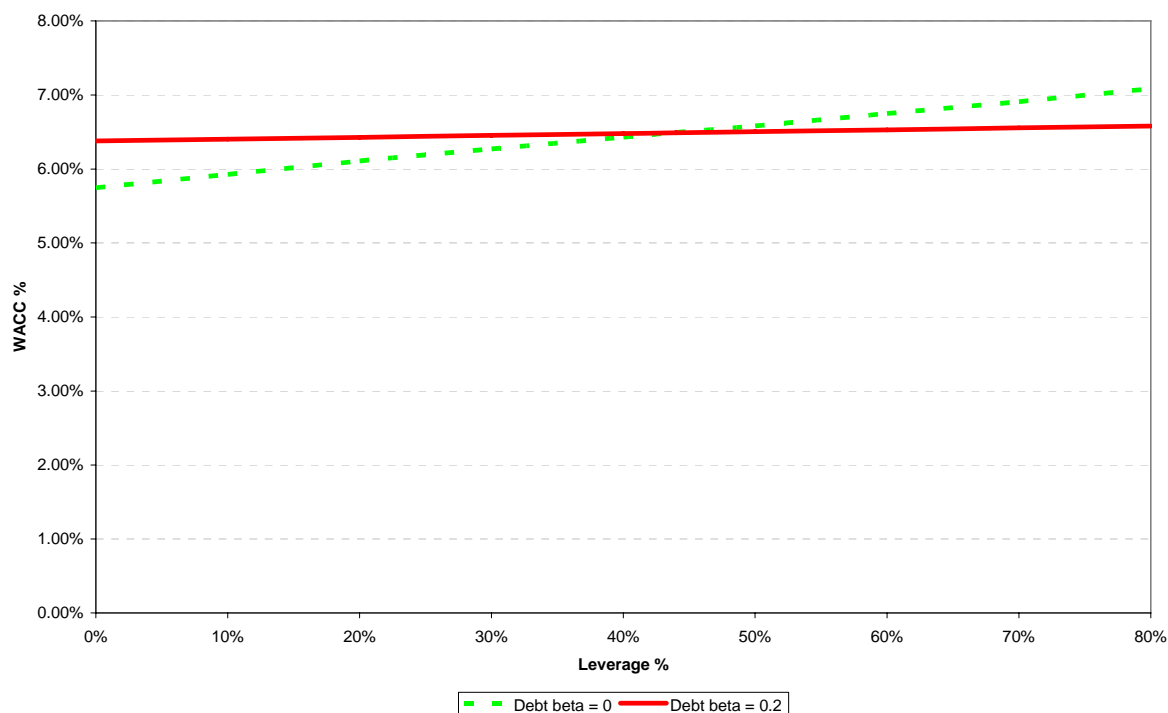
H3.57 Assuming 44% leverage, and keeping all else constant the result of the post-tax WACC from the table and figure above demonstrate that applying Option B.(ii) (debt beta =0) or Option C (debt beta = 0.2) give the same estimate of the post-tax WACC (i.e. 6.49%).[937]

Conclusion - Option B(ii) vs. Option C

H3.58 When using the same value for leverage as the average leverage value observed in the sample of comparator companies, then whether a zero debt beta or a positive non-zero debt beta is used, it will not change the estimate of the post-tax WACC that result from applying the IM to a regulated service.

Overall Conclusion - Leverage

H3.59 The Commission considers that where the use of the simplified Brennan-Lally CAPM results in estimates of WACC which increase with leverage the model is displaying an anomaly. Given the differences can be large, the Commission considers the anomaly should be addressed. The use of a single notional leverage assumption across all services under Part 4 would achieve this, but the Commission accepts (in line with the submission from PwC) that applying this approach to each service separately would ensure the WACC is invariant to leverage in a more technically correct manner.

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[937] As part of this analysis the Commission also evaluated the resulting post-tax WACC estimated using an asset beta consistent with a debt beta of 0.1. This also resulted in the post-tax WACC of 6.49%.

H3.60   Conceptually the use of a non-zero debt beta is superior to the use of notional leverage, as this addresses the anomaly that increases in leverage can increase the cost of capital when using the CAPM framework. That is, the use of a non-zero debt beta can make the post-tax WACC estimate for each service invariant to leverage, as it should be.

H3.61   Most submissions continue to prefer that debt betas not be used (that is, they be set at zero), most regulators do not use debt betas, the Commission has not done so in the past, and there are practical difficulties in accurately estimating debt betas (but this is offset in part by the estimates available from regulatory decisions overseas, and the possibility of back solving for the debt beta). Further, and importantly, the Commission notes that service specific notional leverage based on leverage from the sample of comparator companies (Option B(ii)) and use of a non-zero debt beta (Option C) results in the same estimate of post-tax WACC at the leverage from the sample of comparator companies.

H3.62   Accordingly, the final determination does not reflect the use of debt betas (as the debt beta is set at zero), though the Commission notes that if actual firm leverage were to be used, then non-zero debt betas should be used in the simplified Brennan-Lally CAPM to minimise the effect of the anomaly and ensure there is no incentive on firms to increase leverage to exploit the anomaly.

H3.63   Transpower submitted that its actual leverage should be used. It is not appropriate to use actual leverage for any regulated supplier as this would introduce the same technical issues into the estimation of the cost of capital that PwC identified with the issue of notional leverage across different services.[938] That is, using any leverage assumption other than that of the comparative firm sample for estimating the asset beta, would bias the estimate of the cost of capital. If actual leverage were used, non-zero debt betas would have to be used in the simplified Brennan-Lally CAPM to minimise the effect of leverage on the cost of capital and ensure there are no incentives on suppliers to increase leverage or propose increases in leverage that would exploit the anomaly in the model.[939]

H3.64   The IM specifies a service-wide notional leverage of 44% when estimating the cost of capital for EDBs, GPBs, and Transpower.

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[938]   See paragraph H3.35.

[939]   The Commission also notes that leverage should be estimated based on market values (not Transpower's book value), but that as Transpower's shares are not listed there is no observed market value of Transpower. Further, the Commission notes that Transpower's adviser, Cameron Partners, has submitted that Transpower's market value is greater than its book value (see Transpower Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Cameron Partners, *Relating to a market based rate of return assessment: a report to Transpower New Zealand Limited*, 16 August 2010). If this submission is correct, the use of an estimate of Transpower's leverage based on its book value, would overstate Transpower's gearing which would lead to an over-estimate of Transpower's cost of capital (given the anomaly in the simplified Brennan-Lally CAPM (without debt betas)).

H4   Risk-free Rate

Decision - the risk-free rate

H4.1   In relation to the risk-free rate, the IM specifies:

- the process and methodology for estimating the risk-free rate;

- that the Commission will use the observed market yield to maturity of benchmark NZ government NZ$ denominated nominal bonds to estimate the risk-free rate;

- that the Commission will estimate the risk-free rate by averaging the observed market yields on the government bonds over one calendar month prior to when the cost of capital is being estimated;

- the term of the risk-free rate will be five years in the case of information disclosure regulation for EDBs, GPBs and Transpower and estimates of the five-year risk-free rate will be updated annually;

- the term of the risk-free rate will match the length of the regulatory period for DPPs (five years), IPPs (for Transpower - five years) and for CPPs (three, four or five years);

- the risk-free rate will not be updated during a DPP/IPP period and the risk-free rate will not be updated once a supplier is on a CPP; and

- that the Commission will update the estimate of the risk-free rate for each cost of capital estimation.

Commission's reasons - the risk-free rate

Overview

H4.2   The risk-free rate is the interest rate that an investor would expect to earn by holding a risk-free asset. The Commission uses the risk-free rate when estimating both the cost of debt and the cost of equity.

H4.3   In practice, the risk-free rate cannot be observed; it is usually approximated by the return on a very safe asset such as a government bond. When selecting the risk-free rate, the first step is therefore to identify a suitable proxy. Depending on the proxy chosen, the second step is to decide whether to use the current risk-free rate or an historical average of the risk-free rate. The third step is to decide whether to use spot rates or yields to maturity. The fourth step is to determine the timing and period of estimation from the proxy. The final step is to determine the appropriate maturity of the rate. Each of these issues is discussed in turn below.

Commission's reasons - suitable proxy for the risk-free rate

H4.4   The Commission considers that a good risk-free proxy should be (i) virtually free of risk, (ii) liquid, (iii) free of restrictions on trade, and (iv) not have characteristics other than its returns distribution that attracts or discourages investors.

H4.5　　The Commission and most other regulators have traditionally employed their respective government's local currency denominated bonds as the relevant proxy for the risk-free rate. However, it has been argued before the Commission and some overseas regulators that because of the low supply of government bonds at that time, a more appropriate benchmark is the yield on interest rate swaps (swap rate).[940] This was motivated by a widening of spreads between government securities and swap rate, across maturities.[941] However, this effect has diminished as a result of increased availability of government bonds after the recent GFC.

H4.6　　Submitters generally agreed that the most suitable proxy for the risk-free rate in New Zealand continues to be the New Zealand government bond rate.[942] However, some submitters have suggested that the Commission should continue to review the use of government bonds in preference to swaps for estimating the risk-free rate.[943]

H4.7　　PwC (for ENA) noted that the swap rate may not be totally risk free as it may still incorporate a premium (albeit, typically small) for the default risk of the banks active in this market, who are the swap counterparties. PwC considered a possible approach to address this point was to use the price of credit default swaps for those banks as a deduction from the swap rate in order to derive a "pure" risk free rate.[944]

Conclusion - suitable proxy for the risk-free rate

H4.8　　The Commission considers that benchmark New Zealand government bonds best fulfil the conditions at paragraph H4.4. With regard to swap rates, the Commission notes that:

- swap rates appear to be widely used by practitioners as benchmarks for some purposes but that does not necessarily imply that they are a good proxy for the risk-free rate;

- the conditions that originally motivated the suggestion to use swap rates (low supply of government bonds) no longer apply;

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[940]　An interest rate swap is an agreement between two parties to exchange one stream of interest payments for another. The most common type of interest rate swap exchanges fixed interest rate payments for floating interest rate payments for a given principal amount and period of time. The floating rate in such contracts is often based on interbank offer rates (e.g. LIBOR). Swap rates are quoted in terms of the fixed rate that must be paid in order to convert to floating (Fleming, M. J., Financial Market Implications of the Federal Debt Paydown, Brookings Papers on Economic Activity, Vol. 2, 2000, pp. 221–251).

[941]　An undersupply of government securities can occur when, for example, large fiscal surpluses prompt governments to retire existing debt and issue new debt more slowly.

[942]　Commerce Commission, *Cost of Capital Workshop Transcript*, pp. 136-141.

[943]　PricewaterhouseCoopers, *Submission to the Commerce Commission on the Revised Draft Guidelines – The Commerce Commission's Approach to Estimating the Cost of Capital*, Report on behalf of 17 EDBs, 14 August 2009, p. 8; Electricity Networks Association, *Cross Submission on the Cost of Capital Workshop*, 2 December 2009, p. 9; *Telecom Limited, Post-workshop Submission on the Cost of Capital*, Attachment: PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, 2 December 2009, p. 12; Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010, p. 20.

[944]　Electricity Networks Association, *Submission on EDBs (Input Methodology) Draft Determination and Reasons Paper, PricewaterhouseCoopers Submission on the Cost of Capital Parameter Estimates*, 13 August 2010, p. 20.

- the notion that swap rates should replace government bond yields as the risk-free proxy has not achieved widespread consensus in academia, and therefore does not appear to support the use of swap rates as the risk-free rate in CAPM calculations;[945]

- the Commission is not aware of any regulator that has employed swap rates in place of yields on government securities as a proxy for the risk-free rate; and

- for the Commission to adopt the swap rate as the basis for its risk-free rate, it would need to be satisfied that there is a long-term trend indicating that the swap rate is a better proxy for the risk-free rate than the government bond rate. The Commission considers that, currently, there is no such trend.

H4.9   For these reasons, the Commission considers that benchmark New Zealand government bonds are the better suited proxy for the risk-free rate.

Commission's reasons - historical or current risk-free rates

H4.10   The risk-free rate can be estimated by reference to average historical interest rates (for example, the last ten years to proxy the long-term average risk free rate); or current interest rates (for example, based on rates around the time the cost of capital is determined for each regulatory period). Regulators in the UK generally use approaches which reflect long-term historical average risk-free rates.[946] The Commission and the Australian regulators generally use current interest rates in regulatory determinations.

H4.11   Using historical rates reflects long-term average actual risk-free rates and will lead to estimated costs of equity and debt which tend to be relatively stable over time. In a price setting context, this relative stability will tend to lead to relatively stable returns to suppliers and prices to consumers over time. However, this apparent stability could blunt the signals from structural changes in the financial markets with respect to new investment in infrastructure, as significant changes in interest rates only slowly affect the specified cost of capital.

H4.12   The use of current rates will lead to estimated costs of equity and debt which more closely reflect changes in expectations in the financial markets.[947] That is, they are more up-to-date estimates of interest rates and therefore the cost of capital. In a price setting context, using current rates means changes in expectations in the financial markets will be signalled more rapidly to suppliers, and to consumers.

Conclusion – historical or current risk-free rates

H4.13   The Commission considers that the use of current rates better achieves the Part 4 Purpose (of promoting the long-term benefit of consumers such that suppliers have,

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[945]   Hull, J., Predescu, M., White, A., The Relationship between Credit Default Swaps Spreads, Bond Yields and Credit Rating Announcements, *Journal of Banking and Finance*, Vol. 28, 2004, pp. 2789-2811.

[946]   For example Ofcom based the risk-free rate on a five year average rate with analysis undertaken for periods using six months up to five years. Ofcom, *A new pricing Framework for Openreach, Annexes*, 22 May 2009, p. 168-169.

[947]   See the research by Forsyth Barr, which illustrates how the WACC estimated under the IM will change to reflect changes in interest rates over time (discussed at paragraph H13.56 on page 591 below). Specifically, Forsyth Barr estimate that Transpower's future WACC (under the draft IM) will be higher when interest rates increase from their current lows.

among other things, incentives to invest) and the potential dynamic efficiency benefits of investment, than the use of historic rates.

Commission's reasons - yield to maturity versus spot rates

H4.14   The Commission typically uses yields to maturity[948] on benchmark New Zealand government bonds as the proxy for the risk-free rate in the CAPM.[949] However, the theoretically correct approach would to use spot rates (sometimes referred to as zero coupon rates) instead, i.e. the rates that would apply to a bond that delivers a single payoff at maturity.

H4.15   If yields to maturity on coupon paying bonds are used in place of spot rates, the resulting estimates of the cost of capital will be biased downward or upward depending on whether the yield curve is upward or downward sloping. Such inaccuracies are likely to be greatest for low-risk investments because the NPV[950] of such investments is more sensitive to changes in the risk-free rate than for risky projects, which will have a larger risk premium.

H4.16   In a submission on the RDG PwC (for 17 EDB's) argued that:[951]

> Using spot rates on government bonds as the risk-free rate in the CAPM is the theoretically preferred approach. However, we agree that in many circumstances, for pragmatic reasons, including obtaining data and the preference for the use of a single rate, using yields to maturity would be an appropriate approach.

H4.17   In all previous decisions and determinations using the cost of capital, the Commission has estimated the risk-free rate using the yield to maturity on New Zealand Government bonds. Australian and UK regulators also estimate the risk-free rate using the yields of their respective governments' bonds.

H4.18   In advice to the Commission, the Expert Panel recommended that the Commission employ yields to maturity as an approximation to represent the risk-free rate (as it presently does), but use spot rates as a cross-check. Dr Lally accepted that the risk-free rate should have a duration, rather than a term, equal to that of the regulatory cash flows, but he argued that the effect of using terms rather than durations is slight.[952]

Conclusion - yield to maturity versus spot rates

H4.19   The Commission acknowledges that, in theory, it should use spot rates to estimate the risk-free rate, rather than yields to maturity. However, yields to maturity are more readily obtainable than spot rates (most practitioners rely on financial institutions to estimate the spot rates), and using a single interest rate in the estimation process simplifies the necessary calculations.

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[948]   A bond's yield to maturity, also known as its internal rate of return, is the discount rate that sets the price of the bond equal to the discounted value of the promised future payments on the bond.

[949]   Benchmark New Zealand governmentbonds usually pay coupons every six months.

[950]   NPV refers to the present value of future cash flow less the initial investment.

[951]   PricewaterhouseCoopers, *Submission to the Commerce Commission on the Revised Draft Guidelines – The Commerce Commission's Approach to Estimating the Cost of Capital*, Report on behalf of 17 EDBs, 14 August 2009, p. 8.

[952]   Franks, J., M. Lally and S. Myers, *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology, Report prepared for the Commerce Commission*, 18 December 2008, pp. 17-18.

H4.20   For this reason, the Commission will use yields to maturity when estimating the cost
of capital. The Commission notes that in consultation on the cost of capital a number
of interested parties acknowledged that they use and would advise the Commission
to use yields to maturity when estimating the cost of capital.

Commission's reasons - averaging period

H4.21   The Commission is aware that market volatility can significantly increase at any
time and, thus, of the effect that an event such as the GFC can have. Therefore, the
Commission needs to balance the need to obtain a current market estimate, with the
desire that the estimate be representative of its level more generally.

H4.22   In the Airports Inquiry, the risk-free rate was estimated by averaging the yields on
New Zealand government bonds over the period in which Airports consulted with
their substantial customers. The period used by the Commission was six months.[953]

H4.23   In all TSO net cost calculation determinations, the Gas Control Inquiry, Electricity
Distribution – Control of Unison and the Gas Authorisation, the Commission
estimated the risk-free rate by averaging the yields on New Zealand government
bonds one month before the start of a regulatory period.[954]

H4.24   The Australian Energy Regulator's (AER) approach to the averaging period is to
allow the regulated businesses discretion to choose the length of the averaging
period within the span of 10 to 40 business days. In the opinion of the AER, the
range of 10 to 40 business days represented an optimal length of time to balance the
trade-off between 'volatility driven error' and 'old information driven error'. Other
Australian regulators use a similar approach.

H4.25   In advice to the Commission in the Electricity Distribution – Control of Unison, the
Gas Control Inquiry and the Gas Authorisation, Dr Lally indicated that he favoured
averaging the risk-free rate over the preceding month before the start of the
regulatory/disclosure period. Dr Lally stated that the reason for this position was:[955]

> … the data should be current but the use of the rate on a single day (or less) yields
> exposure to a 'freakish' rate, due to the volumes of trades or to trades motivated by
> particularly strong incentives to transact.

H4.26   At the Cost of Capital Workshop parties agreed that taking a one-month average of
the adjusted yields on New Zealand government bonds was appropriate in estimating
the risk-free rate.[956]

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[953]   Commerce Commission, *PartIV Inquiry into Airfield Activities at Auckland, Wellington and Christchurch International Airports, Final report*, 2002, pp. 150-151.

[954]   Commerce Commission, *Gas Control Inquiry, Final Report*, 28 November 2004; Commerce Commission, *Regulation of Electricity Lines Businesses Target Control Regime Reasons for Not Declaring Control Unison Networks Limited*, 11 May 2007; Commerce Commission, *Gas Authorisation Decision Paper*, 30 October 2008.

[955]   Lally, M., *The weighted average cost of capital for gas pipeline businesses*, paper prepared for the Commerce Commission, 24 November 2004, p. 27; Lally, M., *The weighted average cost of capital for electricity lines businesses*, paper prepared for the Commerce Commission, 8 September 2005, p. 29; Lally, M., *The weighted average cost of capital for gas pipeline businesses,* paper prepared for the Commerce Commission, October 2008, p. 38.

[956]   Commerce Commission, *Cost of Capital Workshop Transcript*, pp. 136-141.

Conclusion - averaging period

H4.27   As discussed above, the Commission needs to balance the need to obtain a current market estimate of the risk-free rate, with the desire that the estimate of the risk-free rate be representative of its level more generally. The Commission considers that a one calendar month averaging period strikes an appropriate balance as it reduces the degree of volatility while still providing a relatively up-to-date estimate of the risk-free rate.

Commission's reasons - updating the risk-free rate

H4.28   As outlined above, the risk-free rate is subject to volatility. This volatility was particularly pronounced during the recent GFC. Therefore, the Commission will update its estimate of this parameter every time it estimates the cost of capital for regulatory purposes. However, once a supplier is on a DPP or CPP the cost of capital estimate used in the determination of the price path will remain unchanged.

Commission's reasons - the appropriate term of the risk-free rate

H4.29   The term of the risk-free rate should ensures the resulting estimate of the cost of capital is estimated with a term that is consistent with the period of the regulatory instrument (for example, the DPP or CPP) in which it will be applied. For most applications, this means a term of five years, though a three year or four year term will be required where a CPP applicant seeks a three or four year CPP.

Previous decisions

H4.30   In previous decisions, the Commission has always matched the term of the risk-free rate to the period for which prices are set or price reset (referred to as the regulatory period). The regulatory periods ranged from one year (the TSO net cost calculation) to seven years for the Gas Authorisation.[957] In the case of the Airports Inquiry, the Commission considered the term of the risk-free rate should be set at five years as this was the period that Airports typically set their prices for.[958] The term of the risk free rate needs to match the regulatory period to ensure the supplier of the regulated service only earns a normal rate of return.

Matching the term of the risk-free rate to the regulatory period to ensure a normal rate of return

H4.31   A fundamental concept in finance is that the interest rate applied to a set of cash flows should reflect the risk, and the term, of those cash flows. To illustrate, consider the pricing of a zero-coupon five year bond. The only discount rate that will correctly price this bond is the five year spot rate. Applying an interest rate with a term other than five years would generate either windfall gains or losses to the holder of the bond by mispricing it. The precise outcome will depend on the slope of the term structure of interest rates.

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[957]   Commerce Commission, *Determination for TSO Instrument for Local Residential Service for period between 20 December 2001 and 30 June 2002*, 17 December 2003, and every year with the latest being the Commerce Commission, *Draft TSO Cost Calculation Determination for TSO Instrument for Local Residential Telephone Service for period between 1 July 2008 and 30 June 2009*, 4 December 2009 and Commerce Commission, *Gas Authorisation Decision Paper*, 2008, pp. 163-165.

[958]   Commerce Commission, *Part IV Inquiry into Airfield Activities at Auckland, Wellington and Christchurch International Airports, Final report*, 2002, pp. 150-151.

H4.32   In the regulatory context, the Commission will typically be setting suppliers of
regulated services' prices or evaluating returns over a given horizon — the
regulatory period. Matching the term of the risk-free rate to the term of the
regulatory period ensures there is no expectation that regulated suppliers will earn
profits that are greater (or lower) than a normal rate of return.[959]

H4.33   The risk-free rate may either increase with term or decrease with term. When the
risk-free rate declines with term, there is said to be an 'inverse yield curve'. That is,
long term interest rates are lower than short term interest rates. New Zealand has
had an inverse yield curve for significant periods in the past. At present New
Zealand has a 'positive yield curve'. That is, Government stock with a longer term
has a higher rate of interest than Government stock with a shorter term (for example,
10 years versus five years). Higher long term rates may be due to the uncertainty
about future short term rates, an expectation that future rates will rise and the
uncertainty about future inflation, which is greater for long-term bonds.

H4.34   Setting the risk-free rate to a term longer (or shorter) than the regulatory period may
provide gains or losses depending on the term structure of interest rates. With a
positive yield curve, (as New Zealand currently has) it is in the interests of suppliers
for the cost of capital to be based on a longer term rate, but the opposite would be
the case when there is an inverse yield curve.

Expert panel

H4.35   In advice to the Commission on the appropriate cost of capital the Expert Panel had
different views about how the term of the risk-free rate should match the regulatory
period. The Expert Panel made the following recommendations on the term of the
risk-free rate:[960]

- Dr Lally recommended the Commission retain its current practice of setting
the intercept term in the CAPM equal to the current risk-free rate whose
maturity matches the length of the regulatory cycle.

- Professor Myers recommended using a L-year forecast of the one-year risk-
free rate as the intercept term of the CAPM, standardising on L = 5 years. If
standardisation is rejected, L should match the length of the regulatory cycle.

- Professor Franks agreed with Professor Myers' recommendation. Professor
Franks suggested that the Commission could standardise on L = 3 if regulatory
cycles in New Zealand are typically three years.

H4.36   In previous advice to the Commission on estimating the cost of capital Dr Lally has
advised the Commission to set the term of the risk-free rate, in the cost of debt and
first term of the CAPM, equal to the price setting period (i.e. regulatory period).[961]

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[959]   Lally, M., Regulation and the choice of the risk free rate, *Accounting Research Journal*, 2004, Vol. 17 (1), pp. 18-23.

[960]   Franks, J., M. Lally and S. Myers, *Recommendations to the New Zealand Commerce Commission on an Appropriate
Cost of Capital Methodology, Report prepared for the Commerce Commission*, 18 December 2008, pp. 13-17.

[961]   Lally, M., *The weighted average cost of capital for gas pipeline businesses, paper prepared for the Commerce
Commission*, 24 November 2004; Lally, M., *The weighted average cost of capital for electricity lines businesses, paper
prepared for the Commerce Commission*, September 2005; Lally, M., *The weighted average cost of capital for gas*

Submissions

H4.37   In consultation, a number of suppliers of regulated services disagreed that the term
of the risk-free rate should match the regulatory period. [962]   These parties argued that

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pipeline businesses, paper prepared for the Commerce Commission, October 2008; Lally, M., *The cost of capital for the airfield activities of New Zealand's international airports*, 2001.

[962]   NZ Airports, *Submission by NZ Airports Association on the Commerce Commission Input Methodologies Discussion Paper*, 31 July 2009, p. 49; Auckland International Airport Limited, *Submission to the Commerce Commission Draft WACC Guidelines Paper,* 31 July 2009, p. 1; Christchurch International Airport Limited, *CIAL Submission on the Revised Draft Cost of Capital Guidelines,* 3 August 2009, p. 2; Christchurch International Airport Limited, *Submission on Commerce Commission Input Methodologies Discussion Paper,* 7 August 2009, p. 27; LECG, Comments on the Commerce Commission's proposed approach to estimating the cost of capital, Report for NZAA, 31 July 2009, p.27; Maui Development Limited, *Submission to the Commerce Commission on the Input Methodology Discussion Paper,* July 2009, pp. 17-18; Orion, *Submission on Input Methodologies Discussion Paper,* 14 August 2009, p. 29; Powerco Limited, Input Methodologies Discussion Paper, 14 August 2009, p. 28; PricewaterhouseCooper, *Revised Draft Guidelines - Submission to Commerce Commission*, Report on behalf of Powerco, August 2009, p. 11; Powerco Limited, Submission on the Input Methodologies Discussion Paper, Attachment: PricewaterhouseCoopers, *Commerce Commission's Revised Draft Guidelines and aspects of the Input Methodologies Discussion Paper relating to Cost of Capital prepared for Powerco Limited*, 14 August 2009, p. 8; PowerNet, *Submission of PowerNet to the Commerce Commission on the Input Methodologies as part of the Implementation of Part 4 of the Commerce Act,* 14 August 2009, p. 4; Telecom, Annex B: *Submission on Commerce Commission Revised Draft Guidelines for estimating the Cost of Capital,* August 2009; Transpower, *Submission to the Commerce Commission on: Transpower Process and Recommendation Discussion paper, Input Methodologies Discussion Paper,* August 2009, pp. 23-24; Unison Networks Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: Castalia Strategic Advisors, *Submission on Input Methodologies: Regulatory Cost of Capital: a report prepared for Unison Limited*, 13 August 2009, pp. 5-6; Vector Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: Synergies Economic Consulting, *Initial Weighted Average Cost of Capital Review: prepared for Vector Limited*, 13 August 2009, pp. 15-16; Synergies Economic Consulting, *WACC Review: Final*, Report on behalf of Vector Ltd, 31 August 2009, p. 17; Unison, Appendix: *Submission on Revised Draft Guidelines: The Commerce Commission's Approach to Estimating the Cost of Capital,* 14 August 2009, p. 6; Auckland Energy Consumer Trust, *Cross Submission to the Commerce Commission on Cost of Capital Workshop*, 2 December 2009, p. 20; Castalia Strategic Advisors, *Commerce Commission – Cost of Capital – Cross Submission on Behalf of Transpower,* 2 December 2009, pp. 3-4; Electricity Networks Association, *Cross Submission on the Cost of Capital Workshop*, 2 December 2009, p. 9-11; Maui Development Limited, *Cost of Capital Workshop 12th-13th November 2009 – Cross-submission,* 2 December 2009, pp. 7-8; PricewaterhouseCooper, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, Report for 17 EDBs, 2 December 2009, p. 11; Telecom Limited, *Post-workshop Submission on the Cost of Capital*, Attachment: PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop,* 2 December 2009, p. 12; Synergies Economic Consulting, *Cost of Capital Cross Submission*, Report on behalf of Vector, 2 December 2009, pp. 11-13; Telecom, *Cost of Capital Guidelines – Post-Workshop Submission,* 2 December 2009 p. 3; Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital,* Report on Behalf of NZAA, 2 December 2009, pp. 24-27; Unison, *Post-Conference Submission on the Weighted Average Cost of Capital*, 2 December 2009, Section 3; Vector, *Cross Submission to the Commerce Commission on the Weighted Average Cost of Capital Workshop*, 2 December 2009, pp. 9-10; Christchurch International Airport Ltd., *Submission on Input Methodologies and Information Disclosure Draft Determinations and Reasons Papers for Airport Services,* 12 July 2010, p. 42; NZ Airports Association, *Submission on Draft Information Disclosure Determination and Draft Reasons Paper,* Attachment: Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper - Report for NZAA,* 12 July 2010, pp. 25-26; NZ Airports Association, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers,* Attachment: Uniservices, *Comments on Air New Zealand's and Board of Airline Representatives New Zealand Incorporated's Submissions to the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper: report prepared for New Zealand Airports Association,* 3 August 2010; p. 11; NZ Airports Association, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers,* 3 August 2010, p. 39; Auckland International Airport Limited, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers,* 3 August 2010, p. 12; Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers,* Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association,* 13 August 2010, pp. 24-25; Powerco Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers,* 13 August 2010, pp. 11-15; PricewaterhouseCoopers on behalf of 20 Electricity Distribution Businesses, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers,* 13 August 2010, pp. 11-13; Unison Networks Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers,* 13 August 2010, pp. 8-11; Unison

the risk-free rate with the longest maturities available in New Zealand – 10 years – should be used. In support of this, suppliers cited:

- Mitigation of re-financing risk;

- The matching principle. Firms that are required to finance assets with expected lives greater than a regulatory review period will seek to borrow term debt with a maturity greater than a typical regulatory review period;

- Normal commercial practice where firms issue a portion of their debt for a longer term; and

- Mitigation of regulatory risk.[963]

H4.38   Therefore, according to submissions from suppliers, the term of the risk-free rate and debt premium which matches the regulatory period is too short and would under compensate suppliers. However, these submissions overlook: (i) the ability of regulated suppliers to reset prices at the end of the regulatory period to compensate for changes in risk-free rates; and (ii) the widespread use of interest rate swaps. These are now discussed.

The power to reset prices

H4.39   The interest rate on Government stock generally increases with term. Higher long term rates may be due to the uncertainty about future short term rates, an expectation that future rates will rise and the uncertainty about future inflation, which is greater for long-term bonds.

H4.40   Regulated suppliers can reset their prices at the end of each regulatory period to reflect, among other things, changes in the risk-free rate if this has altered the cost of capital. Through the regular resetting of prices the premium for uncertainty over the level of long-term interest rates is being borne by users, rather than suppliers. Accordingly, suppliers' prices should not reflect a premium for the uncertainty of risk-free rates beyond the length of the regulatory period.

The availability of interest rate swaps

H4.41   The Commission notes that firms have a mix of debt maturities to manage refinancing risk, including long term debt. This spreads a firm's re-financing

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Networks Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers,* Attachment: Asia-Pacific Risk Management Limited, *Commerce Commission Cost of Debt Funding Submission Report: prepared for Unison Networks Limited,* 12 August 2010, pp. 11-35; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital,* 13 August 2010, pp. 20-22; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital,* Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited,* 15 August 2010, pp. 51-60; Prime Infrastructure, *Submission on EDBs (Input Methodology) Reasons Paper, Cost of Capital - The Investor Perspective,* 13 August 2010, p. 10.

[963]   Uniservices (for NZAA) considered that suppliers subject to regulation have the potential for risk associated with changes in the regulatory framework over time. In the presence of regulatory risk Uniservices submitted that suppliers would source debt financing that matches there assets life and not the regulatory period to ensure a supplier maintains a prudent commercial treasury policy. See NZ Airports Association, *Cross-submission on the Cost of Capital Conference,* Attachment: Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital - Report for NZAA,* 2 December 2009, p. 25.

requirements and reduces the amount of debt that needs to be refinanced in any one year. Reducing re-financing risks has benefits for consumers, but long-term debt typically has a greater cost (specifically a greater debt premium) than medium or short term debt.

H4.42   The use of fixed rate long-term debt to manage refinancing risk also fixes a firm's interest rate for the term of the loan.[964] But many firms want to manage their interest rate risk, often for shorter terms than the term of the loan. Therefore the firm enters into an interest rate swap, typically at the same time as the debt finance is raised, to shorten the period for which their interest rate is fixed. This can result in a lower rate of interest. Indeed, it may result in a much shorter interest rate re-pricing period.

H4.43   In other words, firms are able to use interest rate swaps to re-price their interest costs (earlier than the maturity date of their debt) and lower their overall interest cost. Through the use of interest rate swaps firms can enjoy the benefits of long-term debt (secured funding and reduced refinancing risk) without having to pay the full cost of long term debt finance.

H4.44   Interest rate swaps are used to hedge the risk-free rate component of their debt portfolios. This leaves the debt premium component matched to the term to maturity that the debt was originally issued for. Interest rate swaps are widely used in this way. This was evidenced in the information on debt profiles that the Commission obtained from regulated suppliers in 2010. Specifically, this showed that the interest rate re-pricing period was shorter than the average term to maturity of the debt portfolio. That is, firms were using interest rate swaps extensively. Many had an interest rate re-pricing period that was less than five-years, with the weighted average interest rate re-pricing period being 3.3 years in 2010, which is much shorter than the term of the regulatory period. Transpower explained at the Cost of Capital workshop that its target interest rate re-pricing period was 2 years.

H4.45   Figure H3 compares the weighted average original term to maturity for regulated suppliers' debt with the weighted average interest rate re-pricing period for that debt portfolio reported to the Commission by suppliers in 2010. The chart shows that five firms have a debt portfolio with a weighted average tenor (original maturity) greater than five years, and of these three firms had a weighted average tenor greater than 7.5 years, but that after accounting for interest rate swaps, no firm had an average interest rate re-pricing period which was greater than five years. Through the use of interest rate swaps, suppliers can choose their interest rate re-pricing period, and this decision is independent of the original maturity of the debt.

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[964]   A small number of New Zealand firms have issued bonds with floating rates of interest.

Figure H3 Regulated suppliers' debt portfolios: Weighted average original term to maturity vs. weighted average interest rate re-pricing period (2010)
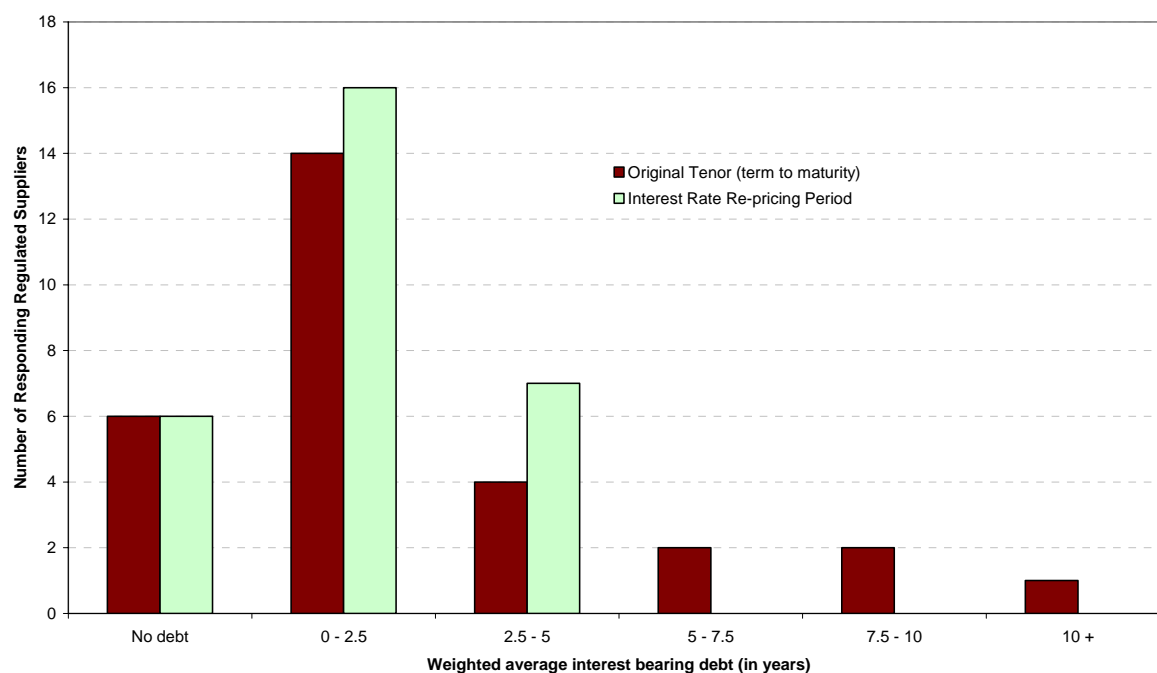
H4.46 The data on the actual interest rate re-pricing faced by regulated suppliers illustrate regulated suppliers' ability to use swaps to alter their interest rate re-pricing period, and to set it to a term consistent with or shorter than the regulatory period. As such, it is inappropriate to set the term of the risk-free rate longer than the term of the regulatory period (and it should not be set at 10 years). That is, doing so would (assuming a positive yield curve) over-compensate suppliers as they would receive a (higher) risk-free rate in their regulatory cost of capital when their actual interest costs have been re-priced to a much shorter term (lower rate) by the use of interest rate swaps.[965]

H4.47 The widespread availability and use of interest rate swaps means the term of the risk-free rate should not exceed the term of the regulatory period (and should not be set at 10 years).

H4.48 In support of the longer period for the risk-free rate, Castalia (for Unison), argued that refinancing risk is real for suppliers and this risk is not considered in any way in the CAPM framework. Therefore, in Castalia's view, the use of a term for the risk-free rate to match the regulatory period, clearly breaches the principle of suppliers expecting to earn at least a normal return as it under-compensates prudent and efficient regulated businesses.[966] The Commission notes that as regulated suppliers can use interest rate swaps to hedge the risk-free rate, this is however an argument

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[965] The cost of executing an interest rate swap is included in the term credit spread differential allowance in respect of suppliers which issue long-term debt (see section E6).

[966] Unison Networks Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: Castalia Strategic Advisors, *Submission on Input Methodologies: Regulatory Cost of Capital: a report prepared for Unison Limited*, 13 August 2009, pp. 3-6.

regarding the term for the debt premium (which cannot be hedged in the same way) rather than an argument relevant to the term of the risk-free rate per se.

H4.49   The Commission accepts that use of a term for the debt premium which matches the regulatory period may under-compensate those suppliers which on average borrow for a term to maturity which exceeds the length of the regulatory period, as the supplier cannot hedge the greater debt premium. To recognise the greater debt premium on long maturity debt (where it is actually incurred by a supplier), the cost of capital IM includes an allowance for the costs incurred by firms in issuing longer-term debt to manage their re-financing risks. This is discussed in section H5 on the debt premium and section H6 on the term credit spread differential.

H4.50   The Commission notes the arguments made by suppliers in support of a 10 year term that it is normal commercial practice to match funding to asset lives to the extent possible. The Commission has surveyed regulated suppliers on their debt portfolios. These surveys, undertaken in 2009 and 2010, showed that the majority of regulated suppliers that are subject to Part 4 only issue debt for periods of up to five years (see Section H5 on the debt premium for a more detailed analysis). Thus, actual behaviour is not consistent with the claim.

H4.51   The Commission notes that a number of monopoly suppliers use a term for the risk-free rate which matches the pricing period, when estimating their cost of capital. This is so even where the supplier is free to determine its own prices. For example, Airways Corporation uses a five year risk-free rate for its estimate of its cost of capital[967] and a number of airports (e.g. Hamilton, AIAL, CIAL[968]) adopt a five year term for the risk-free rate in their estimates of the cost of capital, which corresponds with the length of their pricing agreements.

Conclusion - the appropriate term of the risk-free rate
H4.52   The period of focus for regulatory purposes is the regulatory period, which is generally five years, not the life of the asset or business.   Setting the term of the risk-free rate equal to the term of the regulatory period ensures that regulated suppliers are compensated for the risk they are exposed to during the regulatory period and that regulated suppliers are able to have the expectation of earning a normal return in the long-run. The regulated supplier also knows what the risk-free rate is for the duration of the regulatory period and can plan and manage its business accordingly.

H4.53   Setting the term of the risk-free rate at 10 years, when there is an inverse yield curve, would under-compensate suppliers. Conversely, when there is a positive yield curve, a 10 year term of the risk-free rate would over-compensate suppliers.

H4.54   When suppliers reset their prices at the end of each regulatory period to reflect changes in WACC including changes in interest rate, the premium for uncertainty in long-term risk-free rates is borne by consumers, not suppliers. The use of a risk-free

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[967]   Airways Corporation, *Pricing Proposal 2009/10 Air Navigation Service Charges for Aircraft 5 Tonnes and under Supporting Information Pack,* p. 2. Airways Corporation, *Statement of Corporate Intent 2010/11 – 2012/13*, p. 11.

[968]   Hamilton International Airport, *Landing Charges Pricing Methodology*, March 2008, p. 15. Auckland International Airport Limited, *Identified Airport Activities Disclosure Financial Statements for the year ended 30 June 2009*, p. 42. Christchurch International Airport Limited, *Disclosure Financial Statements for the year ended 30 June 2009*, p. 42.

rate with a term longer than the pricing period would compensate suppliers for an uncertainty they do not bear.

H4.55   New Zealand suppliers make widespread use of interest rate swaps to manage interest rate risk. As suppliers can and do shorten the interest rate re-pricing period through the use of interest rate swaps, the term of the risk-free rate should not be based on a 10 year term.

H4.56   The term credit spread differential has been included in the cost of capital IM to recognise and compensate for the greater debt premium some regulated suppliers may actually incur on their debt portfolio. Regulated suppliers will qualify for this allowance where their average debt tenor (and therefore debt premium) is more than five-years.

H4.57   In the context of information disclosure regulation, the IM specifies a five-year term when estimating the risk-free rate. The estimate will be updated annually.

H4.58   In relation to default/customised price-quality regulation, the Commission considers that it is appropriate to adopt a risk-free rate that is aligned with the regulatory period. This estimate will apply for the entire period and will not be updated during the regulatory period. Hence, for the DPP, which has a regulatory period of five years, the risk-free rate will be based on a five-year estimate. As the regulated supplier that opts for a CPP can take either a three, four or five-year term, the estimated risk-free rate will correspond to the CPP term chosen by the regulated supplier.

H4.59   As the Commission can receive CPP applications each year, the risk-free rates for the three, four and five-year CPP will be estimated annually. Once a supplier is on a CPP, the risk-free rate will not be updated during the regulatory period.

H5   Debt Premium and Debt Issuance Costs

Decision - debt premium and debt issuance costs
H5.1   The debt premium is the additional interest rate, over and above the risk-free rate, required by suppliers of debt capital to compensate them for being exposed to the risks of default in lending to a firm plus an allowance for the inferior liquidity of corporate bonds relative to government bonds. In general, the longer the firm wishes to borrow the debt for, the higher the debt premium that the firm has to pay to the suppliers of debt capital.

H5.2   The Commission estimates the debt premium as an intermediate step towards estimating the cost of debt, which forms a component in estimating the cost of capital.

H5.3   The IM specifies a service-specific (as opposed to a supplier-specific) debt premium as the difference between the corporate borrowing rate and the risk-free rate. As with the risk-free rate, the Commission proposes to update the estimate of the debt premium for each cost of capital estimation.

H5.4   In relation to the debt premium for EDBs, GPBs and Transpower, the IM provides
        that:

•   the term of the debt premium will be the same as the term used for the risk-
     free rate;

•   the debt premium will be estimated by taking account of the average debt
     premium that would reasonably be expected to apply to publicly traded vanilla
     New Zealand dollar denominated corporate bonds that are issued by an EDB
     or GPB that is neither majority owned by the government nor a local authority,
     with a Standard and Poors (S&P) long-term credit rating of BBB+, or
     equivalent rating from Moody's or Fitch;

•   to address the small number of bonds with a S&P long-term credit rating of
     BBB+ that are publicly traded in New Zealand, this may involve, as required,
     progressively expanding the range of publicly traded bonds considered to
     include:

     o   those which are not issued by an EDB or GPB;

     o   those with a S&P long-term credit rating other than BBB+; and

     o   those issued by an entity majority owned by the government or a local
          authority;

     but in each case adjusting the observed debt premium to approximate the debt
     premium that is likely to have been observed had the bond been of the type
     first described;

•   the risk-free rate will be estimated using New Zealand government
     New Zealand dollar denominated bonds (refer Section H4);

•   for information disclosure regulation, as was the case for the risk-free rate, the
     five-year estimate of the debt premium will be updated annually;

•   the term of the debt premium will match the length of the regulatory period in
     the case of default/customised price-quality regulation;

•   for default/customised/individual price-quality regulation, as with the risk-free
     rate, the debt premium will be estimated prior to each regulatory period;

•   for the application as part of a CPP the debt premium will be estimated for a
     three, four and five-year period;

•   for default/customised/individual price-quality regulation, the estimate of the
     debt premium will be updated for each cost of capital estimation but the debt
     premium will not be updated once a supplier is on a DPP, CPP or IPP; and

•   as with the risk-free rate, the Commission will estimate the debt premium by
     averaging the debt premium over one calendar month prior to when the cost of
     capital is being estimated.

H5.5   Unlike the risk-free rate which can be hedged, the greater debt premium on long
        term debt cannot be hedged economically. The IM provides an allowance (the term
        credit spread differential) which compensates for the greater debt premium on long
        maturity debt where the firm has an average original tenor (time to repayment)
        which exceeds the regulatory period. As part of this allowance, the IM also
        compensates a qualifying regulated supplier (that is, a supplier with an average debt
        tenor which is greater than the regulatory period), for executing an interest rate swap
        (to hedge the risk-free rate).

H5.6   The IM provides that debt issuance costs will be included in the cost of capital
        estimation for EDBs, GPBs and Transpower, as a 35 basis points p.a. (0.35% p.a.)
        margin to the cost of debt capital, based on amortising the debt issuance costs over
        the same period as the term of the debt premium, i.e. five years. For CPPs, the
        allowance for debt issuance costs is recalculated to reflect an assumed debt term of
        three, four, or five years to match the length of the CPP regulatory period the
        supplier seeks.

Commission's reasons - debt premium

The term of the debt premium

H5.7   As with the risk-free rate, the term of the debt premium will match the regulatory
        period.[969] This ensures internal consistency.

H5.8   In previous regulatory decisions, the Commission has generally aligned the term of
        the corporate rate of borrowing used to measure the debt premium with the term for
        the risk-free rate.[970]

H5.9   Some submitters disagreed with the Commission's decision to estimate the debt
        premium for the same term as the regulatory period. They stated that the debt
        premium should be measured for the term that is optimal (having regard to cost
        efficiency, including minimising amortised issuance costs and prudent management
        of re-financing risk). Submitters considered that prudent firms in a competitive
        market will match their debt maturities to the life of the assets.[971] Many of these

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[969]   Appendix H4 includes further discussion on the risk-free rate.

[970]   The exception to this is the TSO net cost calculation determination for 2006/2007. For a full explanation of the result
        and reasoning see Commerce Commission, *Final TSO Cost Calculation Determination for TSO Instrument for Local
        Residential Telephone Service for period between 1 July 2006 and 30 June 2007*, 7 October 2009, pp. 25-40.

[971]   Christchurch International Airport Limited, *Submission on the Revised Draft Cost of Capital Guidelines*, 3 August
        2009, p. 2; PricewaterhouseCooper, *Submission to the Commerce Commission on the Revised Draft Guidelines – The
        Commerce Commission's Approach to Estimating the Cost of Capital*, Report on behalf of 17 EDBs, 14 August 2009,
        p. 13; Powerco Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment:
        PricewaterhouseCoopers, *Commerce Commission's Revised Draft Guidelines and aspects of the Input Methodologies
        Discussion Paper relating to Cost of Capital prepared for Powerco Limited*, 14 August 2009, pp. 32-34; Telecom,
        Annex B: *Submission on Commerce Commission Revised Draft Guidelines for estimating the Cost of Capital*, August
        2009; Transpower, *Submission to the Commerce Commission on: Transpower Process and Recommendation
        Discussion paper Input Methodologies Discussion Paper*, August 2009, pp. 25-27; Synergies Economic Consulting,
        WACC Review: Final, Report prepared for Vector, 31 August 2009, pp. 18-24; Unison, *Post-Conference Submission on
        the Weighted Average Cost of Capital*, 2 December 2009, p. 7; Synergies Economic Consulting, *Cost of Capital Cross
        Submission*, Report prepared for Vector, 2 December 2009, pp. 11-13; Electricity Networks Association, *Cross
        Submission on the Cost of Capital Workshop*, 2 December 2009, pp. 9-10; PricewaterhouseCooper, *Cross Submission
        to the Commerce Commission on the Cost of Capital Workshop*, Report on Behalf of 17 EDBs, 2 December 2009,
        p. 12; PricewaterhouseCooper, *Cross Submission on the Commerce Commission's Cost of Capital Workshop*, Report
        on behalf of Telecom, 2 December 2009, p. 13; Auckland Energy Consumer Trust, *Cross Submission to the Commerce
        Commission on Cost of Capital Workshop*, 2 December 2009, p. 20; Vector, *Cross Submission to Commerce
        Commission on the Weighted Average Cost of capital Workshop*, 2 December 2009, pp. 9-10; Uniservices, *Comments

submitters recommended that the Commission should assume a 10 year term for estimating the debt premium.

H5.10 CEG (for Vector) provided evidence from other countries of the original maturity of debt issued by regulated electricity suppliers. Since these suppliers issue debt for periods longer than five years, CEG submitted that the Commission should use a term for the debt premium longer than the regulatory period.[972]

H5.11 In 2009 and 2010 the Commission surveyed suppliers of services regulated under Part 4. In 2010 (2009), only five (four) of 29 (31) regulated suppliers which responded to the Commission's request advised that the actual weighted average original period to maturity of their debt was greater than five years - and only one was greater than ten years.[973] Their responses are shown in Figure H4. Large suppliers generally issued longer-maturity debt, while (the more numerous) smaller suppliers did not. In the 2010 survey, the value-weighted average original period to maturity of the regulated suppliers who responded was 7.4 years (in 2009 it was 7.3 years).[974]

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on the Commerce Commission's Approach to estimate the Cost of Capital, Report prepared for NZAA, 2 December 2009, pp. 43-44., Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers, Attachment: PricewaterhouseCoopers, Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010, pp. 24-25; Powerco Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, pp. 11-15, paragraphs 30-48; PricewaterhouseCoopers on behalf of 20 Electricity Distribution Businesses, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010 (PWC for 20 EDBs, Submission on the Draft Cost of Capital for EDBs and GPBs Determinations and Draft Reasons Papers), pp. 11-13; Unison Networks Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, pp. 8-11; Unison Networks Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers, Attachment: Asia-Pacific Risk Management Limited, Commerce Commission Cost of Debt Funding Submission Report: prepared for Unison Networks Limited*, 12 August 2010, pp. 11-35; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, 13 August 2010, pp. 20-22; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, pp. 51-60; Prime Infrastructure, *Submission on EDBs (Input Methodology) Reasons Paper, Cost of Capital - The Investor Perspective*, 13 August 2010, p. 10; Transpower New Zealand Ltd., Submission on Transpower (Input Methodologies) Draft Reasons Paper, Cost of Capital Decisions, August 2010, p. 10; Transpower New Zealand Ltd., *Submission on Transpower (Input Methodologies) Draft Reasons Paper and Individual Price-Quality Path*, Attachment: R. R. Officer & S. Bishop - *Independent Review of Commerce Commission's WACC Proposals for Transpower*, 5 August 2010, pp. 11-14.

[972] Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, pp. 51-60.

[973] The five suppliers with debt portfolios with an average original tenor exceeding five years comprised two suppliers of airport services, and three suppliers of electricity and/or gas services.

[974] For suppliers of airports services the weighted average original period was approximately five years in 2009 and 2010. The weighted average original period for suppliers of electricity distribution services was 7.8 years. However, if the suppliers that are also suppliers of gas pipeline services are removed the weighted average original period falls to approximately two years.

Figure H4   Regulated suppliers' debt portfolio: weighted average original term to maturity of interest bearing debt
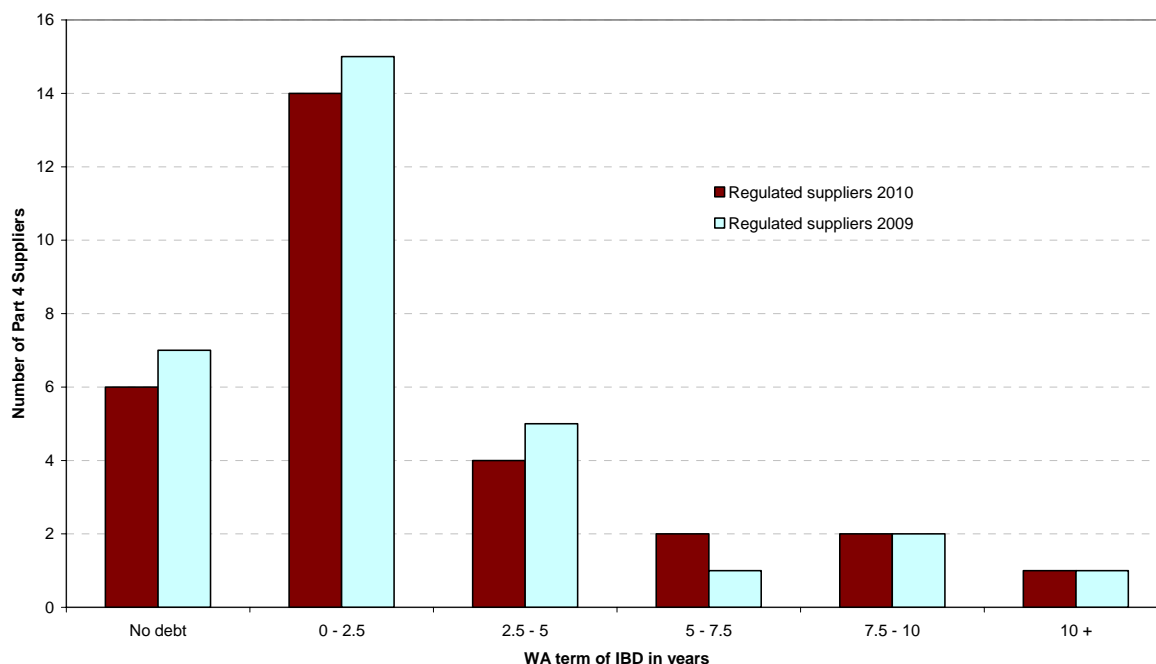
H5.12   For the majority of regulated suppliers (24 of 29 in 2010; and 27 of 31 in 2009) the weighted average original period to maturity of their debt was five years or less. Therefore, basing the estimation of the debt premium on a 10 year term would overstate the debt premium by compensating them for costs that they do not actually incur.

H5.13   For the 24 (27) regulated suppliers in 2010 (2009) whose weighted average term to maturity was less than five years, a debt premium based on a five year term could be seen as concessional (since, on average, they are paying a debt premium on shorter maturity debt, that is, a lower debt premium). However, it is for each supplier to determine the average tenor of its debt portfolio. The Commission would not want to incentivise firms to increase their refinancing risk by relying more heavily on shorter maturity debt.

H5.14   For the suppliers that have, on average, issued debt with a term to maturity that is longer than the regulatory period (thereby incurring a greater debt premium), the Commission has ensured that they will not be under-compensated as they will qualify for the term credit spread differential allowance. This is discussed in Appendix H6.

Conclusion - term of the debt premium

H5.15   For information disclosure regulation, the IM specifies a five-year term when estimating the debt premium. The Commission will update the estimate of the five-year debt premium on an annual basis.

H5.16   In relation to default/customised price-quality regulation, the term of the debt
         premium will be aligned with the regulatory period (and the risk-free rate).

H5.17   The DPP has a regulatory period of five years, so the debt premium will be based on
         a five-year estimate. Once set, the debt premium will not be updated during the DPP
         regulatory period. As a CPP may apply for a three, four or five-year regulatory
         period, the debt premium will be estimated annually by the Commission for each of
         these scenarios. The estimate of the debt premium will correspond to the length of
         the CPP regulatory period. However, once applied (i.e. the supplier is on a CPP) the
         debt premium will not be updated during the CPP regulatory period.

H5.18   At the end of the first DPP or CPP, the regulated supplier will enter into a new DPP
         or CPP, with a new WACC to be applied. That new WACC incorporates a revised
         estimate of the debt premium (and the risk-free rate).

Term credit spread differential

H5.19   Some regulated suppliers issue debt with an original period to maturity greater than
         five years to manage their exposure to re-financing risk. At the same time such
         suppliers may also enter into an interest rate swap to shorten the interest rate re-
         pricing period.

H5.20   Prudent management of re-financing risk by issuing debt with a long period to
         maturity is in the long term interests of consumers. Therefore, where a regulated
         supplier actually issues debt with an original period to maturity greater than five
         years, and the weighted average original period to maturity of its debt portfolio is
         also greater than five years, the IM proposes that an allowance for the additional
         debt premium is appropriate. The allowance relates only to debt issues with an
         original period to maturity greater than the regulatory period.

H5.21   Where an issue of debt qualifies for this allowance, to be consistent, the amortisation
         period applied to the notional debt issuance costs attributed to the issue of debt will
         be adjusted to reflect the actual original period to maturity. In addition, there is an
         allowance for the execution costs of an interest rate swap.

H5.22   A more detailed explanation of the term credit spread differential and how it works
         is set out in Appendix H6.

Australian 10 year debt premium

H5.23   A number of submissions referred to the practice of Australian regulators in
         estimating the debt premium (and the risk-free rate) on a 10 year term and submitted
         that the IM too should adopt a 10 year term for estimating the debt premium (and the
         risk-free rate).[975] The Australian adoption of the 10 year term is often linked to the

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[975]   See, for example, Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital
         (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*,
         Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce
         Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for
         Electricity Networks Association*, 13 August 2010, p. 19. Prime Infrastructure, *Cost of Capital – The Investor
         Perspective*, 13 August 2010, p. 10. Wellington Electricity Lines Limited, *Submission to the Commerce Commission
         on Draft Cost of Capital Input Methodology Decision*, 13 August 2010, p. 12.

Gasnet decision by the Australian Competition Tribunal.[976] In that case, the regulated firm (Gasnet) submitted an access agreement which used a 10 year risk-free rate to estimate its cost of debt. The regulator (ACCC) rejected that approach, arguing a five year term should be adopted.   The issue for the Tribunal was whether the regulator was entitled to reject the firm's rate of return as being inconsistent with the code. The Tribunal decided the firm's use of the 10 year Government bond was permitted under the code and that the regulator was wrong to reject Gasnet's access arrangement.

H5.24   The Gasnet decision did not examine critically whether a 10 year term or a term matching the regulatory period was a better approach to estimating the cost of capital. The issue as to whether or not the use of a 10 year term may overcompensate suppliers was not discussed in the Tribunal's decision.

H5.25   Since around the time of the Gasnet decision, most Australian regulators have adopted a 10 year term for the risk-free rate and debt premium. However, more recently, the use of a 10 year term for estimating the debt premium has been increasingly questioned by Australian regulators and indeed by the Australian Competition Tribunal. For example:

- the AER issued a draft decision paper proposing moving to a five year term, though in its final decision it adopted a "cautious approach" and retained the 10 year term, despite acknowledging that this overstated the cost of debt for suppliers;[977]

- the QCA moved to a five year term (with allowance for additional debt premium on longer maturity debt) in its 2010 decision on QR Networks;[978]

- IPART issued a public discussion document which discusses, among other things, whether to shorten the 10 year term to align with the regulatory period;[979] and

- the Australian Competition Tribunal, in a September 2010 decision, questioned the continued appropriateness of using 10 year bond yields. The Tribunal's judgment noted that:

  There is another point worth noting about the AER's methodology. It arises out of the difficulty in identifying a sufficient number of long term bonds to determine yield. The reasons a 10 year bond was originally chosen was because, in the past, many firms favoured long term debt, albeit that it came at a higher cost, because it reduced refinancing or roll-over risks. The high rate was then hedged via interest rate swaps. That may no longer be the position. If not, the AER may need to reconsider its approach in light of more current strategies of firms in the relevant regulated industry.

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[976]   Australian Competition Tribunal, *Application for review of the decision by the Australian Competition and Consumer Commission published on 17 January 2003 in connection with revisions to the access arrangement for the gas transmission system owned by Gasnet Australia (Operations) Pty Ltd*, 23 December 2003.

[977]   AER, *Electricity transmission and distribution network service providers Review of the weighted average cost of capital (WACC) parameters*, May 2009, p. 173.

[978]   QCA, *QR Network's – Tariffs and Schedule F, Draft decision*, June 2010, pp. 33-39. The final decision made no change to the draft decision. See, QCA, *QR Network's 2010 DAU, Final decision*, September 2010.

[979]   IPART, *Developing the approach to estimating the debt margin Other industries – Discussion Paper*, November 2010, Chapter 8, pp. 57-60.

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Further, there seems to be little point in attempting to estimate the yield on a bond which is not commonly issued.[980]

H5.26   The Commission notes that these developments suggests the preference for a 10 year term by Australian regulators may be changing (and already has changed in the QCA decision noted above) and suggests a potential convergence between those approaches with that adopted in the cost of capital IM.

Debt premium – service-specific or supplier-specific

H5.27   The interest cost of borrowing may vary between suppliers of electricity distribution services, gas pipeline services and Transpower. However, the use of notional leverage requires that the debt premium should reflect the notional leverage level and therefore the debt premium would be a notional debt premium. The notional debt premium should be associated with the Commission's assessment of a Standard and Poors' long-term credit rating of BBB+ for the service provided.[981]

Approach to estimating the debt premium

H5.28   There are a range of options by which firms can raise debt. In simple terms, these options include bank loans, issuing bonds in New Zealand to institutions or the public and issuing bonds overseas. Each option has its own market volume, tenor and credit worthiness characteristics.

H5.29   In principle, there are two generic ways of estimating the debt premium. The 'simple approach' only considers credit-rated publicly traded corporate bonds denominated in New Zealand dollars when calculating the debt premium. The 'complex approach' acknowledges that firms may raise debt capital through a number of channels in addition to issuing bonds in New Zealand.

Estimating the debt premium - the 'simple approach'
H5.30   The simple approach to estimating the debt premium involves three steps:

   i.   identify credit-rated publicly traded vanilla[982] corporate bonds denominated in New Zealand dollars, issued by the regulated service in question in New Zealand and, as a cross-check, issued by other infrastructure businesses which are not the regulated service in question, in New Zealand.

   ii. obtain the market yield to maturity on these bonds and the contemporaneous risk-free rate, and estimate the debt premium by taking the difference between these two.

   iii. estimate, by interpolation, what the debt premium would be for a term to maturity equal to the regulatory period, consistent with a specified S&P long-term credit rating, or equivalent rating from Moody's or Fitch, for bonds issued by suppliers of the regulated service in question.

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[980]   Australian Competition Tribunal, *Application by ActewAGL Distribution [2010] ACompT 4*, 17 September 2010, paragraph 72.

[981]   The appropriate credit rating is discussed below, commencing at paragraph H5.46.

[982]   Vanilla bonds are defined as senior unsecured nominal debt obligations denominated in NZ$ without callable, puttable, conversion, profit participation, credit enhanced or collateral features.

H5.31   Advantages of the simple approach to estimating debt premiums are that it is relatively simple and easy to understand and it is transparent and objective as it only uses publicly available data. Due to its generic nature, the simple approach to estimating debt premiums requires fewer subjective assumptions regarding, for example, treasury risk management policies or market issuance capacity.

H5.32   The main disadvantage of the simple approach to estimating debt premiums is that it does not recognise any other means by which firms can raise debt except publicly traded corporate bonds. However, data for these other means is not publicly available.

Estimating the debt premium - the 'complex approach'

H5.33   The complex approach to estimating the debt premium involves, first, estimating the debt premium for each option by which firms can raise debt denominated in (or swapped back to) New Zealand dollars. Second, it involves estimating the overall debt premium by making assumptions about the weighting of each borrowing option in a notional debt portfolio.

H5.34   A number of submitters argued that the simple approach to estimating debt premiums would ignore the fact that firms raise debt capital through a number of channels in addition to corporate bonds, e.g. bank debt and issuing bonds overseas. Submitters claim that ignoring these channels could result in an estimated debt premium that was not representative of firms' actual debt premiums. [983]

H5.35   Unison submitted a model that sets out the range of borrowing options available in practice to large New Zealand firms, and the respective estimated debt premium associated with each option. The model uses these individual estimated debt premiums to estimate an overall debt premium for a supplier of regulated services. To generate the overall debt premium, the model uses various market-related assumptions (e.g. market bond issuance capacity) and entity-related assumptions

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[983]   Auckland Energy Consumer Trust , *Cross Submission to the Commerce Commission on Cost of Capital Workshop*, 2 December 2009, p. 21; PricewaterhouseCooper, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, Report on behalf of 17 EDBs, 2 December 2009, p. 13; Telecom Limited, *Post-workshop Submission on the Cost of Capital*, Attachment: PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, 2 December 2009, p. 12; Synergies Economic Consulting, *Cost of Capital Cross Submission*, Report on behalf of Vector, 2 December 2009, pp. 11-13; Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital*, Report on Behalf of NZAA, 2 December 2009, pp. 42-51; Unison, *Post-Conference Submission on the Weighted Average Cost of Capital*, 2 December 2009, Section 4; Vector, *Cross Submission to the Commerce Commission on the Weighted Average Cost of Capital Workshop*, 2 December 2009, pp. 19-20; Wellington Electricity, *Post-Workshop Submission for the Commerce Commission's Cost of capital Workshop*, November 12 and 13, 2009, 3 December 2009, p. 6 and Commerce Commission, *Cost of Capital Workshop Transcript*, pp. 144-158; NZ Airports Association, *Submission on Draft Information Disclosure Determination and Draft Reasons Paper*, Attachment: Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper - Report for NZAA*, 12 July 2010, pp. 27-28; NZ Airports Association, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, 3 August 2010, p. 40; Auckland International Airport Limited, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, 3 August 2010, p.12; Unison Networks Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, pp. 16-17; Unison Networks Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Asia-Pacific Risk Management Limited, *Commerce Commission Cost of Debt Funding Submission Report: prepared for Unison Networks Limited*, 12 August 2010, p. 34; Wellington Electricity Lines Limited, *Submission on EDBs and GPBs (Input Methodology) Draft Determination and Reasons Paper, Draft Cost of Capital Input Methodology Decision*, 13 August 2010, pp. 9-10.

(e.g. the entity's treasury risk management policies with respect to liquidity management and minimum headroom) to determine the weighting of each borrowing option in the debt portfolio.[984]

H5.36   The main advantage of the complex approach to estimating debt premiums is that it recognises that firms may raise debt through a number of different channels. As such, this approach better mimics firms' actual behaviour.

H5.37   The main disadvantages of this approach are that it requires data that: (a) is firm-specific and does not correspond to a representative benchmark; and (b) is not publicly available. The use of non-publicly available data would reduce certainty to suppliers and users as it may impede their ability to independently replicate the estimation process.

H5.38   In terms of the ability to obtain the necessary data for this approach, very few debt suppliers in New Zealand would be in a position to supply reliable non-public market representative data, and it is unclear if these entities could be considered un-conflicted (as they might be shareholders, advisers to, or debt capital suppliers of the relevant supplier).

H5.39   If the Commission were to attempt to benchmark using the debt premium on bank loans, it would face the practical issue of obtaining reliable independent data as to what the 'market' average debt premium on bank loans actually is. This is because, by its nature, this information is private and each debt premium 'quote' reflects an individual bank's (undisclosed) assessment of the creditworthiness of the specific borrower, together with the bank's (undisclosed) required financing terms and covenants. The debt premium currently shown in the Unison model presumably reflects Unison's banker's assessment of Unison's creditworthiness. However, the assessed creditworthiness is not stated nor are the financing terms or covenants required by the specific bank disclosed.

H5.40   Any attempt by the Commission to obtain useful data would first need to define a benchmark creditworthiness and 'terms sheet', against which quotes of the applicable debt premium could be obtained, and secondly, would need to involve real potential customers to give the banks an incentive to provide realistic, market driven quotes. Debt premium quotes from all of the banks would be required if something approaching a 'market' average debt premium for bank loans was to be estimated.

H5.41   Estimating an overall debt premium for the range of options by which debt can be raised would also require various assumptions to be made so that the weighting of each borrowing option in the notional debt portfolio could be determined. The nature of the assumptions required, (e.g. various market related assumptions, including maximum issuance capacity and minimum issue size; and various entity related assumptions; including the entity's treasury risk management policies with respect to liquidity management and minimum headroom), means that it is unlikely that the Commission could specify a group of assumptions that all suppliers, yet alone suppliers and users, would agree on.

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[984]   Unison, *Unison Networks Limited Cost of Debt Model*, 22 December 2009.

Conclusion - approach to estimating the debt premium

H5.42   On balance, the Commission considers that it should continue to use the simple approach to estimating debt premiums.[985] This is for three main reasons:

- First, whilst there are a range of options available to suppliers for raising debt, publicly available data with respect to the debt premiums are only available for publicly traded bonds, which form the basis of the simple approach.

- Second, other than for publicly traded bonds, debt premiums are generally not publicly available. Using the complex approach to estimate debt premiums would require such non-public data, which is likely to impede the ability of suppliers and interested parties to independently replicate the debt premium estimation process.

- Third, a Unison model type approach requires several subjective assumptions to be made (e.g. weighting of each borrowing option in the debt portfolio) that are open to challenge by suppliers and users of regulated services.

H5.43   The Commission notes two key differences between Unison's and the Commission's debt premium estimate. First, the dates for the debt premium information are not the same. Second, while Unison's estimate is specific to their company, the Commission's estimate is service-wide. Despite these differences, the overall debt premium estimated by the Unison model is similar to the debt premium estimate shown in the Commission's straw person example which used the simple approach to estimating debt premiums.

H5.44   The Commission, like the Australian regulators (for example, AER, IPART, QCA), has consistently adopted the simple approach to estimating debt premiums.

H5.45   The Commission notes that for any maturity period up to approximately four years, the all up debt premium (that is, including debt issuance costs) on a bank loan is likely to be lower than the all up debt premium (including debt issuance costs) on publicly traded corporate bonds.[986] In practice, firms rarely borrow directly from a bank for a five-year term, and thus the actual all up debt premium incurred by firms on a bank loan (unless a firm were deemed particularly un-creditworthy) would most likely be less than the all up debt premium on a publicly traded corporate bond with five years to maturity. The Commission therefore considers its approach to be relatively favourable to suppliers.

Credit ratings and the debt premium

H5.46   As discussed above, the Commission will approximate the corporate rate of borrowing using publicly traded corporate bonds denominated in New Zealand

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[985]   PwC (for ENA) accepted that there were valid arguments in favour of the simple approach, however PwC had concerns with the application. See Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010, pp. 21-33.

[986]   Against this, bank loans usually require compliance with a range of more onerous financing terms (including regular reporting to the bank) and covenants. In addition, this is one of the main reasons that new publicly traded corporate bonds are rarely issued for an original period to maturity of less than four years.

dollars. An important determinant of a bond's debt premium is the market's assessment of, amongst other things, its credit worthiness. The long-term credit rating associated with the bond can be used as a proxy of this creditworthiness.

H5.47   In the RDG and IM Discussion Paper, the Commission proposed to benchmark allowed debt premiums against the premiums paid by firms on bonds of a reasonable long-term investment grade from a major credit rating agency, e.g. S&P / Moody's ratings A-/A3 or BBB+/Baa1.

H5.48   At the Cost of Capital Workshop a number of suppliers encouraged the Commission to think about a lower benchmark credit rating than outlined in the RDG and IM Discussion Paper.[987] For example, Mr. Morgan (for Unison) preferred a range of BBB to BBB+ as that was the credit rating that he observed most of the EDBs were within. Mr. Basher (for NZAA and WIAL) preferred a lower than A- credit rating, stating that as a consequence of potential investment programmes airports are about to undertake, the extra borrowing required may lead to a reduction in credit ratings and if the firms were not going to receive compensation for that borrowing through a regulatory rate there was a risk that they could be discouraged from making the investment.[988]

H5.49   In submissions on the Draft Reasons Papers suppliers of regulated services considered the benchmark credit rating was too high. EDBs and GPBs submitted for a Standard and Poors' long-term credit rating of BBB rather than BBB+.[989] A number of these parties submitted that the credit rating should be the same as the average credit rating of the comparative firms sample used to estimate the asset beta.

H5.50   In previous regulatory decisions, the Commission has considered advice from Dr Lally on the appropriate debt premium.

H5.51   Dr Lally in his advice on Electricity Distribution – Control of Unison, did not reference a credit rating in order to estimate the debt premium.[990] Instead he relied on the estimate used in the Airports Inquiry, supplemented by data from Powerco and Vector.[991]

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[987]   Commerce Commission, *Cost of Capital Workshop Transcript*, pp. 143-158.

[988]   ibid, p. 145 and p. 148.

[989]   Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010, pp. 9-12 and pp. 26-27; Powerco Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, p. 15; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, 13 August 2010, p. 21; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Bancorp Treasury Services Limited, *Expert Report to Vector Limited*, August 2010, pp. 25-33; Wellington Electricity Lines Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, pp. 9-10.

[990]   Lally, M., *The weighted average cost of capital for electricity lines businesses*, September 2005, pp. 55-57.

[991]   Powerco and Vector currently have publicly traded bonds with a S&P long-term credit rating of BBB and BBB+ respectively.

H5.52　　Similarly, in the Gas Control Inquiry and the Gas Authorisation, Dr Lally estimated a debt premium using data from both Powerco and Vector. In the Gas Authorisation Dr Lally did not favour specifying a credit rating as he considered it was not apparent what credit rating to specify. Further, even if a credit rating could be specified, such as BBB, Dr Lally noted that there were not enough bonds on offer to enable estimation of a debt premium.[992]

H5.53　　Table 1 of the Commission's Straw Person Example displayed the credit ratings of New Zealand (and overseas) companies that supply electricity distribution and/or transmission services (among other services). [993] The table showed that Vector's and Mighty River Power's S&P long-term credit rating is BBB+, and that of Powerco and Contact Energy is BBB. The table also showed that the S&P long-term credit rating of Transpower is AA-.

H5.54　　It is standard practice amongst overseas regulators (such as the AER, Ofgem, Ofwat, Ofcom, the UK Competition Commission, and the UK CAA) to specify an appropriate long-term credit rating on debt for the service in question and then to estimate the debt premium or cost of debt using debt with the same or similar long-term credit rating.[994]

H5.55　　The AER in estimating the cost of debt to Australian energy businesses has applied a S&P long-term credit rating of BBB+.[995] In its draft decision for Jemena the AER concluded that there was not sufficient evidence to depart from the past regulatory practice of using a S&P long-term credit rating of BBB+ and considered that its conclusion in its 2009 WACC review remained valid.[996]

H5.56　　Ofgem's approach, for electricity, is to base the cost of debt on the yield from a mixture of bonds of utility companies with a S&P long-term credit rating of BBB and A. In its 2009 electricity price control review Ofgem included a small margin to allow for a range of factors e.g. transaction costs.[997] Ofgem's approach for gas has been:[998]

> In line with previous price controls, our financial model makes no assumptions about the structure of the debt. However, we have assessed financeability based on whether a

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[992]　Lally, M., *The weighted average cost of capital for gas pipeline businesses*, 28 October 2008, pp. 85-86. The only bond available at the time of the Gas Authorisation was unusable.

[993]　Commerce Commission, Cost of Capital Workshop, Straw Person Example, November 2009, Table 1, p. 6.

[994]　AER, *Final decision: Electricity transmission and distribution network service providers – Review of the weighted average coat of capital (WACC) parameters*, May 2009; Ofgem, *Electricity Distribution Price Control Review Final Proposal*, 7 December 2009, pp. 49-51; PricewaterhouseCoopers, *Advice on the cost of capital analysis for DPCR5*, Final Report to the Office of Gas and Electricity Markets, 28 July 2009, pp. 59-71; Ofwat, *Future Water and Sewerage Charges 2010-2015 – Final Determination* , April 2009, p. 8; Ofcom, *Ofcom's approach to risk in the assessment of the cost of capital*, August 2005; Competition Commission, *Stansted Airport Ltd - Q5 price control review*, 23 October 2008, Appendix L, p. L5; Competition Commission, *BAA Ltd - A report on the economic regulation of the London airport companies (Heathrow Airport Ltd and Gatwick Airport Ltd)*, 28 September 2007, Appendix F; CAA, *Airport Regulation - Economic Regulation of Stansted Airport 2009-2014 - CAA Decision*, 13 March 2009.

[995]　AER, *Final decision: Electricity transmission and distribution network service providers – Review of the weighted average coat of capital (WACC) parameters*, May 2009.

[996]　AER, *Draft Decision - Jemena - Access arrangement proposal for the NSW gas networks - 1 July 2010 - 30 June 2015*, February 2010, p. 136.

[997]　Ofgem, *Electricity Price Control Review Final Proposal*, 7 December 2009, pp. 49-51.

[998]　Ofgem, *Gas Distribution Price Control Review Final Proposals*, 3 December 2007, pp. 108, paragraph 9.37.

GDN funded with nominal debt is likely to be able to achieve financial ratios that are, as a package, consistent with a comfortably investment grade credit rating.

Conclusion - credit rating

H5.57   The Commission considers that a S&P long-term credit rating of BBB+ (or equivalent rating from Moody's or Fitch) is appropriate for benchmarking the allowed regulated service wide debt premium on the debt of EDBs, GPBs and Transpower. The Commission considers that the notional long-term credit rating used for estimating the regulated service wide notional debt premium should reflect a prudent long-term level of exposure to credit default risk. Specifically, the notional long-term credit rating should be, and remain, comfortably within an 'investment grade' credit rating as defined by the major credit rating agencies, and a S&P long-term credit rating of BBB+ (or equivalent rating from Moody's or Fitch) is the minimum notional long-term credit rating that provides an adequate margin of safety with respect to EDBs, GPBs and Transpower. Setting the minimum notional long-term credit rating at, for example, BBB (being only one notch above BBB-, the lowest investment grade long-term credit rating) provides a materially lower margin of safety that a reasonable investment grade is maintained in the long-term.

H5.58   A S&P long-term credit rating of BBB+ is consistent with the approach adopted by the AER in Australia and is within the range considered by Ofgem in the UK.

H5.59   Published long-term credit ratings, and the associated market yields, on corporate bonds are influenced by a range of factors. These factors include the nature of the entity (not just the regulated service, unless it is an entity which operates a stand-alone or 'pure play' business that corresponds to a single regulated service); the owner of the entity and the assessed likelihood of the owner standing behind the entity and its debt, if it were to get into difficulty. From a regulatory perspective, the Commission is interested in the long-term credit rating of the supplier of the regulated service on a stand-alone basis. However, in practice, the Commission is unable to ring fence the regulated service (and its associated credit rating) from the remainder of the entity.

Limited number of publicly traded bonds in New Zealand

H5.60   The EDB and GPB Draft Determination specified that the debt premium was to be estimated based only on the observed yields of publicly traded bonds with a S&P long-term credit rating of BBB+.

H5.61   There are only a limited number of publicly traded vanilla New Zealand dollar denominated corporate bonds that are issued by an EDB or GPB that is neither majority owned by the government nor a local authority, with a S&P long-term credit rating of BBB+, or equivalent rating from Moody's or Fitch. Some submitters on the Draft Reasons Paper considered that reliance only on BBB+ bonds may not be workable or feasible in practice.

H5.62   As discussed in the Update Paper, the Commission has amended the Final Determination to progressively expand the range of publicly traded bonds considered to include:

- those which are not issued by an EDB or GPB;

- those with a S&P long-term credit rating other than BBB+; and

- those issued by an entity majority owned by the government or a local authority.[999]

However, in each case adjusting the observed debt premium to approximate the debt premium that is likely to have been observed had the bond been of the type described in H5.61. In short, the Final Determination enables the Commission to have regard to a wider range of information on prevailing debt premiums, but sets out a methodology to ensure the premium estimated is that which could reasonably be expected to relate to a bond with a Standard and Poors' long-term BBB+ credit rating.

H5.63   A range of submissions were received on the revised debt premium methodology in the Technical Consultation round. ENA sought further clarification around certain points of detail,[1000] and Powerco submitted that the IM "should provide more detail" as under the draft IM (as released for technical consultation in October 2010) Powerco "cannot estimate the material effects of the methodology".[1001] Vector describes the proposed methodology as "unsatisfactory in that it is almost completely subjective",[1002] while CEG (for Vector) submitted that the accuracy of the cost of debt estimate would be improved and its volatility lowered if all that the Commission methodology said was " the Commission will have regard to all relevant information, including submissions from interested parties, when arriving at an estimate of the notional cost of debt for a benchmark bond with the characteristics that they are issued by an EDB, have a qualifying rating of BBB+ debt, and have a remaining term to maturity of 5 years".[1003]

H5.64   Other submissions supported the revised approach. For example, NZ Airports Association submitted that:[1004]

> The Commission's proposal to have regard to bonds with a wider range of long-term credit rating and issuers other than just Airports will likely result in a more commercially realistic debt premium.

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[999]   See, for example, Commerce Commission, *Input Methodologies (Electricity Distribution Services) Consultation Update Paper*, 22 October 2010; Commerce Commission, *Input Methodologies (Gas Pipeline Services) Consultation Update Paper*, 1 November 2010.

[1000]   For example, where the Commission will source its bond yield information, how the averaging would be done, and how the Commission will weight the different estimates of the debt premium. Electricity Networks Association, *Submission on Technical Consultation on Parts 1-4 of Revised Input Methodologies*, 12 November 2010, pp. 10-11.

[1001]   Powerco Limited, *Powerco submissions on Parts 1-4 of revised draft input methodologies determination for electricity and gas distribution businesses*, 12 November 2010, p. 3.

[1002]   Vector, *Submission I response to the Commerce Commission's Revised Draft Determinations and Consultation Update Papers for Electricity Distribution Businesses and Gas Pipeline Businesses, Cost of Capital*, 16 November 2010, p. 4.

[1003]   Vector Limited, *Submission I response to the Commerce Commission's Revised Draft Determinations and Consultation Update Papers for Electricity Distribution Businesses and Gas Pipeline Businesses, Cost of Capital*, Attachment: Competition Economists Group, *Review of updated input methodologies*, November 2010, p. 21.

[1004]   NZ Airports Association, *Technical consultation: Submission on revised draft input methodology determinations*, 22 October 2010, p. 14.

H5.65   Telecom submitted that:[1005]

> The Commission has amended its proposed approach to assessing a debt margin based
> on comparator company market evidence. We agree with this broadened approach on
> this issue.

H5.66   In light of submissions on technical consultation, the final determination includes
        floating rate bonds, and specifies that the debt premium observed on bonds with a
        remaining term of less than five years will ordinarily be taken as the minimum debt
        premium for a five year term.

H5.67   The Commission does not accept that the methodology is subjective. The
        Commission considers that its methodology for estimating the debt premium strikes
        an appropriate balance between:

   •   promoting certainty for consumers and suppliers in relation to the estimation
            of the debt premium; and

   •   providing the flexibility necessary to ensure the methodology is workable for
            the duration of the IM, given the number of publicly traded bonds in New
            Zealand and that the composition of those bonds will change over time.

H5.68   A worked example on the estimation of the debt premium for EDBs is included from
        paragraph H5.109.

Averaging period

H5.69   Debt premiums on corporate bonds, and the risk-free rate, are continually changing.
        Therefore the timing of when these rates are determined for the purposes of
        estimating the cost of capital could have a material effect on the estimate.

H5.70   In previous regulatory decisions, the Commission has used the month end corporate
        borrowing rate for the two or three preceding month ends.

H5.71   The availability of relevant data is gradually improving over time. As a
        consequence, to minimise the effect of unusual market volatility, the IM provides for
        the use of the average of the daily observations for one calendar month prior to when
        the cost of capital is being estimated for both the debt premium and the risk-free
        rate.

Updating the debt premium

H5.72   As outlined above, the debt premium (similar to the risk-free rate) can be subject to
        volatility. This volatility has been particularly pronounced during the recent GFC.
        Therefore, the Commission will update its estimate of this parameter each time it is
        required to estimate the cost of capital. However, once a price-quality path has been
        set the supplier of regulated services will be subject to that debt premium for the
        term of the DPP or CPP.

[1005]   Telecom, *Input methodologies electricity distribution services – WACC (cost of capital)*, 12 November 2010, p. 2.

Standard error of the debt premium

H5.73   The debt premium is an estimate and as such has uncertainty associated with it. The
standard error captures this uncertainty and will be estimated alongside the debt
premium parameter on an annual basis.

H5.74   The standard error of the debt premium, denoted by s_n, is estimated using the
following formula:

$$s_n = \sqrt{\frac{1}{N-1} \sum_{i=1}^{N} (x_i - \bar{x})^2}$$

where:
N is the number of sample observations;
x_i *are the observed values of the sample items; and*
$\bar{x}$ *is the mean value of these observations (the debt premium estimate).*

H5.75   In estimating the standard error of the debt premium the Commission will have
regard to bonds rated BBB+[1006] that are issued by an EDB/GPB that are neither
majority owned by the Crown nor a local authority.

H5.76   However, if there are no bonds that meet the criteria above the Commission
considers that an appropriate floor for the debt premium standard error is 0.0015.

Commission's reasons - debt issuance costs

H5.77   Debt issuance costs are the costs associated with issuing debt capital that firms incur
in addition to the interest rate paid on the debt itself. Debt capital normally has a
finite period to maturity, so debt capital needs to be re-financed regularly. The
Commission considers that debt issuance costs to re-finance debt capital are a
legitimate expense that ought to be compensated.[1007] As the IM adopts a notional
debt premium a notional allowance is also made for debt issuance costs.

H5.78   There are two possible approaches to compensating for debt issuance costs—through
cash flows or a margin that is added to the cost of debt capital.

H5.79   In advice on the Gas Authorisation Dr Lally considered that the allowance for debt
issuance costs in the cost of debt capital as opposed to including them in the cash
flows was superior, because it allocates the costs to all periods rather than
concentrating them in the periods in which they are paid.

H5.80   In advice to the Commission in the Expert Panel report, Dr Lally recommended that
the Commission include debt issuance costs in the cost of capital. Professor Myers
recommended that the Commission handle debt issuance costs through the
regulatory cash flows and not in the cost of capital.[1008]

[1006]   By Standard and Poors or an equivalent rating by Moody's or Fitch's.

[1007]   In contrast, equity capital is normally available into perpetuity and does not need regular refinancing. Therefore, the
Commission has not included an equity issuance cost allowance in estimating the cost of equity capital as the implied
issuance cost per annum is immaterial.

[1008]   Franks, J., M. Lally and S. Myers, *Recommendations to the New Zealand Commerce Commission on an Appropriate
Cost of Capital Methodology, Report prepared for the Commerce Commission*, 18 December 2008, p. 32.

H5.81   In advice on the Gas Authorisation and 2006/2007 and 2007/2008 TSO net cost calculation determinations, Dr Lally recommended that the Commission include debt issuance costs in the cost of debt capital as a 30 basis points addition.[1009] This figure was derived from Lee, Lochhead, Ritter and Zhao (Table 2) who found that the average cost of a new bond issue was approximately 130 basis points (1.30%).[1010] The 30 basis points (0.3%) is the result of annualising the 130 basis points (1.30%) cost for a new bond issuance over five-years, and rounded up from an estimate of 26 basis points (0.26%).

H5.82   Some submitters provided more recent data on the costs of issuing publicly traded bonds in New Zealand:

-    based upon its identified sample of 17 bond prospectuses for New Zealand dollar denominated debt, PwC (for ENA and Telecom) provided evidence that implied an average debt issuance cost of 37 basis points (0.37%) per annum;[1011]

-    Asia Pacific Risk Management (for Unison) did not provide a separate analysis but stated that they agreed with PwC's conclusions;[1012] and

-    based upon its identified sample of 23 bond prospectuses for New Zealand dollar denominated debt, Bancorp (for Vector) provided evidence that implied an average debt issuance cost of 47 basis points (0.47%) per annum.[1013]

H5.83   PwC and Bancorp's analysis has been based on the amount of debt offered. However, according to the Bancorp analysis, approximately half of the offers they identified actually raised significantly more debt than that offered, i.e. significant over-subscription were accepted. This over-subscription would almost certainly lower the actual basis point per annum equivalent of the average debt issuance costs incurred below PwC's and Bancorp's respective estimates.[1014]

[1009]   Lally, M., *The weighted average cost of capital for gas pipelines businesses, paper prepared for the Commerce Commission,* 28 October 2008, p. 87; Lally, M., *The Estimated Debt premium for the TSO*, report prepared for the Commerce Commission, 25 June 2009.

[1010]   Lee, I., Lochhead, S., Ritter, J. and Zhao, Q., The Cost of Raising Capital, *The Journal of Financial Research*, Vol. 19, 1996, pp. 59-74.

[1011]   Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010, p. 34; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on Cost of Capital Material In the Commerce Commission's Draft Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13 August 2010, p. 34.

[1012]   Unison Networks Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Asia-Pacific Risk Management Limited, *Commerce Commission Cost of Debt Funding Submission Report: prepared for Unison Networks Limited*, 12 August 2010, p. 37.

[1013]   Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Bancorp Treasury Services Limited, *Expert Report to Vector Limited*, August 2010, p. 59.

[1014]   Not surprisingly, there is substantial overlap between the samples identified by PwC and Bancorp. However, there are a number of discrepancies in the detail of those offers which appear in both samples.

H5.84   Adjusting the issuance costs for the debt actually raised (as identified by Bancorp), PwC's evidence implies an average actual debt issuance cost of 33 basis points (0.33%) per annum, and Bancorp's evidence implies an average actual debt issuance cost of 34 basis points (0.34%) per annum.[1015]

H5.85   Notwithstanding some issues with the quality of the data regarding the costs of issuing publicly traded bonds in New Zealand, the Commission considers this publicly available data does provide an improved basis for estimating the level of debt issuance costs. Therefore, the Commission has increased the allowance for debt issuance costs to 35 basis points (0.35%) per annum, based on amortising the debt issuance costs over the same period as the term of the debt premium i.e. five years. The Commission considers this to be a generous allowance. The allowance is higher than the allowance used by other regulators but the Commission considers this is reasonable as New Zealand entities tend to be smaller debt issues than their overseas counterparts.

H5.86   The Commission notes that the Australian regulator, IPART, allows 12.5 basis points (0.125%) per annum for debt issuance costs. The UK Competition Commission allowed 15 basis points (0.15%) per annum in the Heathrow and Gatwick decision, but in the subsequent Stansted decision noted that this was too high and reduced the allowance for debt issuance costs to 10 basis points (0.10%) per annum.

H5.87   The submission from PwC (for ENA and Telecom) also highlighted that some small firms have incurred much higher debt issuance costs when issuing bonds in New Zealand – their analysis implied average debt issuance costs of 160 basis points (1.60%) per annum. [1016]   The Commission does not consider that this evidence is relevant to EDBs, GPBs and Transpower. None of these small firms identified by PwC are subject to price-quality regulation under Part 4 or have a similar risk profile to EDBs, GPBs and Transpower. These firms are not comparable with EDBs, GPBs and Transpower. In addition, three of the five referenced bond issues date from 2001. It is likely that these small firms issued bonds, rather than obtain bank loans, to avoid compliance with a range of potentially more onerous financing terms (including regular reporting to the bank) and covenants imposed by banks. Setting the allowance for debt issuance costs based upon this evidence would imply, amongst other things, that consumers of the type of regulated services covered under Part 4 of the Act should be required to pay the costs of decisions by small firms to remain inefficiently small.

H5.88   Asia Pacific Risk Management (for Unison) and Bancorp (for Vector), submitted that allowance should also be made for the costs of maintaining committed bank

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[1015]   Although the actual debt issuance costs are likely to have been slightly higher due to the higher amount of debt actually raised. Therefore, the average actual debt issuance cost per annum would be slightly higher than these estimates.

[1016]   Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010, p. 36; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on Cost of Capital Material In the Commerce Commission's Draft Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13 August 2010, p. 35.

liquidity lines.[1017] The Commission notes that these types of facilities typically support short term funding programmes, such as commercial paper programmes. Neither submitter presented any evidence that the all up debt premium of these facilities exceeded the all up debt premium allowed by the Commission's approach based on publicly traded bonds. In fact, Asia Pacific Risk Management (for Unison) presented a table setting out the all up debt premium over New Zealand government bonds for committed bank funding facilities ranging from one year up to five years (the all up debt premium increases with term). It noted that the all up debt premium for a five year committed bank funding facility is similar to the all up debt premium of a five year publicly traded bond.[1018] This implies that the Commission's approach of estimating the all-up premium on public bonds produces a reasonable estimate of the cost of bank loans.

H5.89   Asia Pacific Risk Management (for Unison), Bancorp (for Vector) and Vector submitted that allowance should also be made for the costs associated with raising debt offshore, including the conversion factor and basis swap spread.[1019]

H5.90   Asia Pacific Risk Management (for Unison) also submitted that EDBs would view the New Zealand debt capital market as their primary funding source and would only tap international debt capital markets on an opportunistic basis.[1020] Asia Pacific submitted that:

> EDB's would "tap" these funding markets when considered favourable relative to the NZ debt market. Any decision to issue in an international market would be considered relative to what could be achieved in the NZ market. It is unlikely that an EDB would have an ongoing bond programme in an international market; rather issues are less frequent and privately placed with wholesale investors. An ongoing funding programme, such as Powerco's, is more likely in the NZ debt markets. Accordingly, I do not believe an arithmetical weighting of NZ and Australian international debt premium amounts, of similar issuers and terms, is appropriate. [1021]

[1017] Unison Networks Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers,* Attachment: Asia-Pacific Risk Management Limited, *Commerce Commission Cost of Debt Funding Submission Report: prepared for Unison Networks Limited,* 12 August 2010, pp. 36-38; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital,* Attachment: Bancorp Treasury Services Limited, *Expert Report to Vector Limited,* August 2010, pp.40-43.

[1018] Unison Networks Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers,* Attachment: Asia-Pacific Risk Management Limited, *Commerce Commission Cost of Debt Funding Submission Report: prepared for Unison Networks Limited,* 12 August 2010, p. 34.

[1019] Unison Networks Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers,* Attachment: Asia-Pacific Risk Management Limited, *Commerce Commission Cost of Debt Funding Submission Report: prepared for Unison Networks Limited,* 12 August 2010, pp. 31-34; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital,* Attachment: Bancorp Treasury Services Limited, *Expert Report to Vector Limited,* August 2010, pp. 42-43.

[1020] Unison Networks Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Asia-Pacific Risk Management Limited, *Commerce Commission Cost of Debt Funding Submission Report: prepared for Unison Networks Limited*, 12 August 2010, p. 31.

[1021] Unison Networks Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Asia-Pacific Risk

H5.91   In contrast, Bancorp (for Vector) submitted that:[1022]

> We are also of the opinion that the Commission should consider using pricing levels
> from Australia when determining the debt premium. We do not recommend using
> pricing data from other jurisdictions such as the United Kingdom or the United States
> other than as a 'reasonableness' test given the inherent difficulties in trying to calibrate
> these to reflect New Zealand specific conditions.

H5.92   An EDB or GPB may decide to obtain a portion of its funding from offshore, where
the cost of such funding is considered more attractive than financing in New
Zealand. However, as the primary funding source is New Zealand, New Zealand
sourced estimates are the benchmark.

Conclusion - debt issuance costs

H5.93   The Commission considers that costs associated with prudent refinancing are
legitimate expenses that ought to be compensated. In principle, so long as suppliers
of regulated services are compensated only once for debt issuance costs, the
Commission is indifferent as to whether the compensation occurs through the
allowed cash flows or as a margin on the cost of debt capital.

H5.94   The cost of capital IM provides a supplier with compensation for a notional cost of
debt capital rather than its actual cost of debt capital. As such, it should also
incorporate the debt issuance costs as a notional amount in the cost of debt capital
rather than as an actual cost in the cash flows. On this basis, the appropriate way to
allow for debt issuance costs is by adding a margin on the cost of debt capital, rather
than the alternative of requiring estimation of nominal debt capital so as to derive a
dollar cash flow value of debt issuance costs.

H5.95   Whilst there are a range of options available to suppliers for raising debt, publicly
available data with respect to debt issuance costs is only available for publicly traded
bonds. Using other options would require the use of non-public data, which is likely
to impede the ability of suppliers and interested parties to independently replicate the
debt issuance cost estimation process. The Commission considers that an allowance
for debt issuance costs of 35 basis points p.a. (0.35% p.a.) added to the cost of debt
capital is appropriate, based on amortising the debt issuance costs over the same
period as the term of the debt premium i.e. five years.

H5.96   The Commission notes that, while there is some level of uncertainty as to what the
true debt issuance costs are, this uncertainty has little effect on suppliers' cost of
capital as a small difference in debt issuance costs is likely to be immaterial to the
final allowed rate of return. Therefore, no allowance is made for the standard error
of debt issuance costs.

Management Limited, *Commerce Commission Cost of Debt Funding Submission Report: prepared for Unison
Networks Limited*, 12 August 2010, p. 2.

[1022] Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and
Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment:
Bancorp Treasury Services Limited, *Expert Report to Vector Limited*, August 2010, p. 34.

Will the IM produce commercially realistic estimates of the debt premium and debt issuance costs?

H5.97   This section discusses whether the IM will produce commercially realistic estimates of the debt premium and debt issuance costs for regulated suppliers, given the actual debt premium and issuance costs for such suppliers.

H5.98   The Commission has compared its estimate of the debt premium when applying the IM with the estimates provided through the Bloomberg New Zealand fair value curve. The Bloomberg fair value curve with the closest rating to the BBB+ rating is the New Zealand A fair value curve. As at 1 September 2010, the Commission estimates the debt premium on a BBB+ rated bond with a five-year remaining term to maturity as 2.0% p.a., while the corresponding Bloomberg fair value curve estimate of the debt premium for an A rated bond is 1.59% p.a. Given the differences in assumed credit ratings, the estimate of a 2.0% p.a. debt premium for a BBB+ rated bond is appropriate in the Commission's view.

H5.99   The Commission requested confidential details of the costs actually incurred by regulated suppliers with respect to raising debt capital. The information provided by suppliers indicates that the all up debt premium (debt premium plus annual allowance for debt issuance costs) under the IM is comparable with the all up debt premium actually incurred on debt capital recently raised by suppliers. Relative to debt capital raised by suppliers in the past, the estimates provided under the IM are generous.

H5.100 The Commission's request for information from regulated suppliers also obtained information on the issuance costs actually incurred on bonds that are currently on public issue. The Commission estimated the value weighted average debt issuance costs on publicly issued bonds for each supplier which responded. The average debt issuance costs averaged 0.22% p.a. This implies the 0.35% per annum allowance for debt issuance costs in the IM is appropriate, if not generous in favour of suppliers.

H5.101 Bancorp (for Vector) submitted an analysis of debt issuance costs and proposed a considerably higher allowance for debt issuance costs.[1023] However, Bancorp's analysis makes little reference to the costs actually incurred by Vector with respect to raising its own debt capital. In light of the confidential information received from EDBs and GPBs in response to the Commission's request for information (referred to in the previous two paragraphs), the Commission is comfortable that the IM will produce an all up debt premium (including debt issuance costs) that is commercially realistic.

H5.102 The IM estimates the debt premium by reference to the yields on New Zealand publicly traded bonds. The Commission notes that some firms can and do access other debt markets, especially via US private placements, to secure long maturity debt and diversify funding sources when it is attractive to do so. The Commission has considered whether the IM generates estimates of the all up debt premium that will allow regulated suppliers to access the US private placement market first by reference to the historic debt premiums between the New Zealand and US markets

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[1023]   Bancorp (for Vector), *Debt Issuance Cost Analysis*, 16 November 2010.

adjusting for costs; and second by reference to recent transactions involving AIAL, a supplier regulated under Part 4. Each is discussed in turn.

H5.103 Figure H5 below sets out the difference (gross credit spread difference) between:

- the credit spread between the Bloomberg NZ A fair value curve and the Bloomberg NZ swap rate, for a tenor of five years, over the last ten years; and

- the credit spread between the Bloomberg US Utility A fair value curve and the Bloomberg US swap rate, for a tenor of five years, over the last ten years.[1024]

H5.104 The figure also shows this gross credit spread difference net of the Bloomberg NZD/USD basis swap spread, for a tenor of five years, (net credit spread difference) over the last ten years.

Figure H5   Raising US Debt – Gross and Net Credit Spread Difference
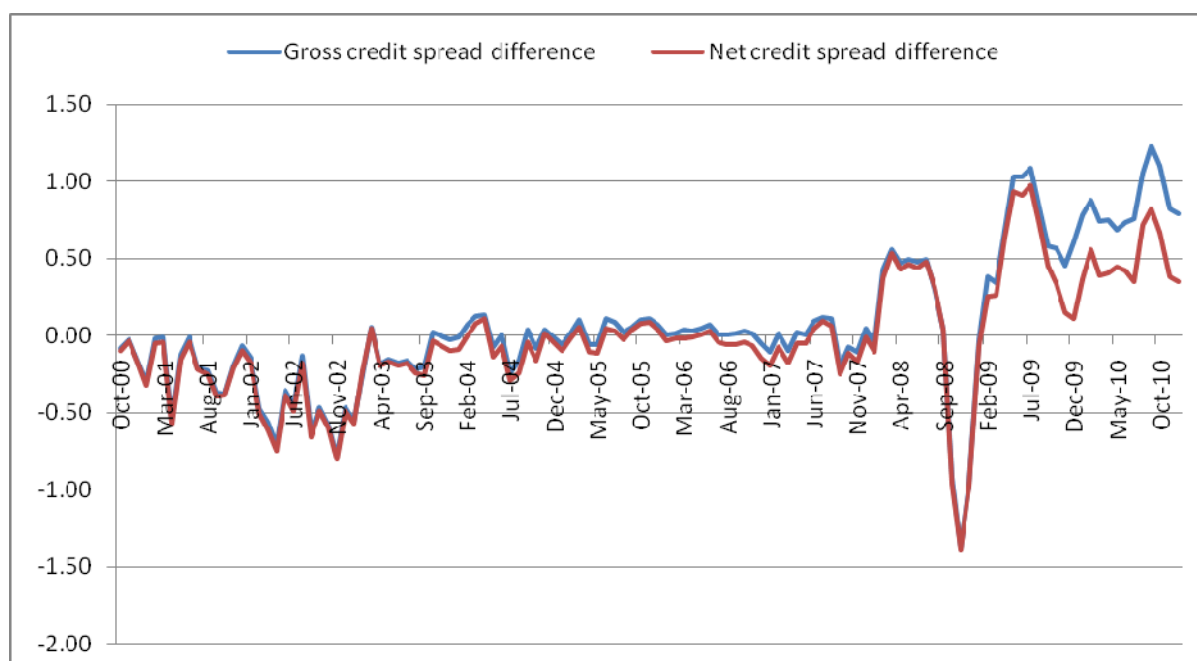
H5.105 Where this net credit spread difference is positive, this indicates the possibility that the all up cost of US dollar debt capital swapped to New Zealand dollars is less than the all up cost of New Zealand dollar debt capital. To ascertain whether this is definitely the case requires a consideration of costs not reflected in the net credit spread difference (for example, the conversion factor, Approved Issuer Levy, hedging credit cost, issue costs), and the 0.35% allowance for debt issuance costs specified under the IM.

H5.106 The Commission concludes that, on average over time, New Zealand referenced estimates of the debt premium are a reasonable proxy for US debt premiums (including the basis swap spread). Sometimes, the US market is relatively

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[1024] Bloomberg fair value curves are used for this analysis as they provide an efficient and consistent basis for a comparison over an extended period of time. The A fair value curve is used as this is the closest available fair value curve to the A- (Airports) / BBB+ (EDB / GPB / Transpower) rating specified under the IM.

unattractive versus the New Zealand debt market (for example, 2000-2002) while at others times (such as the past 18 months) US debt markets are relatively cheaper and therefore attractive to New Zealand corporate borrowers. The Commission notes that a number of New Zealand firms have recently accessed the US debt markets for long maturity debt, including both AIAL and Vector (and have swapped it back to New Zealand dollars).

H5.107   In mid November 2010 Auckland International Airport publicly announced details of its sale of US$150 million of notes (comprised of three tranches) in the US private placement market to re-finance maturing debt.[1025] Swapped into New Zealand dollars (i.e. including the cost of the basis swap, conversion factor and hedging credit cost), the notes provide long term funding at debt premiums over the New Zealand benchmark interest rate of 2.145% (10 year tenor), 2.078% p.a. (12 year tenor) and 2.268% p.a. (10 year tenor) respectively. This re-financing demonstrates that suppliers do use swaps and will raise debt capital overseas when it is cheaper to do so i.e. the all up cost of US dollar debt capital converted to New Zealand dollars is less than the all up cost of New Zealand dollar debt capital. Adjusting for the tenor of this long term debt capital, the debt premium payable by Auckland International Airport on its recent US issue is similar to the debt premium that would be estimated under the Commission's methodology (for example, based on the yield to maturity of Auckland International Airport's publicly traded bonds in New Zealand, the interpolated debt premium for a five year tenor is approximately 1.75% p.a. plus 0.35% per annum for debt issuance costs plus the term credit spread differential allowance).

H5.108   Based on the forgoing discussion of actual costs of debt incurred by New Zealand regulated suppliers, the Commission considers that the cost of capital IM will produce estimates of the cost of debt, including debt issuance costs, which are commercially realistic.

A worked example illustrating how the debt premium is estimated for EDBs

H5.109   Under the IM the debt premium will be estimated by taking account of the average debt premium, relative to five-year government stock, that would reasonably be expected to apply to publicly traded vanilla New Zealand dollar denominated corporate bonds issued by the regulated service in question that is neither majority owned by the government nor a local authority, with a Standard and Poors (S&P) long-term credit rating of BBB+ for EDB/GPB and Transpower (A- for Airports), or equivalent rating from Moody's or Fitch, and a remaining term to maturity of five-years.

H5.110   Under the IM the debt premium for a regulated service is to be estimated using the following three general steps:

    i.   Identify credit-rated publicly traded vanilla[1026] corporate bonds denominated in New Zealand dollars, issued by the regulated service in question in New Zealand and, as a cross-check, issued by other

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[1025]   Auckland Airport, *Inaugural USPP Issuance for Auckland Airport*, NZX Market Release, 19 November 2010.

[1026]   Vanilla bonds are defined as senior unsecured nominal debt obligations denominated in NZ$ without callable, puttable, conversion, profit participation, credit enhanced or collateral features.

        infrastructure businesses which are not the regulated services in question, in New Zealand.

    ii.   Obtain the wholesale market yield to maturity on these bonds and the contemporaneous risk-free rate, and estimate the debt premium by taking the difference between these two.

    iii.   Estimate, by interpolation, what the debt premium would be for a term to maturity equal to the regulatory period, consistent with a specified S&P long-term credit rating, or equivalent rating from Moody's or Fitch, for bonds issued by the regulated service in question.

H5.111   The IM determinations provide a more detailed description of the approach. For EDBs see IM EDBs determinations paper, Part 2, subpart 4, Clause 2.4.4.[1027]

H5.112   To address the small number of bonds with the specified S&P (or equivalent) long-term credit rating that are publicly traded in New Zealand the IM Determination sets out a hierarchy of publicly traded bonds to be considered. These include:

    i.   those which are not issued by the regulated service in question;

    ii.   those with a S&P long-term credit rating other than the stipulated credit rating; and

    iii.   those issued by an entity majority owned by the government or a local authority.

H5.113   In each case the observed debt premium is adjusted to approximate the debt premium that is likely to have been observed had the bond been of the type first described.

H5.114   This section provides a worked example of the process in the IM for estimating the debt premium for EDBs, GPBs and Transpower as at 1 September 2010.

Estimating the debt premium for EDB, GPB and Transpower.

H5.115   For EDBs, GPBs and Transpower the IM specifies that the appropriate S&P long-term credit rating for setting the debt premium is BBB+. This example estimates the debt premium for 1 September 2010.

H5.116   In the EDBs IM determinations Part 2, subpart 2, clause 2.4.4, subclause 3(d) indicates that the debt premium the Commission requires is the average spread that would be expected to apply to a vanilla NZ$ denominated bond that:[1028]

    i.   is issued by an EDB or GPB that is neither majority owned by the crown nor a local authority;

    ii.   is publicly traded;

    iii.   has a qualifying rating of BBB+; and

    iv.   has a remaining term to maturity of five-years.

[1027]   Commerce Commission, *Commerce Act Electricity Distribution Services Input Methodologies Determination*, 22 December 2010. The same definition is also presented in Part 4, subpart 1, clause 4.1.4 and Part 5, subpart 3, section 4, clause 5.3.25 of this paper.

[1028]   There is a difference between the estimation periods of the cost of capital between the various regulatory instruments. For the process for information disclosure see Part 2, subpart 4, clause 2.4.4 and for CPP see Part 4, subpart 3, section 4 clause 5.3.25 in the EDBs IM Determinations.

H5.117   Based on data from Bloomberg, Table H4 provides the remaining term to maturity
         and estimated debt premiums consistent with the remaining term to maturity of five-
         years following the EDBs determinations as at 1 September 2010. That is, it
         averages data for the month of August 2010, to estimate the debt premium for 1
         September 2010, and interpolates to five-years remaining term to maturity (or
         closest period) the debt premium as the difference between the contemporaneous
         wholesale yields of the identified corporate bonds and government bonds.

Table H4   Bond Issuers and Debt Premiums Under Consideration

Bond Issuer	S&P long-term Credit Rating	Remaining Term to Maturity (years)	Estimated Debt Premium (% p.a.)
Transpower*	AA-	5	1.16%
AIAL*	A-	5	1.75%
Genesis Energy*	BBB+	5	1.58%
Mighty River Power*	BBB+	5	1.73%
Vector	BBB+	4.1	1.82%
WIAL	BBB+	3.2	2.34%
Contact Energy*	BBB	5	2.10%
Powerco*	BBB	5	2.24%

* interpolated from bonds with remaining term to maturity greater than and less than five years.

H5.118   Each IM Determination sets out the order in which the Commission will have regard
         to the debt premium estimates (for EDBs, see Part 2, subpart 4, clause 2.4.4, and
         especially subclauses 4 and 5 - all references after this point refer to the subclauses
         associated with clause 2.4.4).

H5.119   Subclause 4(a) indicates that the Commission will have regard to bonds that:

         i.   have a qualifying rating of BBB+; and
         ii.   are issued by an EDB or GPB that is neither majority owned by the
                Crown nor a local authority.

H5.120   In Table H4 there is only one bond that fits the criteria of subclause 4(a), which is
         the bond issued by Vector. However, this single bond has a remaining term to
         maturity of less than five-years.

H5.121   Subclause 5(b) states that the spread on a bond that has a remaining term to maturity
         of less than five-years will ordinarily be considered to be the minimum spread that
         would reasonably be expected to apply on an equivalently credit-rated bond issued
         by the same entity with a remaining term to maturity of five-years.

H5.122   Therefore, only taking into consideration subclause 4(a) the minimum debt premium
         for a qualifying rating of BBB+ is estimated to be 1.82% p.a.

H5.123 Subclause 4(b) indicates that the next criteria the Commission will have regard to are those issues that:

    i.   have a qualifying rating of BBB+; and

    ii.   are issued by an entity other than an EBD or GPB that is neither majority owned by the Crown nor a local authority.

H5.124 A bond issued by WIAL fits these criteria but has a remaining term to maturity of less than five-years (remaining term to maturity is 3.2 years). However, this bond is not considered to meet the criteria of subclause 5(b) as it appears to be anomalous (not normal) as this debt premium estimate is higher than the debt premium estimate of the lower rated longer-term BBB bonds of Contact Energy and Powerco.

H5.125 As a result, there are no results considered from subclause 4(b).

H5.126 The next criteria included in the IM is subclause 4(c) which indicates that the Commission will consider bond issues that:

    i.   have a qualifying rating different to BBB+; and

    ii.   are issued by an EBD or GPB that is neither majority owned by the Crown nor a local authority.

H5.127 There is one debt premium estimate that meets these criteria, the result from Powerco bonds with a BBB S&P long-term credit rating (that is, a rating lower than a BBB+). This five-year debt premium estimate is 2.24% p.a. Having regard to this estimate implies a debt premium for a qualifying rating of BBB+ would be less than 2.24% p.a.

H5.128 The next criteria included in the IM is subclause 4(d) which indicates that the Commission will consider bond issues that:

    i.   have a qualifying rating different to BBB+; and

    ii.   are issued by an entity other than an EBD or GPB that is neither majority owned by the Crown nor a local authority.

H5.129 There are two bonds that meet these criteria, the bonds issued by:

- AIAL which has bonds with a A- S&P long-term credit rating and a five-year debt premium estimate of 1.75% p.a.; and

- Contact which has bonds with a BBB S&P long-term credit rating and a five-year debt premium estimate of 2.10% p.a.

H5.130 The resulting debt premium estimates from subclause 4(c) and (d) are based on a remaining term to maturity of five-years and are one credit rating notch either side of BBB+. Subclause (5)(c) requires the Commission to adjust the spreads of bonds described under subclauses 4(b) to 4(e) to approximate the spread that is likely to have been observed had the bonds in question been of the type described in subclause 4(a) (that is, a long-term credit rating of BBB+, and been issued by an EDB or GPB). Applying subclause 5(c), the AIAL debt premium estimate (1.75% p.a. at A-) would have been higher if it were rated BBB+ , while both the Powerco (2.24% p.a. at BBB) and Contact (2.1% p.a. at BBB) estimates would have been

lower (if rated BBB+).   In short, the three estimates would have converged on around 2.0% p.a. if rated BBB+ with a remaining term to maturity of five-years.[1029]

H5.131   The final criteria included in the IM is subclause 4(e) which indicates that the Commission will consider bond issues that are:

  i.   investment grade credit rated; and

  ii.   issued by an entity that is majority owned by the Crown or a local authority.

H5.132   There are three entities with bonds that meet these criteria, the bonds are issued by:

- Transpower which has bonds with a S&P long-term credit rating of AA- and a five-year debt premium estimate of 1.16% p.a.;

- Genesis Energy which has bonds with a S&P long-term credit rating of BBB+ and a five-year debt premium estimate of 1.58% p.a.; and

- Mighty River Power which has bonds with a S&P long-term credit rating of BBB+ and a five-year debt premium estimate of 1.73% p.a.

H5.133   Clause 2.4.4(5)(a) establishes a hierarchy with progressively lesser regard being had to bonds identified in subclause (4)(b) to (4)(e), with least regard placed on 4(e). Little weight is placed on the debt premium estimates from the Transpower, Genesis Energy and Mighty River Power. These do not alter the debt estimate as they are all below the minimum debt premium estimate set by the Vector bond of 1.82% p.a.

H5.134   In this example, in estimating the five-year debt premium for a qualifying rating of BBB+ as at 1 September 2010 the Commission had primary regard to the following debt premiums estimates:

  i.   On bonds specified in subclause 4(a) the minimum debt premium is 1.82% p.a.;

  ii.   taking into considerations the results from bonds specified in subclause 4(c) and (d), and the adjustment required in Clause 2.4.4(5)(c), the Commission considers this information provides an appropriate debt premium estimate of 2.0% p.a. for EDB, GPB and Transpower.

Conclusion on the debt premium estimate from the worked example

H5.135   Following the EDBs IM Determination Part 2, subpart 4, clause 2.4.4 the Commission estimates an appropriate debt premium to apply to EDB, GPB and Transpower as at 1 September 2010 is 2.0%.

H6   Term Credit Spread Differential

H6.1   The cost of capital IM uses a risk-free rate and debt premium estimated over a term which matches the regulatory period. Generally, this will be a period of five years.

[1029]   Taking a simple average of these three estimates also results in an estimated debt premium of 2.0% p.a.

H6.2   Regulated suppliers may issue debt with a term exceeding five years to manage their refinancing risk. The issue of such debt will typically have a greater debt premium due to the longer term. Regulated suppliers who issue long term debt may also incur costs entering into interest rate swaps to reduce their initial interest rate re-pricing period from the length of the bond, to a shorter period.

H6.3   The IM recognises the additional debt premium and the interest rate swap execution costs that can be incurred from issuing longer term debt, to the extent that such debt is issued. This will be achieved through an allowance – the term credit spread differential allowance.

H6.4   This allowance will not be part of the WACC which applies to all regulated suppliers. Rather, it will apply only to qualifying suppliers and be treated analogously to expenses under the various instruments. That is, it will be treated as follows:

- in the context of information disclosure, the term credit spread differential allowance will be reflected in the ROI disclosed in accordance with the ID Determination;

- given that the allowance for the term credit spread differential will be reflected in disclosed ROIs, it will also implicitly affect the way that any starting price adjustments are implemented for DPPs;

- in the case of CPPs, the term credit spread differential is an explicit allowance in the calculation of building blocks allowable revenue. The allowance in the EDB and GPB Determinations is calculated on the assumption of a three, four or five-year term to match the CPP period.

H6.5   The allowance applies only to regulated suppliers whose debt portfolio, as of the date of the most recent audited financial statements, has a weighted-average tenor greater than five years. For such suppliers the allowance will apply in respect of individual bond issues which have a tenor exceeding five years ('qualifying debt issues').

H6.6   In respect of qualifying debt issues, the allowance represents:

- the additional credit spread over swap on long-term debt versus that on five year debt as at the date of pricing;[1030]

- the execution costs of an interest rate swap; and

- a downward adjustment in relation to the annual notional debt issue costs to reflect the longer term of the qualifying debt issue.

Each is discussed in turn.

H6.7   The term credit spread differential is available to qualifying suppliers on their qualifying debt. Like the methodology for estimating the debt premium, the term

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[1030]   By convention, interest rate swaps reference the swap rate rather than the government bond rate.

credit spread allowance is estimated based on a BBB+ S&P long-term credit rating for EDBs, GPBs, and Transpower (and A- for airports). However, due to the limited number of long-maturity bonds (especially with maturities of around 10 years), the Commission has considered further how the term credit spread difference can best be estimated in practice. In particular, the Commission considers that the Bloomberg NZ fair value curves is a practical alternative to trying to estimate the term credit spread difference by reference to the debt premiums on individual bonds (and avoid the need to extrapolate).

H6.8   The following table sets out the estimated additional credit spread over swap (expressed in % per annum) between a tenor of 10 years and a tenor of five years, at a selection of dates in the past, for selected New Zealand publicly traded bonds, the Bloomberg NZ A fair value curve and the Bloomberg US Utility A, BBB+ and BBB fair value curves.

Table H5   Additional credit spread over swap between five-year and 10 year debt

Entity	S&P Long-term credit rating	Jun 2005	Jun 2006	Jun 2007	Jun 2008	Jun 2009	Jun 2010
Powerco	BBB	0.18%	0.15%	0.14%			
AIAL	A-		0.19%	0.16%			
Telecom	A		0.21%	0.20%			
Bloomberg NZ BFV	A		0.18%	0.16%	0.41%	0.60%	-0.05%
Bloomberg US Utility BFV	A	0.15%	0.17%	0.15%	0.22%	0.18%	0.49%
Bloomberg US Utility BFV	BBB+	0.19%	0.22%	0.15%	0.44%	0.07%	0.39%
Bloomberg US Utility BFV	BBB	0.15%	0.25%	0.19%	0.53%	0.05%	0.41%

Source: Bloomberg

H6.9   As can be seen in the above table, the lack of new issuance of appropriate New Zealand publicly traded bonds since 2007 with a tenor of, for example, 10 years makes it difficult, without extrapolation, to estimate the additional credit spread over swap relative to a tenor of 10 years. In addition, the affects of the volatility associated with the GFC is apparent in the estimates from 2008 onwards.

H6.10   Bloomberg does not currently offer a New Zealand fair value curve with a S&P long term credit rating less than A. However, the estimates from the New Zealand publicly traded bonds and the Bloomberg NZ and US fair value curves shown in the table above do not suggest that there is a discernible difference in the estimate of the additional credit spread over swap related to considering debt issues with a S&P long term credit rating of BBB, BBB+, A- or A, as opposed to the target of BBB+ / A-. This suggests that the Bloomberg NZ A fair value curve is a good proxy for estimating the term credit spread differential on BBB+ / A- bonds. The IM therefore specifies that the term credit spread differential should be estimated by reference to the Bloomberg NZ A fair value curve.

H6.11   The additional credit spread over swap is the difference between the Bloomberg NZ
        A fair value curve, as a proxy for long-term corporate debt, and the
        contemporaneous swap rate for the same tenor as the EDB's or GPB's qualifying
        debt issue and for a tenor of five years, as at the date of pricing the long-term
        corporate debt issue. The graph below illustrates the spread. Specifically the
        additional credit spread is defined as (V-W) - (X-Y) on the graph below. The
        Bloomberg NZ A fair value curve will be used to estimate the interest rates V and X.

Figure H6   Illustration of the term credit spread
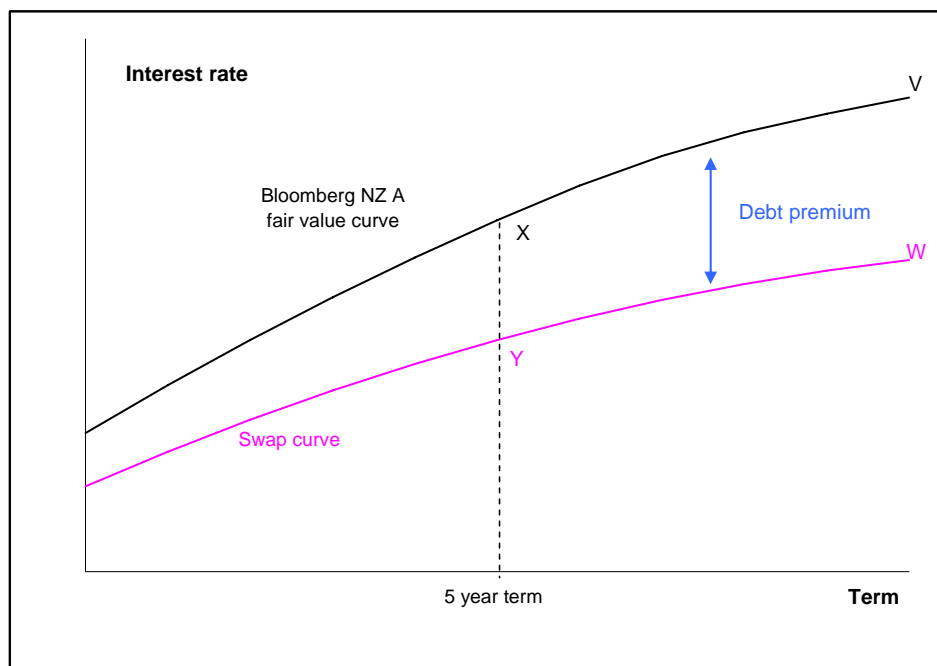
H6.12   It is apparent in the table above that the volatility associated with the GFC is having
        an effect on the estimates of the additional credit spread over swap. In particular,
        there are some estimates which are implausibly low (for example, that the
        differential could be negative). This could be addressed by setting a minimum floor
        on the additional credit spread over swap. Setting a minimum both gives qualifying
        suppliers with qualifying debt a degree of certainty and also protects them on the
        downside from exposure to post GFC volatility. Likewise, there are some estimates
        which appear to be abnormal spikes, which could be addressed by setting a
        maximum cap on the additional credit spread over swap.

H6.13   Based on the estimates from the various data sources referenced in the table above,
        the Commission has set a minimum of 0.15% per annum and a maximum of 0.60%
        per annum for the additional credit spread over swap.

H6.14   Allowance will also be made for interest rate swap execution costs (i.e. the amount
        that is half of the wholesale bid and offer spread for an interest rate swap, for a
        notional principal amount equal to the principal amount of the debt)[1031] on
        qualifying debt as at the date of pricing.

[1031]   For a more detailed description see clause 2.4.9(1) in the IM Determination.

H6.15   There will also be a re-allocation of the annual notional debt issuance costs to reflect the longer tenor of the qualifying debt issue. These costs are included in the WACC at 0.35% per annum on an assumed term of five years. Regulated suppliers that issue longer maturity debt have the greater term credit spread on such debt recognised through the term credit spread difference allowance. Such regulated suppliers will also incur debt issuance costs less frequently. Therefore the allowance for debt issuance costs needs to be re-allocated to reflect the longer debt maturity. The adjustment will reallocate the costs over the tenor of the qualifying debt issue (rather than the assumed five year term in the WACC specified in the IM Determination). This reallocation will be included in the term credit spread differential allowance, while the 0.35% allowance for issuance costs will be included in the WACC. The re-allocation of the debt issuance costs will be a negative number.

H7   TAMRP

Decision - TAMRP

H7.1   The IM provides that the TAMRP, relative to a five-year risk-free rate, is 7%.

H7.2   Due to the impact of the GFC on the premium for owning risky assets, the TAMRP is temporarily increased to 7.5% for the regulatory years ending in the calendar years 2010 and 2011. After this the TAMRP reverts to its long-term level of 7%.

H7.3   The TAMRP will be expressed as a composite rate for a five year period. For example, for the year commencing 1 July 2010, the TAMRP would be 7.1% and for the year commencing 1 July 2011, it would be 7.0%.[1032] Applying this approach in the context of information disclosure for the five year period commencing in April 2010 the TAMRP would be 7.1%, and for the period commencnig in April 2011 it would be 7.0%. In the context of the DPP, the TAMRP for the regulatory period 2010-2015 would be 7.1%. For the CPP, the TAMRP would be 7.0%.

Commission's reasons - approach to estimating the long-term TAMRP
Overview

H7.4   The market risk premium ('MRP') measures the additional expected return over and above the risk-free rate required to compensate investors for holding the market portfolio. It represents the premium investors can expect to earn for bearing only systematic (market) risk. The form of the MRP that is consistent with the simplified Brennan-Lally CAPM is the TAMRP. The TAMRP is neither a supplier-specific parameter nor an industry-specific parameter, but rather is common to all assets in the economy.

H7.5   Most of the underlying data is expressed in terms of the MRP (i.e. before making the tax adjustment that is required in applying this parameter in the simplified Brennan-Lally CAPM) and, therefore, in this Reasons Paper data relating to MRP estimates

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[1032]   A five-year TAMRP is derived as a weighted average of the years that 7.5% applies and the years 7% applies. For example, the TAMRP of 7.1% from 1 July 2010 is derived as the weighted average of one year at 7.5% and four years at 7%, (calculated by $(7.5 \times 1 + 7.0 \times (5 - 1)) \div 5$).

has been converted to the TAMRP equivalent.[1033] In the interest of brevity, the term 'TAMRP' is used in the text that follows except where there is specific reference to a MRP value.

H7.6   The TAMRP is not directly observable and therefore needs to be estimated. This is because:

- the TAMRP is a *ex ante* (forward-looking) concept and, as a result, reflects investors' expectations; and

- the market portfolio itself cannot be observed as market values for many assets are not known, so it requires the use of a proxy (e.g. returns on an index of listed equities).

H7.7   In light of these factors, considerable debate remains over which of the various approaches that have been identified for estimating the TAMRP is most appropriate in a regulatory setting. This has become further complicated by the advent of the GFC, which has led to revisions about the level of risk in markets and investors' expectations towards risk.

H7.8   In reaching an estimate for the TAMRP, the Commission has considered:

- the appropriate methodology and estimate for the TAMRP;

- applying this methodology in a regulatory context, including whether both New Zealand and foreign data should be used; and

- whether any adjustment, temporary or permanent, should be made as a result of the GFC.

Appropriate methodology for estimating the TAMRP

H7.9   In estimating the TAMRP, the Commission has assessed which of a range of possible estimation techniques to adopt. In particular, the Commission has considered:

- whether it should adopt an *ex post* (historic) or *ex ante* (forward-looking) estimate for the cost of capital, or some combination of both;

[1033]   For the non-Australian estimates the MRP is related to the TAMRP by using the formula MRP = TAMRP – R_f(T), where R_f is the risk-free rate of return and T is the investor tax rate (the value for investor tax rate will depend on the time period and tax assumption that the estimate is based on). For the conversion process of the Australian based MRP estimates see Lally, M., *International Comparison of Regulatory Cost of Capital for Gas Distribution Businesses*, Report to the New Zealand Commerce Commission, 28 October 2008, p. 12. Charles River Associates for Unison (see *Regulated Returns for Australian and New Zealand Electricity Distribution*, 15 August 2010, pp. 41-42) submit that the utilisation rate for the Australian based MRP conversion process should use the latest AER estimate of 0.65, rather than assume a utilisation rate of 1 which implies fully segregated markets. Dr Lally (see *Comments on Input Methodologies (EDS) Draft Reasons Paper*, 3 September 2010, pp. 7-9) notes that the AER estimate of 0.65 relies on data both prior to and subsequent to a relevant tax change in 2001, whereas the AER should only rely on data subsequent to this tax change. In addition, the AER has misinterpreted the analysis contained in a study it has relied on. Correcting for these two items, the AER's estimate of the utilisation rate should have been 0.77, rather than 0.65. Finally, Dr Lally notes that the simplified Brennan-Lally CAPM explicitly assumes that the utilisation rate is 1 and this should extend to the estimate used in the present circumstances.

- whether it should estimate the TAMRP using arithmetic averages or geometric averages; and

- the appropriate term of the risk-free rate used in estimating the TAMRP.

Ex post approaches

H7.10 Estimates of the expected MRP have traditionally been based on *ex post* returns. Since these returns have fluctuated significantly across countries and across time - even in terms of decades - regulators have typically used or placed weight on long-term historical estimates. Dimson, Marsh and Staunton is widely regarded by both practitioners and regulators as being one of the most authoritative sources of historical estimates.[1034]

H7.11 The most common *ex post* approach is to average the historical spread between market returns (i.e. the returns on a market index used to proxy the market portfolio) and risk-free rates. The most common of these is the Ibbotson (Morningstar) approach used by Dimson, Marsh and Staunton. Other *ex post* methods have been developed by Siegel[1035] and Merton.[1036]

H7.12 Siegel shows that the Ibbotson type estimate of the standard MRP is unusually high due to the very low returns on bonds during 1926-1990. Siegel adjusts the Ibbotson type estimate through adding back the historical average long-term real risk-free rate and then deducting an estimate of the expected long-term real risk-free rate.

H7.13 Merton estimates the market risk premium as the product of an estimate of market risk and an estimate of the market risk premium per unit of market risk.

H7.14 A key advantage of the Ibbotson *ex post* approach is that it is relatively objective and easy to interpret. Further, a conceptual justification for the use of historical estimates is that investors base expectations of the MRP on past experience. Historical premiums, however, may be poor predictors of future expected premiums. Dimson, Marsh and Staunton argue that global equity returns have exceeded expectations in the past century, and that this growth is unlikely to be repeated.[1037] Thus, prospective MRP estimates based on unadjusted historical averages may be biased upwards.[1038]

[1034] Ofcom, *Ofcom's approach to risk in the assessment of the cost of capital*, August 2005, p. 29; Ofcom, *A new pricing Framework for Openreach*, May 2008, p. 85; Ofwat, *Future Water and Sewerage Charges 2010-2015 – Final Determination*, April 2009, pp. 128-129; Competition Commission, Review of Stansted Airport Q5 price control, October 2008, Appendix L, p. L17; Ofgem, *Electricity Distribution Price Control Review Final Proposal - Allowed Revenues and Financial Issues*, 7 December 2009, p. 12; AER, Final decision: Electricity transmission and distribution network service providers – Review of the weighted average coat of capital (WACC) parameters, May 2009, pp. 191-192.

[1035] Siegel, J., The Equity Premium: Stock and Bond Returns since 1802, *Journal of Economic Theory*, Vol. 8, 1992, pp. 28-38.

[1036] Merton, R., On Estimating the Expected return on the Market. An Exploratory Investigation, *Journal of Financial Economics,* Vol. 8, 1980, pp. 323-361.

[1037] Dimson, E., Marsh, P. and Staunton, M., *Triumph of the Optimists: 101 Years of Global Investment Returns*, Princeton University Press, New Jersey, 2002.

[1038] See Dimson, E., Marsh, P. and Staunton, M., Global Evidence on the Equity Risk Premium, *Journal of Applied Corporate Finance,* Vol. 14, 2003, pp. 27-38.

H7.15   It is possible that investors' risk preferences have changed over time, which would alter expected rates of return. Shifts in investors' tolerance of risk may be reflected in changes in stock price-to-earnings or stock price-to-dividend ratios. Dimson, Marsh and Staunton find a long-term upward trend in price-to-dividend ratios for a number of markets, and argue that such trends cannot persist in the long-run.[1039] Removing the contribution of these trends from historical MRP averages causes their MRP estimates to fall.

H7.16   As financial markets deepen and become more globally integrated, the opportunities for investors to diversify their portfolio increase. This will tend to reduce the level of risk faced by investors, and therefore, the premium they expect for bearing such risk.

H7.17   The results from Dimson, Marsh and Staunton,[1040] applying the Ibbotson methodology, appear to be the most commonly referenced estimates for the historical averages by regulators in Australia and the UK, and practitioners.[1041] Ofcom's view is that the work carried out by Dimson, Marsh and Staunton is widely regarded as being one of the most 'authoritative sources' of historical estimates.[1042] One of the reasons for this is that Dimson, Marsh and Staunton address key methodological problems that previous research on the MRP had failed to deal with, such as survivorship bias.[1043]

H7.18   The reliability of estimates based on historical averages relies on the quality and availability of the underlying data. If only a relatively short time series is available, the resulting MRP estimates are likely to be statistically imprecise. However, adopting too long a series in an attempt to improve the precision of the MRP estimates increases the possibility of including data from periods that are less relevant to the current period.[1044]

H7.19   In advice on the appropriate TAMRP on the Gas Authorisation, Dr Lally considered results from Credit Suisse First Boston[1045] and Boyle[1046] who had used the Merton methodology to estimate the MRP.[1047] Boyle concluded that the results from his

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[1039]   ibid.

[1040]   This data first appeared in Dimson, E., Marsh, P. and Staunton, M., *Triumph of the Optimists: 101 Years of Global Investment Returns*, Princeton University Press, New Jersey, 2002. Since then Dimson, Marsh and Staunton have published the results in an annual Global Investments Return Yearbook.

[1041]   Regulators that have referenced Dimson, Marsh and Staunton estimates for the MRP in recent decisions involving the cost of capital include: AER, Ofwat, Ofcom, Ofgem.

[1042]   Ofcom, *Ofcom's approach to risk in the assessment of the cost of capital*, August 2005, p. 29; Ofcom, *A new pricing Framework for Openreach*, May 2008, p. 85.

[1043]   Survivorship bias is the tendency for companies that no longer exist due to failure, takeovers etc., to be excluded from performance studies because the data on them is no longer collected as they no longer exist.

[1044]   For example, MRP estimates are available for the US using data from as far back as the 1800s. These estimates may have low standard errors due to the large sample they draw on, but because financial markets have changed so significantly since the early years of that sample the results are likely to be biased estimates of future expected premiums.

[1045]   Credit Suisse First Boston, *Equity Valuation Methodology*, 1998.

[1046]   Boyle, G., Risk, Expected return, and the cost of equity capital. *New Zealand Economic Papers*, Vol. 39, 2005, pp. 181-194.

[1047]   Lally, M., *The weighted average cost of capital for electricity lines businesses*, September 2005, p. 12-13; Lally, M., *The weighted average cost of capital for gas pipeline businesses*, 28 October 2008, pp. 18-19.

analysis could not be relied on. In advice on the Gas Authorisation Dr Lally noted that:[1048]

> The apparent source of the problem here is that the variance shifts unpredictably over time and the market risk premium is based upon the *expected* future variance rather than past actual variance. Since actual variance fluctuates much more than expected variance, Boyle's range overestimates the true variation across time in the market risk premium. Clearly the use of a very long period for estimating future variances would be inconsistent with the presumption of intertemporal variations that underlies this methodology.

H7.20   Dr Lally further noted that the Credit Suisse First Boston results faced similar conceptual difficulties and concluded that the results from Merton-type estimates should be excluded from the final estimation of the TAMRP.

H7.21   Whilst Merton has a sound theoretical foundation, it has also been viewed as one of the least robust methods empirically because of the significant standard errors associated with the estimated results. Consequently, the Commission places no weight on the resulting Merton *ex post* estimates in its decisions following Dr Lally's recommendation.[1049]

Ex ante approaches

H7.22   Using a forward-looking or *ex ante* approach to estimate the MRP is consistent with the MRP in theory being an *ex ante* measure. Among the *ex ante* approaches[1050] are the DCF model and the results from surveys of academics and practitioners. The approaches have their own drawbacks.

H7.23   There are a number of well known limitations with the DCF model, which were previously noted under the Overall Approach (see Appendix H2). Some of these limitations which are relevant to estimating an *ex ante* MRP are:

- good forecasts of dividend growth are essential;

- dividend growth forecasts, which are generally only available for the short-run, often exceed the long-run rate of economic growth; and

- the models rely on the assumption that financial markets are efficient and correctly value investments at all times.

H7.24   Survey evidence can be subjective and difficult to interpret. For example, the results may suffer from non-response bias and questions, no matter how carefully crafted, either might not be properly understood or might not elicit the correct response. These issues might result in an upward or downward bias in responses. An example of this was referred to in advice to the Commission where Dr Lally assessed an estimate of the market risk premium from survey evidence and noted that the results

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[1048]   Lally, M., *The weighted average cost of capital for gas pipeline businesses*, 28 October 2008, p. 18.

[1049]   See for example Commerce Commission, *Electricity Distribution - Regulation of Electricity Lines Businesses Targeted Control Regime - Intention to Declare Control Unison Networks Limited*, September 2005; and Commerce Commission, *Gas Authorisation Decisions Paper*, 30 October 2008.

[1050]   Although described here as forward-looking, the *ex ante* approaches mentioned here do, strictly speaking, draw on historical data. Specifically, analysts' earnings and growth forecasts used in the DCF model, and survey respondents' future expectations, would typically be informed by past experience.

for at least one group (practitioners) may be biased upwards due to some responses mistakenly supplying an estimate of the TAMRP rather than the MRP.[1051]

Conclusion - ex post versus ex ante approaches for estimating the TAMRP

H7.25   In light of the above discussion, both *ex post* and *ex ante* approaches are used to estimate the TAMRP for the IM.

H7.26   All Expert Panel members advised that evidence from the *ex ante* and *ex post* looking approaches should be considered. However, the experts did not agree on the weight that should be given to each approach.[1052] Submitters generally agreed that both approaches should be considered by the Commission when determining the TAMRP, but that greatest weight be placed on the *ex post* results.[1053] However, CIAL submitted that standard practice is to use only *ex post* results.[1054]

H7.27   The weighting placed on each approach is a matter of judgment for the Commission, which requires taking into account all the available evidence, and current market circumstances. For instance, if due to the GFC the world were considered a more risky place in the medium or longer term, then additional weight may need to be put on forward-looking estimates. Further consideration is given to the GFC later in this section.

H7.28   In summary, to estimate the TAMRP the Commission relied on *ex post* Ibbotson-type estimates undertaken by Dimson, Staunton and Marsh, the Siegel approach, as well as *ex ante* estimates. The Commission excluded the Merton estimates from its consideration.

Estimating the TAMRP using arithmetic averages versus geometric averages

H7.29   When the TAMRP is estimated by taking the difference between market returns and the risk-free rate, a question can arise as to whether this process should be based on arithmetic or geometric averages.

H7.30   The choice can have a material effect on the estimated TAMRP, as the arithmetic average can be of the order of 2% above the geometric average.

H7.31   As the arithmetic approach results in a higher TAMRP estimate compared to the geometric approach, a preference for the former represents a favourable decision from the view point of suppliers.

H7.32   Although the Commission has not explicitly discussed the matter in previous decisions, the Commission has used a TAMRP estimate that was based on an arithmetic average. BARNZ considered the use of the arithmetic average over the

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[1051]   Commerce Commission, *Gas Control Inquiry*, Final Report, 29 November 2004, pp. 12-13.

[1052]   Franks, J., M. Lally and S. Myers, *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology, Report prepared for the Commerce Commission*, 18 December 2008, pp. 21-22.

[1053]   Maui Development Limited, *Submission on the Input Methodologies Discussion Paper*, July 2009, p. 19; Powerco Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: PricewaterhouseCoopers, *Commerce Commission's Revised Draft Guidelines and aspects of the Input Methodologies Discussion Paper relating to Cost of Capital prepared for Powerco Limited*, 14 August 2009, p. 14; PricewaterhouseCooper, *Submission to the Commerce Commission on the Revised Draft Guidelines – The Commerce Commission's Approach to Estimating the Cost of Capital*, Report on behalf of 17 EDBs, 14 August 2009 , pp. 9-10.

[1054]   Christchurch International Airport Limited, *CIAL Submission on Revised Draft Guidelines,* 3 August 2009, p. 2.

geometric average was another example of the Commission taking what was a favourable decision from the point of view of suppliers'.[1055] In cross-submissions, Uniservices (for NZAA), disagreed with BARNZ, submitting that the Commission was not adopting a position favourable to suppliers in its choice of the arithmetic as opposed to the geometric average in the determination of the TAMRP.[1056]

H7.33 In setting the TAMRP for the IM, the Commission has continued to use a TAMRP estimate based on an arithmetic average. The Commission notes Dr Lally advised that using an arithmetic average generates a value for the regulated service that is expected to match the initial investment. On the other hand, using a geometric average generates a value for the regulated service that is expected to be less than the initial investment.[1057] The arithmetic approach is used by most other regulators when estimating the MRP although The UK Competition Commission and the UK CAA use geometric averages. The geometric MRP estimates range from 2.5% to 4.5%,[1058] whereas arithmetic estimates are typically between 4% and 5.4%.

Term of the risk-free rate used in estimating the TAMRP
H7.34 The risk-free rate features in three places in the cost of capital calculation (in the cost of debt estimation, the first term of the CAPM and in the estimation of the TAMRP). It is explicitly part of both the cost of debt and the cost of equity. In addition, the risk-free rate is also an implied component of the TAMRP (which measures, as outlined above, the additional expected return over and above the risk-free rate required to compensate investors for holding the market portfolio).

H7.35 Appendix H4 discusses the appropriate term of the risk-free rate and that the term of the risk-free rate in the cost of debt and the cost of equity is matched to the term of the regulatory period.

H7.36 There is ongoing debate among practitioners and academics concerning what the term(s) of the risk-free rate in the cost of equity calculation should be. As part of the Expert Panel, Professor Myers and Professor Franks recommended that the Commission employ one risk-free rate in its cost of equity calculation. Dr Lally recommended that the Commission define the TAMRP relative to the average interval (across investors) between portfolio reassessments and define the term of the risk-free rate within the cost of equity calculation to match the regulatory period, even if this leads to the use of two different risk-free rates within the cost of equity.

[1055] Board of Airline Representatives New Zealand Inc, Submission on Commerce Commission Input Methodologies (Airport Services) Draft Reasons Paper and Draft Determination, 12 July 2010, p. 17.

[1056] NZ Airports Association, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, Attachment: Uniservices, *Comments on Air New Zealand's and Board of Airline Representatives New Zealand Incorporated's Submissions to the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper: report prepared for New Zealand Airports Association*, 3 August 2010, p. 12.

[1057] Lally, M., *Comments on Input Methodologies (EDS) Draft Reasons Paper*, 3 September 2010, p. 2.

[1058] On the cost of capital, the UK Civil Aviation Authority takes the UK Competition Commission's advice on the generic elements (i.e. the risk-free rate and the MRP). In the Competition Commission's report it used a range of 2.5-4.5% on a geometric basis CAA, *Heathrow/Gatwick quinquennial review - Final report*, 3 October 2007, Appendix F; CAA, *Airport Regulation Economic Regulation of Stansted Airport 2009-2014 – CAA Decision*, March 2009, Appendix L.

H7.37   A number of submitters agreed that the term of the risk free rate should be consistent throughout the cost of capital IM and as a majority of these indicated, through their submissions on the risk-free rate, that the appropriate term would be 10 years.[1059]

H7.38   In a submission on the Draft Reasons Papers PwC (for ENA) and Uniservices (for NZAA) agreed that the term of the risk-free rate in the TAMRP should match the term of the regulatory period (regulated suppliers considered this term should be 10 years).[1060]

H7.39   At the Cost of Capital Workshop and in post workshop submissions PwC stated that their estimate of 7.5% for the New Zealand TAMRP had been primarily based on analysis it undertook of historical realised returns in the New Zealand market measured relative to 'short-term' government bonds with a term to maturity of one to three years.[1061]   However, although PwC uses a term of five years for the risk-free rate in its quarterly cost of capital publication in conjunction with its TAMRP estimate, it submitted that the Commission should use a term of 10 years for the risk-free rate consistently across the cost of capital.[1062]

Conclusion - term of the risk-free rate used in estimating the TAMRP
H7.40   The Commission has set the term of the risk-free rate equal to the term of the regulatory period, typically five years. Using a term of five years for the risk-free rate in estimating the TAMRP ensures consistency.

H7.41   Given that regulatory periods can be from three to five years under Part 4 price-quality regulation, this would imply multiple TAMRP estimates may be required.

H7.42   In previous decisions, the Commission has used an estimate of the TAMRP relative to the 10 year risk-free rate. The IM continues its the approach of a single TAMRP covering all lengths of regulatory period. However, the TAMRP in the IM has been calculated against a five-year risk-free rate, rather than a 10 year rate. This ensures there is a single risk-free rate used in estimating the TAMRP and that it (generally) matches the term of the regulatory period.

[1059]   Powerco Limited, Input Methodologies Discussion Paper, 14 August 2009, p. 28; Powerco Limited, Submission on the Input Methodologies Discussion Paper, Attachment: PricewaterhouseCoopers, Commerce Commission's Revised Draft Guidelines and aspects of the Input Methodologies Discussion Paper relating to Cost of Capital prepared for Powerco Limited, 14 August 2009, p. 12; Auckland International Airport Limited, *Submission to the Commerce Commission Draft WACC Guidelines Paper,* 31 July 2009, p. 2; LECG, Comments on the Commerce Commission's proposed approach to estimating the cost of capital, Report for NZAA, 31 July 2009, p. 27; PricewaterhouseCooper, Submission to the Commerce Commission on the Revised Draft Guidelines – The Commerce Commission's Approach to Estimating the Cost of Capital, Report on behalf of 17 EDBs, 14 August 2009 , p. 17; Telecom, *Annex B: Submission on Commerce Commission Revised Draft Guidelines for estimating the Cost of Capital,* August 2009, Annex B; Commerce Commission, Cost of Capital Workshop Transcript, pp. 175-176.

[1060]   Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association,* 13 August 2010, p. 18.

[1061]   Commerce Commission, Cost of Capital Workshop Transcript, p. 178 and PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, Report for 17 EDBs, 2 December 2009, p. 17.

[1062]   PricewaterhouseCoopers, *The Cost of Capital Report*: As at 30 June 2010. This report and previous reports can be obtained from PwC New Zealand web site (http://www.pwc.com/nz/en/cost-of-capital).

H7.43   The Commission considers there is no case for changing its TAMRP estimate on a regular basis. This is similar to the practice of many advisors who do not regularly change their estimate of the TAMRP. For example, PwC has not publicly updated its estimate of TAMRP since 2002.

Commission's reasons - the long-term TAMRP estimate

H7.44   In setting the TAMRP, the Commission considered its previous regulatory decisions (as the parameter is a long-term estimate), evidence from studies of forward and backward-looking TAMRP estimates, advice from the expert panel, evidence provided by submitters, market risk premium estimates used by overseas regulators, and the impact of the GFC.

Previous estimates of the TAMRP used by the Commission

H7.45   The Commission has estimated a TAMRP in a number of previous regulatory decisions. These are summarised in Table H6 below.

Table H6   Estimates of the TAMRP used by the Commission

Decision	Year of Decision	TAMRP Estimate
Airports Inquiry[1063]	2002	8%
TSO determinations - 2001-2002	2003	8%
TSO determinations - 2002-2003 onwards	2005 - 2008	7%
Gas Control Inquiry[1064]	2004	7%
Unison Post-breach Inquiry[1065]	2007	7%
Gas Authorisation[1066]	2008	7%

H7.46   The table above illustrates that the Commission has adopted TAMRP estimates of either 7% or 8%. In all decisions after 2003, the Commission has adopted a TAMRP estimate of 7%.

H7.47   In the context of the Airports Inquiry, Dr Lally generated TAMRP estimates in the range of 7% to 9% using both *ex post* and *ex ante* approaches.[1067] No approach to estimating the TAMRP was considered by the Commission to be necessarily better than any other. Having considered submissions and advice from Dr Lally, the Commission's view was to adopt a TAMRP of 8%, within a range of 7% to 9%, in recognition of the uncertainty surrounding the estimate.

H7.48   In the report prepared for the Commission in the Gas Authorisation in 2008, Dr Lally adopted a similar approach as for the Airports Inquiry (in that he used both *ex*

[1063]   Commerce Commission, *Part IV Inquiry into Airfield Activities at Auckland, Wellington and Christchurch International Airports*, Final report, 2002.

[1064]   Commerce Commission, *Gas Control Inquiry*, Final Report, 29 November 2004.

[1065]   Commerce Commission, *Regulation of Electricity Lines Businesses - Targeted Control Regime - Reasons for Not Declaring Control - Unison Networks Limited*, 11 May 2007, pp. 38-39.

[1066]   Commerce Commssion, *Gas Authorisation Decisions Paper*, 30 October 2008.

[1067]   Lally, M., *The cost of capital for the airfield activities of New Zealand's international airports*, November 2001 (Lally, WACC for Airports).

post and *ex ante* approaches to generate TAMRP estimates), but relied on updated evidence where it was available. He reviewed estimates of the TAMRP using *ex post* approaches of the Morningstar (Ibbotson) and Siegel types; the constant reward to risk methodology of Merton, *ex ante* approach of Cornell; and survey evidence, based on information from both New Zealand and foreign markets.[1068] On this basis Dr Lally favoured an estimate of 7% for the TAMRP. Table H7 displays the results from Dr Lally's advice.

Table H7   Estimates of the TAMRP by Lally 2008 - implying a 10 year term for the risk-free rate

Methodology	NZ	US	Other	All
Ibbotson	7.70%	8.40%	8.20%	
Siegel	6.40%	7.30%	6.60%	
Cornell	5.40%	6.60%		
Survey	8.00%	5.70%		
Median	7.05%			6.95%
Mean	6.88%			7.03%

H7.49   Across the entire set of results, the range for the TAMRP is 5.4% to 8.4% with a median of 6.95% and a mean of 7.03%.

Changing the estimate to represent a five-year TAMRP

H7.50   The TAMRP estimates displayed in Table H7 are estimated based on a term for the risk-free rate of 10 years. As outlined above, in the context of regulation under Part 4, the Commission considers that the appropriate term for the risk-free rate is five years. Table H8 displays the result for the TAMRP estimates based on advice provided to the Commission by Dr Lally in 2008[1069] updated for a five year term for the risk-free rate.

Table H8   Estimates of the TAMRP by Lally 2008 - implying a five year term for the risk-free rate

Methodology	NZ	US	Other	All
Ibbotson*	7.70%	8.40%	8.20%	
Siegel*	6.40%	7.30%	6.60%	
Cornell	5.20%	6.80%		
Survey	8.20%	6.20%		
Median	7.05%			7.05%
Mean	6.88%			7.10%
* The Ibbotson and Siegel estimates in this table are for a 10-year risk-free rate term not a 5-year term.				

[1068]   For a more detailed analysis see Lally, M., *The weighted average cost of capital for gas pipeline businesses*, 28 October 2008, pp. 16-38.

[1069]   Lally, M., *The weighted average cost of capital for gas pipeline businesses*, 28 October 2008, pp. 24-25.

H7.51   The results in the above table for the Ibbotson and Siegel-type estimates remain unchanged as Dr Lally did not convert these estimates into an estimate relative to a five year term for the risk-free rate.

H7.52   However, the difference between the average five year and 10 year risk-free rate approximated using New Zealand government bonds covering the period 1985 – 2008 is 8.97% and 8.89% respectively. The TAMRP estimated using a five-year risk-free rate is therefore 0.08% higher than that estimated using the 10 year risk-free rate.

H7.53   This suggests that Ibbotson and Siegel-type estimates of the TAMRP for New Zealand would be slightly lower assuming a five year rather than a 10 year term for the risk-free rate.

H7.54   The difference between the average five year and 10 year risk-free rate approximated using US government bonds covering the period 1962 – 2008 is 6.82% and 7.04% respectively. This results in the five-year risk-free rate being lower than the 10 year risk-free rate by 0.22%.

H7.55   This suggests that Ibbotson and Siegel-type estimates of the TAMRP for the US would be higher.

H7.56   To ensure consistency between the TAMRP and the term of the risk-free rate Table H8 is restated to reflect a risk-free rate term of five-years for the New Zealand and US Ibbotson estimates.

Table H9   Estimates of the TAMRP for 2008 - implying a five year term for the risk-free rate

Methodology	NZ	US	Other	All
Ibbotson*	7.62%	8.84%	8.20%	
Siegel*	6.40%	7.30%	6.60%	
Cornell	5.20%	6.80%		
Survey	8.20%	6.20%		
Median	7.01%	7.05%	7.40%	7.05%
Mean	6.86%	7.29%	7.40%	7.14%

* The Ibbotson estimate for "Other" and Siegel estimates in this table are for a 10-year risk-free rate term not a 5-year term. It is not possible to adjust the Ibbotson estimate for "Other" due to the lack of a suitable proxy. It is not possible to adjust the results from the Siegel method due to the lack of a term structure for inflation-proof bonds.

H7.57   This results in the average TAMRP for New Zealand of 6.86% and an average TAMRP from all estimates of 7.14%.[1070]

[1070]   The adjustment to the TAMRP for the US is estimated by using the conversion MRP = TAMRP – R_f(T), where R_f is the contemporaneous five-year risk-free rate of return and T is the contemporaneous investor tax rate (33%). In this formula the MRP is also adjusted to represent a five-year MRP estimate rather than a 10 year MRP estimate. The New Zealand risk-free rate in obtained from Bloomberg and is the average for the month of December 2007.

Conversion of US Ibbotson estimate to five-years

H7.58   In its submission on the Draft EDBs Reasons Paper and using data from 1931 to 2010, PwC (for ENA) and PwC (for Telecom) estimates the adjustment to the 10 year TAMRP to convert to a five-year TAMRP was 0.04% and using data from 1962 to 2010 estimated the US difference at 0.08%.[1071] Updating the Ibbotson estimates for New Zealand and the US resulted in a mean TAMRP of 7.11%.

H7.59   PwC submitted that the effect of the Commission's revision of the term of the risk-free rate used in estimating the TAMRP from 10 to five-years suggested that the estimated TAMRP should be increased by 0.1% to 7.1%.[1072]

H7.60   However, the results from the PwC analysis concerning the period for the adjustments are not consistent with the data in Table H8 or Table H9. These tables provide evidence based on Dr Lally's 2008 advice not 2010.

H7.61   Further, in advice to the Commission on PwC's analysis, Dr Lally considered that precision down to the level of 0.1% was not possible with respect to the expected TAMRP and therefore continued to favour rounding to a higher unit of measure. Accordingly, the appropriate rounded value for the expected TAMRP remains at 7%.[1073]

H7.62   The Commission notes that that in its published paper on the New Zealand TAMRP, PwC state that their estimate of the TAMRP is rounded to the nearest 0.5% i.e.

Raw US MRP	6.30%
Adjustment for difference between US five-years and 10 year risk-free rate	0.22%
NZ Investor Tax Rate	33%
NZ five-year risk-free rate	7.02%
TAMRP	8.84%

[1071]   Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010, pp. 41-42; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, Submission on Cost of Capital Material In the Commerce Commission's Draft *Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13 August 2010, pp. 40-41.

[1072]   Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010, pp. 41-42; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on Cost of Capital Material In the Commerce Commission's Draft Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13 August 2010, pp. 40-41; Electricity Networks Association, *Cost of Capital Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determination and Reasons Paper*, Attachment: PricewaterhouseCoopers, *Report: prepared for Electricity Networks Association*, 3 September 2010, p. 41.

[1073]   Lally, M., *Comments on Input Methodologies (EDS) Draft Reasons Paper*, 3 September 2010, p. 4.

PwC's submission to the Commission to alter the TAMRP by 0.1% is at variance with their own approach.[1074]

H7.63   Considering the factors discussed above, the Commission considers that an overall long-term TAMRP estimate of 7% is appropriate when using a five-year risk-free rate to estimate the TAMRP.

Expert Panel's view – TAMRP estimate

H7.64   The Expert Panel recommendation on the TAMRP was that the Commission's estimate of 7% (for the simplified Brennan-Lally CAPM) was reasonable.[1075]

Views of submitters – TAMRP estimate

H7.65   In submissions on the RDG and IMs users of regulated services, Air NZ, BARNZ and MEUG, agreed that the Commission's estimate of 7% for the TAMRP was appropriate.[1076] Transpower submitted that the TAMRP should be 7% in normal conditions.[1077]

H7.66   Suppliers of regulated services disagreed with the Commission's use of 7% as the estimate of the TAMRP and indicated that the Commission's estimate was too low.[1078] Some of these submitters contended that the TAMRP proposed by the

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[1074]   PricewaterhouseCoopers, *New Zealand Equity Market Risk Premium*, September 2002, p. 10.

[1075]   Franks, J., M. Lally and S. Myers, *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology, Report prepared for the Commerce Commission*, 18 December 2008, pp. 13-17.

[1076]   Air New Zealand Limited, *Submission on the Input Methodologies Discussion Paper*, 31 July 2009, p. 70; Board of Airline Representatives New Zealand Inc, *Submission on Commerce Commission Input Methodologies Discussion Paper,* 31 July 2009, p. 58; Board of Airline Representatives New Zealand Inc, *Submission on Airports Draft Reasons Paper and Draft Determination - Effect of valuation date*, 12 July 2010, p. 10; Major Electricity Users' Group, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, Appendix, p. 3.

[1077]   Transpower New Zealand Ltd., *Submission on Transpower (Input Methodologies) Draft Reasons Paper, Cost of Capital Decisions,* August 2010, p. 11.

[1078]   NZ Airports Association, *Submission on the Input Methodologies Discussion Paper*, 31 July 2009, p. 80; Auckland International Airport Limited, *Submission on the Input Methodologies Discussion Paper*, 7 August 2009, p. 75; Wellington International Airport Limited, *Submission to the Commerce Commission on Input Methodologies*, 7 August 2009, p.59; Christchurch International Airport Limited, S*ubmission on the Input Methodologies Discussion Paper*, 7 August 2009, p. 27; Christchurch International Airport Limited, *CIAL Submission on the Revised Draft Guidelines*, 3 August 2009, p. 4 ; NZ Airports Association, *Submission on the Input Methodologies Discussion Pape*r, Attachment: LECG, *Comments on Commerce Commission Input Methodologies Discussion Paper prepared for NZ Airports Association,* 31 July 2009, pp. 26-27; Unison Networks Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: Castalia Strategic Advisors, *Submission on Input Methodologies: Regulatory Cost of Capital: a report prepared for Unison Limited,* 13 August 2009, pp. 8-9; LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital*, Report on behalf of ENA, 11 August 2009, pp. 17-18; Maui Development Limited, *Submission on the Input Methodologies Discussion Paper*, July 2009, p. 19; Powerco Limited, *Submission on the Input Methodologies Discussion Paper*, 14 August 2009, pp. 29-30; Powerco Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: PricewaterhouseCoopers, *Commerce Commission's Revised Draft Guidelines and aspects of the Input Methodologies Discussion Paper relating to Cost of Capital prepared for Powerco Limited*, 14 August 2009, pp. 14-17; PricewaterhouseCooper, *Submission to the Commerce Commission on the Revised Draft Guidelines – The Commerce Commission's Approach to Estimating the Cost of Capital*, Report on behalf of 17 EDBs, 14 August 2009, pp. 9-10; Vector Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: *Synergies Economic Consulting, Initial Weighted Average Cost of Capital Review: prepared for Vector Limited*, 14 August 2009, pp. 35-43; Telecom, *Annex B: Submission on Commerce Commission Revised Draft Guidelines for estimating the Cost of Capital*, August 2009, Transpower, *Submission to the Commerce Commission on: Transpower Process and Recommendation Discussion paper, Input Methodologies Discussion Paper,* August 2009;, Annex B; Transpower, *Submission to the Commerce Commission on: Transpower Process and Recommendation Discussion paper Input Methodologies Discussion Paper*, August 2009, pp. 25-27; Unison, *Appendix: Submission on Revised Draft Guidelines: The Commerce Commission's Approach to Estimating the Cost of Capital*, 14 August 2009, Appendix, p. 7; Vector Limited, *Submission on Input Methodologies Discussion Paper*, 14 August 2009, p. 91;Commerce Commission, Cost of Capital Workshop Transcript, pp. 88-96;

Commission should be in the range of 7.5% to 8% based on the estimates they use. However, the majority of the submitters did not provide any information on the approach that their TAMRPs were based on.

H7.67   Officer and Bishop (for Transpower), using historical data estimated an MRP for New Zealand under normal conditions in the range of 6%-8%.[1079] However, Officer and Bishop considered that the MRP is not constant and properly cannot be adequately represented by a stable distribution.

H7.68   Officer and Bishop do not provide persuasive evidence that the long-term forward looking TAMRP is likely to be substantially above the long-term historical TAMRP.

Electricity Networks Association, *Cross submission on the cost of capital workshops,* 2 December 2009, pp. 11-12; Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital*, Report for NZAA, 2 December 2009, p. 41; PricewaterhouseCooper, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, Report for 17 EDBs, 2 December 2009, pp. 14-15; Telecom Limited, *Post-workshop Submission on the Cost of Capital*, Attachment: PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, 2 December 2009, p. 14; PricewaterhouseCooper, *Commerce Commission WACC Conference: Submission on Behalf of Powerco*, 2 December 2009, p. 13; Christchurch International Airport Ltd., *Submission on Input Methodologies and Information Disclosure Draft Determinations and Reasons Papers for Airport Services*, 12 July 2010, pp. 41-42; NZ Airports Association, *Submission on Draft Information Disclosure Determination and Draft Reasons Paper*, Attachment: Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper - Report for NZAA*, 12 July 2010, p. 31; Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010, pp. 42-45; Electricity Networks Association, *Cost of Capital Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determination and Reasons Paper*, 3 September 2010, p. 2; Electricity Networks Association, *Cost of Capital Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determination and Reasons Paper, Attachment: PricewaterhouseCoopers, Report: prepared for Electricity Networks Association*, 3 September 2010, pp. 10-13; Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: LECG, *Response to Commerce Commission's Draft Cost of Capital Input Methodology: a report prepared for the Electricity Networks Association*, 13 August 2010, p. 16; Electricity Networks Association, *Cost of Capital Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determination and Reasons Paper*, 3 September 2010, p. 2; Powerco Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, pp. 13-14; PricewaterhouseCoopers on behalf of 20 Electricity Distribution Businesses, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, pp. 15-16; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on Cost of Capital Material In the Commerce Commission's Draft Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13 August 2010, pp. 38-45; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, 13 August 2010, p. 35; Vector Limited, *Cross Submission on Cost of Capital (Input Methodologies) Draft Reasons Paper*, 3 September 2010, p. 3; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, pp. 24-30; Wellington Electricity Lines Limited, *Submission on EDBs and GPBs (Input Methodology) Draft Determination and Reasons Paper, Draft Cost of Capital Input Methodology Decision*, 13 August 2010, p. 11; KPMG, *Cross-Submission on GPBs (Input Methodology) Draft Reasons Paper, Cost of Capital*, 13 August 2010, p. 15.

[1079] Officer and Bishop based the New Zealand MRP of Australia data as they considered the Australian market to be comparable. See Transpower Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Officer R. and Bishop S., *Independent Review of Commerce Commission WACC proposals for Transpower*, 5 August 2010, pp. 14-15.

H7.69   In its submission on the EDB Draft Reasons Paper PwC (for ENA) and PwC (for
         Telecom) submits that some of the estimates were outdated[1080] and TAMRP
         estimates of the Siegel and Cornell type should be excluded on the grounds of being
         ad hoc and outdated respectively.[1081]

H7.70   Dr Lally noted that whilst PwC argue that Siegel type estimates should be excluded
         on the grounds of being ad hoc, PwC later argues that the estimated TAMRP should
         be adjusted for the GFC, which amounts to making an ad hoc adjustment. With
         respect to Cornell type estimates, Dr Lally observes these estimates should be
         updated not excluded. He notes that PwC has updated the US survey-based
         estimates but that in updating them PwC itself has not made use of the most up to
         date version of the surveys referenced. In addition, PwC has not updated the
         Ibbotson type estimates. Correcting for these items, Dr Lally concluded that the
         PwC submission does not support a current estimate for the expected TAMRP of
         8.0%.[1082]

H7.71   The New Zealand advisors using a 7.5% estimate of the expected TAMRP appear to
         rely on research on the New Zealand TAMRP undertaken by PwC. At the Cost of
         Capital Workshop, PwC confirmed that their TAMRP estimate of 7.5% was
         measured relative to 'short-term' government bonds with a term to maturity of one
         to three years and that the TAMRP estimate would be lower if assessed against long-
         term bonds.[1083] This implies PwC's TAMRP estimate of 7.5% would be lower if
         estimated against a five-year risk-free rate.

H7.72   The Commission understands that PwC's research in support of its 7.5% estimate of
         the TAMRP was last publicly updated in 2002,[1084] and therefore itself is somewhat
         dated. It relies solely on historical estimates of the New Zealand expected TAMRP
         (with no consideration of forward-looking estimates nor of data from overseas).

H7.73   If PwC were to update its own research on the New Zealand TAMRP, based on the
         performance of the New Zealand share market since the end of June 2002 (the stated
         end date of PwC's research) the Commission estimates that the resulting TAMRP
         estimate would be approximately 0.5% lower, i.e. if PwC's unrounded estimate
         versus short-term bonds in 2002 had been 7.5% then the updated unrounded estimate
         of a five-year risk-free rate would be approximately 7.0%. Such a result is in line
         with the Commission's TAMRP estimate of 7%.

[1080]   The Commission notes that PwC did update the survey evidence but did not update the Ibbotson estimates. The
         Commission provided the most recent Ibbotson estimates in the EDBs Draft Reasons Paper, Table 6.12, p. 276.

[1081]   Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity
         Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment:
         PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft
         Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks
         Association*, 13 August 2010, p. 42; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital
         (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*,
         Attachment: PricewaterhouseCoopers, *Submission on Cost of Capital Material In the Commerce Commission's Draft
         Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13
         August 2010, p. 41.

[1082]   Lally, M., *Comments on Input Methodologies (EDS) Draft Reasons Paper*, 3 September 2010, pp. 4-7.

[1083]   Commerce Commission, *Cost of Capital Workshop Transcript*, pp. 89 and 177-178.

[1084]   PricewaterhouseCoopers, *New Zealand Equity Market Risk Premium*, September 2002.

<u>Updating the TAMRP for 2010</u>

H7.74   Table H10 summarises what advisors indicated at the Cost of Capital Workshop was their current advice on the TAMRP to clients (November 2009).

Table H10   Summary of Workshop Advisors Current TAMRP Advice to Client

Organisation	TAMRP Recommendation
KPMG	7.75%
Ireland, Wallace and Associates (Mr Ireland)	7.5%
Uniservices (Dr. Marsden)	7.5%
LECG (Prof Van Zijl)	7.5%
PwC NZ (Mr Redmayne)	7.5%
PwC Aus (Mr Balchin)	7.5%
NZIER (Dr Layton)	7%
Synergies Economic Consultancy (Professor Bowman)	9%

H7.75   The Commission does not consider this informal survey to be the best indicator of the estimated TAMRP in New Zealand. In particular, the sample at the Cost of Capital Workshop was very small, it was not randomly selected – most of the responses were selected by regulated suppliers, and it is not representative of the range of views on the prevailing estimated TAMRP in New Zealand. For example, the informal survey excludes all of the major investment banks in New Zealand, yet they are major and significant players in actually raising debt and equity finance for many firms. The Commission notes the New Zealand investment banks have current TAMRP estimates ranging between 6.5% and 7.25% as shown in Table H11 below.

Table H11   Summary of TAMRP estimate used by New Zealand Investment Banks

Investment Bank	TAMRP estimate used
Deutsche Bank / Craigs Investment Partners	6.5% (plus separate recognition for imputation credits)
Goldman Sachs	6.8%
Forsyth Barr	7%
UBS	7%
Macquarie Bank	7%
First NZ Capital	7.25% (uplifted from a normal 7% after the GFC)

H7.76   The Commission has updated the analysis undertaken in the Gas Authorisation where possible, in particular it has updated the Ibbotson estimate and survey

evidence reported in Table H9 (e.g. 2010 Ibbotson estimates from Dimson, Marsh and Staunton and new survey evidence from the US).[1085]

H7.77   The Commission estimated that the New Zealand five-year long-run average risk-free rate is 0.03% higher than the New Zealand 10 year average risk-free rate using data covering the period 1985 – 2010 (five-year estimate of 8.64% and 10 year estimate of 8.61% respectively). Using data from 1931 to 2010, PwC (for ENA and for Telecom) estimated that the five-year risk-free rate was lower than the 10 year risk-free rate with an adjustment required of 0.04%.[1086] This continues to suggest that Ibbotson and Siegel-type estimates of the TAMRP for New Zealand would be very similar assuming a five year or 10 year term for the risk-free rate.

H7.78   The difference between the average five-year and 10 year risk-free rate approximated using US government bonds covering the period 1962 – 2010 is 0.25% (6.62% and 6.87% respectively). This results in the five-year risk-free rate being lower than the 10 year risk-free rate by 0.25%. PwC estimated this adjustment to be 0.08%.[1087] This suggests that Ibbotson and Siegel-type estimates of the TAMRP for the US would be higher.

H7.79   Table H12 below indicates that from the New Zealand evidence, the mean TAMRP (rounded to the nearest 0.5%) is 7.0%, and if all the eleven estimates are used (i.e. the TAMRP from New Zealand, the US and other), the mean is 7.0%.

[1085]   The analysis has included survey data from the US, submitted by PwC (Electricity Networks Association, *Cost of Capital Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determination and Reasons Paper*, Attachment: PricewaterhouseCoopers, *Report: prepared for Electricity Networks Association*, 3 September 2010, pp. 10-13) and corrected as per the advice from Dr Lally (Lally, M., Comments on Input Methodologies (EDS) Draft Reasons Paper, 3 September 2010). PwC submitted that the survey result from Graham and Harvey was based on a geometric average therefore the MRP estimate has been adjusted to reflect a result based on an arithmetic average.

[1086]   Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010, pp. 41-42; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on Cost of Capital Material In the Commerce Commission's Draft Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13 August 2010, pp. 40-41.

[1087]   Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010, pp. 41-42.

Table H12   Estimates of the TAMRP - Assuming a 5-year term (where possible) of the risk-free rate for 2010

Methodology	NZ	US	Other	All
Ibbotson1088 *	7.27%	7.67%	7.50%	
Siegel *	6.40%	7.30%	6.60%	
Cornell	5.20%	6.80%		
Survey	8.20%	6.90%		
Median	6.84%	7.10%	7.05%	7.09%
Mean	6.77%	7.17%	7.05%	6.98%

* The Ibbotson estimate for "Other" and Siegel estimates in this table are for a 10-year risk-free rate term not a 5-year term. It is not possible to adjust the Ibbotson estimate for "Other" due to the lack of a suitable proxy. It is not possible to adjust the results from the Siegel method due to the lack of a term structure for inflation-proof bonds.

H7.80   As a reasonableness check on the results from Table H12, the Commission evaluated the change to the mean TAMRP by adjusting the Ibbotson result for the difference between the five-year and 10 years risk-free rates as estimated by PwC (for ENA) and PwC (for Telecom). This resulted in an average TAMRP of 6.98%.[1089]

Overseas regulators current estimates of the MRP

H7.81   The table below shows MRP estimates adopted by overseas regulators. The MRP used by overseas regulators is not directly comparable to the TAMRP used in the New Zealand context. MRP is used in the classical CAPM whereas the simplified Brennan-Lally CAPM requires the tax adjusted version of MRP, i.e. the TAMRP. The table below therefore also shows the conversion of the overseas MRP estimates to their corresponding TAMRP equivalents.

[1088]   Estimated using data from Dimson, E., P. Marsh and M. Staunton, 2010, Global Investment Returns Yearbook 2010, Credit Suisse and London Business School. Dimson, Marsh and Staunton estimated the MRP for New Zealand. The MRP is related to the TAMRP by using the formula $MRP = TAMRP - R_f(T)$, where R_f is the risk free rate of return and T is the investor tax rate (30%). Where the MRP is the Dimson et al estimate for the US MRP of 6.0% the adjustment to this estimate to reflect a five-year MRP is 0.24%, using the Commission's estimate. The average five-year risk-free rate for July 2010 (from Bloomberg) is 4.76% and the associated tax rate is 30%.

Conversion of US Ibbotson estimate to five-years

Raw US MRP	6.0%
Adjustment for difference between US five-years and 10 year risk-free rate	0.24%
NZ Investor Tax Rate	30%
NZ five-year risk-free rate	4.76%
TAMRP	7.67%

[1089]   The Ibbotson equivalent TAMRP estimate for the US is derived using the MRP from Dimson et al estimate for the US MRP of 6.0% the PwC adjustment to this estimate to reflect a five-year MRP is 0.08%. The average five-year risk-free rate for July 2010 (from Bloomberg) is 4.76% and the associated tax rate is 30%.

Table H13   MRP (and TAMRP equivalent) for Regulators in the UK and Australia

Regulator	MRP	TAMRP equivalent
Ofgem	4-5%	5.8-6.8%
Competition Commission/CAA	2.5-4.5%: Heathrow/Gatwick Airport 3-5%: Stansted Airport	4.3-6.8% (Full range)
Ofcom	4-5%, 5% used	6.8%
Ofwat	5.4%	7.2%
Australian Energy Regulator (AER)	6.5%	6.9%
ACCC (Rail) and QCA	6%	6.4%
IPART (NSW)	5.5-6.5% (Preliminary view)	5.9-6.9%

H7.82   The table above illustrates that a TAMRP estimate of 7%, as adopted in previous decisions by the Commerce Commission, is higher than those adopted by most overseas regulators.

Conclusion - the long-term TAMRP estimate

H7.83   The Commission considers that Dr Lally's estimate of 7% for the expected TAMRP derived in the context of the Gas Authorisation in 2008 was robust. This estimate is consistent with the range of TAMRP estimates used by New Zealand market participants. This estimate is higher than those adopted by most overseas regulators. The Expert Panel also considered that a TAMRP estimate of 7% was reasonable in the New Zealand context.

H7.84   In deriving and updating the 2008 estimate the Commission considers there is no evidence to support changing the TAMRP estimate of 7%.

H7.85   For these reasons, the IM specifies a TAMRP relative to five-year risk-free rate of 7%. However, the Commission does acknowledge the possibility of the recent GFC having, at least temporarily, increased the TAMRP. This issue is discussed in detail below.

Commission's reasons - the TAMRP estimate and the recent GFC

Views of submitters – Impact of the GFC

H7.86   In submissions, parties argued for an increase in the TAMRP due to the GFC. A number of submitters on the RDG and IM Discussion Paper contended that due to the GFC the TAMRP proposed by the Commission was too low, and it should be in the range of 7.5% to 8%.[1090] As support for this increase, submitters referenced the

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[1090]   NZ Airports, *Submission by NZ Airports Association on the Commerce Commission Input Methodologies Discussion Paper*, 31 July 2009, p. 80; Auckland Airport, *Submission to the Commerce Commission on Input Methodologies Discussion Paper*, 7 August 2009, p. 75; Wellington International Airport Limited, *Submission to the Commerce Commission on Input Methodologies*, 7 August 2009, p. 59; Christchurch International Airport Limited, *Submission on Commerce Commission Input Methodologies Discussion Paper, 7 August 2009*, p. 27; LECG, *Comments on the*

AER's increase in the MRP estimate from 6% to 6.5% as a consequence of the GFC.[1091]

H7.87   At the Cost of Capital Workshop there was general agreement between the experts that, both from a theoretical and a practical point of view, the TAMRP had probably risen due to the GFC, and there was a reasonable consensus that over time it would revert to its long-term historical average. There was no consensus on how long the period of time to revert to historical averages would be. However, several parties indicated that the Commission should not be too premature and assume that markets have returned to their long-term historical averages too quickly.[1092]

H7.88   However, when asked at the Cost of Capital Workshop if the practitioners had changed their estimate of the TAMRP due to the GFC, only KPMG indicated that it had made an explicit adjustment (of 0.25%) to the underlying rate that it had previously used when advising clients.

H7.89   Table H14 summarises what advisors indicated at the Cost of Capital Workshop was their current advice on the TAMRP to clients and whether the advice included an adjustment to reflect the GFC.

Commerce Commission's proposed approach to estimating the cost of capital, Report prepared for the NZAA, 31 July 2009, pp. 26-27; Unison Networks Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: Castalia Strategic Advisors, *Submission on Input Methodologies: Regulatory Cost of Capital: a report prepared for Unison Limited, 13 August 2009*, pp. 8-9; Electricity Networks Association, Comments on the Commerce Commission's proposed approach to estimating the cost of capital, 11 August 2009, pp. 17-18; Maui Development Limited, Submission on the Input Methodologies Discussion Paper, July 2009, p. 19; Powerco Limited, *Input Methodologies Discussion Paper*, 14 August 2009, pp. 29-30; PricewaterhouseCooper, *Revised Draft Guidelines - Submission to Commerce Commission, Report on behalf of Powerco*, August 2009, pp. 14-17; PricewaterhouseCooper, *Submission to the Commerce Commission on the Revised Draft Guidelines – The Commerce Commission's Approach to Estimating the Cost of Capital*, Report on behalf of 17 EDBs, 14 August 2009 , pp. 9-10; Vector Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: Synergies Economic Consulting, *Initial Weighted Average Cost of Capital Review: prepared for Vector Limited*, 13 August 2009, pp. 35-43; Telecom, *Annex B: Submission on Commerce Commission Revised Draft Guidelines for estimating the Cost of Capital*, August 2009, Annex B; Transpower, *Submission to the Commerce Commission on: Transpower Process and Recommendation Discussion paper Input Methodologies Discussion Paper*, August 2009, pp. 25-27; Unison, *Appendix: Submission on Revised Draft Guidelines: The Commerce Commission's Approach to Estimating the Cost of Capital*, 14 August 2009, p. 7; Vector, *Submission to Commerce Commission on Input Methodologies Discussion Paper*, 14 August 2009, p. 91; Wellington Electricity, *Submission to the Commerce Commission on its Input methodologies Discussion Paper*, 14 August 2009, p. 27.

[1091] Using a risk-free rate of 6% (based on the 10 year New Zealand government bond rate averaged over January 2010) and an investor tax rate of 30%, these values convert to a TAMRP of 6.4% and 6.9%. For the conversion process of the Australian based MRP estimates see Lally, M., *International Comparison of Regulatory Cost of Capital for Gas Distribution Businesses*, Report to the New Zealand Commerce Commission, 28 October 2008, p. 12.

[1092] Commerce Commission, *Cost of Capital Workshop Transcript*, pp. 88-96.

Commerce Commission

Table H14 Summary of Advisors Current TAMRP Advice to Client

Organisation	TAMRP Recommendation	Was TAMRP adjusted due to the GFC?
KPMG	7.75%	Yes (from 7.5%)
Ireland, Wallace and Associates (Mr Ireland)	7.5%	No
Uniservices (Dr. Marsden)	7.5%	No
LECG (Prof Van Zijl)	7.5%	No
PwC NZ (Mr Redmayne)	7.5%	No
PwC Aus (Mr Balchin)	7.5%	No change in Australia
NZIER (Dr Layton)	7%	No
Synergies Economic Consultancy (Professor Bowman)	9%	No consideration given to the issue

H7.90 In post-workshop submissions, suppliers suggested that due to the GFC there was persuasive evidence for a higher TAMRP.[1093] These recommendations are displayed in Table H15.

Table H15 Recommendations to the Commission on the TAMRP due to the GFC

Organisation	TAMRP Recommendation
AECT	9% (the Commission should increase the TAMRP to 7.5%, then add an increase above this for the GFC)
MDL	7.75%
Synergies Economic Consulting (for Vector)	9%
Unison	8.2%
Vector	9% (at least 1.5% increase above 7.5%)

H7.91 The Commission notes that many submitters have continued to urge the Commission to maintain the 0.5% uplift in the TAMRP for the GFC but only KPMG has actually altered its TAMRP estimate because of the GFC.[1094]

[1093] Auckland Energy Consumer Trust, *Cross Submission to the Commerce Commission on Cost of Capital Workshop*, 2 December 2009, p. 26; Maui Development Limited, *Cost of Capital Workshop 12th-13th November 2009 – Cross-Submission by Maui Development Limited*, 2 December 2009, p. 22; Vector, *Cross Submission to the Commerce Commission on the Weighted Average Cost of Capital Workshop*, 2 December 2009, p. 4 and pp. 11-12; Synergies Economic Consulting for Vector, *Cost of Capital Cross Submission*, 2 December 2009, pp. 15-16; Unison, *Post Workshop Submission: Weighted Average Cost of Capital*, 2 December 2009, p. 12.

[1094] Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010, p. 46; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on Cost of Capital Material In the Commerce Commission's Draft Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13

H7.92   In a submission on the Transpower Draft Reasons Paper, Officer and Bishop (for
         Transpower) using evidence on Australian and New Zealand stock market return
         volatility and implied MRP from Australian forward markets contracts considered
         that the TAMRP should be increased by 2%.[1095]

H7.93   The Commission considers that Officer and Bishop's measure provides some
         evidence that the prevailing short-term Australian MRP may be above its long-term
         historical level. However, it does not follow that the New Zealand TAMRP over the
         full five-year regulatory period is above its long-term historical level. Officer and
         Bishop also submitted their approach to the AER which did not accept the
         approach.[1096]

Expert Panel's view - Impact of the GFC

H7.94   Consultation with the Expert Panel on the TAMRP was completed prior to the full
         impact of the GFC being realised and this was highlighted in a statement by Dr Lally
         at the Cost of Capital workshop.[1097]

H7.95   Given the significance of the matter, following the Cost of Capital workshop the
         Commission requested the Expert Panel to review the 7% estimate of the TAMRP
         outlined in the RDG and IM Discussion Paper in light of the GFC.

H7.96   The Expert Panel prepared a report for the Commission addressing this issue.[1098] In
         its report, the Expert Panel assessed whether an increase in the previously
         recommended estimate of the TAMRP of 7% was required, and carefully examined
         the issue of the backward-looking versus forward-looking estimation technique in
         light of the GFC.

August 2010, p. 45; Electricity Networks Association, Cost of Capital Cross Submission on EDBs and GPBs (Input Methodologies) Draft Determination and Reasons Paper, 3 September 2010, p. 2; KPMG, Cross-Submission on GPBs (Input Methodology) Draft Reasons Paper, Cost of Capital, 13 August 2010, pp.15-17; PricewaterhouseCoopers on behalf of 20 Electricity Distribution Businesses, Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers, 13 August 2010, pp. 15-16; Wellington Electricity Lines Limited, Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers, 13 August 2010, p. 11; Vector Ltd., Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital, 13 August 2010, p. 27; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, pp.24-30; Marlborough Lines, Submission on EDBs (Input Methodology) Draft Determination and Reasons Paper, Draft Reasons Paper and Associated Draft Determination - Cost of Capital, 13 August 2010, p. 4; Transpower New Zealand Ltd., Submission on Transpower (Input Methodologies) Draft Reasons Paper, Cost of Capital Decisions, August 2010, p. 11; Transpower New Zealand Ltd., Submission on Transpower (Input Methodologies) Draft Reasons Paper and Individual Price-Quality Path, Attachment: R. R. Officer & S. Bishop - Independent Review of Commerce Commission's WACC Proposals for Transpower, 5 August 2010, pp. 14-22.

[1095]   Officer and Bishop based the New Zealand MRP on Australian data as they considered the Australian market to be comparable. See Transpower Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Officer R. and Bishop S., *Independent Review of Commerce Commission WACC proposals for Transpower*, 5 August 2010, pp. 14-22.

[1096]   AER, *Final decision: Electricity transmission and distribution network service providers – Review of the weighted average coat of capital (WACC) parameters*, May 2009, pp. 233-234.

[1097]   Commerce Commission, *Cost of Capital Workshop Transcript*, p. 95.

[1098]   Franks, J., Lally, M., Myers, S., *Recommendation to the New Zealand Commerce Commission on whether or not it should change its previous estimate of the tax-adjusted market risk premium as a result of the recent global financial crisis,* 14 April 2010.

H7.97   The Expert Panel agreed that historical (backwards-looking) estimation techniques do not pick up short-term shocks very quickly, and to the extent that they do recognise them, they will initially, i.e. until a longer term of data affected by the GFC is available, (wrongly) result in lower estimates of the market risk premium as a result of the GFC.[1099] They also agreed that forward-looking models are problematic to apply.

H7.98   The Expert Panel agreed that, as a result of the recent GFC, the market risk premium and therefore the TAMRP was likely to have increased at least temporarily, due to increased levels of financial market volatility and investors' perception of the world as a much riskier place. However, the Expert Panel was unsure as to how long these increased levels of the market risk premium would persist.

H7.99   Professor Franks noted that, after a period of rapid revaluation of asset prices in late 1987 (also referred to as 'Black Monday'), financial market volatility decreased rapidly, within around 13 weeks, after the event. However, in more recent years, he considered that financial market volatility has tended to persist over longer periods of time.

H7.100   Professor Myers commented that since the height of the recent GFC approximately one year previous (at the time of his advice), financial market volatility has decreased markedly and asset prices had recovered. However, Professor Myers considered that investors still faced substantial macro economic uncertainties. Professor Myers considered that the MRP remained above its long-term historical average.

H7.101   Professor Myers recommended that the Commission set a range for the MRP. He considered that the bottom of the range for the MRP should be 5%, and the top of the range should be a long-term historical arithmetic average MRP over long-term government returns, (which Dr Lally later estimated represented a MRP of 5.7%)[1100]. The Commission should then use the top of the range for the TAMRP until the world economy returns to normalcy and stable growth. Based on Lally's estimate of the upper bound, the recommendation of Professor Myers yielded a proposed MRP of between 5% and 5.7%, which implied a range for the TAMRP of 6.8% to 7.5%.

H7.102   Professor Franks recommended that the Commission consider an increase of 0.5% to 1% to the TAMRP estimate, but suggested it should take the form of a temporary surcharge. Professor Franks did not provide a timeframe for the temporary increase.

H7.103   In responding to Professor Franks' recommendation to increase the TAMRP temporarily, Dr Lally indicated that updating the TAMRP estimate to reflect temporary changes in market volatility would require a robust estimation technique to determine both the magnitude of the change to the TAMRP and the speed of reversion back to the earlier level. Dr Lally mentioned that quantitative models (for

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[1099]   The historical methods rely on the assumption that the outturns observed regarding achieved returns will be a reliable indication of investors' expected (required) returns only when periods of above expected performance are cancelled out by periods of below expected performance.

[1100]   Franks, J., Lally, M., Myers, S., *Recommendation to the New Zealand Commerce Commission on whether or not it should change its previous estimate of the tax-adjusted market risk premium as a result of the recent global financial crisis,* 14 April 2010, p. 6.

example as proposed by Merton)[1101] could potentially be used for this purpose. However, there would be serious questions around the reliability of any such model and its parameter values.

H7.104 The alternative was to use judgement, but Dr Lally was wary about doing so because of the inevitable lack of transparency in such a process. Dr Lally also thought that desisting from making such temporary adjustments to the TAMRP, in view of the problems noted here, would not necessarily prevent regulated suppliers from earning their cost of capital over the life of their investments. This is because periods in which the TAMRP estimate was temporarily understated (through not temporarily raising the estimate) would tend to be offset by periods in which the TAMRP was temporarily overstated (through not temporarily lowering the estimate). On this basis, Dr Lally did not favour a change in the TAMRP estimate as a result of the GFC.

Overseas regulators and the GFC

H7.105 In the UK and Australia, regulators have had to consider the impact that the GFC will have on the cost of capital. In each of these decisions some consideration has been given as to whether or not the MRP should be adjusted in light of the effect of the GFC. A table summarising the MRP outcomes in recent decisions taking into account the GFC is provided below.

Table H16   MRP for Regulators in the UK and Australia

Regulator	MRP: Previous Views (Pre GFC)	MRP: Recent Views (Post GFC)	TAMRP equivalent (Post GFC)
Ofgem[1102]	4-5%	No range quoted, but figure appears the same	5.8-6.8%
Competition Commission/CAA	2.5-4.5% Heathrow/Gatwick Airport1103	3-5% Stansted Airport1104	4.8-6.8%
Ofcom[1105]	4-5%, 4.5% used	4-5%, 5% used	6.8%
Ofwat[1106]	4-5%	5.4%	7.2%
AER[1107]	6%	6.5%	6.9%
ACCC (Rail) and	6%	6%	6.4%

[1101]   This refers to: Merton, R., On Estimating the Expected return on the Market. An Exploratory Investigation, *Journal of Financial Economics*, Vol. 8, 1980, pp. 323-361.

[1102]   Ofgem, *Electricity Price Control Review Final Proposal*, 7 December 2009, pp. 52-53.

[1103]   BAA Ltd, *A report on the economic regulation of the London airport companies (Heathrow Airport Ltd and Gatwick Airport Ltd)*, 28 September 2007, Appendix F, p. F29.

[1104]   CAA, *Airport Regulation Economic Regulation of Stansted Airport 2009-2014 – CAA Decision*, March 2009, p. 62; Competition Commission, Review of Stansted Airport Q5 price control, October 2008, Appendix L, p. L24.

[1105]   Ofcom, *Ofcom's approach to risk in the assessment of the cost of capital*, August 2005, p. 36; Ofcom, *A New Pricing Framework for Openreach – Annexes*, 22 May 2009, pp. 161-162.

[1106]   Ofwat, *Future Water and Sewerage Charges 2010-2015 – Final Determination*, April 2009, pp. 128-129.

[1107]   AER, *Final decision: Electricity transmission and distribution network service providers – Review of the weighted average coat of capital (WACC) parameters*, May 2009, pp. 46-47.

Regulator	MRP: Previous Views (Pre GFC)	MRP: Recent Views (Post GFC)	TAMRP equivalent (Post GFC)
QCA[1108]			
IPART (NSW)1109	5.5-6.5%	6% (Preliminary view)	5.9-6.9%

H7.106 The regulators in Australia and the UK appear to have outlined different justifications for the approaches they have taken to account for the GFC. For example:

- Ofgem (December 2009) noted that there had been a strong recovery in equity prices since the low point of April 2009 and that many commentators and the Bank of England had indicated that the cost of equity had returned to normal levels in recent months. On that basis Ofgem maintained that there was no reason to believe that there had been a fundamental departure from the long-term trend in the MRP generally estimated to be between 3-5%;[1110]

- Ofcom (May 2009), reviewed evidence from market commentators and the Bank of England. It suggested that the prolonged downturn in equity markets and higher levels of volatility suggested the MRP had increased in recent years. It maintained that setting an MRP too low (which could lead to discretionary investment being discouraged) was worse than the downside of setting an MRP too high, and therefore favoured setting an MRP at the upper end of the 4-5% range. It subsequently chose a point estimate of 5% as a response to the increased market volatility and turbulence. This was above its 2005 point estimate of 4.5%;[1111]

- Ofwat (April 2009) used a figure of 5.4%, which was at the high end of the Dimson, Marsh and Staunton series data for the long-term MRP and above its previous range of 4-5%. It outlined that this reflected its view that it should assume a high equity risk premium given the economic conditions within which the cost of capital was set. It acknowledged, however, that recent analysis suggested that the future long-run risk premium would be less than the historical average which had been used;[1112]

[1108] ACCC, *Australian Rail Track Corporation Limited – Hunter Valley Coal Network Access Undertaking – Draft Decision*, 5 March 2010, pp. 565-570; QCA, *Draft Decision – QR Network 2009 Draft Access Undertaking*, December 2009, pp. 13-15.

[1109] IPART, *IPART's Cost of Capital after the AER's WACC Review – Lessons from the GFC*, November 2009, p. 39-40; IPART, *Final Decision: New South Wales Rail Access Undertaking – Review of rate of return and remaining mine life from 1 July 2009*, August 2009, p. 7.

[1110] Ofgem, *Electricity Price Control Review Final Proposal*, 7 December 2009, pp. 52-53.

[1111] Ofcom, *A New Pricing Framework for Openreach – Annexes*, 22 May 2009, pp. 161-162.

[1112] Ofwat, *Future Water and Sewerage Charges 2010-2015 – Final Determination*, April 2009, pp. 128-129.

- The AER (May 2009) increased its MRP figure from 6% to 6.5% on the basis that relatively stable market conditions did not presently exist, and there was uncertainty surrounding the GFC;[1113]

- AER (October 2010) noted that they maintain the view that the long run historic MRP is 6%, and that this should be adopted as market conditions return to those seen pre GFC. The AER considered that a MRP of 6.5% may be considered conservative when accounting for improved financial conditions since the onset of the GFC, however, recovery in the global economy and conditions in global capital markets remained fragile.[1114]

- ACCC (March 2010) notes that it and AER increased their MRP estimate to 6.5% in late April 2009 based upon capital market and global economic conditions at the time. However, the ACCC considered that economic and capital market conditions had significantly improved since that time and the arguments that the MRP used by investors' remains above 6% are extremely weak. An important feature of the decision was that the ACCC drew a distinction between its position and the previous AER WACC position of having an MRP of 6.5%.[1115]

- IPART (August 2009) applied an MRP estimate of 6% in its determination of the rate of return applicable to the Hunter Valley Coal Network in 2009;[1116]

- IPART (November 2009) outlined that even though current market conditions indicated that the MRP may be higher than the MRP based on a long-term time series, this did not necessarily suggest that this would be the case in the near future. In particular, it noted that given the medium term pricing decision made by the regulator, it needed to ensure that the MRP was representative of the MRP during the regulatory period. IPART's preliminary view was that the MRP range should not be changed. It noted that as financial markets were quite volatile in the short-term, reliance on forward-looking estimates could lead to significant variance in MRP estimates between cost of capital decisions and would not provide for regulatory certainty;[1117]

- Queensland Competition Authority (QCA) (December 2009) in its draft decision for Queensland Rail Network also applied an MRP of 6%. The QCA did not propose to adopt the AER's change in MRP estimate because it considered that 6% was a reasonable estimate. It argued that any adjustment made for short-term fluctuations in market conditions was inherently subjective, in terms of both the scale of the adjustment that was required and the period of the adjustment over which the adjustment was made. The QCA

[1113] AER, *Final decision: Electricity transmission and distribution network service providers – Review of the weighted average coat of capital (WACC) parameters*, May 2009, pp. 46-47.

[1114] AER, *Final decision Victorian electricity distribution network service providers Distribution determination 2011-2015*, October 2010, pp. 484 & 489

[1115] ACCC, *Australian Rail Track Corporation Limited – Hunter Valley Coal Network Access Undertaking – Draft Decision*, 5 March 2010, pp. 565-570.

[1116] IPART, *Final Decision: New South Wales Rail Access Undertaking – Review of rate of return and remaining mine life from 1 July 2009*, August 2009, p. 7.

[1117] IPART, *IPART's Cost of Capital after the AER's WACC Review – Lessons from the GFC*, November 2009, pp. 39-40.

also highlighted that if it were to increase the MRP now it would be inconsistent as the QCA had not lowered the MRP estimate in previous decisions when less volatile market conditions were evident and some stakeholders had sought reductions in the MRP.[1118]

H7.107 Table H16 shows that some regulators increased their MRP estimates as a result of the GFC. However, the Commission notes that when calculating the equivalent TAMRP corresponding to the post GFC MRPs set by overseas regulators, in all but one instance these estimates would still have been below the 7% estimate suggested by the Commission as being appropriate in the RDG and the IM Discussion Paper. Further, in the more recent decisions or draft decisions by these regulators, (i.e. the decisions made by Ofgem, IPART, QCA and the ACCC since August 2009), the MRP has not been adjusted upwards to account for the GFC.

H7.108 Despite the increase in the estimated MRP to take into account the GFC by regulators, it appears that the overall cost of capital in a number of the examples outlined above, has either remained unchanged or decreased between regulatory decision points. This has been due to reductions in other parameters, such as the estimated risk-free rate, and in the case of the AER, the estimated equity beta.

H7.109 Finally, the Commission notes that the matters leading Ofcom to adopt the upper bound of the MRP range, have typically been considered by the Commission when assessing what percentile it should use for the overall cost of capital, rather than for assessing the TAMRP in isolation.

Options for the Commission in dealing with the TAMRP for the GFC

H7.110 In light of submissions, the Expert Panel advice and the approach taken by other regulators in response to the GFC, the Commission considers that there are two options open to it:

- keep the TAMRP at 7.0%, which was the recommendation of Dr. Lally;

- raise the TAMRP temporarily to (i.e. for a fixed duration), as was suggested by both Professors Myers and Franks.

H7.111 The Commission considers that a temporary adjustment to 7.5% is appropriate.

H7.112 The Commission considers that despite the GFC there are strong arguments for maintaining a long-term TAMRP estimate at 7% (evidence in Table H14 post GFC). That is, while other regulators may have increased the MRP in response to the GFC, the higher MRP they have set corresponds to a TAMRP measure that is generally below the 7%. Further, the more recent regulatory decisions have not increased the MRP to take into account the GFC. Ofgem noted in its December 2009 decision that many commentators and the Bank of England had indicated that the cost of equity had returned to normal levels in recent months after the share market lows of April 2009.

H7.113 The Commission considers, however, that there are good arguments for temporarily increasing the TAMRP to 7.5% in response to the GFC. Whilst there was no

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[1118]   QCA, *Draft Decision – QR Network 2009 Draft Access Undertaking*, December 2009, pp. 13-15.

unanimous agreement by the Expert Panel on how to deal with the GFC, there was agreement that the TAMRP was likely to have increased, at least temporarily, due to the increased levels of financial market volatility and investors' perception of the world as much riskier for investors.

H7.114   The Commission also recognises that crises eventually pass but the timing of the return to normalcy is uncertain. The Commission is conscious that when estimating the TAMRP for a regulatory period, the Commission needs to reflect its best estimate of the average conditions over the complete disclosure/regulatory period.

H7.115   Taking into account the original shock and the subsequent partial recovery of the markets, in the context of the regulatory period over which the Commission's decision will apply, the Commission is of the view that it is appropriate to temporarily increase the TAMRP before reverting to its long-term TAMRP estimate of 7%. Specifying in advance the quantum and period of the temporary increase provides regulatory certainty.

H7.116   In assessing the appropriate time period for the adjustment in the TAMRP, the Commission has examined the behaviour of the S&P 500 equity index of US stocks from a point in time prior to the significant events that occurred in the debt capital and equity capital markets until the time of making final decisions (i.e. January 2007 until October 2010). The behaviour of the S&P 500 equity index during this period is shown in the Figure H7 below.

Figure H7   Value of the S & P 500 January 2007 to October 2010

Source: Yahoo Finance http://finance.yahoo.com/
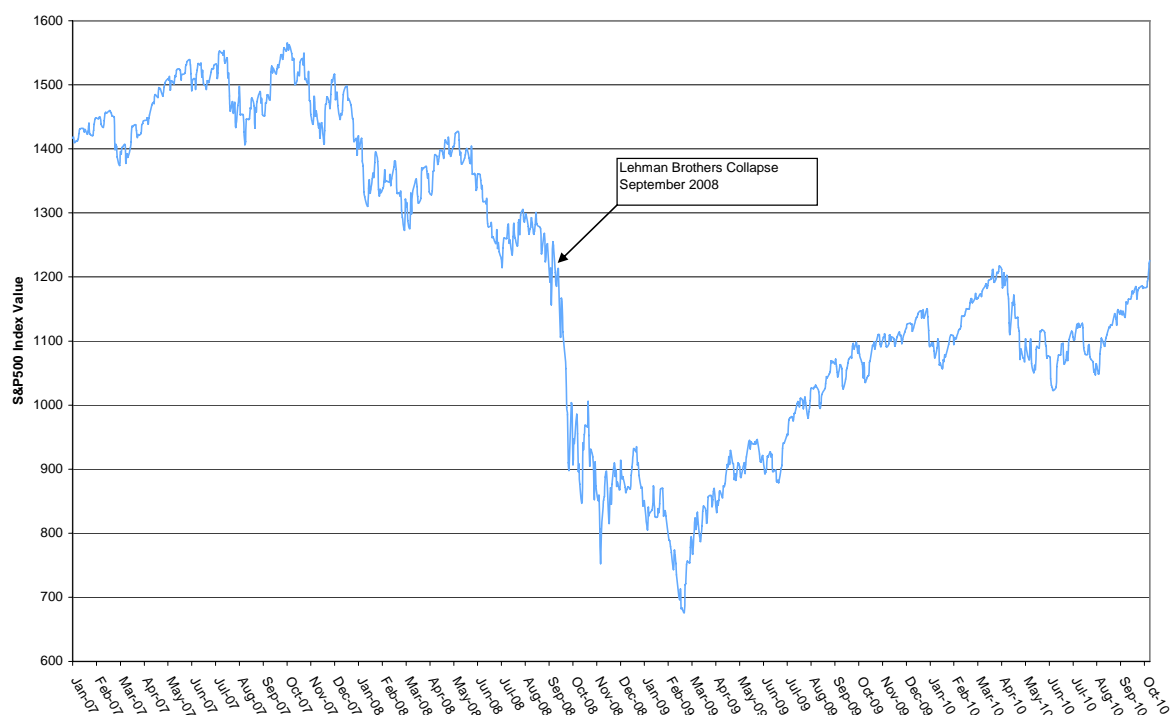
H7.117   Whilst the events in the debt capital markets commencing in July 2007 and the events surrounding Bear Stern in March 2008 had some (relatively short lived) effect

on the equity capital markets, it is the events surrounding Lehman Brothers in September 2008 (leading to Lehman Brothers filing for bankruptcy on 15 September 2008) which triggered the massive fall in the equity capital markets.

H7.118   From the low point reached in March 2009, the S&P 500 equity index has since recovered almost to the level now that it was at immediately prior to Lehman Brothers filing for bankruptcy. In light of the above events, the Commission considers the GFC effect on the equity markets essentially began on the date when Lehman Brothers filed for bankruptcy. The Commission also notes that the market has recovered quickly from other subsequent shocks such as the default by Greece, with no apparent lasting effect.

H7.119   The Commission also notes that from its high point reached in late 2008, the volatility implied by the VIX has quickly reverted to its long-term trading range, as displayed in Figure H8.[1119]

Figure H8   Volatility of the S&P500 index (VIX)

Source: Yahoo Finance http://finance.yahoo.com/
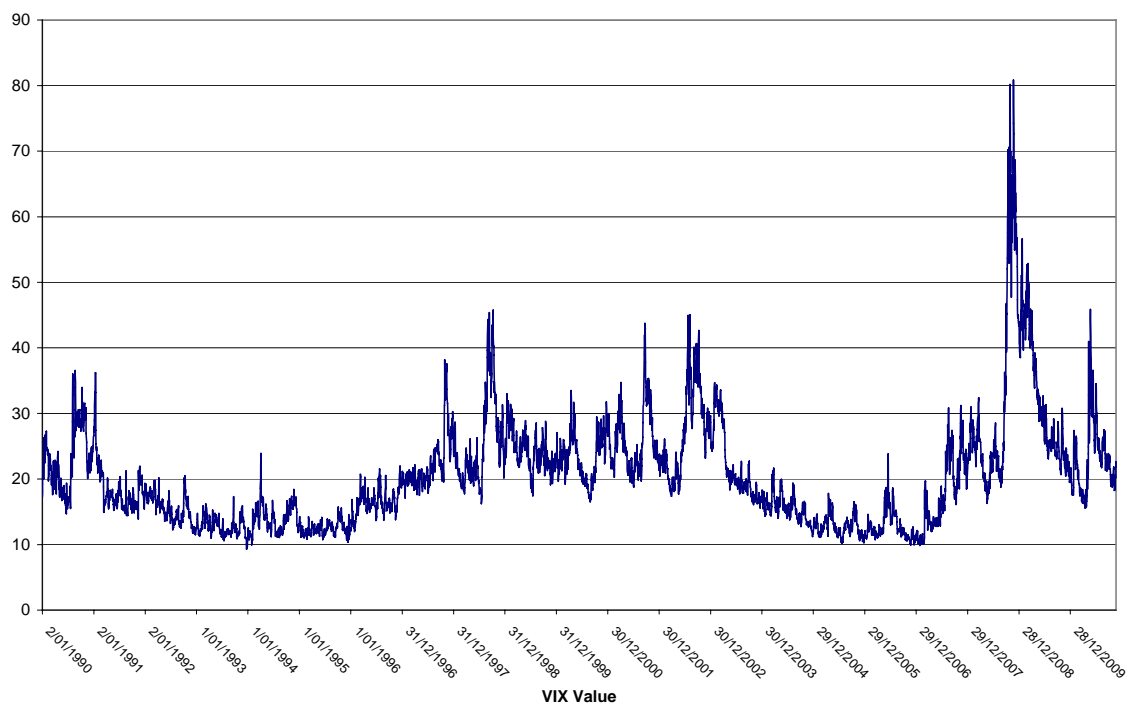
H7.120   The Commission considers that, although the equity index has substantially recovered and volatility has reverted to its long-term trading range, it is prudent to be cautious in assessing whether the effects of the GFC, in so far as they might affect the TAMRP, are now behind us. Therefore, consistent with the Commission erring on the side of caution, the Commission considers that it is prudent to maintain the adjustment in the TAMRP until June 2011. This cannot be interpreted to imply that the Commission is stating that the effects of the GFC will be over at a particular

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[1119]   VIX is the ticker symbol for the Chicago Board Options Exchange's Volatility Index. The VIX is a key measure of market expectations of near-term volatility conveyed by S&P 500 stock index option prices. Higher levels of the VIX indicate greater expected market volatility, while lower VIX levels indicate a more benign outlook.

point in time. The Commission accepts that the effects of the GFC in terms of slow economic growth will likely last beyond June 2011, but with respect to the TAMRP the relevant issue is the GFC's effect on the size of the premium investors seek for holding risky assets. On this, the Commission considers there is good evidence that the increase in the TAMRP from the GFC was temporary and is reverting to its long-term level (that is, around 7%). In particular, the Commission notes:

- the New Zealand share market and global share markets have stabilised and are at levels well above their GFC-induced lows;

- the VIX, a key short-term indicator of investor risk aversion, has fallen significantly and is back to around its long-term trend levels;

- some regulators who increased their MRP estimates after the GFC have ceased adding the increase to their long-run estimates of the MRP to allow for the GFC (especially ACCC);

- annual surveys of the level of MRP companies and analysts use in their CAPM models exhibit a decline since GFC;[1120] and

- many New Zealand market participants did not increase their TAMRP estimates during or after the GFC (for example, only one of the advisors at the Cost of Capital Workshop had increased its TAMRP estimate). Some New Zealand market participants have subsequently reduced the temporary increase they made to their TAMRP estimates during the GFC (e.g. First NZ Capital).

Conclusion - the TAMRP estimate

H7.121 As stated above, the Commission's decision is that the long-term TAMRP should be set at 7%. However, due to the effect that the GFC has had on the equity markets, the Commission considers that it is appropriate for the TAMRP to be temporarily increased to 7.5%. This temporary increase will apply for the regulatory year-ends falling in the calendar years 2010 and 2011, before the TAMRP reverts to its long-term level of 7%.

H7.122 The TAMRP will be expressed as a composite rate over a five-year period. Further, the higher TAMRP will only apply if the regulatory period falls over the entire year when the uplift to account for the GFC applies. Therefore, for a cost of capital estimated for five years commencing on 1 April 2010, the TAMRP would be 7.1% (estimated by $(7.5 \times 1 + 7.0 \times (5 - 1)) \div 5$).

H7.123 Following this approach in the context of information disclosure in 2010 - 2011 the five-year TAMRP would be 7.1%, and in 2011-2012 would be 7%. For the cost of capital used for starting price adjustments for the period 2010-2015, the TAMRP will be 7.1%. For the three, four or five-year CPP applied after 30 June 2011 the TAMRP would be 7%.

[1120] See for example Fernandez, P, and del Campo, J., Market Risk Premium used in 2010 by Analysts and Companies: a survey with 2,400 answers, 21 May 2010. In the survey reported in that paper three times as many respondents has reduced their MRP estimates in 2010 when compared to their estimates in 2009, than had increased their estimates (at pp. 3-4, and 6-7).

Decision - Standard Error of the TAMRP

H7.124 The standard error of the TAMRP is 1.5%.

Commission's reasons – approach to estimating the standard error of the TAMRP

Previous estimates of the standard error of the TAMRP used by the Commission

H7.125 To estimate the TAMRP and its standard deviation[1121] in the Gas Control Inquiry, Electricity Distribution – Control of Unison and the Gas Authorisation, Dr Lally reviewed *ex post* approaches,[1122] *ex ante* approaches,[1123] and survey evidence from both New Zealand and foreign markets.[1124]

H7.126 Dr Lally, in Appendix 2 of the Gas Authorisation, demonstrates the process to estimate the standard deviation of the TAMRP estimate.[1125] As with the TAMRP estimate, Dr Lally had concerns with the reliability of the standard deviation estimate from the Merton methodology and therefore did not use the Merton result in the estimation of the standard deviation of the TAMRP estimate. In addition, survey evidence is not amenable to estimation of a standard deviation. Therefore, the process places equal weight on the standard deviation estimates from the Ibbotson, Siegel and Cornell approaches based on New Zealand data, the Ibbotson, Siegel and Cornell estimates from the US data, and the Ibbotson and Siegel estimates of 16 other countries' estimated standard deviations of the estimated TAMRP.

H7.127 From this information Dr Lally estimated a standard deviation of 1.5% for the estimated TAMRP.[1126] As this estimate is relatively recent and the methodology applied is essentially the same as that used by the Commission in the current context, the Commission does not consider that there are sufficient grounds to depart from this estimate of the standard deviation around the TAMRP.

H7.128 The Commission notes that the survey by Fernandez and del Campo noted earlier also provides the standard deviation of the MRP used by analysts and companies. For US analysts, the standard deviation of the MRP used was 1.1%. For US companies, the standard deviation of the MRP used was 1.8%.[1127] This supports the reasonableness of the 1.5% estimate of the standard error specified in the IM.

[1121] The Commission notes that the estimates of the standard deviations referred to by Dr Lally are standard errors.

[1122] *Ex post* estimation techniques evaluated were Morningstar (Ibbotson) and Siegel types, the constant reward to risk methodology of Merton.

[1123] *Ex ante* approaches were Cornell, and survey evidence.

[1124] Lally, M., *The weighted average cost of capital for gas pipeline businesses*, paper prepared for the Commerce Commission, 24 November 2004, pp. 10-26; Lally, M., *The weighted average cost of capital for electricity lines businesses*, September 2005, pp. 10-29; Lally, M., *The weighted average cost of capital for gas pipeline businesses*, 28 October 2008, pp. 16-38.

[1125] Lally, M., *The weighted average cost of capital for gas pipeline businesses*, 28 October 2008, Appendix 2, pp. 166-169.

[1126] Lally, M., *The weighted average cost of capital for gas pipeline businesses*, paper prepared for the Commerce Commission, 24 November 2004, p. 18; Lally, M., *The weighted average cost of capital for electricity lines businesses*, September 2005, pp. 20-21; Lally, M., *The weighted average cost of capital for gas pipeline businesses*, 28 October 2008, p. 27 and Appendix 2.

[1127] Fernandez, P., and J. del Campo *Market Risk Premium used in 2010 by Analysts and Companies: a survey with 2,400 answers*, 21 May 2010. The standard errors for European and UK analyst estimates were 1.3% and 1.4% (p.2); and were 1.5% and 1.8% for European and UK company estimates (p.5).

<u>Views of submitters – standard error of the TAMRP</u>

H7.129   Professor Guthrie on behalf of Transpower submits that the standard deviation of the
            TAMRP of 1.5% estimated by Lally is subject to a number of errors or questionable
            assumptions, particularly with respect to assumptions regarding the correlation
            between the different estimators. Professor Guthrie also provides his own estimate of
            3.1% for the standard deviation of the TAMRP.[1128]

H7.130   The Commission asked Dr Lally to review Professor Guthrie's submission. Dr Lally
            refutes Professor Guthrie's points and advises that the estimate of the standard
            deviation of the TAMRP of 1.5% does not require alteration.[1129]

Conclusion – standard error of the TAMRP

H7.131   The standard error of the TAMRP is 1.5%.

H8   Asset and Equity Betas

Decision - asset and equity betas

H8.1   The IM specifies an asset beta for EDBs of 0.34. Combining this estimate with a
            notional leverage of 44% equates to an equity beta for EDBs of 0.61.

H8.2   The IM specifies an asset beta for GPBs of 0.44. Combining this estimate with a
            notional leverage of 44% equates to an equity beta for GPBs of 0.79.

H8.3   In finalising the IM the Commission:

    •   uses comparable entity analysis as its primary approach to estimating the
         regulated service wide equity beta, and performs a sense check of the resulting
         equity beta estimate against other New Zealand market equity betas;

    •   converts equity beta estimates into asset beta estimates (and vice versa) using
         the tax-neutral formula. It applies the tax-neutral formula regardless of the tax
         regime that exists in the country from which the beta estimates are drawn;

    •   makes no adjustment for regulatory differences to EDBs or GPBs asset beta
         estimates;

    •   makes an adjustment of 0.1 to the GPBs' asset beta estimate to account for the
         difference in risk between EDBs and gas pipeline services in New Zealand;

    •   makes no adjustments of a Blume or Vasicek type;

    •   determines the standard error for EDBs' asset beta is 0.13; and

    •   determines the standard error for GPBs' asset beta is 0.14.

[1128]   Transpower Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses
         and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Guthrie G., *Measurement Error
         and Regulated Firms' Allowed Rates of Return: a report prepared for Transpower New Zealand Limited*, 14 August
         2010, pp. 15-17.
[1129]   Lally, M., *Comments on Measurement Error and Regulated Firms' Allowed Rates of Return*, 13 September 2010, pp.
         2-11.

Reasons - asset and equity betas

H8.4   The equity beta measures a security's sensitivity to market risk (i.e. beta is a measure of exposure to systematic risk). As neither asset nor equity betas are directly observable, they need to be estimated. For firms with traded stocks, the equity beta for the firm can be estimated directly from the historical returns on those stocks, relative to the market's return.

H8.5   In many cases direct estimation may not be feasible because no traded returns are available. For example, the firm may be unlisted, or the Commission may be interested in estimating the beta of only a single division within a company with multiple lines of business.

H8.6   Moreover, even when traded returns are available, firm-specific beta estimates are often statistically imprecise. To help overcome these problems, the Commission has estimated a regulated service wide equity beta using individual beta estimates of a portfolio of comparable businesses.

H8.7   Due to the uncertainty associated with beta estimates the Commission estimates the standard error for the asset beta from the portfolio of comparable firms used to estimate the asset beta.

Equity betas – service-specific or supplier-specific

Experts' advice

H8.8   In the Expert Panel report Professor Myers and Dr Lally recommended that service-specific[1130] betas should be estimated, i.e. separate betas for airports, EDBs, GPBs and Transpower. Dr Lally was doubtful whether reliable adjustments could be made to service-specific betas to account for intra-service variations (i.e. variations across individual airports, or EDBs, or GPBs) in factors other than financial leverage.[1131]

Decision

H8.9   The Commission agrees that as the equity beta measures an asset's or a security's sensitivity to market risk and EDBs, GPBs and Transpower may face different levels of systematic risk, different equity betas could apply, in principle, to Transpower and different EDBs and GPBs.

H8.10   However, estimating asset betas for an industry (or specific service) is inherently imprecise and involves a significant degree of judgement. Estimating individual supplier-specific equity betas would require an even greater degree of judgment than estimating service-specific equity betas.

H8.11   Most of the EDBs and GPBs are not listed and there is no reliable information available to the Commission to enable it to estimate a supplier-specific asset/equity beta.[1132]

[1130]   The Expert Panel referred to a regulated service (service-specific) as an industry. Under Part 4 of the Act the Commission regulates services not industries. Therefore a service-specific asset beta refers to the average beta of that service.

[1131]   Franks, J., M. Lally and S. Myers, *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology, Report prepared for the Commerce Commission,* 18 December 2008, pp. 24-26.

[1132]   There are only two listed energy distribution service providers. Horizon Energy for electricity and Vector for electricity and gas.

H8.12   The cost of capital IM provides for a service specific cost of capital. Making supplier-specific estimates is not practical or necessary and would require even greater judgement than making service-specific estimates.

H8.13   Therefore, in the context of EDBs, GPBs and Transpower, the Commission considers a service specific asset/equity beta to be appropriate.

The Commission's approach to estimating equity betas

H8.14   The steps the Commission has followed in estimating equity betas can be summarised as follows:

- Step 1: identify a sample of relevant comparator firms. This includes:

  o   New Zealand firms from the service in question;

  o   New Zealand firms from industries with a similar risk profile;

  o   overseas firms from the service in question; and

  o   overseas firms from industries with a similar risk profile.

- Step 2: estimate the equity beta for each firm in the sample;

- Step 3: de-lever each equity beta estimate to get an estimated asset beta for each firm in the sample;

- Step 4: calculate an average asset beta for the sample;

- Step 5: apply any adjustments for regulatory differences or differences in systematic risk across services to the average asset beta for the sample;

- Step 6: re-lever the average asset beta for the sample to an equity beta estimate using the Commission's assumed notional leverage.

H8.15   In the EDBs and GPBs Draft Reasons Papers the Commission followed the six step process outlined above.[1133] This resulted in 54 comparator companies identified (as shown in Table H17) and analysed over a single five-year period using monthly frequency data. This analysis estimated an asset beta of 0.34. An additional 0.10 increment was added to the asset beta for GPBs (becoming 0.44) to allow for greater risks associated with GPBs in New Zealand.

H8.16   Combining the estimate of the asset beta of 0.34 with the notional leverage of 40% proposed in the Draft Reasons Paper equated to an equity beta of 0.57 for EDBs and 0.73 for GPBs. The Draft Reasons Paper noted the Commission would undertake further analysis on beta in time for the Final Reasons Paper.

Standard error of the asset beta

H8.17   In the EDB and GPB Draft Reasons Papers the Commission estimated the standard error for the asset betas. These estimates used the Lally (2008) methodology and

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[1133]   See Commerce Commission, *Input Methodologies Electricity Distribution Services, Draft Reasons Paper*, section 6.9, pp. 279-302; Commerce Commission, *Input Methodologies Gas Pipeline Services, Draft Reasons Paper*, section 6.9, pp. 260-291.

using the comparative companies sample the Commission estimated a standard error of 0.12 for EDBs asset beta and 0.14 for GPBs asset beta.

<u>Submitters views on the Commission's approach</u>

H8.18   The Commission received a number of submissions discussing the Commission's approach and results for the asset beta in the EDBs and GPBs Draft Reasons Papers. These are summarised below.

Submitters views on comparative sample selection (Step 1)

H8.19   Marlborough Lines and KPMG (for MDL) were concerned about the Commission's reliance on overseas comparator companies.

H8.20   Marlborough Lines considered that the sample the Commission had used potentially included businesses with different characteristics from those the Commission regulates in New Zealand. Marlborough Lines considered that the Commission should make a greater allowance in the estimation of the cost of capital to incorporate factors such as scale when applying empirically observed overseas evidence to New Zealand businesses.[1134]

H8.21   In estimating the asset beta for GPBs, KPMG (for MDL) suggested that the Commission should use a comparator company set based on a large number of GPBs. However, KPMG noted that there are very few listed GPBs in NZ, Australia and the US (even less that are solely gas transmission or gas distribution). Therefore, KPMG suggested the comparable company sample should be comprised of the asset beta estimates for GPBs applied by other regulators.[1135]

Submitters views on estimating the asset beta (Steps 2-4)

H8.22   A number of the submitters highlighted that when estimating betas a number of issues need to be considered: the choice of the market index; size of the comparable firms; thin trading; estimation period which may include market stress events or outliers (e.g. the dot com bubble and GFC); day of the week or month the data is sampled over and the estimation period.[1136]

H8.23   ENA provided a report from PwC that commented on the Commission's approach to estimating the asset beta. PwC (for ENA) analysed the Commission's comparator company beta data and considered there was evidence of thin trading.[1137] PwC

[1134]   Marlborough Lines, *Submission on EDBs (Input Methodology) Draft Determination and Reasons Paper, Draft Reasons Paper and Associated Draft Determination - Cost of Capital*, 13 August 2010, p. 4.

[1135]   KPMG, *Cross-Submission on GPBs (Input Methodology) Draft Reasons Paper, Cost of Capital*, 13 August 2010, pp. 7-8.

[1136]   Commerce Commission *Cost of Capital Workshop Transcript*, pp. 185-203; Electricity Networks Association, Submission on EDBs (Input Methodology) Draft Determination and Reasons Paper, PricewaterhouseCoopers *Submission on the Cost of Capital Parameter Estimates*, 13 August 2010, pp. 47-54; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on Cost of Capital Material In the Commerce Commission's Draft Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13 August 2010, pp. 46-52.

[1137]   Thin trading in a company's shares can lead to a downward biased ordinary least squares equity beta estimate. In evaluating thin trading on the Commission sample in the draft reasons paper, PwC found evidence that the a number of the US firms trade in small volumes and that Vector and the Australian companies there were occurrences of days when no share trading occurred. PwC considered that collectively these companies exhibit mild thin trading problems. PwC noted that this was a significant problem with the shares for Horizon Energy. See Electricity Networks Association, *Submission on EDBs (Input Methodology) Draft Determination and Reasons Paper*,

corrects for thin trading and selects different days of the month for analysis. This results in an average asset beta estimate, using monthly data of 0.37 (and 0.39 for the average asset beta using daily data).[1138]

H8.24   Vector provided reports from CEG and Professor Grundy that covered the Commission's asset beta estimate. Vector and its advisers claim the Commission had underestimated the asset beta as it had not checked its results for sensitivities to the sampling period. This was because the Draft Reasons Paper had only evaluated monthly asset betas over a single five-year period. Vector considered that the asset beta for EDBs/GPBs should be closer to the asset beta of Airports and considered that for GPBs the underlying risks are comparable to Airports.[1139] CEG performs sensitivity tests on the asset beta and concluded that from the sensitivity tests the best estimate of the asset beta is 0.40.

H8.25   Transpower suggested the asset beta should be 0.40. It supports this with submissions from its experts, Officer and Bishop who use a debt beta of 0.2 to estimate an asset beta of 0.37, which they rounded to 0.40.[1140,1141]

H8.26   In consultation on the cost of capital some submissions recommended the Commission should adjust its asset beta estimate in light of the effect of the GFC.

H8.27   PwC (for ENA) submitted that the sample period chosen by the Commission, in the draft reasons paper encompasses the GFC, which raises the possibility of producing unrepresentative beta estimates. In line with best practice of other regulators, PwC recommended that the Commission should exclude the period of the GFC when estimating the asset beta.[1142,1143]

PricewaterhouseCoopers, *Submission on the Cost of Capital Parameter Estimates*, 13 August 2010, pp. 54-55, Appendix A.1 – A.2, pp. 59-62, and Appendix A.3 – A.6, pp. 1-12 (63-74).

[1138]   The Commission notes that PwC did not provide the results of the analysis before corrected for thin trading so the effect of correcting for thin trading on PwC analysis can not be evaluated to see if the results were different.

[1139]   Vector Ltd., *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, 13 August 2010, pp. 26-27; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, pp. 12-14; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Grundy B., *The Calculation of the Cost of Capital: a report prepared for Vector Limited*, 13 August 2010, pp. 11-12.

[1140]   Transpower New Zealand Ltd., *Submission on Transpower (Input Methodologies) Draft Reasons Paper and Individual Price-Quality Path*, Attachment: R. R. Officer & S. Bishop, *Independent Review of Commerce Commission's WACC Proposals for Transpower*, 5 August 2010, pp. 22-24 and 36-41.

[1141]   Transpower New Zealand Ltd., *Submission on Transpower (Input Methodologies) Draft Reasons Paper, Cost of Capital Decisions, August 2010*, p. 11.

[1142]   Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010, pp. 54-55.

[1143]   The Commission notes, however, PwC advice is not consistent with other advice PwC has provided in other contexts. In its advice to Ofgem UK on the cost of capital for the UK electricity distribution businesses (December 2009), PwC UK did not propose to exclude the period of the GFC when estimating the asset beta (see PwC, *Advice on the cost of capital analysis for DPCR5, Final Report to the Office of Gas and Electricity Markets*, 28 July 2009). In its advice to the NZAA on the asset beta estimate for Airports as part of NZAA submission's on the Draft Airports Reasons Paper

H8.28   By putting no weight on the GFC, PwC (for ENA) recommended that the
         Commission adopt an asset beta value of 0.46 for EDBs.[1144]

H8.29   In contrast to PwC's submission, CEG (for Vector) and Vector submitted that the
         Commission should give greater weight to beta estimates during the GFC, as beta
         matters most to investors when risk is high.[1145]

H8.30   Based on the analysis by CEG and by putting more weight on the estimates from the
         GFC, Vector recommended the asset beta for EDBs should be 0.44.[1146]

Submitters' views on making adjustments to the estimated the asset beta (Step 5)
H8.31   KPMG (for MDL) considered that GTBs justify a higher asset beta compared to
         GDBs to reflect the higher risk that exists to the transmission business. KPMG (for
         MDL) recommended that the asset beta for GTBs should be 0.54 (compared to
         GDBs of 0.44) to reflect the differences between transmission and distribution.[1147]

H8.32   In response to MDL, Vector, on advice from its expert Synergies Economic
         Consulting, were unconvinced that any adjustment to the asset beta should be made
         solely due to the difference between a revenue cap and a price cap.[1148]

Submitters views on the standard error of the asset beta
H8.33   Several submitters suggested that the Commission's approach to estimating the
         standard error of the asset beta was unclear.[1149]

H8.34   Professor Guthrie (for Transpower) demonstrated a procedure to estimate the
         standard error of the asset beta which resulted in an estimate of 0.11 to 0.12.[1150]

        PwC did not exclude or propose to exclude the period of the GFC (see NZ Airports *Association, Cross Submission on
        the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, Attachment:
        PricewaterhouseCoopers, *Analysis of Airport Betas: a report prepared for New Zealand Airports Association*, 3 August
        2010).

[1144] Electricity Networks Association, *Submission on EDBs (Input Methodology) Draft Determination and Reasons Paper,
        PricewaterhouseCoopers Submission on the Cost of Capital Parameter Estimates*, 13 August 2010, pp. 54-55.

[1145] Vector Ltd., *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and
        Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, 13 August 2010,
        pp. 26-27; Vector *Limited, Submission in response to the Commerce Commission's Input Methodologies Draft Reasons
        and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment:
        Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August
        2010, pp. 15-23.

[1146] Vector Ltd., *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and
        Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, 13 August 2010,
        p. 27; Vector *Limited, Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and
        Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment:
        Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August
        2010, pp. 12-23.

[1147] KPMG, *Cross-Submission on GPBs (Input Methodology) Draft Reasons Paper, Cost of Capital, 13 August 2010*, pp. 4-
        6.

[1148] Vector Limited, *Cross-submission to Commerce Commission on Gas Default Price-Quality Path: Issues Paper*, 31
        May 2010, pp. 4-5.

[1149] Transpower Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses
        and Gas Pipeline Businesses) Determinations and Draft Reasons Papers, Attachment*: Guthrie G., *Measurement Error
        and Regulated Firms' Allowed Rates of Return: a report prepared for Transpower New Zealand Limited*, 14 August
        2010, pp. 8-14; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity
        Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Guthrie
        G., *Comments on the Commerce Commission's Input Methodologies Draft Reasons Papers: a report prepared for
        Telecom New Zealand Limited*, 12 August 2010, 12 August 2010, pp. 9-11; KPMG, *Cross-Submission on GPBs (Input
        Methodology) Draft Reasons Paper, Cost of Capital*, 13 August 2010, pp. 10-11.

This is similar to the Commission's estimate of 0.12 which was included in the EDBs Draft Reasons Paper.

Commission's response to submissions

H8.35   The Commission has carefully considered the submissions received and has undertaken further analysis on the asset beta and its standard error. In particular, the Commission has:

- explained below in greater detail its approach to applying its six-step process;

- identified additional comparable US electricity and gas utilities companies for inclusion in the analysis;

- expanded its analysis to cover a greater range of return periods (including weekly return data) and more sampling periods; and

- considered again the estimate of the standard error for the asset beta.

H8.36   The Commission's application of the six step process and the estimation of the standard error are outlined below.

Step 1: Identifying a sample of comparable firms

H8.37   The first step is to identify relevant comparable firms for inclusion in the sample. 'Comparable' means firms that have very similar exposure to market risk. In practice, in most New Zealand industries, it is difficult to find a sufficient number of comparable businesses to implement such an approach based solely on domestic data. Indeed, in some cases (e.g. electricity transmission), the entire industry consists of a single supplier. The sample of comparable firms includes overseas jurisdictions which have a larger number of similar firms.

H8.38   In previous electricity (and gas) decisions the Commission has been advised by Dr Lally on the sample of comparative firms used in the estimation of the asset beta.[1151] As there have been limited New Zealand electricity distribution and gas pipeline service providers available Dr Lally incorporated US electricity and gas utilities into the analysis. Dr Lally advised that the US electricity utilities were a comparator for the gas utilities, and vice versa, as firms from each sector appeared to have similar activities and regulations. Dr Lally favoured drawing upon both groups of US firms in drawing conclusions about asset beta for New Zealand gas pipeline businesses and electricity lines businesses.

H8.39   The notion that electricity distribution and transmission suppliers are comparable businesses to gas distribution and transmission suppliers, is consistent with the

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[1150]   Transpower Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Guthrie G., *Measurement Error and Regulated Firms' Allowed Rates of Return: a report prepared for Transpower New Zealand Limited*, 14 August 2010, pp. 8-14.

[1151]   Lally, M., The weighted average cost of capital for gas pipeline businesses, November 2004; Lally, M., The weighted average cost of capital for electricity lines businesses, September 2005; Lally, M., The weighted average cost of capital for gas pipeline businesses, October 2008.

approach taken in Australia by the AER. In its draft decision for Jemena the AER stated that:[1152]

> …the AER considers that the empirical evidence presented in the WACC review [2009 WACC review for electricity distribution and transmission networks[1153]] contains the best available estimate of the equity beta that would apply to a gas distribution network service provider. Although the WACC review was conducted in an electricity context, gas and electricity businesses are close comparators. Further, the sample set of data used to derive the equity beta is predominantly made up of gas businesses.

H8.40   Only two companies on the New Zealand Stock Exchange operate electricity distribution services (Horizon Energy Ltd and Vector Ltd). This is too small a sample to estimate a reliable asset beta for EDBs/GPBs. Therefore, as with previous decisions, the Commission included overseas entities that are classified as integrated energy utilities in its sample of comparable firms. The Commission has included firms from Australia, the UK and the US in its sample.

H8.41   The sample is displayed in Table H17 below which indentifies if the firm was included in original sample, if the firm is classified as either an electricity utility or gas utility by Bloomberg[1154] and the type of regulatory regime the comparative firm operates under.

H8.42   The Commission considers this a representative sample of EDBs/GPBs. The sample contains US gas and electricity utilities and Australian and UK entities with both gas pipeline businesses and electricity lines businesses.. The US utilities contain suppliers that are vertically-integrated into electricity distribution, generation, transmission and/or retail services and horizontally-integrated into gas transmission and/or distribution services.

H8.43   Given the size of the sample, the Commission did not consider it necessary to consider firms from other services/industries with a similar risk profile.

Comparative sample selection

H8.44   Overseas firms that operate electricity distribution and gas pipeline businesses were identified based upon the Bloomberg classifications 'Electric – Distribution', 'Electric – Integrated', 'Electric – Transmission', Gas - Distribution' and 'Pipelines'. Any firms with either insufficient history as a listed entity (i.e. too few available data points) or a market value of equity below US$100 million (i.e. small entities) were excluded from the sample.[1155]

H8.45   For the remaining firms in the sample, to further assess comparability, Bloomberg's 'Segment Analysis' information was used to assess the nature and extent of electricity distribution / gas pipeline versus non-electricity distribution / gas pipeline services provided. As a result, any firms which the Commission did not consider were sufficiently comparable were also excluded from the sample.

[1152]   AER, *Access arrangement proposal for the NSW gas networks - Jemena, Draft Decision, 1 July 2010-30 June 2015*, February 2010, p. 125.

[1153]   AER, *Final decision: Electricity transmission and distribution network service providers – Review of the weighted average coat of capital (WACC) parameters*, May 2009.

[1154]   Bloomberg is a worldwide provider of financial and market information.

[1155]   Small firms may affect the empirical estimates of the asset beta due to the potential effect from thin trading volumes.

Table H17   Comparative firms sample used to derive the asset beta for EDBs, GPBs and Transpower

Name	Country	Included in IMs Draft Reasons Paper	Identified by Bloomberg as an Electricity utility	Identified by Bloomberg as a Gas utility	Regulatory Regime[1156]
Horizon Energy	New Zealand	Yes	Yes		Incentive
Vector	New Zealand	Yes	Yes		Incentive
DUET	Australia	Yes	Yes		Incentive
Spark Infrastructure	Australia	Yes	Yes		Incentive
SP AusNet	Australia	Yes	Yes		Incentive
APA	Australia			Yes	Incentive
Envestra	Australia			Yes	Incentive
Hastings Diversified Utilities	Australia			Yes	Incentive
National Grid	UK	Yes	Yes		Incentive
Allegheny Energy	USA	Yes	Yes		Both
Allete	USA	Yes	Yes		
Alliant Energy	USA	Yes	Yes		Both
Ameren	USA	Yes	Yes		Incentive
American Electric Power	USA	Yes	Yes		Both
Avista Corp	USA		Yes		Incentive
Black Hills	USA	Yes	Yes		Incentive
Central Vermont Public Service	USA	Yes	Yes		
CH Energy	USA	Yes	Yes		Incentive
Cleco	USA	Yes	Yes		Incentive
CMS Energy	USA	Yes	Yes		Non-incentive
Consolidated Edison	USA	Yes	Yes		Both
Constellation Energy	USA	Yes	Yes		Both
Dominion Resources	USA	Yes	Yes		Both
DPL	USA	Yes	Yes		Non-incentive
DTE Energy	USA	Yes	Yes		Non-incentive
Duke Energy	USA	Yes	Yes		Non-incentive
Edison International	USA	Yes	Yes		Incentive
El Paso Electric	USA	Yes	Yes		Non-incentive
Empire District Electric	USA	Yes	Yes		Both
Entergy	USA	Yes	Yes		Both
Exelon	USA	Yes	Yes		Incentive

[1156]   The regulatory regime is identified by evaluating what states of the USA the utilities operates in and then matching this with the information EDB from Kwoka, Table 1 and additional analysis by the Commission. Some utilities have not been identified as these utilities operate in a state(s) that has not been classified either in Kwoka or by the Commission. If a utility is subject to both forms of regulation it is marked by "both".

Name	Country	Included in IMs Draft Reasons Paper	Identified by Bloomberg as an Electricity utility	Identified by Bloomberg as a Gas utility	Regulatory Regime[1156]
FirstEnergy	USA	Yes	Yes		Both
Great Plains Energy	USA	Yes	Yes		Non-incentive
Hawaiian Electric	USA	Yes	Yes		
Idacorp	USA	Yes	Yes		
Integrys Energy	USA	Yes	Yes		Both
ITC Holdings	USA		Yes		Incentive
MGE Energy	USA	Yes			Incentive
NextEra Energy [formerly FPL Group]	USA	Yes	Yes		Incentive
Northeast Utilities	USA	Yes	Yes		Both
Northwestern Corp	USA		Yes		Both
NSTAR	USA	Yes	Yes		Incentive
NV Energy	USA	Yes	Yes		
OGE Energy	USA	Yes	Yes		Non-incentive
Pepco	USA	Yes	Yes		Both
PG&E	USA	Yes	Yes		Incentive
Pinnacle West	USA	Yes	Yes		Incentive
PNM Resources	USA	Yes	Yes		Non-incentive
PPL Corporation	USA	Yes	Yes		Both
Progress Energy	USA	Yes	Yes		Both
Public Service Enterprise	USA	Yes	Yes		Incentive
Scana Corp	USA	Yes	Yes		Non-incentive
Southern Corp	USA	Yes	Yes		Incentive
Teco Energy Corp	USA	Yes	Yes		Incentive
UIL Holdings Corp	USA	Yes	Yes		Non-incentive
Unisource Energy Corp	USA	Yes	Yes		Non-incentive
Unitil Corp	USA	Yes	Yes		Incentive
Westar Energy	USA	Yes	Yes		Incentive
Wisconsin Energy	USA	Yes	Yes		
Xcel Energy	USA	Yes	Yes		Both
AGL Resources	USA			Yes	
Atmos Energy Corp	USA			Yes	
Centerpoint Energy	USA			Yes	
Chesapeake Utilities Corp	USA			Yes	
Laclede Group	USA			Yes	
National Fuel Gas Co	USA			Yes	
New Jersey Resources Corp	USA			Yes	

Name	Country	Included in IMs Draft Reasons Paper	Identified by Bloomberg as an Electricity utility	Identified by Bloomberg as a Gas utility	Regulatory Regime[1156]
Nicor Inc	USA			Yes	
Nisource Inc	USA			Yes	
Northwest Natural Gas Co	USA			Yes	
Oneok Inc	USA			Yes	
Piedmont Natural Gas Co	USA			Yes	
Sempra Energy	USA			Yes	
South Jersey Industries	USA			Yes	
Southwest Gas Corp	USA			Yes	
Spectra Energy Corp	USA			Yes	
UGI Corp	USA			Yes	
Vectren Corp	USA			Yes	
WGL Holdings Inc	USA			Yes	

Step 2: Estimating the equity beta of comparable firms

H8.46   The second step in the estimation process is to econometrically estimate the equity beta of each firm in the sample by regressing historical individual firm returns on historical market returns.[1157] Each of these ordinary least squares estimators will be an unbiased estimator of the true equity beta of that firm, and the standard error of the estimate—a measure of its statistical precision—is readily obtained from the regression output.

H8.47   The Commission notes that, in the context of the Expert Panel report on the cost of capital, Professor Myers and Dr Lally recommended that for mature firms, the Commission check beta estimates, for example with a plot of rolling five-year betas, to reveal any short-term anomalies.[1158]

H8.48   The Commission previously received advice on the asset beta for the EDBs and GPBs from Dr Lally (the result of this analysis and how it compares to the current analysis are covered in paragraphs H8.65 to H8.68).[1159] In this advice Dr Lally used different periods to evaluate the beta. Ultimately the Commission considers it is important to ensure that the beta is a fair measure of the underlying risk associated

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[1157]   The Commission notes that consistent with the CAPM specification the correct methodology for estimating the equity beta would involve regressing excess returns of the individual firm against the excess returns of the market index. The estimation technique outlined in this paragraph is used by Bloomberg and is consistent with the estimation techniques used by many market practitioners. The returns of each firm in the sample are regressed against the market returns from the jurisdiction within which it is listed.

[1158]   Franks, J., M. Lally and S. Myers, *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology*, Report prepared for the Commerce Commission, 18 December 2008, pp. 24-26

[1159]   Lally, M., The weighted average cost of capital for gas pipeline businesses, November 2004; Lally, M., *The weighted average cost of capital for electricity lines businesses*, September 2005; Lally, M., *The weighted average cost of capital for gas pipeline businesses*, October 2008.

with the supply of a service and not a product of a host of other possible measurement problems, such as infrequent trading.

H8.49   Therefore, for each firm in the sample of comparable firms, the Commission obtained from Bloomberg the unadjusted[1160] equity beta estimate, the standard error of the estimate and the reported average leverage,[1161] for the following periods and observation intervals:[1162, 1163]

- Five year period to 31 May 1995 using weekly and monthly observations

- Five year period to 31 May 2000 using weekly and monthly observations

- Five year period to 31 May 2005 using weekly and monthly observations

- Five year period to 31 May 2006 using weekly and monthly observations

- Five year period to 31 May 2007 using weekly and monthly observations

- Five year period to 31 May 2008 using weekly and monthly observations

- Five year period to 31 May 2009 using weekly and monthly observations

- Five year period to 31 May 2010 using weekly and monthly observations.

H8.50   The Commission's approach is to estimate the beta over a range of periods which include and exclude the GFC (accepting the fluctuations of the markets as they actually are), without taking a view on whether or not the effects of the GFC will continue. While there is some evidence that asset betas showed some modest increases during the GFC, the asset betas are generally stable across the period.

Step 3: Turning the equity betas into asset betas

H8.51   The third step is to remove from each firm's unadjusted equity beta estimate the effect of that firm's average leverage by de-levering the equity beta estimate to

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[1160]   The term 'unadjusted' refers to the absence of a Blume or Vasicek adjustment.

[1161]   The average leverage was calculated as the unweighted arithmetic average of leverage at each financial year end for the same period as the observations used for the equity beta estimate (using the book value of net interest bearing debt and market value of equity).

[1162]   Not all of the entities have data going back 20 years. The following table briefly summarises the number of entities by period:

Five year period to:	Non-US entities	US predominantly electricity distribution entities	US predominantly gas distribution entities
31 May 1995	0	43	16
31 May 2000	2	43	16
31 May 2005	4	48	18
31 May 2010	9	51	19

To determine whether the change in the sample over time had a material effect on the asset beta estimate for the total sample, the results from only those entities with a full 20 year history were also looked at. In the majority of cases, the asset beta estimates for the total sample (expressed to two decimal places) was unaffected. Where there was an effect, the majority of changes were 0.01.

[1163]   The results from the analysis of daily data were very similar to the results presented in this section.

arrive at an estimate of the firm's unadjusted asset beta. This allows the estimated asset beta for each firm to be directly compared with that for other firms without the effects of different levels of leverage.

H8.52   A range of formulae have been developed as possible ways to de-lever and re-lever beta estimates. All of these formulae rely on making assumptions, including how firms manage their debt and the tax environment of the country in which the firm operates.

H8.53   The two principal formulae that could be used in the current context are the Hamada formula and the tax-neutral formula.

H8.54   The formula advocated by Hamada[1164] assumes that (a) debt is fixed in dollar terms, and (b) that a classical tax system applies. The tax-neutral formula assumes that dividend imputation is fully effective and that capital gains are tax free. Miles and Ezzell[1165] extended the formula advocated by Hamada to allow the assumption that leverage is fixed (rather than debt is fixed in dollar terms), whilst still assuming that a classical tax system applies. Removing the tax parameter from Miles and Ezzell formula results in a tax neutral formula.

H8.55   The key concern raised by parties in relation to the de-levering and re-levering of betas was consistency in the formula used for doing so.[1166]

Conclusion - The approach to de-levering and re-levering
H8.56   The Commission has previously used the Hamada formula to de-lever overseas betas, and the tax-neutral formula (equivalent to the Miles and Ezzell formula without taxes) to re-lever New Zealand betas, based upon the different respective tax systems in the relevant overseas countries and New Zealand. The Commission has, however, reconsidered this issue taking into account the assumptions used in the respective formulae regarding debt policy.

H8.57   The Commission now considers that a formula without a tax term is appropriate because:

• inclusion of the tax term requires not only a classical tax regime but that debt is fixed in dollar terms (as opposed to leverage being fixed); and

• the assumption that leverage rather than the dollar level of debt being fixed is the better assumption, which leads to the Miles and Ezzell formula, which is, in turn, close to a model without a tax term.

H8.58   Expressed in terms of estimating an asset beta (i.e. in a form suitable for de-levering an equity beta estimate), the tax-neutral formula takes the form:

[1164] Hamada, R. S., The Effect of the Firm's Capital Structure on the Systematic Risk of Common Stocks, *Journal of Finance*, 27(2), 1972, pp. 435–452.

[1165] Miles, J. A. and J. R. Ezzell, The Weighted Average Cost of Capital, Perfect Capital Markets and Project Life: A Clarification, *Journal of Finance and Quantitative Analysis*, September, 1980, pp. 719-730.

[1166] Commerce Commission, *Cost of Capital Workshop Transcript*, pp. 100-101; Charles River Associates, *Leverage and the Cost of Capital*, Report on behalf of Unison, 2 December 2009; NZ Airports Association, *Submission on the Revised Draft Guidelines*, Attachment: Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital*, 2 December 2009, Appendix 2 and 3, pp. 82-91.

$$\beta_a = \beta_e(1\text{-}L) + \beta_dL$$

where β_a is the asset beta, β_e is the equity beta, β_d is the debt beta, and L is the leverage.

H8.59   Expressed in terms of estimating an equity beta (i.e. in a form suitable for re-levering an asset beta estimate), the tax-neutral formula takes the form:

$$\beta_e = \beta_a + (\beta_a\text{-}\beta_d)L/(1\text{-}L)$$

H8.60   Table H18 shows the average unadjusted asset beta estimates, over all sampling periods, for the sample of comparator firms.

Table H18   Average Unadjusted Asset Betas of Comparable Firms

Name	Average Unadjusted Asset Beta Monthly Observations	Average Unadjusted Asset Beta Weekly Observations
Horizon Energy	0.38	0.16
Vector	0.28	0.25
DUET	0.20	0.15
Spark Infrastructure	0.19	0.20
SP AusNet	0.16	0.10
APA	0.29	0.23
Envestra	0.14	0.10
Hastings Diversified Utilities	0.17	0.54
National Grid	0.24	0.30
Allegheny Energy	0.43	0.41
Allete	0.49	0.47
Alliant Energy	0.31	0.36
Ameren	0.33	0.36
American Electric Power	0.29	0.32
Avista Corp	0.30	0.29
Black Hills	0.50	0.42
Central Vermont Public Service	0.38	0.33
CH Energy	0.28	0.41
Cleco	0.43	0.41
CMS Energy	0.31	0.25
Consolidated Edison	0.15	0.26
Constellation Energy	0.41	0.39
Dominion Resources	0.22	0.27
DPL	0.36	0.38
DTE Energy	0.21	0.25

Name	Average Unadjusted Asset Beta Monthly Observations	Average Unadjusted Asset Beta Weekly Observations
Duke Energy	0.34	0.41
Edison International	0.30	0.37
El Paso Electric	0.27	0.39
Empire District Electric	0.26	0.26
Entergy	0.26	0.31
Exelon	0.29	0.41
FirstEnergy	0.19	0.32
Great Plains Energy	0.39	0.34
Hawaiian Electric	0.37	0.44
Idacorp	0.28	0.33
Integrys Energy	0.26	0.32
ITC Holdings	0.48	0.49
MGE Energy	0.23	0.36
NextEra Energy [formerly FPL Group]	0.27	0.31
Northeast Utilities	0.20	0.20
Northwestern Corp	0.42	0.43
NSTAR	0.22	0.28
NV Energy	0.40	0.29
OGE Energy	0.29	0.32
Pepco	0.26	0.39
PG&E	0.31	0.31
Pinnacle West	0.30	0.32
PNM Resources	0.43	0.36
PPL Corporation	0.29	0.33
Progress Energy	0.24	0.28
Public Service Enterprise	0.26	0.33
Scana Corp	0.24	0.29
Southern Corp	0.10	0.20
Teco Energy Corp	0.28	0.32
UIL Holdings Corp	0.35	0.34
Unisource Energy Corp	0.19	0.16
Unitil Corp	0.15	0.10
Westar Energy	0.32	0.27
Wisconsin Energy	0.17	0.24
Xcel Energy	0.35	0.31
AGL Resources	0.22	0.32
Atmos Energy Corp	0.20	0.30

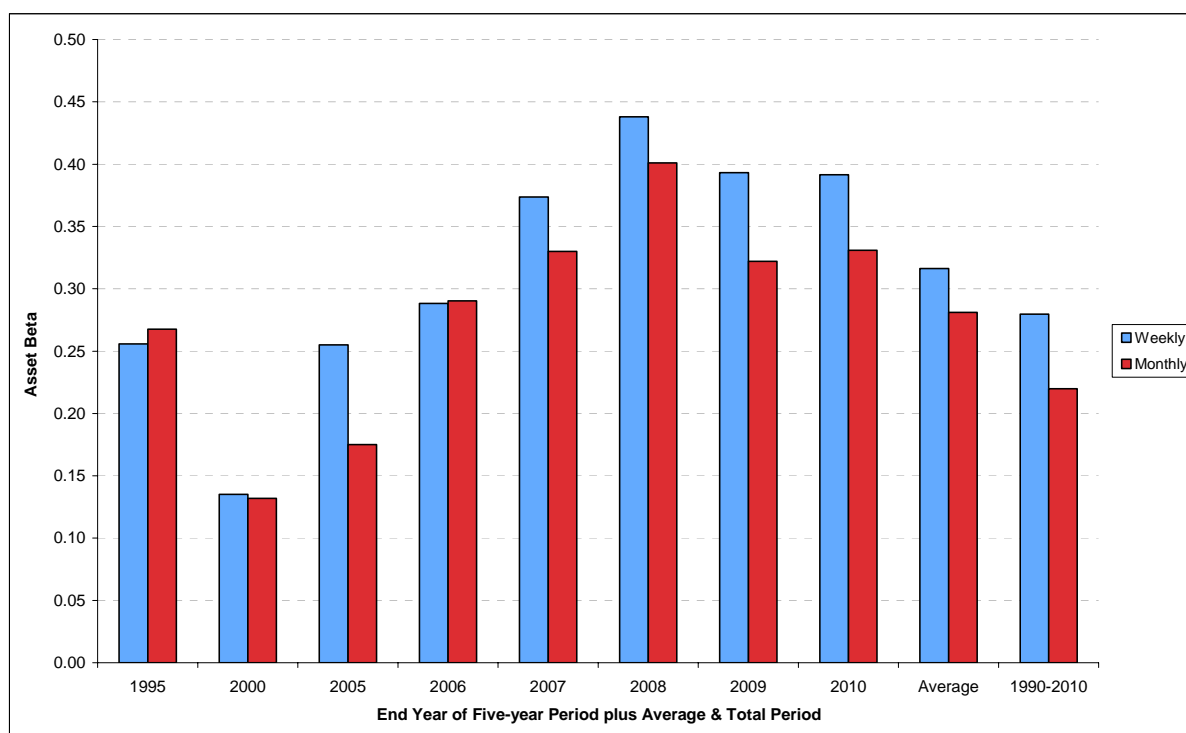| Name	Average Unadjusted Asset Beta Monthly Observations	Average Unadjusted Asset Beta Weekly Observations
Centerpoint Energy	0.26	0.23
Chesapeake Utilities Corp	0.23	0.17
Laclede Group	0.15	0.33
National Fuel Gas Co	0.34	0.41
New Jersey Resources Corp	0.14	0.32
Nicor Inc	0.31	0.49
Nisource Inc	0.27	0.26
Northwest Natural Gas Co	0.15	0.27
Oneok Inc	0.32	0.37
Piedmont Natural Gas Co	0.20	0.35
Sempra Energy	0.43	0.49
South Jersey Industries	0.18	0.29
Southwest Gas Corp	0.19	0.28
Spectra Energy Corp	0.55	0.64
UGI Corp	0.21	0.32
Vectren Corp	0.23	0.36
WGL Holdings Inc	0.21	0.36
Mean (of all observations)	**0.28**	**0.32**

Step 4: Calculate the average asset beta of comparable firms

H8.61   The fourth step is to estimate a 'service-wide' asset beta by taking an average of the individual unadjusted asset beta estimates of the comparable firms. As a starting point, each estimate receives an equal weighting.

H8.62   As outlined in paragraph H8.49 above, the Commission investigated the effect on the asset beta estimate of different time periods and different observation intervals within each time period. The results are displayed in Figure H9 and summarised in Table H19. The Commission's original unadjusted asset beta estimate of 0.34 is within the range of the averages obtained.

Table H19   EDBs Comparable Firms Unadjusted Average Asset Betas

	Average asset beta estimate	Average asset beta range
Monthly data	Overall 0.28 Gas 0.23 Electricity 0.30	0.13-0.40 0.13-0.38 0.11—0.41
Weekly data	Overall 0.32 Gas 0.31 Electricity 0.32	0.14-0.44 0.15-0.42 0.13—0.44
Monthly five-year periods 2005-2010	Overall 0.31 Gas 0.25 Electricity 0.33	0.18-0.40 0.13-0.38 0.19—0.41
Weekly five-year periods 2005-2010	Overall 0.36 Gas 0.36 Electricity 0.36	0.25-0.44 0.25-0.45 0.26—0.44

Figure H9   Unadjusted Average Asset Beta for Comparable Firms

H8.63   The results from this analysis indicate the average monthly asset beta is 0.28 and the average weekly asset beta is 0.32. Putting equal weight on each estimate results in an unadjusted asset beta estimate of 0.30.

H8.64   The Commission notes that the result displayed in Table H19 indicates that gas pipeline business have monthly asset beta estimates lower than the electricity

utilities. Prima facie this implies that overseas gas pipeline business face lower systematic risk than overseas electricity utilities.

Previous advice on asset betas for EDB/GPBs

H8.65   Dr Lally had previously advised the Commission on the asset betas for EDBs and GPBs.[1167] He considered asset betas from New Zealand publicly listed EDBs/GPBs and a combination of US electricity and gas utilities.

H8.66   In the advice for EDBs Dr Lally estimates the asset betas based on US electricity utilities was 0.27, 0.22 for gas, and an overall asset beta of 0.26. For electricity utilities the range of asset betas was from 0.12 to 0.35, and for gas utilities the range of the asset beta was from 0.06 to 0.33.

H8.67   In his advice on the Gas Authorisation the asset betas based on US electricity utilities was 0.27, 0.23 for gas, and an overall asset beta 0.27. For electricity utilities the range of asset betas was from 0.03 to 0.36, and for gas utilities the range of the asset beta was from 0.04 to 0.33.

H8.68   On the basis of his analysis Dr Lally advised that prior to taking account of regulatory and other differences between the US and New Zealand, an asset beta of 0.30 was an appropriate estimate for the asset beta of US gas and electricity utilities and has been the starting point that should be applied for the previous gas and electricity decisions in New Zealand.

H8.69   In previous decisions, based on advice from Dr Lally, the Commission adopted an unadjusted asset beta of 0.30 for EDBs and GPBs.[1168]

Conclusion

H8.70   In its analysis for the Draft Reasons Paper the Commission estimated the value of the unadjusted asset beta for EDBs, GPBs and Transpower (and before any adjustments reviewed in Step 5) to be 0.34. The Commission has undertaken extensive subsequent analysis using different time periods and different observation intervals within each time period.

H8.71   The additional analysis confirms the Commission's original estimate of 0.34 included in the Draft Reasons Paper is a reasonable estimate of the asset beta for the sample. Indeed it could be argued, based on the broader range of time periods that were analysed, that an allowance of 0.34 is generous in favour of suppliers, and could be reduced to around 0.30 (the average of the weekly and monthly estimates), and is in line with the Commission's estimates in previous decisions. However, given the variability in the estimates, and that beta cannot be estimated with precision, the Commission considered the more prudent approach was to leave the estimate of the asset beta at 0.34 as proposed in the Draft Reasons Paper.

[1167]   Lally, M., *The weighted average cost of capital for gas pipeline businesses*, November 2004, Table 3, p. 45; Lally, M., *The weighted average cost of capital for electricity lines businesses*, September 2005, Table 3, p. 45; Lally, M., *The weighted average cost of capital for gas pipeline businesses*, October 2008, Table 3, p. 59.

[1168]   See Commerce Commission, *Regulation of Electricity Lines Business – Target Control Regime Intention to Declare Control Unison networks limited*, 9 September 2005; Commerce Commission, *Gas Authorisation Decision Paper*, 2008, p. 172.

H8.72   The Commission has compared this estimate against the previous advice from Dr
         Lally. The Commission notes that its empirical analysis, which includes periods
         covering the GFC, yields an asset beta of 0.28 using monthly data, and 0.32 using
         weekly data. The result from the advice from Dr Lally on the asset beta, which does
         not cover the GFC, yields an asset beta of 0.26 or 0.27.

Step 5: Undertaking adjustments

H8.73   The Commission accepts the principle that there may be grounds for (a) making
         adjustments to multi-divisional asset betas estimates, (b) adjusting asset beta
         estimates sourced from overseas for differences in systematic risk due to regulatory
         differences, and (c) adjusting asset beta estimates due to differences in systematic
         risk between services.

H8.74   The Commission in the following sub-sections outlines how each of the
         considerations (i.e. Step 5(a), Step 5(b) and Step 5(c)), is used in sequence to adjust
         the basic asset beta estimate from Step 4.

Step 5(a): Making adjustments to multi-divisional asset betas estimates

H8.75   A company's overall beta can be viewed as a weighted average of the betas of its
         component businesses. The risk attached to a company's different businesses may
         vary considerably, and the weighted average gives the overall risk of the firm.
         Where multi-division firms are used in the Commission's empirical analysis, it may
         be necessary to extract an estimate of beta for a specific type of regulated service
         from the overall group beta.

H8.76   The task of estimating divisional betas is complicated by the fact that there are no
         traded returns for individual business units. Nevertheless, a number of approaches
         for estimating divisional betas have been proposed in the finance literature.[1169] Of
         these, the Commission has narrowed the set to three possibilities:

         i.   the 'pure play' approach;

         ii.   the full information approach; and

         iii.   econometric prediction based on risk-drivers.

H8.77   Under the 'pure play' approach, the Commission would identify traded stand-alone
         firms that are very similar across the fundamental risk drivers discussed above, and
         benchmark the division's beta to, for example, the average beta of a sample
         comprising these stand-alone firms. The main drawback of the 'pure-play' approach
         is that it requires 'pure-play' companies. In the case of EDBs, such 'pure-play'
         companies do not exist.

H8.78   The full-information approach exploits the idea that a multi-product firm is simply a
         portfolio of projects, and so its overall beta is a weighted average of the

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[1169]   See, for example, Fuller, R. J., and H. S. Kerr, Estimating the Divisional Cost of Capital: An Analysis of the Pure-Play
         Technique, *Journal of Finance*, Vol. 36, No. 5, 1981, pp. 997–1009; Ehrhardt, M. C., and Y. N. Bhagwat, A Full-
         Information Approach for Estimating Divisional Betas*, Financial Management*, Vol. 20, No. 2, 1991, pp. 60–69;
         Grinblatt, M., and S. Titman, *Financial Markets and Corporate Strategy*, 2nd edition, McGraw-Hill: New York, 2002,
         pp. 390-391; Brealey, R., and S. C. Myers, *Principles of Corporate Finance*, 7th ed., McGraw-Hill/Irwin: New York,
         2003, pp. 237-238.

unobservable betas of its individual business units.[1170] The asset betas are then estimated using econometric techniques.

H8.79   The third technique—the econometric investigation of risk-drivers—involves estimating a beta equation, specified as a function of potential drivers of asset betas.

H8.80   The main disadvantage of the full information approach and econometric prediction based on risk-drivers is that they require a large amount of high-quality data.

H8.81   The applicability and performance of these techniques will depend on the data available, so no one approach can be recommended in all instances.

Conclusion - making adjustments to multi-divisional asset beta estimates

H8.82   The comparator companies are generally not pure plays. That is, they can have a mix of activities (e.g. gas transmission/distribution and electricity transmission/distribution) as well as some activities that are not subject to regulation under part 4 (e.g. electricity generation). The services that would not be subject to regulation under Part 4 are a small proportion of their total business. On average, therefore, the asset beta for these comparator companies is likely to reflect a similar degree of systematic risk as could be expected for EDBs, GPBs and Transpower.

H8.83   Overall, the Commission does not consider an adjustment for the other business activities of the comparator firms is necessary as there is no evidence or reason to consider that the average asset betas of the comparator group would be unrepresentative of the asset beta for EDBs, GPBs and Transpower.[1171]

H8.84   The Commission's estimated asset beta for EDBs and Transpower (and the raw asset beta for GPBs) is in line with previous advice by Dr Lally which has been applied previously by the Commission (see paragraphs H8.65 to H8.69); and with other available estimates of the asset betas for similar services (see paragraph H8.208).

Step 5(b): Adjusting for differences in systematic risk due to regulatory differences

H8.85   Due to the limited number of relevant listed firms in New Zealand, i.e. Horizon Energy an EDB and Vector an EDB/GPB, the Commission has had to look to comparable electricity and gas utilities from overseas. These overseas firms are subject to regulatory regimes that may differ to New Zealand's regime.

H8.86   Inevitably, regulatory regimes applied to sectors may differ across and between countries. A key question relevant to beta estimation, and the transferability of overseas beta estimates to the New Zealand context, is whether different types of regulation systematically affect the ability of suppliers of regulated services to reduce their exposure to fluctuations in the economy (i.e. affects the providers in terms of their sensitivity to systematic risk). If yes, the next question is how any adjustment to the asset beta estimate should be made.

[1170] Ehrhardt, M. C., and Y. N. Bhagwat, A Full-Information Approach for Estimating Divisional Betas, *Financial Management*, Vol. 20, No. 2, 1991, pp. 60–69; Wood, R. A., T. H. Mcinish, and K. D. Lawrence, Estimating Divisional Betas with Diversified Firm Data, *Review of Quantitative Finance and Accounting*, Vol. 2, No. 1, 1992, pp. 89–96; Kaplan, P. D., and J. D. Peterson, Full-Information Industry Betas, *Financial Management*, Vol. 27, No. 2, 1998, pp. 85–93.

[1171] The exposure to systematic risks of GPBs is considered further at paragraphs H8.167 to H8.182.

The theory of regulatory regimes and differences in systematic risk

H8.87   In theory, different regulatory regimes can allocate risks differently between the regulated supplier (i.e. shareholders) and consumers.

H8.88   If the regulatory regime is such that it insulates the regulated supplier from the effect of any shocks to the economy, then the returns that are achieved will only be weakly correlated with market returns and the supplier will be exposed to less systematic risk, which will be reflected in a lower asset beta. Such an outcome is more likely to emerge if regardless of any shock that uncontrollably decreases demand or increases the cost of the service, the regulated price that is charged is simply adjusted by the regulator so that there is little, if any, effect on the return that the regulated supplier earns.

H8.89   Extreme forms of cost-of-service or rate-of-return regulation will in theory result in the regulated supplier bearing minimal systematic risk. This arises as any increase in cost is immediately passed through to the consumer by the regulatory authority and will not be borne by the supplier, and conversely, any benefit of decreased cost will not be realised by the supplier, but will be immediately passed through to the consumers by the regulatory authority.[1172] As the regulated supplier under such a scheme earns almost the same return regardless of its costs or any changes in demand, it is argued that cost-of-service or rate-of-return regulation (also known as cost-plus regulation) creates 'low-powered' incentives for suppliers to keep costs down. In fact, Joskow notes that under rate-of-return regulation:[1173]

> …the regulatory agency sets the prices of services and not rates of return. Once the prices for utility services are set by the regulatory authority, they remain at fixed levels until they are officially increased or decreased by action of that regulatory authority.

H8.90   Established through the US judicial system, rate-of-return regulation was the traditional form of regulation that applied to many services supplied by regulated utilities in the US from the mid-1940s. While in practice, under rate-of-return regulation, price was set to recover costs, as regulated suppliers or customers generally had to apply for price adjustments through a rate hearings process, there was normally a considerable lag between the time the cost has decreased/increased and the time the discount/higher cost was passed through to customers (i.e. the 'regulatory lag'). Joskow observed that this regulatory lag could last between 18-24 months.[1174]

H8.91   Consequently, compared to the scenario of perfect cost pass-through, rate-of-return regulated suppliers are potentially exposed to greater systematic risk. Further, the longer the regulatory lag lasts, the greater this level of risk exposure. For example, the existence of the regulatory lag means that the regulated supplier will in the interim be able to make above the normal allowed rate of return, providing

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[1172]   Guthrie, G., Regulating Infrastructure: The Impact on Risk and Investment, *Journal of Economic Literature*, Vol. 44, 2006, pp. 925-972. Guthrie on p. 937 states that: "Rate of return regulation immunizes shareholders from shocks to long-term cash flows because prices will be adjusted at future hearing to allow the firm to recover its costs."

[1173]   See p. 118, Joskow, P, Pricing Decision of Regulated Firms: A Behavioral Approach, *Bell Journal of Economics*, Vol. 4, 1973, pp. 118-140.

[1174]   ibid, p. 121.

incentives for performance. Kahn saw the existence of the regulatory lag as a positive for the regulatory regime, stating that:[1175]

> … the regulatory lag-the inevitable delay that regulation imposes in the downward adjustment of rate levels that produce excessive rates of return and in the upward adjustments ordinarily called for if profits are too low-is thus to be regarded not as a deplorable imperfection of regulation but as a positive advantage.

H8.92   If in contrast to pure cost-of-service or rate-of-return regulation, the regulatory regime instead increased the exposure of the regulated supplier to shocks to the economy, then the returns will be more strongly correlated with market returns and the supplier will face greater systematic risks. This will be reflected through a higher asset beta. Such an outcome is more likely to arise where the regulatory regime fixes prices for a long period of time. That is, the supplier that is subject to fixed-price regulation benefits from any uncontrollable increases in demand or decreases in costs that occurs, but is exposed to any losses that arise due to any decreases in demand or increases in cost until such a time when the fixed price is reset. At the time of the price reset consumers bear the consequences of any decreases in demand and increases in cost.[1176]

H8.93   In theory, pure forms of price-cap regulation (also known as CPI-X or RPI-X regulation)[1177] will generate outcomes where the regulated supplier will bear the risk of any increase in the cost, while the consumer price remains unaffected. As the supplier can potentially earn higher than normal returns over a period for which the price is fixed, such regulation creates 'high-powered' incentives for suppliers to keep costs down. Price-cap regulation is therefore sometimes referred to as a form of incentive-based regulation or a form of performance-based regulation (PBR).

H8.94   Price-cap regulation was introduced in the UK in the mid 1980s with the deregulation of the traditional statutory monopolies supplying utility services. The first price cap was introduced in the UK in 1984, and applied on the retail services supplied by the telecommunications incumbent supplier British Telecom. These caps have since evolved to be applied not only on price, but also on revenue, and across retail and wholesale services.

H8.95   The reset of the price cap under price-cap regulation often involves similar considerations to the reviews that are used under rate-of-return regulation. The shorter the regulatory period is, the more price-cap regulation converges towards a form of rate-of-return regulation,[1178] and consequently, the lower the level of systematic risk that the regulated supplier is likely to be exposed to.

[1175]   See Kahn, A.E., The Economics of Regulation, Volume II - Institutional Issues, MIT Press, 1988, p. 48.

[1176]   Guthrie, G., Regulating Infrastructure: The Impact on Risk and Investment, *Journal of Economic Literature*, Vol. 44, 2006, pp. 925-927.

[1177]   RPI - X (or CPI - X) regulation is a form of price cap regulation that in its basic form requires that the price index for a defined basket of the regulated supplier's services should increase by no more than the retail (or consumer) price index minus some "X" per cent per annum for a set period of years. Where X is positive (negative) it implies that the average price for regulated services must fall (rise) in real terms by at least X per cent. The so called "X factor" is often based on a productivity measure, although regulators will also often set or reset X by taking into consideration the cost of capital.

[1178]   Liston, C, Price-Cap versus Rate-of-Return Regulation, *Journal of Regulatory Economics* 5, pp. 25-48.

H8.96   Variants of price caps have been introduced, such as revenue caps and partial price caps, involving a mix of the two. Where a large proportion of the costs associated with the supply of a service are fixed (e.g. transmission costs), a large fluctuation in demand under price-cap regulation can expose the firm to large changes in revenue whilst overall costs remain unchanged. Alexander, Mayer and Weeds (Alexander et al.)[1179] noted that revenue caps provide a means to mitigate the risks firms face when there are such large fixed costs, and such regulations were introduced in the UK in the early 1990s in the electricity transmission sector. In practice, Alexander et al. outlines that a form of hybrid regulation has evolved, so that fixed costs are dealt with through revenue caps, and variable costs dealt with through price caps.[1180]

H8.97   The Commission accepts in principle that regulatory regimes can allocate risks differently and expose regulated suppliers to different systematic risks. Therefore adjustments may need to be made to asset beta estimates in order to account for such differences that might arise. However, before that can be done, there needs to be evidence that in practice the regulatory regimes allocate risks differently. This will need to be based on empirical estimates of average asset betas that differ where different regulatory regimes exist, and an assessment of the types of regulatory regimes that are currently in place in different countries.

Empirical evidence of regulatory differences and differences in systematic risk
H8.98   Empirical analysis by Alexander, Mayer and Weeds (Alexander et al.)[1181] using data between 1990-1995, showed that different regulatory regimes appeared to affect the level of shareholder risk for regulated suppliers across a number of countries for a number of different services – electricity, gas, energy, water and telecommunications.[1182] Their results suggested that high-powered incentive schemes, such as price-cap or RPI-X regulation, resulted in higher systematic risks compared with low-powered incentive schemes, such as rate-of-return regulation.

H8.99   In particular, when comparing data between 1990-1995 for services across the UK, (where variants of price-cap regulation have been used since the mid 1980s), with services across the US (where rate-of-return regulation has traditionally been employed for most services since the 1940s), Alexander et al. found that the estimated average asset beta across all services in the UK was at least two times that of the US.[1183] For the electricity sector the average asset beta estimated for the UK was 0.6, while the average asset beta estimated for the US was 0.3.

H8.100   Alexander et al. concluded in relation to their results from comparing the regulatory regimes:[1184]

> Regimes with low-powered incentives tend to coexist with low asset beta values, while high-powered incentives imply significantly high beta values. These results, in accordance with existing comparison of regulatory regimes, seem to imply that

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[1179]   Alexander, I, Mayer, C., and Weeds, H. Regulatory Structure and Risk: An International Comparison, Policy Research Working Paper 1698, The World Bank, December 1996, p. 10.

[1180]   ibid, p. 11.

[1181]   Alexander, I, Mayer, C., and Weeds, H. Regulatory Structure and Risk: An International Comparison, Policy Research Working Paper 1698, The World Bank, December, 1996.

[1182]   ibid.

[1183]   ibid, pp. 27-28.

[1184]   ibid, p. 30.

companies under RPI-X regulation are exposed to much higher levels of systematic risk in comparison with those under rate-of-return regulation, and that the cost of capital for these firms is therefore likely to be higher.

H8.101   Nevertheless, the authors indicated that their results should not be accepted without caveats. The authors noted that drawing comparisons between beta values on an international scale was difficult as each country's stock was being compared against a different market index. As indices differed in composition and were calculated differently, it introduced a possible source of non-comparability. One example highlighted was that in countries where the utility companies formed a large proportion of the total market capitalisation, the index would reflect movements in utility shares and the estimated beta will be higher.[1185]

H8.102   Alexander et al. noted that additionally national stock markets operated in different ways and were prone to different degrees of interval bias. For example, UK utilities tended to be large relative to the market as a whole, whereas US utilities were typically smaller regionally-based businesses. For this reason, estimated beta values could be expected to overstate the degree of market risk borne by UK utilities while risk incurred by US utilities would be understated. Similarly, the authors outlined that the much-quoted difference between US and UK utility betas, usually attributed to difference in regulatory risk, may simply reflect the systematic interval-effect biases that are present in these estimates.[1186]

H8.103   Further, Dr Lally has noted that beta estimates from different countries may be affected by differences in market leverage. Dr Lally showed that a significant proportion of the difference in the estimated asset betas for US and UK electricity utilities in the early 1990s was due to differences in market leverage of these businesses in the US and the UK.[1187]

H8.104   The findings of Alexander et al. have been used to provide support for adjustments made by Dr Lally when providing expert advice to the Commerce Commission on EDBs' asset betas.[1188]

H8.105   In estimating the EDBs' asset betas in 2005 and GPBs' asset beta in 2004 and 2008, Dr Lally considered asset betas from New Zealand publicly listed EDBs and a combination of US electricity and gas utilities. As he relied primarily on the data from US utility companies subject to rate-of-return regulation to estimate an asset beta of 0.30, Dr Lally recommended that there should be an upward adjustment to account for the more incentive-based nature of regulation used in New Zealand and to reflect the length of time between price resets.

H8.106   However, the results from research by Buckland and Fraser on the beta sensitivity in UK electricity distribution brings in to question the results from Alexander et al.[1189]

[1185]   ibid, p. 31.

[1186]   ibid, p. 31.

[1187]   Lally, M., Betas and Market Leverage, *Accounting Research Journal*, Vol. 15, 2002, pp. 91-97.

[1188]   Lally, M., *The weighted average cost of capital for electricity lines business*, September 2005.

[1189]   Buckland, R., and P. Fraser, Political and Regulatory Risk: Beta Sensitivity in U.K. Electricity Distribution, *Journal of Regulatory Economics*, Vol. 19, 1, 2001, pp. 5-25.

H8.107　Buckland and Fraser analysed 12 privatised UK electricity utilities betas over a period from December 1990 through to December 1998. They found that the period from 1990 to 1995 was influenced by two significant events (one political and one regulatory) that biased upwards the beta estimate over this period (this is the same period considered by Alexander et al.).

H8.108　The first of these events was the effect of political uncertainty that was observable first on April 1, 1992 and did not subside until October 1992 when the betas return to their previous levels.[1190]

H8.109　The second event occurs in the period 1994-1995 where spikes and shifts occurred in the betas. Buckland and Fraser comment that this change in the risk occurs contemporaneously with the regulators (Office of Electricity Regulation (Offer), superseded by Ofgem in 1999) shifts over amendments to the published distribution price review.

H8.110　The Commission considerers that the result of these two events would bias upwards the beta estimate over the period considered by Alexander et al., thereby bringing into question the results of their study and the appropriateness of the previous adjustment below for regulatory difference.

Electricity

H8.111　In advice for the Unison Post-Breach Inquiry Dr Lally considered that as New Zealand had a form of price-cap regulation it would affect the systematic risk of an EDBs (i.e. asset beta) and estimated that an adjustment of 0.10 should apply to account for this regulatory difference. The Commission adopted an adjusted asset beta of 0.4.[1191]

H8.112　Dr Lally's approach was criticised by Boyle, Evans and Guthrie, (Boyle et al.) who indicated that:[1192]

- the sample US electricity utilities operated other services as well as regulated electricity services;

- the structure of the US electricity industry had changed and that many state regulators had adopted incentive regulation. Lally's claim that US electricity utilities are subject to rate-of-return regulation with annual resetting of prices was a gross over-simplification and ignored the incentive regulation implemented in many states; and

- it was incorrect that rate-of-return regulated firms are reviewed annually.

[1190]　Buckland and Fraser found a similar result for UK water; see Buckland, R., and P. Fraser, Political and Regulatory Risk in Water Utilities: Beta Sensitivity in the United Kingdom, *Journal of Business Finance & Accounting*, Vol. 28, Issue 7-8, 2001, pp. 877-904.

[1191]　ibid, p. 47; Commerce Commission, *Regulation of Electricity Lines Businesses Targeted Control Regime, Reasons for Not Declaring Control, Unison Networks Limited*, 11 May 2007, pp. 39-39.

[1192]　Boyle, G., Evens, L., and Guthrie, G., Estimating the WACC in a Regulatory Setting, New Zealand Institute for the Study of Competition and Regulation, March 2006, pp. 20-31.

Gas

H8.113 In advice on the Gas Control Inquiry and Gas Authorisation Dr Lally considered that as New Zealand had a form of price-cap regulation it would affect the systematic risk of the GPBs (i.e. asset beta).[1193] Dr Lally estimated that if New Zealand entities were subject to a five-year price cap, an upward adjustment of 0.20 should be applied to the estimated rate-of-return regulated asset beta of 0.3, to account for the regulatory difference. This resulted in an asset beta of 0.50, before any other adjustments were made.

H8.114 Dr Lally further considered that the period of the price cap would affect the asset beta. If the price cap was less than five years he argued that a regulated business would face less risk and any upward adjustment to the asset beta would be lower. He maintained that as rate-of-return regulation was equivalent to a one-year price cap, it should have an asset beta of 0.30. Using asset beta estimates for the one-year and five-year periods of price-cap regulation, Dr Lally scaled the asset beta estimate to match the regulatory period applied to GPBs in New Zealand.[1194]

H8.115 In the Gas Authorisation the GPBs were subject to a seven-year price-cap from 2005-2012. However, since the Commission was making the decision in 2008 it proposed to break the seven years into two periods, three years (2005-2008) followed by four years (2008-2012). This meant that it effectively imposed a three-year price cap and four-year price cap on the GPBs.

H8.116 In estimating the asset beta for the three-year and four-year price caps, Dr Lally used linear interpolation between the asset beta of 0.30 and the asset beta of 0.50. This resulted in an estimate for the asset beta of 0.40 for the three-year price cap, and 0.45 for the four-year price cap.

H8.117 Recognising the seven-year period of price-cap regulation was being split into a three-year and a four-year period, Dr Lally estimated the asset beta to apply for the Gas Authorisation by then placing weights of 3/7th on the asset beta of 0.4 and 4/7th on the asset beta of 0.45. This resulted in a final asset beta recommendation for the Gas Authorisation, only incorporating changes for different regulatory regimes, of 0.43.

H8.118 While the Commission considers that regulatory differences can affect the systematic risks faced by the regulated suppliers, and has previously adjusted US estimates upward to account for regulatory differences, it finds that in contrast to previous evidence (e.g. Alexander et al.), the current asset beta estimates in Table H18 for US electricity utilities now appear to be similar and in some cases higher than the estimates from the UK, Australia and New Zealand.

H8.119 That is, whilst the Commission estimated an average EDB asset beta for the US integrated electricity and gas utilities of 0.29, with a range from 0.10-0.55, Ofgem in

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[1193] Lally, M., *The weighted average cost of capital for gas pipeline businesses*, November 2004, pp. 44-46; Lally, M., *The weighted average cost of capital for gas pipeline businesses*, October 2008, p. 59, pp. 60-62.

[1194] Lally, M., *The weighted average cost of capital for gas pipeline businesses*, October 2008, p. 59, pp. 133-134 and 139-144.

its most recent electricity price control review, evaluated the appropriate asset beta for electricity distribution sector in the UK to be in the range 0.24-0.34.[1195]

H8.120   The Ofgem result was based on evidence provided by PwC UK. The PwC UK data primarily used a UK comparator sample in order to avoid any distortions caused by differences in regulatory risk across different countries.[1196] The sample included three energy companies—National Grid (electricity and gas distribution/transmission), Scottish and Southern Energy (electricity distribution/transmission and retail/generation) and Scottish Power (electricity distribution/transmission), as well as four UK traded water/sewerage companies—United Utilities, Severn Trent, Pennon and Kelda.[1197]

H8.121   PwC UK estimated unadjusted and adjusted (using Blume) asset betas for different periods and different frequencies (five-yearly with monthly, three-yearly with weekly and two-yearly with daily) as well as incorporating a debt beta of zero and 0.1. PwC UK identified the adjusted asset beta for the UK was in the range of 0.31 to 0.38 (with an average of 0.34). As a cross-check on the UK sample PwC UK used 14 international electricity and gas utilities, which were a mixture of electricity and gas distribution and transmission services.[1198] PwC UK's analysis indicated an adjusted asset beta range for the international suppliers of 0.21 to 0.46 (with an average of 0.31), and it considered this range to be broadly in line with the range estimated for the UK sample.[1199] On the basis of these findings PwC UK recommended, for the UK EDBs', a range for the asset beta of 0.31 - 0.38 and a range for the equity beta of 0.5 - 1.1.

H8.122   In Australia, the implied asset beta of the AER for electricity distribution and transmission network providers (where revenue-cap regulation is in place for electricity transmission[1200] and a combination of price and revenue caps are in place for electricity distribution[1201]) was 0.32. For the five-year period ending 2010 the Commission has estimated asset betas for the sample of Australian entities that range from 0.16-0.31, and for New Zealand entities that range from 0.18-0.28.

H8.123   As in the final cost of capital decision for the AER electricity distribution and transmission network suppliers, the AER in a number of gas distribution decisions since 2009 has adopted the equity beta of 0.8, and thus used an implied asset beta of 0.32, using the tax-neutral de-leveraging formula.[1202] The AER adopted the equity beta of 0.8 despite recognising that its best estimate of the equity beta for the gas

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[1195]   Ofgem, *Electricity Distribution Price Control Review Final Proposal*, 7 December 2009, pp. 52 and Ofgem, *Electricity Distribution Price Control Review Final Proposal - Allowed Revenues and Financial Issues*, 7 December 2009.

[1196]   PricewaterhouseCoopers, *Advice on the cost of capital analysis for DPCR5, Final Report to the Office of Gas and Electricity Markets*, 28 July 2009.

[1197]   ibid, pp. 34-41.

[1198]   ibid, pp. 42-48.

[1199]   ibid, p. 48.

[1200]   See p. 132, AER, *State of the Energy Market 2009*, 8 December 2009, Chapter 5, pp. 124-151.

[1201]   See Table 6.2, p. 163, AER, State of the Energy Market 2009, 8 December 2009, Chapter 6, pp. 122-189.

[1202]   AER, *Access arrangement proposal for the NSW gas networks - Jemena, Final Decision*, June 2010, p. 173. In this decision the equity beta was estimated as 0.8, a notional leverage assumption of 60% adopted, and a debt beta of zero was used.

distribution service was between 0.4-0.7.[1203] Applying the tax-neutral de-levering formula, this implies the best estimate of asset betas for gas distribution businesses of 0.16-0.28. The AER used the figure of 0.8 as it concluded a conservative approach had merit and provided the supplier with a reasonable opportunity to at least cover efficient costs.

H8.124 Prior to the AER taking over the economic regulation of the electricity distribution networks on 1 January 2008 and the gas distribution networks on 1 July 2008, these economic regulatory functions in Australia lay with the States. The AER in its 2009 decision on the WACC parameters for electricity distribution and transmission, noted that the asset betas used by the State-based regulators for gas distribution services had ranged between 0.30-0.55, while equity betas ranged between 0.7-1.1.[1204]

H8.125 The lower bound for the range was based on the Essential Services Commission (ESC) final decision for gas distribution suppliers in Victoria. In estimating the cost of capital it reduced the equity beta from 1.0 to 0.70. Although no decision was made with regards to the debt beta, given the notional level of leverage of 60% used and a debt beta of zero, the tax-neutral de-levering formula implies an asset beta of 0.28. In order to reduce the effect of the decrease in the equity beta, however, the ESC provided for an allowance in each distributor's total revenue, which effectively meant that the estimate for the equity beta was 0.8, which would imply an asset beta of 0.32.[1205]

H8.126 The upper bound of the range, the equity beta of 1.1 and the implied asset beta of 0.55, was as a result of a decision by the Queensland Competition Authority (QCA) for the gas distribution businesses in 2006.[1206]

H8.127 For the EDBs Draft Reasons Paper, the Commission estimated that the asset betas for the sample of Australian entities ranged from 0.10-0.20, and for New Zealand entities ranged from 0.18-0.29. When the Commission added to the Australian sample the other predominantly gas businesses, and excluded the electricity-only supplier Spark Infrastructure, the estimated range increased from 0.10-0.31.

H8.128 The results have led the Commerce Commission to consider further whether or not the differences previously identified between the regulatory regimes in the US and UK currently exist in practice, and how the current New Zealand default/customised price-quality regulation compares to these overseas regulatory regimes.

[1203] ibid. A similar finding was also made by the AER when examining the equity beta for electricity distribution and transmission. That is, the underlying analysis commissioned by the AER, indicated a lower equity beta than the equity beta of 0.8 that was adopted, which implies (using the tax-neutral de-levering formula) an asset beta of lower than 0.32. See, Ólan, T. H., *Estimating β*, Report to ACCC, 23 April 2009; AER, *Electricity Transmission and Distribution Network Service Providers - Review of the Weighted Average Cost of Capital (WACC) Parameters, Final Decision*, May 2009.

[1204] AER, *Final decision: Electricity transmission and distribution network service providers – Review of the weighted average coat of capital (WACC) parameters*, May 2009, p. 242, Table 8.2.

[1205] Essential Services Commission, *Gas Access Arrangement Review 2008-2012*, Final Decision, 7 March 2008.

[1206] QCA, *Revised Access Arrangement for Gas Distribution Networks: Allgas Energy*, May 2006; QCA, *Revised Access Arrangement for Gas Distribution Networks: Envestra*, May 2006. The QCA in both decisions assumed a debt beta of 0.12 and used the Conine Levering formula, replacing the corporate tax rate term with the imputation-adjusted tax rate. (See QCA, *Revised Access Arrangement for Gas Distribution Networks: Envestra*, May 2006, p. 103).

The regulatory framework in the US, UK and New Zealand

H8.129   The US and UK are often painted as using two diametrically opposed regulatory regimes. The US is viewed as implementing a low-powered incentive-based rate-of-return regulation, whilst the UK is portrayed as implementing a high-powered incentive-based price-cap regulation.

H8.130   However, this ignores the fact that the actual differences between the two types of regulations may be minimal. Further, there appears to have been an increased move towards more incentive-based regulatory regimes in the US, and a move in the UK to reduce the risks associated with RPI-X.

H8.131   In assessing incentive regulation in theory and in practice in electricity distribution and transmission networks, Joskow contrasted the revenue-cap regulation used in the UK with the cost-of-service regulation developed in the US. He found that in comparing the two regimes there were actually many similarities between them, stating that:[1207]

> …I believe that there is less difference than may first meet the eye. The UK's implementation of a price cap based regulatory framework is best characterized as a combination of cost-of-service regulation, the application of a high powered incentive scheme for operating costs for a fixed period of time, followed by a cost-contingent price ratchet to establish a new starting value for prices. The inter-review period is similar to "regulatory lag" in the U.S. context…except it is structured around a specific RPI-x formula that employs forward looking productivity assessments that allows for automatic adjustments for inflation and has a fixed duration. A considerable amount of regulatory judgment is still required by OFGEM.

H8.132   Further, Joskow noted that due to the existence of a 'regulatory lag', cost-of-service regulation created a similar incentive for suppliers to decrease costs as under incentive-based regulation. However, unlike incentive-based or performance-based regulation this was more a consequence of the impracticality of having frequent price reviews and changing economic conditions, than by design.

H8.133   The convergence of UK RPI-X and the US cost-of-service regulations highlighted by Joskow and noted by Boyle et al., has also been acknowledged by Pfeifenberger, who in the following diagram contrasted the incentive spectrum between the high powered or pure incentive-based or performance-based regulations (PBR) and the very low powered pure cost-of-service (COS) regulation.[1208]

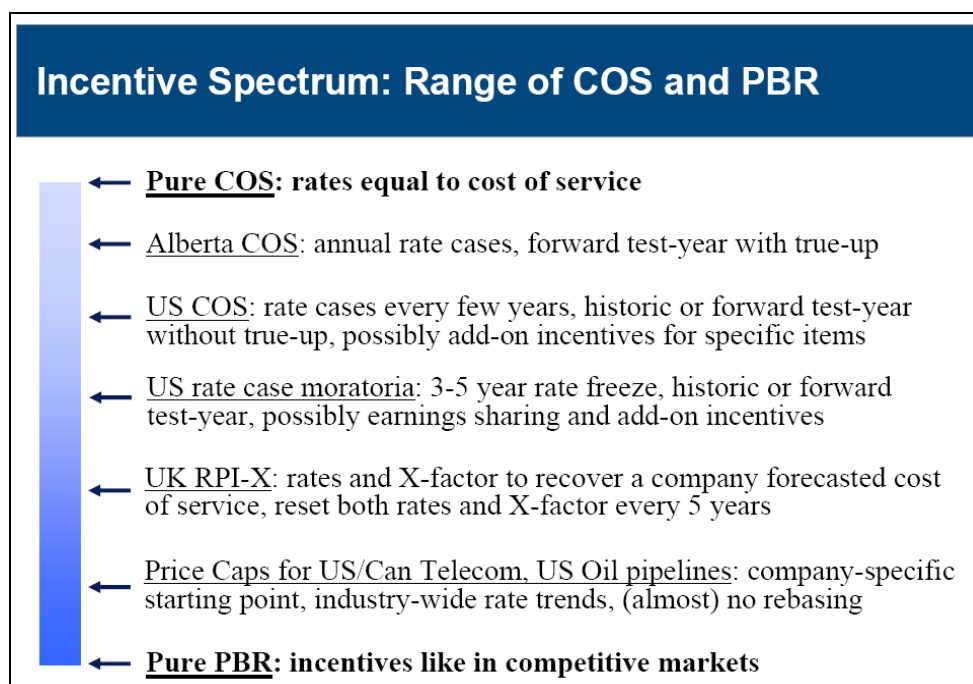[1207]   Joskow, P.L., Incentive Regulation in Theory and Practice: Electricity Distribution and Transmission Networks, A Paper Prepared for the National Bureau of Economic Research Conference on Economic Regulation, 9-10 September, 2005, p. 44.

[1208]   Pfeifenberger, J., Incentive Regulation: Introduction and Context, Presentation at AUC PBR Workshop, Edmonton , Alberta, May 26-27, 2010, slide 10.

Figure H10   Incentive spectrum between PBR and COS regulation[1209]

Incentive Spectrum: Range of COS and PBR

← **Pure COS**: rates equal to cost of service

← Alberta COS: annual rate cases, forward test-year with true-up

← US COS: rate cases every few years, historic or forward test-year without true-up, possibly add-on incentives for specific items

← US rate case moratoria: 3-5 year rate freeze, historic or forward test-year, possibly earnings sharing and add-on incentives

← UK RPI-X: rates and X-factor to recover a company forecasted cost of service, reset both rates and X-factor every 5 years

← Price Caps for US/Can Telecom, US Oil pipelines: company-specific starting point, industry-wide rate trends, (almost) no rebasing

← **Pure PBR**: incentives like in competitive markets

H8.134   While the US was traditionally subject to rate-of-return regulation across all sectors, by the 1990s a number of states had started to look to using forms of incentive regulation for telecommunications. By 2000, 40 states had price-cap regulation in place for telecommunications and four states had other forms of incentive regulation.[1210] Similarly, Kwoka shows that this movement towards incentive-based forms of regulation has also been occurring in electricity regulation in the US. When state-based regulators were asked the question whether or not a form of incentive-based regulation was used, 20 state regulators answered yes, whilst 19 responded that it was not being used.[1211] This is consistent with the analysis of Boyle et al.[1212] which noted that the structure of the US electricity industry had changed and that many of the state regulators in the US had adopted incentive-based regulation.

H8.135   Using the information in Kwoka the Commission has further surveyed the remaining state electricity regulators that Kwoka did not have information for. The Commission increased the sample of known regulatory regimes from the 38 in

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[1209]   Note, 'true ups', referred to in Figure 6.4, allow firms to reconcile the regulated prices with the actual costs that have been incurred by the firm. For example, where the actual costs are not used to establish prices, the regulation can provide for a 'true-up' to the actual costs. This has sometimes been done in the US electricity markets in order to take into account potential stranded costs associated with deregulating markets and opening them up to competitive entry. True-ups to actual costs are sometimes used under price-cap regulation, through a rate of return-sharing mechanism. The use of true-ups typically results in the regulatory regime being more closely aligned with a low-powered incentive-based cost-of-service regulation.

[1210]   Vogelsang, I., Incentive Regulation and Competition in Public Utility Markets: A 20-Year Perspective, *Journal of Regulatory Economics* 22 Vol. 1, 2002, pp. 5-27. See pp. 7-8.

[1211]   Kwoka, J., Investment Adequacy Under Incentive Regulation, Northwestern University Working Paper, September 2009, Table 1, pp. 25-26.

[1212]   Boyle, G., Evans, L., and Guthrie, G., Estimating the WACC in a Regulatory Setting, New Zealand Institute for the Study of Competition and Regulation, March 2006, pp. 20-31.

Kwoka to 46. The results in Table H17 indicate that of the 50 US electricity utilities in the sample:

- 24 utilities operated in more than one state;

- 17 utilities are subject only to incentive regulation;

- 12 utilities are not subject to incentive regulation;

- 16 utilities were identified as being under both incentive-based and non-incentive-based regulations as they operated in more than one state;[1213] and

- several utilities could not be classified as they operated in a state that had not been identified as using regulation that was incentive or non-incentive based.

H8.136 This analysis on the regulatory regime faced by US electricity utilities is consistent with the criticism from Boyle et al. that the structure of regulation of the US electricity industry has changed. The majority of the US firms from the comparable firms sample are exposed to some form of incentive based regulation. The results of analysis on the comparative firms sample from the US electricity utilities indicate that there is no difference in the systematic risk between the three identified groups.

H8.137 Even ignoring the potential convergence of the regulatory regimes in the US and UK, empirical analysis by The Allen Consulting Group (ACG), using a 2008 sample of US electricity and gas suppliers' subject to rate-of-return regulation and a sample of firms subject to some form of incentive-based regulation, showed that the group of suppliers with some form of incentive-based regulation had an estimated average equity beta of 0.98, whilst the rate-of-return regulated suppliers had an estimated average equity beta of 1.01. ACG concluded that "we have been unable to find support for the hypothesis that the beta risk of US firms varies materially with the form of regulation".[1214]

H8.138 With regards to electricity regulation in the UK there appears to have been ongoing developments to mitigate the risks associated with price-cap regulation. Alexander et al. highlighted that in the early 1990s in the UK, price-cap regulation evolved into a form of revenue/price-cap regulation (i.e. hybrid regulation) in order to decrease risk.[1215] There are also often provisions made to allow for cost pass-through under the any price or revenue caps.

H8.139 Further, the CEO of Ofgem, Alistair Buchanan as part of Ofgem's RPI@20 project noted that while prices were down, and investment and quality had increased, this had been achieved whilst still decreasing the cost of capital from a pre-tax WACC of 8.5% allowed in 1990 to a rate of just above 6.0% now. He stated that Ofgem

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[1213] Of the 50 firms 24 operated electricity distribution services in more than one state. Of the 24, 16 utilities operated in a state that was classified as incentive regulation and in a state that was classified as not incentive regulations. Some utilities that operated in more than one state could not be classified as they operated in a state that was not identified by Kwoka as incentive or non-incentive based.

[1214] Allen Consulting Group, *Beta for regulated electricity transmission and distribution - Report for Energy Networks Association, Grid Australia and APIA*, 17 September 2008, pp. 49-50.

[1215] Alexander, I, Mayer, C., and Weeds, H. Regulatory Structure and Risk: An International Comparison, Policy Research Working Paper 1698, The World Bank, December, 1996.

believed that this low level for the WACC had been secured due to the use of a consistent stable regime, which has still allowed for RPI-X to adapt and accommodate change.[1216]

H8.140   In terms of the default/customised price-quality regulatory regime in New Zealand, the Commission considers that it has elements of both a more incentive-based price-cap regulatory regime and a less incentive-based rate-of-return regulatory regime.

H8.141   The DPP subjects regulated suppliers to a productivity-based price cap, but may not take into account comparative benchmarking analysis, which is often a key feature of incentive-based regulatory regimes used in the UK and Europe. Further, if the regulated supplier considers that it cannot earn a normal rate of return on its investments under this scheme, it can opt to apply to the Commission for a CPP.

H8.142   The CPP takes into account the supplier's specific circumstances by adopting a building blocks approach and uses forecast information provided by the supplier, which is assessed by the Commission. Taking into account costs of the supplier is typically a feature of less incentive-based forms of regulation, however, the reliance on forecast information that is assessed by the regulator is generally a feature of the incentive-based regimes used in the UK and Australia.

H8.143   The DPP framework itself also has a number of adjustment mechanisms built into it, such as cost pass-through provisions, which may reduce the supplier's exposure to systematic risk.

H8.144   As the Commission has determined that transmission pipelines may be subject to a different form of price-cap regulation (subject to meeting the conditions noted below), another related consideration is whether adjustments should be made to the asset betas of any transmission pipeline in New Zealand that faces a different form of regulation to other GPBs.

Gas transmission and gas distribution regulation in New Zealand

H8.145   The IM Determination provides that in setting the form of control for a gas transmission business the Commission will take into account whether the business manages capacity through contract carriage arrangements and supplies services on the basis of non-standard pricing arrangements (refer to clause 3.1.1(2)). This may result in a gas transmission business being subject to a total revenue cap or a weighted average price cap.

H8.146   In principle, the Commission considers that while both are a form of price-cap regulation, revenue-cap regulation may result in some mitigation of both systematic and unsystematic risks associated with unanticipated demand shocks. If it has a lower level of systematic risk then it would also have a lower asset beta compared to weighted-average price caps.

H8.147   In having regard to the regulated services under Part 4, the Commission considers that the systematic risk associated with gas transmission businesses will to a large extent already be low, because of the low elasticity of demand for the services. The Commission further notes that suppliers subject to price-cap regulation can in

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[1216]   Buchanan, A., *Is RPI-X still fit for purpose after 20 years?*, Beesley Lecture, London, 2 October 2008.

practice structure their pricing in such a way to insulate themselves from demand shocks, creating a similar outcome to that which would result under revenue-cap regulation. This can be done through a price capped firm converting tariffs based on usage charges into predominantly tariffs based on fixed charges.

H8.148 Therefore, the question with regard to the effect of revenue-cap regulation is, how much additional systematic risk does the use of revenue-cap regulation actually eliminate?

H8.149 The Commission does not have any robust evidence that demonstrates that these differences in regulatory regimes affect or reduce the level of systematic risk in any material way. This is also the view shared by Vector.[1217] In practice, the empirical evidence has not shown a significant difference between the systematic risks associated with different types of regulation.

H8.150 On this basis the Commission considers that if there is any reduction of systematic risk it is likely to be small, and the Commission therefore considers it not appropriate to differentiate the asset beta between regulatory regimes for gas transmission and gas distribution services

Overseas regulators - adjusting for differences in systematic risk due to regulatory differences

H8.151 Australian and UK regulators primarily used data from their own countries, with US and other foreign firms being used as a cross-check only.[1218] As such, there was no consideration of whether or not they should adjust for differences in systematic risk due to regulatory differences.

H8.152 The AER did not differentiate the equity beta between the different forms of price-cap regulation. It uses the same asset and equity beta for electricity distribution and electricity transmission, which are subject to different forms of regulation. That is, revenue-cap regulation is in place for electricity transmission[1219] and a combination of price and revenue caps are in place for electricity distribution.[1220]

H8.153 As a cross-check the AER evaluated a portfolio of US electricity utilities and compared the results of the equity beta to its estimated equity beta from Australian firms.[1221] The US electricity and gas sample result was 0.71 compared to 0.71 for the highest average of the Australian individual equity betas.

Conclusion - adjusting for differences in systematic risk due to regulatory differences

H8.154 Due to the limited number of relevant listed firms in New Zealand, the Commission has looked to comparable firms listed overseas, which operate under a variety of regulatory regimes to derive a beta estimate.

[1217] Vector Limited, *Cross-submission to Commerce Commission on Gas Default Price-Quality Path: Issues Paper*, 31 May 2010, pp. 4-5.

[1218] AER, *Final decision: Electricity transmission and distribution network service providers – Review of the weighted average coat of capital (WACC) parameters*, May 2009, p. 328.

[1219] See p. 132, AER, *State of the Energy Market 2009*, 8 December 2009, Chapter 5, pp. 124-151.

[1220] See Table 6.2, p. 163, AER, *State of the Energy Market 2009*, 8 December 2009, Chapter 6, pp. 122-189.

[1221] ibid, p. 332.

H8.155   In theory, regulatory regimes can allocate risks between regulated suppliers and consumers differently, such that a regulatory regime can either insulate the regulated supplier from more risk or expose the regulated supplier to more risk. Consequently, the regulatory regime can affect the asset beta that should be set and differences in regulatory regimes should in principle be taken into account.

H8.156   Previous research suggests that US electricity utilities were subject to less risk than UK electricity utilities and that this was a function of the different regulatory regimes. The Commission notes that the results from research by Buckland and Fraser questions the results of the previous research.

H8.157   The Commission does not consider that it has any recent empirical evidence that demonstrates different regulatory regimes affect or reduce the level of systematic risk in any material way.[1222]   The empirical evidence considered by the Commission has not shown a significant difference between the systematic risks associated with regulated US and UK entities or for regulated US entities subject to different regulatory regimes.

H8.158   In part, the current results may reflect that:

- in practice, the difference between the two types of regulation may be minimal;

- over the past decade there has been a strong movement by US state-based regulators towards more incentive-based forms of regulation; and

- price-cap regulation has evolved in the UK with new variants of price-cap regulation being introduced, and refinements to RPI-X being made, which have been designed to mitigate risk.

H8.159   In terms of the default/customised price-quality regulatory regime in New Zealand, the Commission considers that the level of risk it exposes businesses to is comparable to that observed in overseas regimes. New Zealand's incentive-based price-cap regulatory regime is similar to those used overseas, but the New Zealand arrangements include an option for a business to apply for a review during the regulatory period (i.e. the ability to apply for a CPP) which is similar in many ways to arrangements under rate-of-return regulation. The option can only be exercised once every three to five years (depending on the regulatory period chosen), and the number of firms that can apply is limited, so the option may be more restrictive than under some rate of return regimes.

H8.160   The Commission considers that the estimates for the asset betas for the US and UK electricity utilities; the evidence of the convergence between the two regulatory regimes; and the elements of both price-cap and rate-of-return regulation under the default/customised price-quality regime in New Zealand; suggests that in contrast to the Commission's previous approach, there is no need to adjust upwards the current asset beta estimates sourced from overseas to account for regulatory differences.

[1222]   The current empirical evidence does not necessarily appear to support this conclusion with average asset betas for the US estimated being higher than those in the UK.

H8.161   Therefore, for EDBs, GPBs and Transpower the Commission does not consider it necessary to make an adjustment to the unadjusted asset beta estimate of 0.34 derived from New Zealand and overseas markets for differences in systematic risk due to regulatory differences.

H8.162   The Commission notes that while under a CPP the firm can opt for a shorter regulatory timeframe of three or four years, rather than five years, and this could in principle decrease its systematic risk, the Commission considers that any such decrease is likely to be small and difficult to quantify. Further, the effect is likely to be most pronounced where the supplier engages in two successive CPPs with three-year regulatory periods (i.e. six years of CPP regulation), and this type of outcome appears unlikely at this stage. Consequently, the Commission considers that given there is only likely to be a small time difference in regulatory periods faced by the regulated supplier, no adjustment should be made here to take shorter periods of price regulation into account.

Step 5(c): Adjusting for differences in systematic risk between services

EDBs

H8.163   The Commission recognises that, in principle, there could be differences in exposure to systematic risk between services within an industry and between industries, which would justify an adjustment to asset beta estimates.

H8.164   As outlined above, the Commission estimates an industry-wide asset beta that applies to all EDBs, GPBs and Transpower. As such, a discussion regarding the differences in systematic risk across EDBs, and subsequent adjustment to EDBs', GPBs' and Transpower's asset betas, does not apply.

H8.165   As also outlined above, the Commission derives its asset beta estimate for EDBs, GPBs and Transpower from overseas integrated electricity utilities asset beta estimates. Therefore, no adjustment for differences between industries is required.

Conclusion - EDBs' and Transpower's final asset beta from step 5

H8.166   The Commission notes that there is a wide range of estimates. Having considered the above factors and using the previous advice and its own analysis, the Commission arrived at an average asset beta for EDBs and Transpower of 0.34 from its initial analysis and 0.28 from its updated analysis for monthly frequency data. The Commission has settled on an unadjusted asset beta estimate for regulated EDB services and Transpower of 0.34.

GPBs

H8.167   The Commission recognises that, in principle, there could be differences in exposure to systematic risk between regulated suppliers within an industry and between different industries, which would justify an adjustment to asset beta estimates.

H8.168   As outlined above, the Commission estimates an industry-wide asset beta that applies to all GPBs and does not distinguish between gas distribution and gas transmission services. As such, a discussion regarding the differences in systematic risk across GPBs, and subsequent adjustment to GPBs' asset betas does not apply.

H8.169   However, the Commission has in previous gas decisions considered that an upward adjustment should apply for the differences between EDBs and GPBs in New

Zealand. Dr Lally has provided advice to the Commission on the appropriate level of this adjustment.

H8.170 In advice on the asset beta for the Gas Control Inquiry and Gas Authorisation, Dr Lally outlined several factors that would influence the level of systematic risk—the nature of the product or service; nature of customers; pricing structure; duration of contract prices with suppliers and customers; presence of regulation; degree of monopoly power; presence of growth options; operating leverage; and market weight of the industry on the market proxy.[1223]

H8.171 When assessing these factors Dr Lally considered that EDBs and GPBs had similar pricing structures; similar exposure to a 'regulatory' threat of price control; operating leverage; and both sectors were small as a proportion of the market index. Dr Lally considered the situation regarding monopoly power was ambiguous.[1224]

H8.172 However, Dr Lally considered there were significant differences between EDBs and GPBs in relation to growth options, the nature of the product, and the composition of customers. On the basis of these factors Dr Lally highlighted four potential significant differences between EDBs and GPBs on these factors:

- GPBs, unlike EDBs, had significant options to expand their networks and this may raise the asset beta;

- a large proportion of gas is used as an intermediate product in the petrochemical industry (methanol production). This suggested a higher elasticity of demand for gas, and therefore a higher asset beta for GPBs. However, Dr Lally considered there were two mitigating factors that ensured the overall effect on the asset beta was small. Firstly, methanol was exported, and secondly, as the distance gas was transported to the methanol production facility was relatively short, very little revenue resulted from the transportation of gas for methanol production;

- a large proportion of gas is used in electricity generation and some of this is used to generate the variable supply rather than the base supply. If the variable supply were substantial then the demand for gas would be more sensitive to macroeconomic shocks than the demand for electricity, and this would result in a higher asset beta. However, Dr Lally considered most of the gas was used by electricity generators that provided base supply rather than variable supply, and this result did not point to a higher asset beta for GPBs; and

- leaving aside the fact gas was used by the petrochemical industry (30%), Lally highlighted that 64% was used for commercial and industrial use (i.e. electricity generation) and the remaining 6% used by residential customers. As the majority of gas was used by commercial and industrial users, gas

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[1223] Lally, M., *The weighted average cost of capital for gas pipeline businesses*, paper prepared for the Commerce Commission, 24 November 2004, pp. 34-38; Lally, M., *The weighted average cost of capital for gas pipeline business*, 28 October 2008, pp. 49-53.

[1224] Lally, M., *The weighted average cost of capital for gas pipeline businesses*, paper prepared for the Commerce Commission, 24 November 2004, pp. 46-48; Lally, M., *The weighted average cost of capital for gas pipeline business*, 28 October 2008, pp. 62-64.

should be regarded as an intermediate product whose demand was driven by the demand of final goods and services. As the demand for goods and services of commercial and industrial users of gas was likely to be more sensitive to macroeconomic shocks than demand for gas (or electricity) by residential customers, this implied a higher asset beta for GPBs compared with EDBs.

H8.173   Taking into account these factors, Dr Lally considered that GPBs warranted a "modestly" higher asset beta than for EDBs in New Zealand, and recommended adding a margin of 0.10 to reflect the greater risk. This was in addition to the increase in the asset beta to reflect differences in regulatory regimes between New Zealand and the US that Dr Lally proposed.

Empirical evidence and other regulators' views on differences in systematic risk between electricity and gas services

H8.174   In advice to the Commission on gas and electricity Dr Lally has estimated the asset beta from a sample of US gas and electricity utilities.[1225] The results from the analysis indicate that US gas pipeline services on average appear to be subject to lower systematic risk than US electricity utilities. The Commission's more recent empirical analysis confirms this finding.

H8.175   In evidence presented to Ofgem, PwC UK showed that there was minimal difference between the Blume adjusted asset betas for international electricity comparators (i.e. a range of 0.22-0.42, with an average of 0.31) and international gas comparators (a range of 0.24-0.46, with an average of 0.31).[1226] For the unadjusted asset beta analysis the international gas comparators had a lower asset beta (average of 0.15) compared to the international electricity comparators (average of 0.18).

H8.176   The AER in considering electricity distribution and transmission network providers, used an equity beta of 0.80, which combined with a notional level of leverage of 60%, implied an asset beta of 0.32.[1227] The AER in three other gas distribution access arrangements adopted the same equity beta and notional leverage parameters on the basis that it considered that gas and electricity businesses were close comparators.[1228] In a 2009 draft decision for the Jemena gas distribution network the AER stated that:[1229]

> The AER estimates an equity beta of 0.8 for a benchmark efficient service provider which it has applied in recent draft decisions for the ActewAGL and Country Energy gas distribution access arrangements.

[1225]   Lally, M., *The weighted average cost of capital for gas pipeline businesses*, November 2004, Table 3, p. 44; Lally, M., *The weighted average cost of capital for electricity lines businesses*, September 2005, Table 3, p. 45; Lally, M., *The weighted average cost of capital for gas pipeline businesses*, October 2008, Table 3, p. 59.

[1226]   PricewaterhouseCoopers, *Advice on the cost of capital analysis for DPCR5, Final Report to the Office of Gas and Electricity Markets*, 28 July 2009, pp. 42-49.

[1227]   AER, *Final decision: Electricity transmission and distribution network service providers – Review of the weighted average coat of capital (WACC) parameters*, May 2009.

[1228]   AER, *Draft decision Jemena Access arrangement proposal for the NSW gas networks 1 July 2010 - 30 June 2015*, February 2010, p. 125.

[1229]   AER, *Draft decision, ActewAGL distribution access arrangement proposal 1 July 2010 - 30 June 2015*, November 2009, pp. xiv, xxxvii, 62-65, 72; AER, *Draft decision, Country Energy Access arrangement proposal 1 July 2010 - 30 June 2015*, November 2009, pp. xiv, xxxiv, 47-49, 60; AER, *Draft decision Jemena Access arrangement proposal for the NSW gas networks 1 July 2010 - 30 June 2015*, February 2010, pp. 124-131.

> Consistent with these draft decisions the AER considers that the empirical evidence presented in the WACC review [2009 review of the WACC parameters for electricity distribution and transmission networks[1230]] contains the best available estimate of the equity beta that would apply to a gas distribution network service provider. Although the WACC review was conducted in an electricity context, gas and electricity businesses are close comparators. Further, the sample set of data used to derive the equity beta is predominantly made up of gas businesses.

H8.177 The Commission notes, however, that in Australia, the QCA has recognised the potential for higher systematic risks to arise from gas distribution services compared with electricity distribution services. In two separate decisions in May 2006, the QCA, when considering the asset beta for gas distribution networks Envestra and Allgas, stated that:[1231]

> The Authority is of the view that, in many instances, gas is a fuel of choice, while everyone generally connects to electricity. Because it is a fuel of choice, it faces competition from other sources of energy such as electricity and LPG. As such, the Authority accepts that the gas distributors will be subject to a greater level of systematic risk than the electricity distributors and that a higher equity beta is justified.

Conclusion - differences in systematic risk between services

H8.178 The AER appears to consider that GPBs have similar systematic risk to EDBs, and the empirical evidence seems to indicate that international gas utilities either face very similar or slightly lower systematic risks than electricity utilities.

H8.179 The Commission nevertheless accepts that in New Zealand, GPBs may face higher systematic risk than EDBs, due to the considerations highlighted in previous advice provided to the Commission by Dr Lally (and summarised above) in relation to the differences between New Zealand GPBs and EDBs. At present, there is no evidence in New Zealand to suggest that this situation has changed. Therefore, the Commission considers that it is appropriate to apply the upward adjustment of 0.1 used in past decisions to the asset beta estimate, after any other adjustments have been made.

Conclusion - GPBs final asset beta from step 5

H8.180 The Commission notes that there is a wide range of estimates. Having considered the above factors and using the previous advice and its own analysis, the Commission estimates an average monthly asset beta for GPBs of 0.34 (from Steps 1 to 4) from its initial analysis, and 0.28 (0.23 from the sample of gas utilities) for its updated analysis. On balance, the Commission considers that an appropriate asset beta estimate for regulated gas pipeline services before any adjustments are made is 0.34.

H8.181 No adjustment should be made for multi-divisional asset beta estimates or for differences in systematic risk due to regulatory differences. The Commission considers though that GPBs in New Zealand face higher systematic risk than New Zealand EDBs. Therefore, as in previous decisions, an upwards adjustment of 0.1 is

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[1230] AER, Final decision: *Electricity transmission and distribution network service providers – Review of the weighted average coat of capital (WACC) parameters*, May 2009.

[1231] QCA, *Revised Access Arrangement for Gas Distribution Networks: Allgas Energy*, May 2006, p. 75; QCA, *Revised Access Arrangement for Gas Distribution Networks: Envestra*, May 2006, p. 106.

applied to reflect this difference in systematic risk between services (EDBs versus GPBs).

H8.182　After Step 5, the asset beta for GPBs is 0.44.

Step 6: Turning the adjusted asset betas into equity betas

H8.183　The final step in estimating the equity beta is to convert the estimated 'service-wide' asset beta to an equity beta that can be applied in the CAPM. In making its decision for EDBs, GPBs and Transpower, the Commission has undertaken the conversion process by applying step three (turning equity betas into asset betas) in reverse.

Other possible adjustments - Blume and Vasicek

H8.184　Blume and Vasicek adjustments are designed to reflect equity beta mean reversion tendencies over time. Applying the Blume adjustment implies a belief that the equity beta will trend over time towards the market average equity beta of one. However, this trend says nothing about the tendencies of the asset beta, particularly for a specific regulated service. Applying the Vasicek adjustment implies a prior belief about the true value of the equity beta which, if valid, should be used in the first place (i.e. represents a Bayesian adjustment). Again, this says nothing about the tendencies of the asset beta, particularly for a specific regulated service.

H8.185　Neither the Blume nor the Vasicek adjustment has been applied in any of the Commission's previous regulatory decisions.

H8.186　Of the Expert Panel, Dr Lally considered Blume and Vasicek adjustments inappropriate as these types of adjustments lead to an upward bias for low beta industries. Dr Lally recommended that the Commission not make Blume adjustments to equity betas; even Vasicek adjustments are undesirable if beta estimates are sought for more than one firm in an industry because it will lead to different estimates for different firms in the same industry.[1232]

H8.187　Professors Franks and Myers agreed that some form of Blume and Vasicek adjustments to beta estimates may be sensible, "but did not strongly recommend a specific adjustment method".[1233]

H8.188　In submissions on the RDG, some submitters considered that the Commission should either apply, or at least maintain an open mind, to using Blume and Vasicek adjustments to beta estimates.[1234] Unison submitted:[1235]

> … but they do not alter the fact that given the current specification of the CAPM returns for low beta companies are higher than predicted by the CAPM. One way to correct for

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[1232]　Franks, J., M. Lally and S. Myers, *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology, Report prepared for the Commerce Commission*, 18 December 2008, p. 27.

[1233]　ibid.

[1234]　Powerco Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: PricewaterhouseCoopers, *Commerce Commission's Revised Draft Guidelines and aspects of the Input Methodologies Discussion Paper relating to Cost of Capital prepared for Powerco Limited*, 14 August 2009, pp. 26-29; Powerco Limited, *Submission on the Input Methodologies Discussion Paper*, 14 August 2009, p. 30; NZ Airports Association, *Submission on the Revised Draft Guidelines, Attachment: Uniservices, Comments on the Commerce Commission's Approach to estimate the Cost of Capital*, 2 December 2009, p. 31.

[1235]　Unison, *Post-workshop submission - weighted average cost of capital*, 2 December 2009.

this downward bias would be to employ blume adjusted betas. Blume adjusted betas might not be part of a clean theoretical model, but they more accurately reflect the returns that are actually earned by firms in real world workably competitive markets.

Conclusion - Blume and Vasicek adjustments

H8.189 The Commission considers that the reasons given by submitters for requiring Blume and Vasicek adjustments can be explained by a range of factors other than any tendencies of the asset betas, particularly for a specific service.

H8.190 The IM does not provide for Blume or Vasicek adjustments in determining the cost of capital for regulated suppliers.

Other possible adjustments - Use of long term financing by the sample of comparator companies

H8.191 CEG (for Vector) submitted that as the average original period to maturity of the debt capital of the US entities in the Commission's comparable company sample used to estimate the equity beta is of the order of 17 years, based on a generalised Modigliani-Miller proposition with respect to financing structure and conservation of risk, the equity beta of these entities must reflect this long term certainty of financing.[1236] Given the assumption of five year re-financing for suppliers in New Zealand, the re-financing risk for the New Zealand suppliers must be greater than for the US entities. Therefore, in CEG's submission, any New Zealand equity beta estimates derived from US equity beta estimates need to be adjusted to reflect the additional re-financing risk.

H8.192 The proposition regarding the conservation of risk, which relies on a number of key assumptions, relates to the sum total of risks. CEG has focused on a single risk associated with debt capital (i.e. the maturity structure of the debt capital). However, debt capital also has other risks associated with it, for example, interest rate risk.[1237] How interest rate risk on the debt capital itself is handled, for example, a fixed coupon versus an interest rate that is regularly reset, will also affect the distribution of risk between providers of debt capital and equity capital (and thus the impact on the equity beta).

H8.193 In addition, an entity's interest rate risk can be, and generally is, actively managed independent of the issue of the debt capital, via the use of derivatives. The use of derivatives also provides the opportunity to share risk with a party who is neither a provider of debt capital or equity capital.[1238]

H8.194 Therefore, CEG's conclusion that the overall equity beta must be affected does not follow from CEG's observation regarding the maturity structure of the debt capital. To have any basis for arriving at the conclusion that the overall equity beta must be affected, it would be necessary to analyse the range of risks associated with debt capital, and then undertake empirical analysis of the impact that any actual differences for each of these risks would have on the overall US equity beta

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[1236] Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, pp. 51-60.

[1237] Risks may exist for a given debt issue, for example, optionality, currency, indexation, profit participation.

[1238] Derivatives can be either outright or operate equivalent to a financial insurance policy, for example, a cap or knock in.

estimates relative to the overall New Zealand equity beta estimates. CEG does not offer a methodology by which this exercise could practically be performed nor does CEG offer the Commission its estimate of the overall impact on the equity beta estimates. The Commission is not aware of any methodology which could be used in practice to perform this exercise.

H8.195   Further, the Commission has adopted an asset beta estimate for EDBs and Transpower that is above the empirical estimates derived from the comparable company sample. In particular, the asset beta has been specified at 0.34 while the empirical estimates were 0.28 (monthly observations) and 0.32 (for weekly observations). Therefore, if any adjustment to the equity beta is required to address the difference in debt maturities, this may already have been offset by the higher asset beta adopted by the Commission.

H8.196   CEG's analysis assumes that the Commission has only allowed a cost of debt based upon five year re-financing. However, the IM allows a supplier that issues long-term debt, to also claim the term credit spread differential allowance (covering both the term credit spread difference and the execution costs of an interest rate swap) on the longer term debt. That is, the IM already allows for the additional costs of long-term debt (to reduce refinancing risks) and it is therefore appropriate to use the estimates of the asset betas from international firms, as the Commission has done.

H8.197   CEG (for Vector) further submit that an important reason why regulated utilities issue long term debt is to reduce the risks that equity holders face associated with re-financing. However, the Commission considers that in, regard to an essential service, re-financing risk is not borne just by shareholders, but could also be borne by consumers if the supplier reduces service, maintenance, and investment levels (and potentially also by bondholders).

H8.198   For these reasons, the Commission does not consider it appropriate to make any adjustment to the equity beta provided in the IM to allow for differences in the debt maturity profiles between regulated suppliers and the sample of comparator companies.

Standard error of the asset beta

H8.199   Due to the uncertainty associated with the asset beta estimation the Commission has estimated a standard error for the asset beta.

H8.200   Dr Lally, in Appendix 3 and Appendix 6 of the Gas Authorisation, demonstrates the process to estimate the standard error of the asset beta estimate (this is similar to the approach displayed in Professor Guthrie (for Transpower) who estimated the standard error of approximately 0.11-0.12 for EDBs).[1239]

H8.201   In his advice on the Gas Authorisation Dr Lally estimated the standard error of the asset beta to be 0.175. This estimate was derived from the standard error of the component parts that made up the overall asset beta for GPBs. That is:

[1239]   Lally, M., *Weighted average cost of capital for gas pipeline businesses*, 28 October 2008, Appendix 3 and Appendix 6, pp. 170-178 and pp. 185-186; Transpower New Zealand Ltd., *Submission on Transpower (Input Methodologies) Draft Reasons Paper and Individual Price-Quality Path*, Attachment: Graeme Guthrie, *Measurement Error and Regulated Firms' Allowed Rates of Return,* 14 August 2010, pp. 8-14.

    i.   the standard error of the asset beta estimated from the US comparable firms analysis derived using the process outlined in Appendix 3 of the Gas Authorisation, 0.136 (Steps 1-4);

    ii.   standard error of the estimate for the difference in regulatory regimes, 0.126 and standard error for the estimate to reflect lower risk on New Zealand EDBs compared to five-year price capped firms, 0.29 (Step 5(b)); and

    iii.   the standard error for the estimate for GPB versus EDB in New Zealand, 0.06 (Step 5(c)).

H8.202   The Commission followed this process to estimate the standard error of the asset beta for EDBs and GPBs in the respective Draft Reasons Papers. In the EDBs Draft Reasons Paper, the Commission estimated a standard error for the asset beat of 0.12 for EDBs/Transpower. This estimate is based on the standard error of the asset beta from the comparable firms sample only (point (i), above) as the Commission does not apply estimates for points (ii), and (iii) therefore a standard error does not apply to the asset beta for EDBs/Transpower for these factors.

H8.203   For GPBs the estimate was based on the result from EDBs and the previous estimate applied by Lally for point (iii). This resulted in a standard error of the asset beta of 0.14 for GPBs.

H8.204   Subsequent to the EDB and GPBs Draft Reasons Papers, the Commission has also estimated the standard error of the asset beta using the enlarged sample, data frequencies, and sampling periods identified in paragraph H8.49. This produced a range of estimates, which are displayed in Figure H11 for each period and overall summaries in Table H20.

Figure H11   Comparable Firms Unadjusted Asset Beta Standard Errors
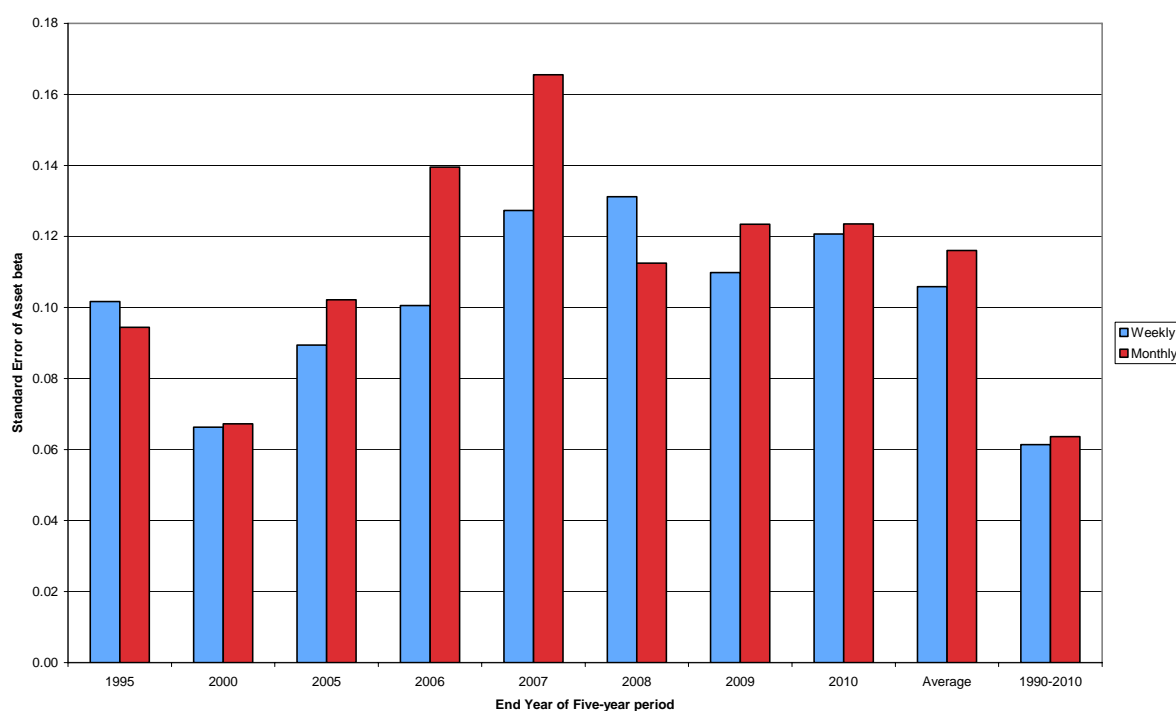
Table H20   Asset Beta Standard Error Summary

|	Asset beta standard error estimate	Asset beta standard error range
Monthly all five-year periods	Overall 0.12 Gas 0.09 Electricity 0.12	0.07-0.17 0.03-0.14 0.07-0.17
Weekly all five-year period	Overall 0.11 Gas 0.11 Electricity 0.11	0.07-0.13 0.07-0.16 0.07—0.14
Monthly five-year periods 2005 to 2010	Overall 0.13 Gas 0.10 Electricity 0.13	0.10-0.17 0.05-0.14 0.11-0.17
Weekly five-year periods 2005 to 2010	Overall 0.11 Gas 0.12 Electricity 0.11	0.09-0.13 0.107-0.16 0.09—0.14

Conclusion

H8.205 Table H20 illustrates the range of estimates for the standard error depending on the period sampled and the frequency. Having particular regard to the estimate of the standard error in the most recent five year period, suggests a standard error for the asset beta of 0.13 for EDBs and Transpower.

H8.206 A higher asset beta has been specified for GPBs, compared to EDBs to reflect the greater perceived riskiness of New Zealand gas pipeline businesses. Consistent with this approach, the standard error of the asset beta for GPBs is set at 0.14, slightly above that for EDBs/Transpower.

Reasonableness checks on the estimated asset beta

H8.207 The Commission has compared the results of its asset beta analysis between services, and across a range of estimates of the asset beta from other sources. This comparison is shown in Figure H12.

Figure H12   Reasonableness Checks on the Asset beta for EDBs and Transpower
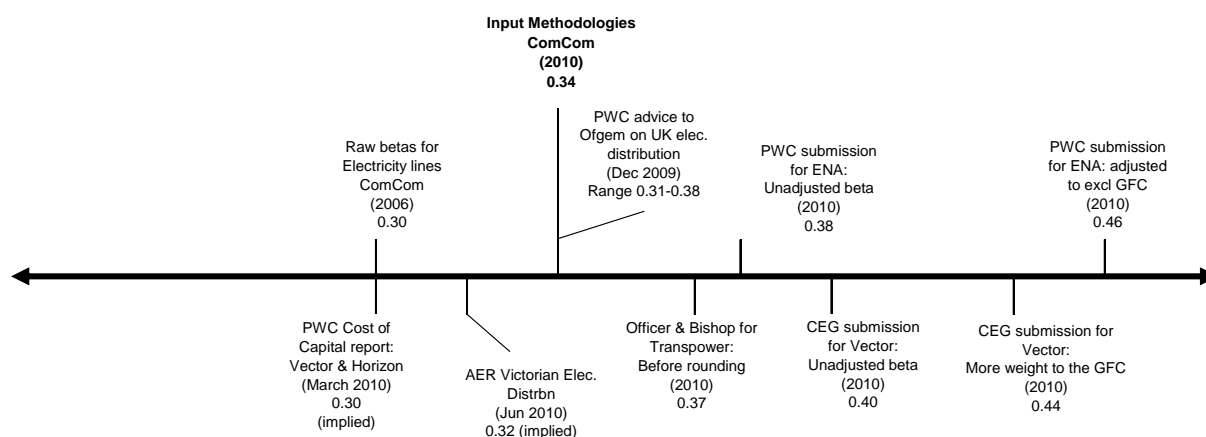
H8.208 Figure H12 shows the Commission's 0.34 estimate of the asset beta for electricity distribution companies falls within the range of comparable information. The Commission also notes that despite the differing approaches to estimating beta, most of the estimates reported above fell within a reasonably tight range, (and with the Commission's estimate in or near the middle of that tight range). This supports the Commission's view that its estimate is a reasonable estimate of the asset beta.

H8.209 For the gas asset beta, the Commission takes the "raw" asset beta of 0.34 (derived from international estimate of beta for electricity and gas firms) and adds an uplift of 0.10 (to allow for New Zealand specific factors). As there are no pure gas companies listed on the New Zealand market it is not possible to test empirically this estimate of the New Zealand gas asset beta.

H8.210 The Commission notes that in a recent decision the AER considered "that the best estimate of the equity beta for a gas distribution service provider is between 0.4 and 0.7 taking into account the need to reflect prevailing market conditions, the risks involved in providing reference services and the importance of regulatory certainty."[1240] De-levering this equity beta at the AER's assumed 60% leverage, implies the AER's best estimate of the asset beta lies within the range of 0.16 to 0.28, though to be conservative the AER used an equity beta of 0.80 (an implied asset beta of 0.32). This provides some confidence that the raw asset beta for gas (before the adjustment to reflect greater exposure to systematic risks for New Zealand GPBs) is reasonable (if not generous in favour of suppliers).

Overall conclusion - equity betas

H8.211 The Commission notes that estimation of the asset beta is not a precise science and produces a range of estimates. The Commission has considered issues raised in submissions on the EDBs, GPBs and Transpower Draft Reasons Papers and has therefore:

> i.   set out its practical application of the six-step methodology for estimating the equity beta in detail;
>
> ii.   increased its sample size and included gas pipeline business;
>
> iii.   excluded small companies to minimise the risk of bias from thin trading;
>
> iv.   estimated the asset beta using monthly and weekly data;
>
> v.   estimated asset betas over a wide range of periods using monthly and weekly data from 1990 to 2010;
>
> vi.   considered what adjustment may be required to the empirical estimate of the asset beta; and
>
> vii.   tested the reasonableness of its asset beta against other estimated asset betas.

H8.212 Having considered the above factors, which include previous advice, decisions and its current analysis, the Commission through using Steps 1-4 has estimated an average asset beta for EDBs, GPBs and Transpower of 0.34.

[1240]   AER, *Jemena Gas Networks Access arrangement proposal for the NSW gas networks 1 July 2010 – 30 June 2015, Final decision*, June 2010, p. 173.

H8.213　On balance, the Commission considers that prior to any potential adjustments being taken into account, 0.34 represents an appropriate unadjusted asset beta, albeit somewhat generous estimate for EDBs, GPBs and Transpower.

H8.214　Taking into account the potential adjustments to the asset beta (i.e. Step 5), the Commission considers that while no adjustments should be made for regulatory differences between New Zealand and overseas, or between electricity/gas transmission and distribution services, GPBs in New Zealand may face higher systematic risks than EDBs. Therefore, as in the past, an adjustment upwards of 0.1 is appropriate to reflect this difference in systematic risk faced by GPBs. This yields an asset beta of 0.44.

H8.215　Applying the 6 step approach outlined above for EDBs and Transpower results in an asset beta for EDBs and Transpower of 0.34. Combining this estimate with a notional leverage of 44% equates to an equity beta for EDBs and Transpower of 0.61 with a standard error of 0.13.

H8.216　Applying the 6 step approach outlined above for GPBs results in an asset beta for GPBs of 0.44. Combining this estimate with a notional leverage of 44% equates to an equity beta for GPBs of 0.79 with a standard error of 0.14.

H9　　Debt Beta

Decision - debt beta

H9.1　　The IM assumes a debt beta of zero.

Commission's reasons – debt beta

Overview

H9.2　　The debt beta measures a firm's systematic risk associated with borrowing, and is measured by the sensitivity of the returns on corporate debt to movements in returns on the market portfolio of all assets.[1241]

H9.3　　Debt betas can affect cost of capital estimates in three ways: first, when converting estimated asset betas to equity betas; second, when converting estimated equity betas of comparators into asset betas; and, third, when estimating the firm's cost of debt (in particular, the debt premium).

H9.4　　Whereas considerable attention has been given to investigating the riskiness of common stocks, little empirical work has been done to measure the systematic risk of debt. The Commission recognises that the greater the riskiness of debt the more it resembles equity and therefore the greater the systematic risk of debt due to market conditions, the greater is the debt beta. Therefore, in principle, debt betas should be included in the cost of capital calculation.

H9.5　　The Commission notes that the Expert Panel recommended that the Commission should take account of empirical estimates of debt betas and if debt betas are significant they should be included in the cost of capital estimation.[1242]

[1241]　In principle, the market portfolio should encompass all assets in the economy, including debt and equity securities, as well as those assets that are traded and untraded.

H9.6   The use of debt betas to address the counter-intuitive relationship between the cost of capital and leverage when applying the simplified Brennan-Lally CAPM was discussed in section H3 (from paragraph H3.46). As noted in that discussion, an assumption of a specific level for the debt beta could remove this anomaly. This feature of the cost of capital when applying the simplified Brennan-Lally CAPM could be viewed as suggesting that in considering what value for the debt beta should be used in the simplified Brennan-Lally CAPM a joint consideration of the empirical estimation of the debt beta and of its interaction with leverage in the simplified Brennan-Lally CAPM would be appropriate. The analysis considered here focuses on:

    i.   the prior issue of the empirical estimation of the debt beta;

    ii.   the results for the equity beta given a non-zero debt beta; and

    iii.   leverage and the results on the cost of capital.

Practical difficulties when estimating the debt beta

H9.7   There are three common approaches to estimating the debt beta:

    i.   estimate the debt beta using the structure of the CAPM (i.e. the systematic risk component of all outstanding debt with the same maturity, tenor and credit rating characteristics as the companies debt;

    ii.   consider the systematic risk component of the company's debt; and

    iii.   assume that the debt beta is either zero or a positive non-zero point estimate.

H9.8   Using the CAPM based approach (approach i) debt betas can be estimated using a portfolio of traded corporate bonds aggregated by rating class and by maturity, and regressing the returns to this portfolio, against the returns of the overall market portfolio. The coefficient on the market factor would be the estimated beta for that risk and maturity class of bonds.

H9.9   However, even the portfolio approach, which pools together information from several traded debt instruments, can be difficult to implement for small, thinly-traded markets such as New Zealand. Paucity of data can be a major hindrance to obtaining reasonably precise debt beta estimates.

H9.10   In their submission for NZAA, LECG stated that, in practice, it would be very difficult to obtain a market estimate of the debt beta, especially when, as in New Zealand, there are few frequently traded debt securities on issue.[1243]

H9.11   Dr Lally advised the Commission that using a debt beta that flattened the line entirely may be inappropriate as not all of the debt premium is entirely due to systematic risk.[1244]

[1242]   Franks, J., M. Lally and S. Myers, *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology*, December 2008, pp. 23-24.

[1243]   LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital*, Report on behalf of NZAA, 31 July 2009, p. 27.

[1244]   Lally, M., *WACC and Leverage*, Report to the Commerce Commission, 17 November 2009.

H9.12   With regard to estimating equity betas, the Commission noted that these would be inherently imprecise and involve a significant degree of judgement. Given the difficulty associated with obtaining reliable data for a portfolio of traded corporate bonds, the Commission considers that the estimation of debt betas would be even more imprecise and require an even greater degree of judgement.

H9.13   An indirect method to estimate the debt beta involves decomposing the observed cost of debt into a number of smaller components to leave an estimate of the premium that lenders require as compensation for bearing systematic risk (approach ii).[1245] The debt beta estimate would be decomposed using the following formula:

Debt premium = liquidity premium + default premium + systematic risk premium

$$= \text{liquidity premium} + \text{default premium} + \beta_d . \text{MRP}$$

H9.14   This method involves a significant degree of judgement as it would require the Commission to attribute values to each of the parameters used.

H9.15   The third approach, to assume a positive value for the debt beta, that would make the cost of capital invariant to leverage, would also require a significant degree of judgement from the Commission. As the Commission's debt premium is based on promised yields the estimate of the debt beta would need to reflect that not all of the risk associated with the debt margin is systematic.

H9.16   Dr Lally advised the Commission that even if the debt beta were estimated to accurately capture the true systematic risk component of the debt premium, the cost of capital/leverage relationship might still be positive. This was because there was a liquidity premium for corporate debt (for which there is no counterpart in the cost of equity) and debt incurs bankruptcy costs which increase as leverage does (but again equity does not incur such costs). Furthermore, Dr Lally recommended that if debt betas were used the Commission should define the cost of debt as the expected yield (not the promised yield) plus an allowance for bankruptcy costs. As he noted, this is not easy. Dr Lally does not address whether the liquidity premium and bankruptcy costs factors are likely to be significant in practice (at moderate levels of leverage).[1246]

H9.17   The Commission notes that the majority of Australian and UK regulators apply a debt beta of zero in regulatory determinations.

H9.18   In Australia, the Queensland Competition Authority (QCA) has consistently applied a positive debt beta. The QCA applies a mid-point debt beta value of approximately 0.1 as it considers that the historical debt beta estimate of 0.2, using the CAPM method, would overstate the estimate of systematic risk.[1247]

[1245]   The debt margin a borrower is required to pay primarily reflects three types of risk. These are default premium (credit risk of the borrower), liquidity premium (compared to government bonds) and uncertainty premium (compensation for lack of diversification).

[1246]   Lally, M., *WACC and Leverage*, Report to the Commerce Commission, 17 November 2009.

[1247]   For decisions relating to the use of debt betas see Queensland Competition Authority, *Gladstone Area Water Board: Investigation of Pricing Practices*, Final report, June 2010 and Queensland Competition Authority, *QR Network's 2010 DAU - Tariffs and Schedule F, Draft Decision*, June 2010.

H9.19   The UK Competition Commission applied the second approach in the assessment of the appropriate debt beta to be used in both its decisions on the price reviews of Heathrow/Gatwick in 2007 and Stansted in 2008.[1248] This approach resulted in a range for the debt beta of 0.09 to 0.19 in 2007 and 0.10 to 0.22 in 2008. The UK Competition Commission considered that the appropriate point estimate of the debt beta was 0.10 in both decisions.

H9.20   The majority of submissions considered that the estimation of debt betas for New Zealand firms is problematic and probably not feasible at present and preferred that the Commission set debt betas to zero. [1249]

A non-zero debt beta

H9.21   BARNZ noted that the Commission described 0.1 as a conservative estimate of the debt beta; therefore adopting an estimate of zero is extremely conservative and highly favourable to the regulated suppliers.[1250]

H9.22   In a submission on the EDBs Draft Reasons Paper, Officer and Bishop (for Transpower) considered the assumption that the beta of BBB+ debt was zero was unrealistic. Officer and Bishop proposed a debt beta of 0.2.[1251]

H9.23   A debt beta of 0.2 is consistent with the debt beta recommendation of UK CAA to the UK Competition Commission in the assessment of the cost of capital for Heathrow and Gatwick airports in 2007.[1252] However, as discussed above, the UK Competition Commission used a debt beta of 0.1.[1253]

H9.24   The Commission recognises that the greater the riskiness of debt the more it resembles equity and therefore the greater the systematic risk of debt due to market conditions, the greater is the debt beta. Therefore, in principle, debt betas should be included in the cost of capital calculation.

Overall Conclusion - debt beta

H9.25   In principle, the Commission considers the use of non-zero debt betas as conceptually sound. Debt premiums do have an exposure to systematic risk, and the use of non-zero debt betas this addresses the anomaly that post-tax WACC can increase with leverage. That is, non-zero debt betas makes the post-tax WACC estimate for an individual service less variant or invariant to leverage.

[1248]   UK Competition Commission, *A report on the economic regulation of the London airports companies (Heathrow Airport Ltd and Gatwick Airport Ltd)*, Appendix F - Cost of Capital, pp. F21-F26, 28 September 2007; UK Competition Commission, *Stansted Airport Ltd - Q5 price control review*, 23 October 2008, Appendix L, pp. L33-L35.

[1249]   References to submissions on debt betas are noted in paragraph H3.47.

[1250]   Board of Airline Representatives New Zealand Inc, *Submission on Commerce Commission Input Methodologies (Airport Services) Draft Reasons Paper and Draft Determination*, 12 July 2010, p. 18.

[1251]   Transpower Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Officer R. and Bishop S., *Independent Review of Commerce Commission WACC proposals for Transpower*, 5 August 2010, pp. 22-24 and p. 37.

[1252]   UK Competition Commission (UK), *A report on the economic regulation of the London airports companies (Heathrow Airport Ltd and Gatwick Airport Ltd), Appendix F - Cost of Capital*, paragraphs 88-90, 28 September 2007, Table 1, p. F6.

[1253]   UK Competition Commission (UK), *A report on the economic regulation of the London airports companies (Heathrow Airport Ltd and Gatwick Airport Ltd), Appendix F - Cost of Capital*, paragraphs 88-90, 28 September 2007, pp. F24-26.

H9.26   However, there are practical difficulties in accurately estimating the debt beta, though these are offset by the regulatory precedents noted offshore for the use and level of non-zero debt betas.

H9.27   For the reasons set out in the Leverage section (see paragraphs H3.46 to H3.64), the Commission has assumed a zero debt beta in the cost of capital IM.

H10   Taxation

Decision - taxation

H10.1   The Commission's decision is that the corporate tax rate used in calculating the cost of capital should mirror the statutory tax rates. This will be 30% until the regulatory period that starts on or after 1 April 2011 when the corporate tax rate will be 28% (until any change in the statutory corporate tax rate).

H10.2   The investor tax rate has been set to reflect the maximum prescribed investor rate under the PIE regime. The PIE regime enables individuals to limit tax liability on interest to a maximum of 30% until 30 September 2010, and 28% from 1 October 2010 (until any change to the maximum tax rate applicable to the PIE regime). Those rates are therefore used in determining the investor tax rate.

H10.3   The IM Determination allows for any future changes in tax rates to flow through to the calculation of the cost of capital.

H10.4   No account is taken of individual tax circumstances (accumulated tax losses, inability to use imputation credits) as the cost of capital under Part 4 must be consistent with outcomes in workably competitive markets. As discussed in paragraphs 6.2.2 - 6.2.7, this means the relevant cost of capital is that of an efficient industry cost of capital, rather than the cost of capital which reflects the tax situation of individual suppliers or investors.

Commission's reasons – corporate tax rate

H10.5   The corporate tax rate is the statutory tax rate for business entities set by the New Zealand government. The corporate tax rate enters the cost of capital estimation when estimating a post-tax cost of capital.

H10.6   The statutory corporate tax rate is 30% until the regulatory period that starts on or after 1 April 2011 when the corporate tax rate will be 28%. The Commission's decision is to therefore adopt these rates when estimating the cost of capital.

H10.7   A provision has been added to the IM Determinations that links the corporate tax rate to the statutory tax rate, thereby allowing for future possible corporate/statutory tax rate changes.

Commission's reasons – investor tax rate

H10.8   The investor tax rate is the average personal tax rate across all investors in the economy. It enters the cost of capital estimation (as t_i) in the simplified Brennan-Lally version of the CAPM.

H10.9   This adjustment to the classical CAPM is incorporated to reflect the fact that the New Zealand tax regime permits the use of imputation tax credits (attached to dividend payments) to offset personal tax obligations and the fact that most investors are exempt from tax on capital gains, with the result that equity returns are essentially tax free whilst interest income is not.

Determining the investor tax rate

H10.10   The Commission considers that an assumed investor tax rate of 30% until 30 September 2011 and reduced to 28% thereafter recognises that whilst there are a range of statutory tax rates for interest earned by individuals, depending upon their respective total taxable income, the utilisation of the Portfolio Investment Entity ('PIE') regime effectively enables individuals to limit their tax liability on interest earned to a maximum of 30% until 30 September 2010 and this has been reduced to 28% from 1 October 2010.[1254] The Commission' decision is to lower the investor tax rate from 1 October 2011.

H10.11   A provision has been added to the Determinations which will allow for changes in the investor tax rate for future possible changes to the PIE regime on an ongoing basis.

H10.12   In a regulatory period that straddles 1 October 2010 the investor tax rate will be applied as a blended rate incorporating the proportion of the regulatory year the investor tax rate was at 30% and the proportion of the regulatory year that the investor tax rate was at 28%.

H10.13   Whilst applying the figures of 30% until 30 September 2010 and 28% from 1 October 2010 would not be reflective of the true position for all investors in suppliers of regulated services under Part 4, the Commission has previously noted that the effect of any difference is likely to be relatively small.

Conclusion - investor tax rate

H10.14   The Commission recognises that whilst there is a range of statutory tax rates for interest earned by individuals, depending upon their respective total taxable income, the utilisation of the PIE regime effectively enables individuals to limit their tax liability on interest earned to a maximum of 30% until 30 September 2010 and 28% thereafter. The Commission concludes that the reduction of the top marginal tax rate from 38% to 33% does not change the logic that has been applied in arriving at the estimates for the investor tax rates, as investors can continue to shelter income at the PIE rate.

H10.15   The Commission notes that, while there is some uncertainty as to what the true average investor tax is, this uncertainty has little effect on suppliers' cost of capital as a small difference in this tax rate is likely to be immaterial to the final allowed rate of return.

H10.16   Therefore, the Commission will use an investor tax rate of 30% until 30 September 2010. This estimate has been reduced to 28% from 1 October 2010.

[1254]   A PIE is a type of entity, such as a managed fund that invests the contributions from investors in different types of investments. For more information on PIE see New Zealand IRD at http://www.ird.govt.nz/toii/pie/companies/about/pie-investors-companies-about.html.

H10.17   A provision has been added to the Determinations which will allow for changes in the investor tax rate for future possible changes to the PIE regime on an ongoing basis.

H11   The Cost of Capital Range

Decision - the cost of capital range

H11.1   The IM estimates a cost of capital range by estimating and combining individual parameters' standard error.

H11.2   For the EDBs, Transpower and GPBs, for information disclosure, the Commission considers it appropriate to take a range between the 25th to 75th percentiles.

H11.3   For the purposes of default/customised price-quality regulation for EDBs and GPBs, and the Individual Price Path for Transpower, the 75th percentile estimate of the cost of capital is to be applied.

Commission's reasons - the cost of capital range

H11.4   The cost of capital must be estimated as it cannot be observed directly. This raises the prospect of error since it is not possible to know the true cost of capital. The Commission has to make a judgement call as to how the IM should address the consequences of potential error.

H11.5   Typically, the Commission is faced with uncertainty when it estimates the cost of capital. These uncertainties include, for example, choice of the models to estimate and the statistical error surrounding individual parameter estimates.

H11.6   Model error relates to the choice of a particular model used in the estimation, while parameter error is the error between the (unknown) best approximation and the true value of a parameter estimate. These two errors are closely related especially in trying to estimate the true cost of capital when it is unknown. That is, both relate to the difficulty in estimating the true cost of capital when one cannot observe the true cost of capital, or its components.

H11.7   The IM accounts for uncertainties in parameter estimates by deriving a plausible range for the cost of capital (rather than a single point estimate) that reflects the possible spread between estimated and true parameter values underlying the cost of capital. Selecting an appropriate point estimate within this range for application under each regulatory instrument will then depend on the particular regulatory instrument under which the cost of capital is applied (i.e. information disclosure, DPP, CPP, and IPP). The Commission has also considered the potential for model error when undertaking its reasonableness tests in section H 13. The Commission concludes that the IM estimates of the cost of capital are reasonable and commercially realistic.

H11.8   The Commission must make an allowance for the potential errors that are reasonable in the particular circumstance in which the cost of capital is to be used, but without producing a range that is so broad as to be meaningless and of no practical use in assessing profitability or determining price-quality paths.

Estimating the cost of capital range - four possible approaches

H11.9   In principle, there are two approaches that can be used to estimate the cost of capital
         range: an analytical approach and a simulation approach. Each of these can be
         relatively simple or relatively complex (when compared to each other), bringing the
         total number of approaches to four. These are defined below as the simple analytical
         approach, complex analytical approach, simple simulation approach and complex
         analytical approach.

H11.10   Each of the four approaches starts by grouping the underlying cost of capital
         parameters (i.e. the risk-free rate, debt premium, leverage, asset betas, TAMRP, and
         corporate and investor tax rates) into those that have and those that do not have
         significant uncertainty associated with them.

H11.11   The parameters that the Commission considers may have significant uncertainty
         associated with them are the asset beta, debt premium, and the TAMRP. This is
         because the Commission considers the procedures that are required to estimate these
         parameters are more complex due to the variability of the data needed to estimate
         them compared to the other relevant parameters. For this reason, these parameter
         estimates are likely to be subject to a significantly larger degree of variability than
         the other parameters, and this variability needs to be accounted for when estimating
         the cost of capital.

H11.12   In contrast, the risk-free rate, leverage, and corporate and investor tax rates do not
         have the same degree of uncertainty associated with them. This is because they are
         either: (i) readily observable such as the corporate tax rate; (ii) relatively simple to
         estimate such as the risk-free rate; or (iii) take an assumed value that is fixed such as
         'notional' leverage.

The 'simple analytical approach'

H11.13   The simple analytical approach would require the IM to determine an upper and
         lower bound alike for each of those parameters that the IM considers has uncertainty
         associated with it. These bounds are determined based on qualitative judgement.

H11.14   The next step is to estimate the cost of capital using only the upper bound values of
         the underlying parameters and then to estimate the cost of capital using only the
         lower bound values. The resulting cost of capital estimates are then the upper and
         lower bound of the cost of capital range.

H11.15   The advantages of the simple analytical approach to estimate the cost of capital
         range are that it is readily understandable, intuitive and easy to replicate.

H11.16   The main disadvantages of this approach are that:

         i.   it relies on judgement when determining the upper and lower bounds of
                individual parameters;

         ii.   it does not make use of some statistical information that is readily
                available and that could be used to provide some guidance regarding the
                extent of uncertainty surrounding parameter estimates;

         iii.   the underlying assumption of parameters being uniformly distributed is
                unrealistic; and

iv.   it expands the range associated with the cost of capital estimate, and thus may not appropriately account for the uncertainty that underlies the estimates.

H11.17 The simple analytical approach is the approach used by UK regulators, e.g. Ofgem.

The 'complex analytical approach'

H11.18 The complex analytical approach can be broken down into the following steps:

- use the estimates of all parameters to derive an overall cost of capital estimate;

- group the cost of capital parameters into those that have and those that do not have significant uncertainty associated with them;

- estimate a statistical measure of the uncertainty for each parameter that the Commission considers has significant uncertainty associated with it (this measure is called the standard error and can be estimated using the parameter estimates' underlying data);[1255]

- combine these standard errors to derive an overall level of uncertainty for the cost of capital estimate; and

- derive a cost of capital range, at a given percentile, by applying the overall estimate of uncertainty to the estimated cost of capital.

H11.19 The standard error of the post-tax cost of capital is estimated using the following formula: [1256]

$$\sqrt{\begin{array}{l} \text{var}\left(TA\hat{M}RP\right)\text{var}(\hat{B}_a) + E^2(TA\hat{M}RP)\,\text{var}(\hat{B}_a) + E^2(\hat{B}_a)\,\text{var}(TA\hat{M}RP) \\ + (1 - T_c)^2\left[\text{var}(\hat{p})\,\text{var}(\hat{L}) + E^2(\hat{p})\,\text{var}(\hat{L}) + E^2(\hat{L})\,\text{var}(\hat{p})\right] \end{array}}$$

[1255] The standard error of a sample, denoted by s_n is defined as follows:

$$s_n = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2}$$

where:

N is the number of sample observations;

x_i are the observed values of the sample items; and

$\bar{x}$ is the mean value of these observations.

[1256] For a detailed description of the process to derive the standard error of the cost of capital from the individual parameter standard errors see Lally, M., *The weighted average cost of capital for gas pipeline businesses*, 28 October 2008, Appendix 6.

where:

$\text{var}\left(TA\hat{M}RP\right)$ is the square of the standard error of the estimated tax-adjusted market risk premium;

$E^2(TA\hat{M}RP)$ is the square of the estimated tax-adjusted market risk premium;

$\text{var}(\hat{B}_a)$ is the square of the standard error of the asset beta;

$E^2(\hat{B}_a)$ is the square of the estimated asset beta;

T_c is the corporate tax rate;

$\text{var}(\hat{p})$ is the square of the standard error of the debt premium;

$E^2(\hat{p})$ is the square of the estimated debt premium;

$\text{var}(\hat{L})$ is the square of the standard error of leverage; and

$E^2(\hat{L})$ is the square of leverage.

H11.20 For the purpose of the formula for determining the standard error of the cost of capital, it is assumed that the parameters are uncorrelated to each other and are normally distributed.

H11.21 The advantages of the complex analytical approach are: (i) that it makes greater use of statistical information regarding the level of uncertainty of individual parameter estimates; and (ii) that it is transparent and still easy to replicate.[1257]

H11.22 The main disadvantages of this approach are that, although greater use is made of statistical information, the use of such information might create a sense of precision that is not warranted. Also, some degree of judgment is still involved when applying this approach. Finally, the assumption of the overall cost of capital estimate being normally distributed is unlikely to be satisfied in reality.

H11.23 This is the approach favoured by the Commission in recent energy related decisions, e.g. Gas Authorisation and Electricity Control Inquiry of Unison.

[1257] Professor Guthrie (for Transpower) notes this point submitting that:

> … I appreciate that use of a mathematical formula has transparency benefits that may offset some of its disadvantages. In particular, a much wider range of interested parties will be able to test the impact of parameter assumptions on the level of the increment using a published formula than using a Monte Carlo simulation.

See Transpower Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Guthrie G., *Measurement Error and Regulated Firms' Allowed Rates of Return: a report prepared for Transpower New Zealand Limited*, 14 August 2010, p. 22.

Simulation approach

H11.24   Under a simulation approach, for each parameter that the IM considers has
         uncertainty associated with it, the Commission would randomly select a large
         number of values drawn from a distribution with the same underlying statistical
         properties (in terms of mean and standard error) as the parameter itself. A
         simulation approach may have the ability to be as simple or complex as required. An
         example of this approach is the Monte Carlo method.[1258]

The 'simple simulation approach'

H11.25   The IM's parameter estimates and standard errors are to be combined to generate a
         large number of random cost of capital estimates. The statistical properties of this
         random sample of cost of capital estimates can then be used to derive an overall
         measure of uncertainty of that estimate, which in turn informs the cost of capital
         range at any given percentile.

H11.26   Similar to the complex analytical approach, the simple simulation approach assumes
         that the underlying cost of capital parameters are not correlated.

H11.27   A simulation approach is particularly useful for models, where the parameters are
         related in a complex fashion due to feedback loops or correlations. In such a case, it
         might not be feasible to derive an analytical solution to the problem.

H11.28   The main disadvantage of the simple simulation approach is that it is more complex
         to implement than analytical approaches. More importantly, in the current context
         where an analytical approach is feasible, the two approaches result in the same
         outcomes as they are subject to the same assumptions. In this case, the simple
         simulation approach adds unnecessary complication while adding no significant
         benefit.

The 'complex simulation approach'

H11.29   The difference between the simple and complex simulation approach is that the latter
         relaxes the assumptions on the distribution and correlations of the underlying cost of
         capital parameters.

H11.30   The advantage of the complex simulation approach is that it relaxes some of the
         restrictive assumptions of the previous approaches. However, this is, at the same
         time, a disadvantage as relaxing those assumptions would add a significant degree of
         complexity.

H11.31   The Commission is not aware of any UK or Australian regulator that uses a Monte
         Carlo or other simulation approach.

Expert advice

H11.32   The Expert Panel agreed with using the approach described as the complex
         analytical approach of estimating standard errors for each variable underlying the
         cost of capital. Further, Professor Myers and Dr Lally consider that there would be
         no significant additional benefit to the Commission (over the complex analytical

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[1258]   Monte Carlo method is a technique used to estimate the probability distribution of a random variable. Monte Carlo
         simulates the results of a model or process by accumulating average results of thousands of random draws from the
         probability distributions of input variables. Monte Carlo simulation can accommodate complex stochastic process.

approach) in employing a simulation approach to estimate cost of capital
distributions.[1259]

Submissions

H11.33   In submissions on the RDG and IMs parties either explicitly or implicitly agreed
with the Commission's view to specify a range of possible cost of capital values. [1260]

H11.34   However, a wide variety of submissions were made on the Commission's choice of
approach to estimating a range. The views regarding how to arrive at such a range
varied widely among submitters with some favouring the simple analytical
approach,[1261] some favoured the complex analytical approach,[1262] while others
favoured the complex simulation approach.[1263]

[1259]   Franks, J., M. Lally and S. Myers, *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology, Report prepared for the Commerce Commission*, 18 December 2008, pp. 34-35.

[1260]   Aurora Energy Limited, *Submission to the Commerce Commission on its Discussion paper on Input Methodologies*, 14 August 2009, p. 6; Unison Networks Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: Castalia Strategic Advisors, *Submission on Input Methodologies: Regulatory Cost of Capital: a report prepared for Unison Limited*, 13 August 2009, pp. 7-9; LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital*, Report on behalf of ENA, 11 August 2009, pp. 7-12; LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital*, Report for NZAA, 31 July 2009, pp. 23-26; Christchurch International Airport Limited, *Submission on Commerce Commission Input Methodologies Discussion Paper*, 7 August 2009, p. 27; Christchurch International Airport Limited, *Submission on the Revised Draft Cost of Capital Guidelines*, 3 August 2009, pp. 3-4; Orion, *Submission on Input Methodologies Discussion Paper*, 14 August 2009, p. 29; Powerco Limited, *Input Methodologies Discussion Paper*, 14 August 2009, p. 32 Powerco Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: PricewaterhouseCoopers, *Commerce Commission's Revised Draft Guidelines and aspects of the Input Methodologies Discussion Paper relating to Cost of Capital prepared for Powerco Limited*, 14 August 2009, p. 36; PricewaterhouseCooper, *Submission to the Commerce Commission on the Revised Draft Guidelines – The Commerce Commission's Approach to Estimating the Cost of Capital*, Report on behalf of 17 EDBs, 14 August 2009, pp. 14-15; PricewaterhouseCoopers, *Submission on the Input Methodologies Discussion Paper*, Report prepared for 19 EDBs, 14 August 2009, p.39; Telecom, *Annex B: Submission on Commerce Commission Revised Draft Guidelines for estimating the Cost of Capital*, August 2009; Vector Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: Vector Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: Synergies Economic Consulting, *Initial Weighted Average Cost of Capital Review*: prepared for Vector Limited, 14 August 2009, pp. 44-45; Vector, *Submission to Commerce Commission on Input Methodologies Discussion Paper*, 14 August 2009, p. 92, Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: LECG, *Response to Commerce Commission's Draft Cost of Capital Input Methodology: a report prepared for the Electricity Networks Association*, 13 August 2010, pp. 15-16; PricewaterhouseCoopers on behalf of 20 Electricity Distribution Businesses, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, p. 19, Telecom Limited, *Submission on the Draft Input Methodologies (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 9 August 2010; Telecom, *Submission on Input Methodology Draft Reasons Papers*, Comments by Graeme Guthrie, 12 August 2010, pp. 11-13; KPMG, *Cross-Submission on GPBs (Input Methodology) Draft Reasons Paper, Cost of Capital*, 13 August 2010. pp. 9-12; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on Cost of Capital Material In the Commerce Commission's Draft Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13 August 2010, p. 56.

[1261]   Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: LECG, *Response to Commerce Commission's Draft Cost of Capital Input Methodology: a report prepared for the Electricity Networks Association*, 13 August 2010, pp. 15-16; PricewaterhouseCoopers on behalf of 20 Electricity Distribution Businesses, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, p. 19.

[1262]   At the cost of capital workshop and in further consultation the following parties agreed with the Commission's approach to estimating the range (complex analytical approach) - Dr Layton (NZIER advising BARNZ), Mr Hoogland (Transpower), Mr Balchin (PwC advising Powerco), Mr Redmayne (PwC advising 17 EDBs and Telecom), Mr Best (Saha advising AECT), Mr Shelly (CRA advising Unison), Mr Carvell (Vector) and Mr Goodeve (Powerco). See

H11.35 Some submissions criticised the Commission's approach as implying greater precision than was possible in practice.[1264]

H11.36 A number of submitters argued that the Commission should utilise the Monte Carlo simulation instead of, or as a cross-check to, its present complex analytical approach when developing cost of capital ranges. They considered that if different distribution types and/or partial correlations were assumed for different parameters, then Monte Carlo would (in many cases) be simpler to apply than trying to analytically derive the distribution function for the resulting cost of capital.[1265]

H11.37 In short, there was no consensus on what a better methodology for establishing a range would be. The Expert Panel generally supported the Commission's statistical approach and considered there would be no significant additional benefit by the

Commerce Commission, *Cost of Capital Workshop Transcript*, pp. 206-226; Auckland Energy Consumer Trust, *Cross Submission to the Commerce Commission on Cost of Capital Workshop*, 2 December 2009, p. 27; Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital*, Report on Behalf of NZAA, 2 December 2009, pp. 73-74; Vector Limited, *Post-Workshop Submission on the Cost of Capital*, Attachment: Synergies Economic Consulting, *Cost of Capital Cross Submission*, 2 December 2009, pp. 16-18; Vector, *Cross Submission to the Commerce Commission on the Weighted Average Cost of capital Workshop*, 2 December 2009, pp. 20-23; Major Electricity Users' Group, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, Appendix.

[1263] LECG, *Comments on the Commerce Commission's Proposed Approach to Estimating the Cost of Capital*, Report on behalf of ENA, July 2009, p 8; LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital*, Report for NZAA, 31 July 2009, pp. 23-26; PricewaterhouseCooper, *Submission to the Commerce Commission on the Revised Draft Guidelines – The Commerce Commission's Approach to Estimating the Cost of Capital*, Report on behalf of 17 EDBs, 14 August 2009, pp. 14-15; Unison, *Appendix: Submission on Revised Draft Guidelines: The Commerce Commission's Approach to Estimating the Cost of Capital*, 14 August 2009, p. 9; Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital*, Report on Behalf of NZAA, 2 December 2009, pp. 73-74; Telecom Limited, *Submission on the Draft Input Methodologies (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons* Papers, 9 August 2010; Telecom, *Submission on Input Methodology Draft Reasons Papers*, Comments by Graeme Guthrie, 12 August 2010, pp. 11-13; KPMG, *Cross-Submission on GPBs (Input Methodology) Draft Reasons Paper, Cost of Capital*, 13 August 2010. pp. 9-12; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on Cost of Capital Material In the Commerce Commission's Draft Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13 August 2010, p. 56.

[1264] LECG, *Comments on the Commerce Commission's Proposed Approach to Estimating the Cost of Capital*, Report on behalf of ENA, July 2009, p. 8; LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital*, Report for NZAA, 31 July 2009, pp. 23-26; PricewaterhouseCoopers, *Submission to the Commerce Commission on the Revised Draft Guidelines – The Commerce Commission's Approach to Estimating the Cost of Capital*, Report on behalf of 17 EDBs, 14 August 2009, pp. 14-15; Unison, *Appendix: Submission on Revised Draft Guidelines: The Commerce Commission's Approach to Estimating the Cost of Capital*, 14 August 2009, p. 9.

[1265] LECG, 2009, *Comments on the Commerce Commission's Proposed Approach to Estimating the Cost of Capital, Report on behalf of ENA*, p. 8; LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital, Report for NZAA*, 31 July 2009, pp. 23-26; PricewaterhouseCoopers, *Submission to the Commerce Commission on the Revised Draft Guidelines – The Commerce Commission's Approach to Estimating the Cost of Capital, Report on behalf of 17 EDBs*, 14 August 2009, pp. 14-15; Unison, *Appendix: Submission on Revised Draft Guidelines: The Commerce Commission's Approach to Estimating the Cost of Capital*, 14 August 2009, p. 9; Uniservices, Comments on the Commerce Commission's Approach to estimate the Cost of Capital, Report on Behalf of NZAA, 2 December 2009, pp. 73-74; Telecom Limited, *Submission on the Draft Input Methodologies (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers,* 9 August 2010; Telecom, *Submission on Input Methodology Draft Reasons Papers, Comments by Graeme Guthrie*, 12 August 2010, pp. 11-13; KPMG, *Cross-Submission on GPBs (Input Methodology) Draft Reasons Paper, Cost of Capital*, 13 August 2010. pp. 9-12; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on Cost of Capital Material In the Commerce Commission's Draft Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13 August 2010, p. 56.

Commission employing Monte Carlo simulation techniques to estimate the cost of capital.

Conclusion - calculating the cost of capital range

H11.38 As evidenced by the diversity of approaches favoured by submissions, it is a matter of judgement as to which approach is best. For the purpose of IMs, the decision is to estimate the cost of capital range using the complex analytical approach where it estimates and combines individual parameters' standard error (i.e. their level of uncertainty) into a plausible cost of capital range.

H11.39 This approach involves less judgement than the simple analytical approach, makes greater use of statistical information to guide the IM's decision, is more transparent and can be replicated by interested parties.

H11.40 The Commission considers that a simple simulation approach would add no significant gains for the purpose of estimating the cost of capital. Simulation techniques are typically used to evaluate a system in which variables interact in a complex manner, due to feedback loops or correlations, and therefore obtaining an analytical solution to the system is not feasible. This is not the case when estimating the cost of capital.

H11.41 The Commission does not see any feedback loops or significant correlations in the interaction between costs of capital variables that warrant the use of simulation techniques; nor have any submitters provided persuasive evidence on this point. The Commission considers that it is feasible to obtain direct estimates and reasonable ranges for the cost of capital without simulation techniques; employing such techniques would add unnecessary complexity and less transparency to the estimation process without offering significant additional benefit.

Applying the 'complex analytical approach'

H11.42 Details of the IM's proposed approach for estimating the cost of capital range in the context of Part 4 of the Act are set out in, for example, Lally (2008, Appendix 6; pp. 92–93). Broadly, the approach involves the following steps:

    i.   Estimate each of the individual cost of capital parameters and their associated standard errors using the procedures discussed above. In some cases the standard errors will be readily available (e.g. if the parameters have been econometrically estimated); in other instances, the Commission must rely on qualitative judgement to specify plausible values.[1266]

    ii.   Combine each of the point estimates for the individual parameters using the relevant cost of capital equation (e.g. pre-tax, post-tax or vanilla cost of capital depending on circumstances) to obtain an overall cost of capital estimate (the so-called 'midpoint' of the cost of capital range).

    iii.   Make some reasonable assumptions about the degree of correlation between the individual cost of capital parameters.

[1266] Sometimes, even when statistically-estimated standard errors are available, in order to account for any uncertainties (e.g. model uncertainty) that cannot readily be quantified, it may be desirable to augment or attenuate these estimates using qualitative judgment.

iv.   Combine the estimated standard errors for the individual parameters and correlations between them to estimate a 'standard error' for the cost of capital.

v.   Apply this standard error to either side of the cost of capital estimate to derive a plausible cost of capital range.

Applying the 'complex analytical approach' to EDBs/GPBs and Transpower

H11.43 Estimating each of the individual cost of capital parameters and their associated standard errors using the procedures discussed above gives the following results:

Table H21   Parameter Point Estimates and their Standard Error

Parameter	Point estimate	Standard error
Leverage	44%	0
Risk-free rate	To be estimated	0
Debt premium	To be estimated	To be estimated, with a minimum value of 0.0015
Debt issuance cost	0.35%	0
Asset beta (EDB and Transpower)	0.34	0.13
Asset beta (GPB)	0.44	0.14
Tax-adjusted market risk premium	7% -7.5%	0.015
Corporate and investor tax rate	28% - 30%	0

H11.44 As discussed above, in some cases the standard errors will be readily available (e.g. if the parameters have been econometrically estimated); in other instances, the Commission must rely on qualitative judgement to specify plausible values.

Leverage

H11.45 In the case of leverage, the IM assumes a standard error of zero.[1267]

H11.46 As discussed in section H3 on Leverage, due to the anomaly associated with the simplified Brennan-Lally CAPM the Commission applies a notional leverage estimate based on the average leverage of the comparative firms' sample. This notional level of leverage is necessary to make the cost of capital invariant to

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[1267]   A number of submitters disagreed with the assumption that the standard error for leverage should be zero and considered that it should be 10%-11%. For example see Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: PricewaterhouseCoopers, *Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association*, 13 August 2010, p. 15; Transpower New Zealand Ltd., *Submission on Transpower (Input Methodologies) Draft Reasons Paper and Individual Price-Quality Path*, *Attachment*: Graeme Guthrie, *Measurement Error and Regulated Firms' Allowed Rates of Return*, 14 August 2010, pp. 14-15; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: Guthrie G. *Comments on the Commerce Commission's Input Methodologies Draft Reasons Papers: a report prepared for Telecom New Zealand Limited*, 12 August 2010, p. 10-11; Unison Networks Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, p. 19; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, 13 August 2010, pp. 28-29.

changes in leverage. If the Commission were to assume a non-zero estimate for the standard error for leverage the estimate of the cost of capital would vary with leverage. This would contradict the reason the Commission is applying notional leverage, i.e. the cost of capital would change due to leverage.

Risk-free rate

H11.47 The risk-free rate also has a zero standard error. Although the risk-free rate does vary on a day-to-day basis, there is no uncertainty as to what the rate actually is at any one time.

H11.48 Professor Guthrie (for Transpower and Telecom) disagreed with the assumption that the standard error for the risk-free rate should be zero. Professor Guthrie argued that the cost of capital was affected by intra-cycle variance in the risk-free rate during the regulatory period.[1268]

H11.49 Dr Lally reviewed Professor Guthrie's submission. He concludes that intra-cycle changes in the risk-free rate are "… so much less significant than that of estimation errors in respect of other parameters [the market risk premium and the equity beta] that it can reasonably be ignored."[1269] Further, the Commission notes that there are a number of instruments available in the financial markets to allow a supplier of a regulated service to manage any intra-cycle variation in risk-free rates during (and beyond) the regulatory period.

Debt issuance costs and tax rates

H11.50 As for debt issuance costs, the corporate and investor tax rate, the Commission considers that these parameters are not associated with significant levels of uncertainty. See the respective sections for the explanations.

Debt premium, TAMRP and asset beta

H11.51 As outlined above, the debt premium, TAMRP and asset beta usually have uncertainty associated with their estimation due to the estimation techniques used, and should therefore have a standard error greater than zero attached to them. The estimation of the standard error of each of these parameter estimates is covered in their respective appendices:

      i.   debt premium (see paragraphs H5.73 to H5.76);

      ii.   TAMRP (see paragraphs H7.124 to H7.131); and

      iii. Asset beta (see paragraphs H8.199 to H8.206).

Selecting the cost of capital range

H11.52 If the cost of capital is set too low it might incorrectly suggest that a supplier of regulated services was not limited in its ability to extract excessive profits. If the

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[1268] Transpower New Zealand Ltd., *Submission on Transpower (Input Methodologies) Draft Reasons Paper and Individual Price-Quality Path, Attachment: Graeme Guthrie, Measurement Error and Regulated Firms' Allowed Rates of Return,* 14 August 2010, pp. 14-15; Telecom Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers, Attachment: Guthrie G. Comments on the Commerce Commission's Input Methodologies Draft Reasons Papers: a report prepared for Telecom New Zealand Limited,* 12 August 2010, pp. 7-9; Telecom, *Submission on Input Methodology Draft Reasons Papers, Comments by Graeme Guthrie,* 12 August 2010, pp. 6-11.

[1269] Lally, M., *Comments on measurement error and regulated firms' allowed rates of return,* 13 September 2010, pp. 11-13.

supplier were to reduce prices as a response to such an incorrect indication of excessive profitability, this might prevent the supplier from attracting sufficient capital to undertake efficient investment. This would be inconsistent with s 52A(1)(a) of the Act and would not be in the long term interests of consumers. Equally, a cost of capital that is set too high would mask the regulated supplier's ability to extract excessive profits over the medium or long-term.[1270] This would be inconsistent with s 52A(1)(d) of the Act.

H11.53   In balancing the risk between setting the cost of capital too high or too low, the Commission has to make an assessment as to the consequences of error. The consequences depend on the regulatory context in which the estimate of the cost of capital is being used. In some regulatory contexts a cost of capital estimate below the midpoint might be considered;[1271] in other contexts the midpoint is appropriate, in other contexts a cost of capital estimate that is above the midpoint maybe recommended.

H11.54   The Commission's choice over the precise percentile estimate of the cost of capital that is used for each regulatory instrument is informed by a number of factors, including considering:

- That the purpose of Part 4 is to promote the long term benefit of consumers, including:

    i.   ensuring suppliers of regulated services have incentives to invest and innovate, which will benefit consumers over time (s 52A(1)(a));

    ii.   ensuring suppliers of regulated services are limited in their ability to extract excessive profits (s 52A(1)(d));

- that in workably competitive markets the risks are borne by the party that is best equipped to manage these risks. That is not all risks can be passed on to the consumer and that firms will have to manage some of the risks themselves;

- the risk that the true (but unobservable) cost of capital is above the estimated mid-point WACC;

- the risk that CAPM and the simplified Brennan-Lally CAPM may under-estimate the returns on low beta stocks;

- the risk that the use of a domestic CAPM (simplified Brennan-Lally) may lead to higher estimates of the cost of capital than the international CAPM and that international investors can be viewed as the key marginal investors;

- the impact on potential subsequent investment by service users and the potential impacts on dynamic efficiency; and

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[1270]   The Commission notes that, in the short-term, suppliers of regulated services may achieve above-normal profits if they outperform the objectives set by the regulator.

[1271]   IPART notes this point in their cost of capital review, see Alternative approaches to the determinations of the cost of equity – other industries discussion paper, November 2009, p. 18. Such an approach may be appropriate in setting the cost of capital for a service, if there is a significant subsequent investment by a user of that service, which is likely to bring greater benefits to end-users, relative to any investment by the original service provider.

- considering the risk of error in estimating individual parameters of the simplified Brennan-Lally CAPM including beta and the TAMRP. For example, the Commission has considered the risk that the values for some parameters may be above their true (but unobservable) level including, for example, the estimated asset beta, debt issuance costs.

Information disclosure regulation - the cost of capital range for EDBs/GPBs and Transpower

H11.55 All suppliers of regulated services are subject to information disclosure regulation. The purpose of information disclosure regulation is to provide interested persons with sufficient information to assess whether the Part 4 Purpose is being met.

H11.56 In the Draft Reasons Papers the Commission considered that the appropriate range for information disclosure would be between the 25th to 75th percentiles.

H11.57 Suppliers of regulated services considered the range was too narrow and did not adequately cover risks, and market frictions.[1272] Some recommended a range between the 5th to the 95th percentile.[1273]

H11.58 The Commission notes that a number of the criticisms of the cost of capital range were directed at a parameter's standard error (e.g. asset beta, TAMRP and debt premium). These issues are covered in the respective sections for the parameter.

H11.59 It is a matter of judgement as to what is the appropriate range of the cost of capital to be applied in assessing excess profits. The Commission considers that it needs to balance all of the considerations above and recognises that returns in competitive markets often fall below or exceed the mid-point of the cost of capital. On this basis the Commission considers it appropriate to take a range between the 25th to 75th percentiles.

[1272] Christchurch International Airport Ltd., *Submission on Input Methodologies and Information Disclosure Draft Determinations and Reasons Papers for Airport Services*, 12 July 2010, p. 41; NZ Airports, *Submission on Draft Input Methodologies Determination and Draft Reasons Paper*, 12 July 2010, p. 9; NZ Airports Association, *Submission on Draft Information Disclosure Determination and Draft Reasons Paper*, Attachment: Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper - Report for NZAA*, 12 July 2010, pp. 38-46; Wellington International Airport Ltd., *Submission on the Draft Input Methodologies & Information Disclosure (Airport Services) Determinations and Draft Reasons Papers*, 12 July 2010, p. 19; Auckland International Airport Limited, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, 3 August 2010, p. 12; NZ Airports Association, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, 3 August 2010, p. 41; NZ Airports Association, *Cross Submission on the Draft Input Methodologies (Airport Services) Determinations and Draft Reasons Papers*, Attachment: Uniservices, *Comments on Air New Zealand's and Board of Airline Representatives New Zealand Incorporated's Submissions to the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper: report prepared for New Zealand Airports Association*, 3 August 2010, pp. 17-18; Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: LECG, *Response to Commerce Commission's Draft Cost of Capital Input Methodology: a report prepared for the Electricity Networks Association*, 13 August 2010, pp. 9-15; PricewaterhouseCoopers on behalf of 20 Electricity Distribution Businesses, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, p. 19; KPMG, *Cross-Submission on GPBs (Input Methodology) Draft Reasons Paper, Cost of Capital*, 13 August 2010, pp. 13-14.

[1273] NZ Airports, *Submission on Draft Input Methodologies Determination and Draft Reasons Paper*, 12 July 2010, p. 9; NZ Airports Association, *Submission on Draft Information Disclosure Determination and Draft Reasons Paper*, Attachment: *Uniservices, Comments on the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper - Report for NZAA*, 12 July 2010, pp. 38-46; KPMG, *Cross-Submission on GPBs (Input Methodology) Draft Reasons Paper, Cost of Capital*, 13 August 2010, pp. 13-14.

H11.60   The use of this range recognises uncertainty in the estimation of the cost of capital. It also recognises that profitability measures (such as ROI) can fluctuate on a yearly basis.

Default/customised and individual price quality regulation - the cost of capital point estimate for EDBs/GPBs and Transpower

H11.61   Given the imprecision of the cost of capital estimation process, the Commission considers it may be preferable, in the context of non-exempt EDBs, GPBs and Transpower that will be subject to default/customised or individual price-quality regulation, to err on the side of caution. That is, if a point estimate is required to set the price/quality path for this service, a figure above the mid-point of the range may be used.

H11.62   The reason for the Commission adopting under Part 4 a cost of capital estimate that is above the mid-point is that it considers the costs from the point of view of consumers associated with underestimation of the cost of capital in the Part 4 regulatory setting, are likely to outweigh the short-term costs of overestimation. That is, the Commission acknowledges that where there is potentially a trade-off between dynamic efficiency (i.e. incentives to invest) and static allocative efficiency (i.e. higher short-term pricing), the Commission, under Part 4, generally favours outcomes that promote dynamic efficiency. Accordingly, this consideration has been given greater weight for price-quality regulation than minimising the costs to consumers of regulated suppliers earning excess profits through higher prices in the short-term.

H11.63   In the EDBs, GPBs and Transpower Draft Reasons Papers, the Commission considered that the appropriate point estimate for the cost of capital for the DPP, CPP and IPP would be based on the 75th percentile.

H11.64   Suppliers of regulated services considered the application of the 75th percentile did not adequately cover errors and risks.[1274] The Commission notes that a number of the criticisms to the cost of capital range were directed at a parameter's standard error (e.g. asset beta, TAMRP and debt premium). These issues are covered in the respective sections for the parameter.

H11.65   It is a matter of judgement as to what is the appropriate percentile of the cost of capital to be applied when considering DPPs, CPPs and IPP. The IM specifies a

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[1274]   Transpower New Zealand Ltd., *Submission on Transpower (Input Methodologies) Draft Reasons Paper, Cost of Capital Decisions*, August 2010, p. 12; Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, pp. 11-12; Electricity Networks Association, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, Attachment: LECG, *Response to Commerce Commission's Draft Cost of Capital Input Methodology: a report prepared for the Electricity Networks Association*, 13 August 2010, pp. 9-15; Powerco Limited, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, p. 9; PricewaterhouseCoopers on behalf of 20 Electricity Distribution Businesses, *Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers*, 13 August 2010, p. 19; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, pp. 35-45; KPMG, *Cross-Submission on GPBs (Input Methodology) Draft Reasons Paper, Cost of Capital*, 13 August 2010, pp. 13-14.

point estimate for the cost of capital for the DPP, CPP and IPP that is based on the 75th percentile of the cost of capital range. This reflects:

- the Part 4 Purpose (the long term benefit of consumers);

- the uncertainty in estimating the true cost of capital; and

- that in workably competitive markets not all risks can be passed on to the consumer in the form of higher prices. Insetad, in workably competitive markets firms have to manage some risks.

H11.66 Selecting a higher percentile estimate such as the 95th percentile would imply that almost no risk was to borne by suppliers, and that suppliers were price-makers who set the price for users. Such an outcome is not consistent with promoting the long-term benefit of consumers by promoting outcomes consistent with outcomes produced in workably competitive markets.

H11.67 The Commission also notes that selecting a higher percentile estimate such as the 95th percentile would result in an estimate of the cost of capital that would not be considered reasonable having regard to the reasonableness information described in Appendix H13.

H12   Possible Adjustments to the Cost of Capital for Asymmetric Risk

Decision - possible adjustments to the cost of capital

H12.1   The IMs do not make any adjustments to the cost of capital for asymmetric risk. However, the Commission does consider that it may be appropriate to deal with asymmetric risks through some other forms of adjustment or mechanisms, such as adjustments to regulatory cash flows with the use of flexible depreciation (e.g. a front-loaded depreciation profile in the event that asset standing becomes apparent).

Commission's reasons - possible adjustments to the cost of capital

H12.2   The IM applies a 'benchmark' or service-specific cost of capital for all suppliers of a regulated service. If the Commission were to apply an ad-hoc adjustment to the service-wide cost of capital it would imply that all suppliers of a particular service are exposed to the same level of asymmetric risk. However, suppliers of a regulated service are exposed to different levels of asymmetric risks and at possibly different time periods. If the IMs were to make an ad-hoc adjustment for asymmetric risks in the service-wide cost of capital, it may over-compensate some suppliers and possible under-compensate other suppliers.

H12.3   A firm faces asymmetric risk when its distribution of returns is truncated at one extreme without an offsetting truncation at the other. In other words, the firm's payoffs are 'asymmetric'. For example, in competitive markets existing firms may be exposed to the risk of new entry that would erode upside returns when the market is profitable. However, when the market is unprofitable entrants are unlikely to arrive so incumbent firms are left to entirely bear any losses. This type of cost is specific to the individual supplier and is not compensated for in the standard cost of capital estimations. Similarly, in monopolised markets regulation can cap potential profits without providing commensurate insulation from downside risk. All firms

may also be exposed to stranding risk (e.g. through technical obsolescence, unfavourable demand shocks), and large catastrophic events such as natural disasters.

H12.4   For clarity, it is useful to distinguish two categories of asymmetric risk:

- Type I risks are risks that are generally unrelated to the day-to-day operations of the firm, and arise through infrequent events that could produce large losses. Examples include natural disasters; pandemics; terrorist threats; or large, unexpected policy shifts that could force the shutdown of operating plant before the end of its economic life.

- Type II risks are risks that derive from such events as the threat of competitive entry or expansion. That is, there tends to be a cap on any significant upside to the firm, but typically not the significant downside risk that it faces. On the downside, assets can become stranded through technical innovations that unexpectedly lower operational costs or through negative demand shocks.

H12.5   The treatment for each of these types of risk differs, and so the discussion below deals with each separately.

Type I asymmetric risk

H12.6   The events that give rise to Type I risk are events that firms would naturally wish to insure against. Insurance markets typically provide no cover for catastrophic risks, so firms—even those operating in competitive markets—are often left to self-insure.[1275]

H12.7   The lumpy and extreme nature of events that give rise to Type I risk means it is often unfeasible for firms in workably competitive markets to recover the cost of catastrophic events after the fact. Often, the only option available to firms is to self-insure in advance. Since one aim of regulation is to mimic outcomes that are consistent with those of workably competitive markets, any scheme designed to deal with Type I risk should ideally allow some *ex ante* recovery. On the other hand, regulators are in the unique position of being able to make *ex post* adjustments with the benefit of hindsight. Therefore, a scheme that permits some flexibility in this regard is desirable.

H12.8   A number of suppliers of regulated services submitted that an allowance for asymmetric risks should be included within the cost of capital.[1276] Some of these

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[1275] Froot, K. A., *The Financing of Catastrophic Risk, NBER Project Report Series*, University of Chicago & London, 1999, p. 3.

[1276] Auckland Energy Consumer Trust, Submission to the Commerce Commission on Input Methodologies, 14 August 2009, pp. 18-19; Auckland Airport, Commerce Commission Draft WACC Guidelines Paper, 31 July 2009, p. 3; Unison Networks Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: Castalia Strategic Advisors, *Submission on Input Methodologies: Regulatory Cost of Capital: a report prepared for Unison Limited*, 13 August 2009, pp. 6-7; LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital, Report on behalf of ENA*, 11 August 2009, pp. 13-15; LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital, Report prepared for the NZAA*, 31 July 2009, p. 26; Maui Development Limited, *Submission to the Commerce Commission on the Input Methodology Discussion Paper*, July 2009, p. 20; NZ Airports, *Submission by NZ Airports Association on the Commerce Commission Input Methodologies Discussion Paper*, 31 July 2009, p. 81; Orion, *Submission on Input Methodologies Discussion Paper,* 14 August 2009, p. 30*;* Powerco Limited*, Input Methodologies Discussion Paper*, 14 August 2009, p. 6; PricewaterhouseCoopers, *Submission to the Commerce Commission on the Revised Draft Guidelines – The Commerce Commission's Approach to Estimating*

submitters considered that the Commission could make allowance by adopting a point estimate at the upper end of the estimated plausible range. However, other submitters argued that choosing a point at the higher end of the range did not make any allowance for asymmetric risks.[1277]

H12.9   The Commission recognises that choosing a point estimate at the upper end of the range would be difficult to quantify and would risk becoming conflated with the unrelated issue of recognising the potential asymmetries arising from estimation uncertainty. In addition, whilst allowing an uplift to the cost of capital might provide firms with the necessary revenues to undertake self insurance, without any form of 'ring fencing' arrangements in place, it is unlikely to provide consumers with any guarantee that the additional funds would be employed for that purpose. The Commission's decision is therefore to not make any adjustments to the cost of capital for Type I asymmetric risk.

H12.10   With these issues in mind, the Expert Panel in their report proposed a hybrid scheme that mixes *ex ante* and *ex post* allowances. In particular, they recommended that the Commission handle Type I risks by allowing regulated firms to charge an 'insurance premium' that is invested in a reserve fund, which would pay out in the event of a Type I occurrence (effectively, a form of self-insurance that simulates what might otherwise occur, absent regulation). *Ex post* adjustments could be made if the fund proves inadequate or too generous.

H12.11   Such a scheme has potential benefits in securing continuity of services, and reducing the need for firms to demand significant price increases in the event that such a risk were to crystallise. However, the Commission acknowledges that there would be a number of practical challenges in implementing such a scheme, not least the requirement to calculate an appropriate annual premium.

H12.12   An alternative approach might be to require the firm to set-up its own self-insurance fund, with payments into the fund allowed to be borne as an operational expense subject to pre-determined conditions on the management and operation of the fund.

Conclusion - compensating supplier for Type I asymmetric risk
H12.13   The IM does not make any adjustments to the cost of capital for Type I asymmetric risk.

Type II asymmetric risk and real options
H12.14   Type II asymmetric risks are potentially large in industries that are: (i) characterised by long-lived, irreversible (large sunk cost) investments; and (ii) subject to substantial uncertainty over such things as future demand and costs.

the Cost of Capital, Report on behalf of 17 EDBs, 14 August 2009, p. 4 and pp. 15-16; PricewaterhouseCoopers, *Revised Draft Guidelines – Submission to Commerce Commission*, Report on Behalf of Powerco, August 2009, pp. 37-38; Telecom, *Submission on Commerce Commission Revised Draft Guidelines for estimating the Cost of Capital*, August 2009, pp. 6-7; Unison, *Appendix: Submission on Revised Draft Guidelines: The Commerce Commission's Approach to Estimating the Cost of Capital*, 14 August 2009, pp. 10-11.

[1277]   PricewaterhouseCoopers, *Revised Draft Guidelines – Submission to Commerce Commission*, Report on Behalf of Powerco, August 2009, pp. 37-38; Unison Networks Limited, *Submission on the Input Methodologies Discussion Paper*, Attachment: Castalia Strategic Advisors, *Submission on Input Methodologies: Regulatory Cost of Capital: a report prepared for Unison Limited*, 13 August 2009, pp. 6-7.

H12.15   Real options theory suggests that in industries with such features, firms will not
        enter or invest unless the (conventionally calculated) expected rate of return is above
        normal.[1278] Instead, firms will wait until expected profits are large enough to cover
        both the cost of capital and the type II asymmetric risks associated with entry. Such
        delay can occur in workably competitive markets that are characterised by
        significant uncertainty and a high degree of sunk costs, and can be efficient. Hence,
        the presence of type II asymmetric risk creates a timing decision and suggests that
        there potentially should be either a mark up on the standard cost of capital estimate
        or some upward adjustment to allowed revenues.

H12.16   Uniservices (for NZAA) and LECG (for ENA) indicated that new investments by
        regulated suppliers were sunk and irreversible, which may provide incentives for a
        supplier to delay making those investments. [1279] LECG further submitted that the
        Commission should increase suppliers' allowed rate of return as a result of real
        options. LECG argued that such an outcome would be consistent with outcomes
        expected in workably competitive markets where suppliers tend to set hurdle-rates
        for new investments that are above the normal rate of return.

H12.17   The Commission notes that it was not clear from arguments presented by submitters
        that their request for an increased allowed rate of return was because of the existence
        of an asymmetric risk. At the same time, the Commission acknowledges that
        suppliers might set hurdle-rates for new investments above the normal rate of return
        on a project-by-project basis. However, as some of these projects are likely to
        perform better than others, the Commission considers that, on average, and suppliers
        will achieve a normal rate of return on the long-term, and this will be reflected in
        their long-term expectations. Further, such policies used by firms may not be a
        reflection of asymmetric risk faced by firms, but the need of the business to
        discipline overly optimistic forecasts by project managers.

H12.18   In a submission on behalf of Telecom, Professor Guthrie argued that it was
        appropriate for the Commission to account for real options, and drew attention to the
        real options/investment timing model developed by McDonald and Siegel.[1280]
        While Professor Guthrie noted that in the McDonald and Siegel model the firm
        holds a perpetual option to develop a project (and thus had some market power over
        the project), he considered that the model could easily be modified so that the
        development option was not perpetual.

H12.19   Specifically, Professor Guthrie outlined that a workably competitive market outcome
        could be captured by taking into account the potential for the threat of pre-emption
        and extinguishing the option at some unknown future date. In particular, he argued
        that:[1281]

[1278] 'Conventionally calculated' refers to ordinary procedures, which assume symmetric payoff distributions.

[1279] LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital*, Report on
       behalf of ENA, 11 August 2009, pp. 12-15; Uniservices, *Comments on the Commerce Commission's Approach to
       estimate the Cost of Capital*, Report on Behalf of NZAA, 2 December 2009, p. 67.

[1280] McDonald, R., and Siegel, D., The Value of Waiting to Invest, *Quarterly Journal of Economics*, Vol. 101, 1986, pp.
       707–728.

[1281] Guthrie, G., *Further Notes on Incorporating Real Options in Regulated Prices, Submission to the New Zealand
       Commerce Commission on behalf of Telecom New Zealand Ltd*, 2 December 2009, p. 11.

- Under perfect competition, the firm can be expected to be pre-empted if it delayed investing - even for an instant - when the asset created by investment is worth more than the capex required. In this case, the expected time until pre-emption is zero.

- At the other extreme, if the firm is the only one able to invest, it could delay indefinitely without any threat of pre-emption. In this case, the expected time until pre-emption is infinite.

- Workable competition will lie somewhere between these two extremes.

H12.20 In arguing for real options to be taken into account, Professor Guthrie did not argue for an increment to the cost of capital. Instead, in his submissions and at the Cost of Capital Workshop, he maintained that the Commission should take real options into account by employing a service-specific multiplier on the value of the RAB. He suggested that this would potentially solve the problem of requiring a mark-up on the cost of capital as a regulated supplier would only ever be earning its cost of capital.[1282]

H12.21 A number of parties including the AECT, Uniservices (for NZAA), Wellington Electricity and PwC (for Telecom) supported the process of augmenting the RAB by Professor Guthrie's real option multiplier rather than adding an increment to the cost of capital.[1283]

H12.22 NZIER (for BARNZ) argued against the adoption of a real options approach. It highlighted that advocates did not provide the Commission with any practical guidance as to how it could identify or value real options among the firms it was required to regulate, and did not identify any other regulators that have allowed for real options to be taken into account. Further, NZIER submitted that for Airports subject to information disclosure real options had no relevance, and was sceptical that real options were even relevant for price-path regulation.[1284]

H12.23 As part of the Expert Panel's advice, Professor Myers recommended that timing options in the face of symmetric risk are a manifestation of market power, and regulators should not provide compensation for these. However, timing options extinguished in the face of Type II risk (asymmetric options) should be compensated for by the regulator. Dr Lally agreed that options exercised in the face of symmetric risk were a manifestation of market power that should not be compensated for and agreed that Type II asymmetric risk potentially warranted compensation. However,

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[1282] For full discussion between Professor Guthrie and the Commission on real options see the transcript from the Cost of Capital Workshop, *Cost of Capital Workshop Transcript*, pp. 65-71, (http://www.comcom.govt.nz/IndustryRegulation/Part4/DecisionsList.aspx#1312). For Professor Guthrie's submission see http://www.comcom.govt.nz//IndustryRegulation/Part4/ContentFiles/Documents/Telecom%20-%20Graeme%20Guthrie%20-%20WACC%20sub%20-%20881160_1.pdf.

[1283] Auckland Energy Consumer Trust, *Cross Submission to Commerce Commission on Cost of Capital Workshop*, 2 December 2009, p. 17; Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital*, Report on Behalf of NZAA, 2 December 2009, p. 66; Wellington Electricity, *Post-Workshop Submission for the Commerce Commission's Cost of Capital Workshop, November 12 and 13, 2009*, 3 December 2009, p. 4; Telecom Limited, *Post-workshop Submission on the Cost of Capital*, Attachment: PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, 2 December 2009, p. 7.

[1284] NZIER, *Cost of Capital, Report for Post-Workshop Submission, Report on behalf of BARNZ*, 28 November 2009, pp. 4-5.

he considered that a crucial feature of the Type II risk was asymmetry of the cash flows, rather than the presence of a timing option. Professor Franks recommended that any allowance for extinguished timing options be made through the regulatory cash flows.[1285]

H12.24 The Commission, in assessing real options, recognises that in order for such an approach to apply, investments need to be both irreversible and uncertain. While a significant proportion of investments in industries that provide regulated services (such airports, gas and electricity) are sunk, there is often a question as to whether regulated services have the requisite degree of demand and supply side uncertainty to warrant the use of such an approach.

H12.25 In practice, most regulatory systems do not expose the returns on investments to the large fluctuations that might arise in current market current conditions. Instead, regulation tends to take a long-term approach, akin in many ways to long-term contracting, in that the regulator sets the value of assets when they enter the regulatory asset base, and does not adjust them thereafter. As long as businesses are allowed to earn a return of and on capital, with appropriate treatment of stranded assets, investors will (in theory) not have incentives to delay investment. In such circumstances, option values should disappear.[1286]

H12.26 The ability of long-term contracts to remove the need to explicitly account for real options in the presence of sunk costs and uncertainty is also highlighted by those advocating a real options approach in telecommunications access regulation. They note long-term contracting arrangements remove the uncertainties associated with cost recovery for sunk investments subject to uncertainty.[1287]

H12.27 To the extent there may be an issue of uncertainty and irreversibility of the investment in relation to the asset base, this is addressed in the regulatory regime through the roll forward mechanism that assesses new investments on an *ex ante* basis, e.g. 'prudence reviews' or requirements that investments be efficiently incurred. However, rather than delay investment, this approach often creates the risk of excessive investment by the regulated supplier, and investments being incurred ahead of the socially optimal time.

H12.28 Even if there were risks such as asset stranding, these can be dealt with in the roll forward mechanism for the RAB by allowing for a depreciation profile that front loads the allowed returns as stranding becomes apparent or allow the stranded asset to remain in the RAB. Presently, the Commission provides for such flexibility in its treatment of the RAB.

H12.29 The Commission notes that a real option to wait only has value where a firm has some level of market power. While in theory it has been shown that a single firm in a competitive market subject to sunk costs may have some incentive to delay

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[1285] Franks, J., M. Lally and S. Myers, *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology, Report prepared for the Commerce Commission*, 18 December 2008, pp. 39-41.

[1286] Yarrow, G., Cave, M., Pollitt, M., Small, J., *Asset Valuation in Workably Competitive Markets - A Report to the New Zealand Commerce Commission*, May 2010, pp. 16-17.

[1287] See California Public Utility Commission, *Interim Decision Setting Final Prices for Network Elements Offered by Pacific Bell, California Public Utility Commission, Decision 99-11-050*, 18 November 1999, pp. 24-25 and footnote 26.

investments, the real option value of waiting will be equal to zero.[1288] Further, even in environments where there are only a small number of firms, provided one has a first-mover advantage, then it has been demonstrated in theory that a firm's ability to delay investment will be undermined by the fear of pre-emption. In such a scenario the traditional neoclassical NPV approach should be used to assess investments as opposed to a real options approach.[1289]

H12.30 Presently, the Commission is not aware of any regulatory authority that has allowed for a real option surcharge to deal with asymmetric risk. In particular, concerns have been expressed by regulators about the potential for the regulator to compensate the regulated supplier for some form of market power. To the extent that there have been concerns about asset stranding these have instead been dealt with through allowing accelerated or front loading of the depreciation profiles as stranding becomes apparent.

H12.31 While the Commission outlined in the RDG and IM Discussion Paper that it would be open to submissions from suppliers that can prove, with substantive evidence, that Type II errors are a material issue and should be recognised, no party has met this threshold.[1290]

H12.32 Submitters argued the Commission's approach imposed (and proposes to continue imposing) too high a 'burden of proof' on regulated firms such that no explicit allowance or recognition would ever actually be made.[1291] The Commission maintains the view that this burden of proof is appropriate. Suppliers of regulated services are in a better position to provide information about the sunk nature of new investments and the likely uncertainty in the market place compared to the regulator. This position is consistent with the approach taken by Ofcom when it considered this issue.[1292]

Conclusion - compensating supplier for Type II asymmetric risk and real options
H12.33 The IM's approach is to apply a 'benchmark' or service-specific cost of capital for all suppliers of a regulated service. If the Commission were to apply an ad-hoc adjustment to the service-wide cost of capital it would imply that all suppliers of a particular service are exposed to the same level of Type II asymmetric risk. However, suppliers of a regulated service are exposed to different levels of Type II

[1288] See Leahy, J., Investment in Competitive Equilibrium: The Optimality of Myopic Behavior, *Quarterly Journal of Economics,* Vol. 108, No. 4, 1993, pp. 1105-1133 and Dixit, A. K. and Pindyck, R. S., *Investment under Uncertainty*, Princeton: Princeton, New Jersey, 1994, Chapter 8.

[1289] Weeds, H., Strategic Delay in a Real Options Model of R&D Competition, *Review of Economic Studies*, Vol.69, No. 3, 2002, pp. 729-747.

[1290] Commerce Commission, *Revised Draft Guidelines - The Commerce Commission's Approach to Estimating the Cost of Capital*, 19 June 2009, p. 59.

[1291] Auckland Airport, *Commerce Commission Draft WACC Guidelines Paper*, 31 July 2009, p. 3; LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital*, Report on behalf of ENA, 11 August 2009, p. 14; LECG, *Comments on the Commerce Commission's proposed approach to estimating the cost of capital*, Report prepared for the NZAA, 31 July 2009, p. 26; PricewaterhouseCoopers, *Submission to the Commerce Commission on the Revised Draft Guidelines – The Commerce Commission's Approach to Estimating the Cost of Capital*, Report on behalf of 17 EDBs, 14 August 2009, p. 15; Telecom, *Submission on Commerce Commission Revised Draft Guidelines for estimating the Cost of Capital*, August 2009, p. 7; Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital*, Report on Behalf of NZAA, 2 December 2009, p. 66.

[1292] Ofcom, *Ofcom's Approach to Risk in the Assessment of the Cost of Capital: Final Statement*, 18 August 2005, p. 43.

asymmetric risks and at possibly different time periods. If the IM were to make an ad-hoc adjustment for Type II asymmetric risks in the service-wide cost of capital, it may over-compensate some suppliers and possibly under-compensate other suppliers.

H12.34   The Commission considers that regulated suppliers have not provided evidence to demonstrate that a Type II asymmetric risk exists and needs to be compensated using a real options approach. On this basis, the Commission considers a real options approach that provides for a mark up in the cost of capital (or regulatory asset base) is not appropriate for dealing with Type II asymmetric risks.

H12.35   The Commission has more general concerns about the applicability of real options to all services regulated under Part 4. In particular:

- regulated firms are unlikely to be subject to the requisite degree of uncertainty for a real options approach to apply due to the long-term nature of regulation (comparable in many ways to a long-term contract) where an asset value is fixed at the moment it enters the RAB, and suppliers are allowed to earn a return on and of that investment. In workably competitive markets with sunk costs and uncertainty, the existence of long-term contracts mitigates the need for a real options approach;

- assigning a positive value to real options could reward a regulated supplier for its position of market power, which would be inconsistent with the Part 4 Purpose;

- the Commission is not aware of any regulatory precedent for taking into account real options in the cost of capital (or asset base); and

- to the extent that any Type II asymmetric risk does exist, the Commission considers this is better dealt with through front loading of the depreciation profile or cash flows, or allowing stranded assets to remain in the RAB, as has been done by other regulators.

H12.36   The Draft Reasons Paper noted the Commission remained open to receiving evidence from regulated suppliers, that Type II risks exist in the case of EDBs/GPBs and Transpower and that real options are a particular concern for them. However, EDBs/GPBs and Transpower would need to provide evidence of the Type II risk and demonstrate how real options could be incorporated. Limited submissions were received on this point, and the IM does not make allowance for these items, though the Commission notes they could be demonstrated in a CPP application.

H13   Reasonableness Checks on the WACC

H13.1   This section reports the estimates of the WACC as at September 2010 for EDBs, GPBs and Transpower using the IM. The estimate of the WACC for EDBs and Transpower is then compared with a range of comparative information to ensure it is a reasonable estimate of the cost of capital. The section also discusses the reasonableness of the estimate for GPBs.

The estimated WACC for EDBs and Transpower as at September 2010

H13.2   Each regulatory instrument specifies when the WACC is to be calculated under that regulatory instrument. For EDBs under a DPP, the WACC is to be calculated as at 1 September 2009 for the purpose of making starting price adjustments. For Transpower's first regulatory control period the WACC is to be calculated as at 1 September 2010. GPBs are subject to information disclosure regulation, but the cost of capital IM will not apply to DPPs or CPPs for GPBs until 2012.

H13.3   For the purposes of testing the reasonableness of the WACC estimates produced by applying the IM, the Commission estimates the WACC as it would apply to EDBs and Transpower as at 1 September 2010. If the IM produces reasonable estimates at that date, it is also likely to produce reasonable estimates at other dates since the IM provides for regular updating of the risk-free rate and debt premium. Once a supplier is on a DPP or CPP however, the WACC which pertains to that regulatory period will not change.

H13.4   Table H22 summarises the values of the fixed parameters as specified in the IM for EDBs and Transpower and estimates of the five-year risk-free rate and five year debt premium as at 1 September 2010 (using data from the month of August 2010).

Table H22   Parameter Point Estimates and their Standard Error as at 1 Sept 2010 for EDBs and Transpower

Parameter	Point estimate	Standard error
Leverage	44%	
Debt issuance costs	0.35%	
Asset beta	0.34	0.13
Equity beta	0.61	
Tax-adjusted market risk premium	7.1%	0.015
Average corporate tax rate	28.4%	
Average investor tax rate	28.2%	
Debt premium (as at 1 Sept 2010)	2.00%	0.0015 (minimum)
Risk-free rate (as at 1 Sept 2010)	4.64%	

H13.5   Based on the parameter estimates in Table H22, Table H23 shows the estimates of the mid-point, and 75th percentile vanilla and post-tax WACCs as at September 2010.

Table H23   Estimated WACCs Using the Parameters Specified

Estimate of WACC	
Vanilla WACC	7.37%
Post-tax WACC	6.49%
Vanilla WACC (75th percentile)	8.09%
Post-tax WACC (75th percentile)	7.22%

H13.6   Under the IM, the 75th percentile of the vanilla WACC is to be applied for the
         purposes of DPPs and CPPs. Most New Zealand advisers and market participants
         use the post-tax WACC and most comparative information is of post-tax WACC
         estimates. To assist comparability, the reasonableness discussion below focuses on
         the post-tax WACC estimates reported in the above table. The rest of this section
         tests whether a post-tax WACC estimate of 7.22% for EDBs and Transpower is
         reasonable and commercially realistic in light of the comparative information on
         post-tax WACC estimates.

*Will the WACC IM produce reasonable and commercially realistic estimates of the
WACC?*

H13.7   The Commission has tested the estimates of the WACC produced using the IM
         against a range of other information on expected and historic returns. This is to
         ensure that the cost of capital estimated by applying the IM is reasonable and
         commercially realistic given the returns expected on other investments, having
         regard to differences in risk. Doing so ensures that the returns available to suppliers
         of regulated services are sufficient to incentivise innovation and investment, and that
         suppliers are limited in their ability to extract excessive profits. It also ensures that
         the expected rates of returns for regulated suppliers are consistent with the expected
         returns of firms in workably competitive markets.

H13.8   The comparative information against which the WACC estimates are tested
         includes:

         •   estimates of the long-run historical returns earned by New Zealand investors
              on investments of average risk (over the period 1900-2009).

         •   estimates of future returns expected by New Zealand investors on investments
              of average risk.

         •   estimates of the post-tax WACC in other regulatory contexts especially in New
              Zealand, Australia and the United Kingdom.

         •   independent estimates of the post-tax WACC for New Zealand monopolies.

         •   estimates of the post-tax WACC using other approaches including the classical
              CAPM.

H13.9   The conclusions from this comparative analysis are that the estimate of the post-tax
         WACC for EDBs and Transpower using the IM is reasonable and commercially
         realistic for regulated suppliers. This is because the post-tax WACC estimate of
         7.22% produced using the IM:

         •   is below the long-term historical (8.5%) and the forecast return on New
              Zealand investments of average risk (8.8%-9.3%) but well above the after-tax
              returns on five-year and 10-year government stock (3.2% and 3.7%
              respectively) and on five-year BBB+ bonds (4.6%). This is consistent with
              expectations as businesses such as Transpower and EDBs face lower risks than

the average New Zealand firm, but greater risks relative to corporate bonds and government stock;

- is similar to the Ofgem estimates for UK electricity and transmission businesses (6.8% and 7.2% respectively) and to the estimates (updated for subsequent changes in risk-free rates and debt premiums) used in the Transpower settlement (6.3%) and electricity lines decisions (6.5%);

- is below the AER's most recent estimate for Australian electricity distribution businesses (7.8%) due to differences in prevailing monetary conditions and taxation laws (neither of which are determined by the regulator), and the choice over the term of the risk-free rate and debt premium which matches the regulatory period (rather than a 10 year term preferred by the AER). However, the AER acknowledges its approach over-compensates suppliers and, in addition, the term credit spread allowance in the IM is not part of the WACC (but is reflected in cash flows for each supplier). The IM's approach to dealing with uncertainty over the estimation of the cost of equity appears more generous than the AER's approach in this regard;

- is in the middle of the range of publicly available independent estimates of WACC for NZ monopolies. For example, the IM post-tax WACC estimates are above PwC's estimate of the WACC for Vector (6.5%) and Horizon (6.2%), similar to estimates by two investment banks of Transpower's post-tax WACC (7.2% and 7.35%), but below the average broker forecast of the WACC for the Vector group including non-regulated businesses (8.0%); and

- is close to the estimates produced when applying the classical CAPM (7.5%).

H13.10 There is limited New Zealand information to test the reasonableness of the estimates of post-tax WACC for GPBs produced by the IM.[1293] The available overseas data suggest the post-tax WACC estimates for gas should be close to, or the same as for, EDBs. On theoretical grounds, the Commission considers NZ GPBs should have a higher WACC than EDBs, as they are considered to face greater systematic risks.

H13.11 The final section of this appendix discusses points raised in submissions which test the reasonableness of the post-tax WACC estimates produced using the IM.

Long-run returns earned by New Zealand investors on investments of average risk

H13.12 The actual returns earned historically by New Zealand investors provides one means of testing whether an estimate of a future rate of return (WACC) is realistic. The advantage of looking at historic returns is that they can be calculated without the need for an analytical tool such as CAPM. That is, it is independent of the analytical model, does not require a number of assumptions that such models require, and can be estimated without a consideration of systematic and unsystematic risk.

H13.13 Dimson, Marsh and Staunton of the London Business School are generally regarded as having produced the most authoritative source of historical returns to

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[1293] Using the same parameters for EDBs and Transpower as used in this appendix, see Table H22 (except assuming an asset beta of 0.44, an equity beta of 0.79, and a standard error for the asset beta of 0.14), the 75th percentile estimate of post-tax WACC for GPBs is 8.0%. The midpoint estimate is 7.2%.

investors.[1294] Dimson, Marsh and Staunton have analysed returns to investors in over 20 countries. Dimson, Marsh and Staunton's data for New Zealand covers the period from 1900 to 2009; that is, over 100 years.

H13.14 Dimson, Marsh and Staunton estimate that the average return to New Zealand equity investors over the period 1900-2009 was 9.8% p.a.[1295] This is a nominal, pre-investor tax return. Over the same period, the return on government bonds was 5.8% p.a.[1296] The return on corporate debt is not calculated by Dimson, Marsh and Staunton, but for the purposes of this analysis it is assumed it falls midway between the return on government debt and the average for NZ equities (that is, 7.8%).[1297] At a corporate tax rate of 30%, assuming market-wide leverage of 30%, and no investor taxes on equity returns, this implies a post-tax WACC estimate of around 8.5% for an investment of average risk.

H13.15 This compares with a 7.22% post-tax WACC for a supplier of essential services such as an EDB or Transpower.

Future returns expected by New Zealand investors on investments of average risk

H13.16 Future expected returns can be estimated using CAPM. By definition, the market has an average equity beta equal to one. The analysis also assumes a TAMRP of 7.1%, leverage of 30%, a risk-free rate of 4.64%, a debt premium of 2.5%, issue costs of 0.35% per annum, and a corporate and investor tax rate of 28%. The lower leverage assumption and higher debt premiums are intended to reflect those for an average listed NZ firm. Under these assumptions, the estimated post-tax WACC is 8.9% (under both the classical and simplified Brennan-Lally CAPM).

H13.17 Using a 10 year estimate of the risk-free rate (of 5.35%), and the same other assumptions as set out in the preceding paragraph, the post-tax WACC would be 9.2% for the New Zealand market.

H13.18 The Cost of Capital Report is published quarterly by PwC and is a long-standing and well-known report to many users.[1298] It includes estimates of the post-tax WACC for around 70 New Zealand listed companies. The approach used by PwC is similar to the IM in a number of respects, including the use of the simplified Brennan-Lally CAPM model and a five-year term for the risk-free rate (of 4.9% as at June 2010).

H13.19 In the June 2010 Cost of Capital Report, PwC estimate that the average post-tax WACC for the approximately 70 companies they analyse, is 8.4%.

H13.20 Table H24 below summarises the information discussed above on the market average post-tax WACC, on a historic and forecast basis. It also shows the current

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[1294] Dimson, E., P. Marsh, and M. Staunton, *2010 Global Investment Returns Yearbook 2010.*

[1295] Dimson, E., P. Marsh, and M. Staunton, *2010 Global Investment Returns Yearbook 2010*, p. 27. The Dimson, Marsh and Staunton estimates are estimated on a geometric basis. The arithmetic equivalent is 11.8%. The Dimson, Marsh and Staunton approach also makes no adjustment to the nominal returns on NZ investments despite these having likely been inflated during periods when New Zealand experienced high rates of inflation. The real returns would therefore be lower.

[1296] Dimson, E., P. Marsh, and M. Staunton, *2010 Global Investment Returns Yearbook 2010*, p. 27.

[1297] This is likely to be a conservative estimate of the cost of debt as it assumes a return on debt halfway between the return on government debt and the return on an equity investment of average risk

[1298] The report can be found at http://www.pwc.com/nz/en/cost-of-capital.

five-year and 10 year government bond rates (that is the returns on investment with no default risk) and the pre-tax cost of BBB+ corporate bonds.

Table H24   Market estimates of return on NZ investments of average risk

Approach	Estimate of post-tax WACC
Historical returns on NZ market for a firm of average risk	8.5%
Expected return on NZ market for a firm of average risk (using a five-year risk-free rate as at 1 September 2010)	8.9%
Expected return on NZ market for a firm of average risk (using a 10 year risk-free rate as at 1 September 2010)	9.2%
NZ Market weighted average WACC (PwC calculation), i.e. average risk	8.4%
Estimate of the post-tax WACC for an EDB / Transpower (at the 50th percentile as at September 2010). Essential service provider.	6.5%
Estimate of the post-tax WACC for an EDB / Transpower (at the 75th percentile as at September 2010). Essential service provider.	7.2%

H13.21   The estimates in the top part of Table H24 relate to the market average firm. That is, they are indicative of the post-tax WACC for a firm of average risk.

H13.22   EDBs (and Transpower), on the other hand, provide essential services, with very stable demand, face no real substitutes and have no or limited competition. As providers of essential services, used 24 hours a day 365 days a year by virtually every consumer in the country, they have locked-in users with no choices and little bargaining power. Such firms face significantly lower systematic risk than the average firm, and are the quintessential low risk business. Equity investors in such companies would expect to earn a lower return on their investments, than in an average NZ company. This conclusion is supported by the empirical estimates of beta by the Commission and of the expert advisors who provided beta estimates. No advisor submitted the equity beta for EDBs should equal one, or be above one (that is, no advisor submitted that EDBs face average or above average systematic risk).

H13.23   As would be expected, the estimates of the post-tax WACC for EDBs using the IM are modestly below the estimates of the WACC for a New Zealand firm of average risk. Specifically, they are between 2.1% and 1.6% below that for an investment of average risk at the 75th percentile (and between 2.8% and 2.3% at the midpoint WACC estimate below an investment of average risk). This is consistent with the analysis in the prior paragraph.

H13.24   The Commission notes that some suppliers, and some expert advisors on behalf of suppliers, provided estimates of the WACC for EDBs that were above, and sometimes significantly above, the estimate for a New Zealand firm of average risk.[1299] Such submissions did not provide an explanation for why EDBs could

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[1299]   For example, relying on its advisor CEG, Vector's submission implies the post-tax WACC should be 10.3-11.1%, assuming 43% leverage. PwC (for 20 EDBs) proposes 9.35% at the 75th percentile. LECG propose a point estimate of 8.60% and a high estimate (for application in pricing setting) of 10.13% before an allowance for model error of 1%. See: Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and*

reasonably be expected to have an estimated post-tax WACC which is above that of firms exposed to average risk. The Commission does not consider such estimates to be realistic estimates of post-tax WACC as estimates of the post-tax WACCs for EDBs which are above the estimated post-tax WACC for firms of average risk are implausible.

H13.25   The Commission considers a return on an investment of average risk to be at a level that is above the plausible maximum post-tax WACC for an EDB.   The post-tax cost of debt for an EDB is below the plausible minimum post-tax WACC for an EDB. Table H25 below compares the post-tax return on fixed interest investments currently for the NZ market with the post-tax WACC estimates applying the IM.

H13.26   Using the IM approach gives an estimate of the midpoint post-tax WACC of around 3.2% above the post-tax yield on Government bonds, and 1.7% above the estimated post-tax yield on BBB+ bonds.

Table H25   Market estimates of return on NZ investments

Approach	Estimate of post-tax WACC
Post-tax yield on five-year government stock (Sept 2010)[1300]	3.2%
Post-tax yield on 10 year government stock (Sept 2010)[1301]	3.7%
Post-tax yield on five-year BBB+ bonds (Sept 2010)[1302]	4.6%
Estimate of the post-tax WACC for an EDB / Transpower (at the 50th percentile as at September 2010)	6.5%
Estimate of the post-tax WACC for an EDB / Transpower (at the 75th percentile as at September 2010)	7.2%

H13.27   Comparing Table H24 and Table H25, the IM estimate of the post-tax WACC falls midway between the post-tax cost of debt and the post-tax WACC for a firm of average risk. This is appropriate and reasonable given the risks of investing in an EDB (or Transpower) would be expected to be greater than for BBB+ bonds, but lower than that for a firm of average risk.

Estimates of the WACC in other regulatory contexts

H13.28   This section considers estimates of the post-tax WACC in prior regulatory decisions, in New Zealand, the United Kingdom and Australia.

New Zealand

H13.29   A previous estimate of the post-tax WACC for electricity lines businesses was provided to the Commission in 2005 by Dr Lally who estimated a post-tax WACC

Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital, 13 August 2010, pp. 5, 26. PricewaterhouseCoopers on behalf of 20 Electricity Distribution Businesses, *Input Methodology for Electricity Distribution Services Cost of Capital*, 13 August 2010, p. 18. LECG, *Response to Commerce Commission's Draft Cost of Capital Input Methodology, Report for the Electricity Networks Association*, August 2010, p. 16.

[1300]   Based on a 4.64% five-year yield and tax at 30%.

[1301]   Based on a 5.35% 10-year yield and tax at 30%.

[1302]   Based on 2% debt premium above a 4.64% five-year yield and tax at 30%.

of 7.4%, based on a then prevailing risk-free rate of 6.3% and a debt premium of 1.2%.[1303] Updating this solely for subsequent changes in risk-free rates and debt premiums, implies a midpoint post-tax WACC of 6.5%, which is slightly above the mid-point estimate under the IM.

H13.30 Transpower proposed a post-tax WACC of 7.8% as part of a settlement with the Commission in 2007, which was reviewed and accepted by the Commission. This assumed a risk-free rate of 7.2%. Updating this estimate to reflect subsequent changes in the risk-free rate and debt premium as at September 2010 produces a revised estimated post-tax WACC of 6.3%. This is very similar to the mid-point estimate produced using the IM.

United Kingdom

H13.31 Ofgem regulates the companies which run the UK gas and electricity networks. It uses estimates of the WACC for affected companies as part of its five-yearly Price Control Reviews. Its most recent price control proposals were issued for electricity distribution in December 2009,[1304] for gas distribution in December 2007,[1305] and for transmission in December 2006.[1306] Ofgem uses the classical CAPM to estimate a real post-tax WACC. To enable comparison, the Commission has converted Ofgem's estimates into nominal post-tax estimates. This produced estimates of the WACC of 6.8% for electricity distribution, 7.1% for gas distribution, and 7.2% for transmission.[1307] These are very close to the Commission's estimates of the post-tax WACC that would be applied to DPPs and CPPs.

Australia

H13.32 The AER is responsible for the economic regulation of the electricity transmission and distribution networks in the national electricity market (NEM) and for most gas transmission and distribution networks in Australia. The AER's most recent estimate of the vanilla WACC is for the Victorian electricity distribution network service providers.[1308] The AER proposed a vanilla WACC of 9.40% for CitiPower, Powercor and United Energy, 9.65% for SP AusNet and 9.95% for Jemina[1309]. The differences in the vanilla WACC between the companies reflected the different periods in which the risk-free rate was estimated for each company.[1310] To simplify the analysis, the analysis below focuses on the vanilla WACC of 9.4% calculated for the first three companies mentioned.

[1303] Lally, M., *The Weighted Average Cost of Capital for Electricity Lines Businesses*, Sept 2005, p. 105. This estimate includes issuance costs.

[1304] Ofgem, *Electricity Distribution Price Control Review Final Proposals – Allowed Revenue and Financial Issues*, 7 December 2009, p. 16.

[1305] Ofgem, *Gas Distribution Price Control Review Final Proposals (GDPCR),* 3 December 2007, p. 105.

[1306] Ofgem, *Transmission Price Control Review Final Proposals*, 4 December 2006, p. 54.

[1307] Using the Fisher function and an assumed inflation rate of 2.7% consistent with the inflation expectation noted in Ofgem, *Electricity Distribution Price Control Review Final Proposals – Allowed Revenue and Financial Issues*, 7 December 2009, p. 10. The real vanilla WACC in GDPCR has been converted to a real, post-tax WACC and then to a nominal post-tax WACC.

[1308] AER, *Victorian electricity distribution network service providers, Distribution determination 2011-2015, Final decision*, October 2010.

[1309] The AER's conclusion on Victorian electricity distributors is similar to its conclusions for companies in South Australia, Queensland and a NSW gas distribution service.

[1310] AER, *Victorian electricity distribution network service providers, Distribution determination 2011-2015, Final decision*, October 2010, p. 477.

H13.33   The AER's estimate is a vanilla WACC. As the analysis in this section focuses on post-tax WACCs, the Commission has converted the AER's estimate to a post-tax WACC. This produced a post-tax WACC of 7.8%, around 0.6% above that under the IM.

H13.34   There are a number of differences between the AER's estimate and that produced using the IM. These are set out in the Figure H13 and discussed below.

Figure H13   A comparison of Australian and New Zealand post-tax WACCs for regulatory purposes
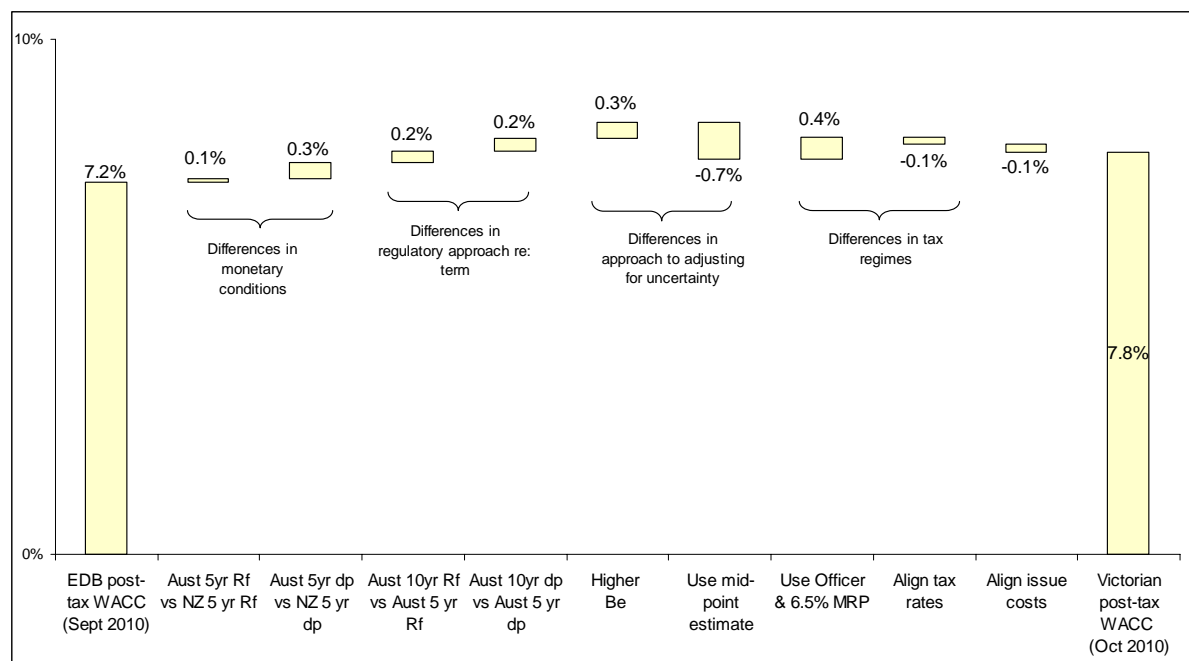
H13.35   The differences highlighted in the figure fall into 4 main categories which are discussed in turn below:

- differences due to differences in monetary conditions prevailing in each country at the time when the risk-free rate and debt premium are estimated;

- differences in regulatory approach regarding the term of the risk-free rate and debt premium;

- differences in regulatory approach regarding the treatment of uncertainty particularly as regards estimating the cost of equity; and

- differences in tax regimes.

Differences in monetary conditions

H13.36   At the time the AER and the IM estimates were made, Australian 5 year risk-free rates and debt premiums were higher than in New Zealand. Higher Australian interest rates increased the AER's post-tax WACC by 0.1% relative to the IM estimate, while the higher Australian debt premium increased the AER's post-tax WACC by a further 0.3%.

H13.37   These differences are a function of differing monetary conditions between Australia and New Zealand at different points in the economic and monetary cycle. Risk-free rates and debt premiums change over time. At other points in the cycle, estimates of the WACC under the IM could be higher or lower than the AER's estimate.[1311]

H13.38   The IM reflects the estimated post-tax WACC for a New Zealand firm having regard to New Zealand monetary conditions, not those in another country.

Differences in regulatory approach regarding term

H13.39   There is a difference in regulatory approach concerning the term of the risk-free rate and debt premium. The AER's methodology assumes a 10 year term on the risk-free rate and debt premium, whereas the IM provides for a five-year term. The Commission estimates the AER's use of a 10 year Australian risk-free rate in the IM increases the resulting estimate of the post-tax WACC by 0.2% compared with a five year Australian rate, and use of a 10 year debt premium rather than a five year term increased the post-tax WACC by a further 0.2%.

H13.40   The IM's use of the five-year term of the risk-free rate compensates suppliers appropriately. As discussed in paragraphs H4.29 to H4.59, use of a 10 year term will over-compensate suppliers when the interest rate yield curve is upward sloping, and under-compensate suppliers when it is downward sloping. Further, use of a 10 year rate compensates suppliers for a risk borne by consumers. Regulated suppliers can and do make extensive use of interest rate swaps to shorten their repricing period. Accordingly, the term of the risk-free rate in the IM matches the term of the regulatory period. The AER acknowledges that its use of a 10 year risk-free rate can be expected to over-compensate suppliers.[1312]

H13.41   Through the term credit spread differential allowance the IM allows regulated suppliers to recover the greater premium on debt whose term exceeds that of the regulatory period (where the firm has actually incurred it). However, this is a separate allowance and is not part of the WACC (and not shown in Figure H13). By contrast, the AER's approach includes an estimate of the 10 year debt premium in its estimated WACC. To compare the AER and IM estimates on a like-for-like basis, the term credit spread differential allowance should be added to the IM WACC estimate. However, this is not practical since the amount of the term credit spread differential allowance will vary between regulated suppliers. Accordingly, a like-for-like comparison of approaches in regard to the premium on long-term debt is not practical.

H13.42   Finally, the Commission notes that while the AER currently uses a 10 year debt premium, this approach is increasingly being called into question by Australian regulators and the Australian Competition Tribunal.[1313]

[1311]   For example, at September 2009 (the relevant date for estimating the WACC for SPA), the post-tax WACC is estimated at 7.7%, almost identical to the AER's estimate discussed above.

[1312]   AER, *Electricity transmission and distribution network service providers Review of the weighted average cost of capital (WACC) parameters*, Final decision, May 2009, p. xiii and p. 154.

[1313]   Refer section on debt premium in this appendix. See paragraphs H5.23 to H5.26.

H13.43 In sum, there are strong reasons to set the term of the risk-free rate and the debt
premium to match the regulatory period, rather than adopt a 10 year term as used by
the AER.

Differences in regulatory approach to deal with uncertainty in estimating the cost of equity

H13.44 The AER and IM take different approaches to ensuring there are sufficient
incentives to invest in regulated services. The IM specifies the 75th percentile
estimate of the post-tax WACC to be used when setting price-paths, rather than the
mid-point estimate of the post-tax WACC. This is to reflect the greater social costs
of setting the WACC too low, versus the social costs of setting it too high (given the
uncertainty in knowing what the true post-tax WACC is). The practical impact of
this is to increase the estimate of the IM post-tax WACC by 0.7% relative to the
mid-point.

H13.45 In contrast, the AER does not use a 75th percentile estimate of WACC. Rather, it
sets the equity beta at a level which is above the level implied by the empirical
estimates of beta which were considered by the AER. The AER explains that this is
to achieve a WACC that ensures efficient investment in services for the long-term
interest of consumers.[1314] The AER's approach increases its estimate of the post-tax
WACC by 0.4% when compared to the IM approach (at the mid-point WACC).
This has a smaller impact on the post-tax WACC than the IM's use of the 75th
percentile estimate.

Differences attributable to tax and issue costs

H13.46 The AER uses the Officer CAPM (and an MRP of 6.5%), while the IM uses the
simplified Brennan Lally CAPM. The choice of the form of the CAPM reflects the
differences in the New Zealand and Australian taxation regimes, in particular that
there is no general capital gains tax in New Zealand. The AER's use of the Officer
CAPM and a 6.5% MRP produces a post-tax WACC about 0.4% higher than the
IM's SBL CAPM with a 7.1% TAMRP.

H13.47 The AER continues to use a 6.5% MRP estimate, which was increased from 6%
after the GFC. The AER maintains its view that the long run Australian MRP is 6%
and that this should be "adopted as market conditions return to those seen pre-
GFC."[1315] The AER was not yet persuaded that market conditions have stabilised.
The Commission notes that the 6.5% MRP estimate used by the AER is higher than
that used by most other Australian regulators, including the ACCC which has
reverted back to its long-term view of the Australian MRP (being 6%, the same as
the AER's view). If the AER moves back to its long-run estimate of the Australian
MRP, the regulated post-tax WACC for Australian energy firms will fall by 0.2%,
all other things remaining unchanged. The corresponding change in post-tax WACC
from estimating the TAMRP under the Commission's long-term view of the
New Zealand TAMRP (7%), will reduce the New Zealand post-tax WACC by 0.1%.
In sum, if both the Australian and New Zealand estimates reverted to the long-run

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[1314] AER, *Electricity transmission and distribution network service providers Review of the weighted average cost of
capital (WACC) parameters, Final decision*, May 2009, p. 343-344.

[1315] AER, *Victorian electricity distribution network service providers, Distribution determination 2011-2015, Final
decision*, October 2010, p. 484.

estimates of the market risk premium, this would reduce the difference between the respective post-tax WACC estimates by 0.1%.

H13.48   The IM compensates firms for debt issuance costs through the post-tax WACC, whereas the AER does not include such costs through the post-tax WACC. This explains 0.1% of the difference between the IM and AER post-tax WACC estimates.

Summary of the differences between the AER and the IM

H13.49   The Commission has compared the post-tax WACC estimates produced using the IM with the AER's post-tax WACC estimates, and considered the factors responsible for the differences. Some of these factors reflect differences in the respective taxation regimes and in prevailing monetary conditions, which are not determined by the respective regulators. The AER and the IM take different approaches to ensuring there are adequate incentives for investment in regulated services. The Commission considers its explicit allowance in the IM (through the 75th percentile estimate) is transparent and favourable to suppliers.

H13.50   There is also a difference in the term of the risk-free rate. A term of the risk-free rate that matches the regulatory term ensures suppliers are fairly compensated, with less risk of over- or under-compensation than a 10 year term, and more appropriately reflects regulated suppliers' exposure to base interest rates given their widespread use of interest rate swaps. The term credit spread differential allowance also compensates firms for the greater debt premium on longer term debt, to the extent this is incurred by firms, rather than over-compensating all firms which would occur if the debt premium was based on a 10 year term. On balance, the Commission considers the approach on these matters in the IM is preferable to that taken by the AER.

H13.51   Table H26 summarises the estimates from the regulatory decisions discussed above. The estimates produced via the IM are comparable to, and generally above, the estimates in the prior energy-sector regulatory decisions.

Table H26   WACCs in previous energy-sector regulatory decisions

Approach	Estimate of post-tax WACC
Updated Electricity Lines (Dr Lally for the Commerce Commission)	6.5%
Updated Transpower settlement	6.3%
Ofgem – electricity distribution	6.8%
Ofgem – gas distribution	7.1%
Ofgem – electricity transmission	7.2%
AER – Victorian electricity distribution (Oct 2010)	7.8%
Estimate of the post-tax WACC for an EDB / Transpower (at the 50th percentile as at September 2010)	6.5%
Estimate of the post-tax WACC for an EDB / Transpower (at the 75th percentile as at September 2010)	7.2%

Independent estimates of the WACC for NZ monopolies

H13.52   There are several publicly available estimates of the post-tax WACC for New
         Zealand monopolies, including EDBs, GPBs and Transpower, which have been
         produced independently of the regulatory context. These are discussed below.

H13.53   PwC includes estimates of the post-tax WACC for Vector and Horizon in its June
         2010 Cost of Capital Report. For Horizon, an EDB, PwC estimates a 6.2% post-tax
         WACC, and a 6.5% post-tax WACC for Vector.[1316] These estimates are consistent
         with the IM mid-point estimate of the post-tax WACC, but lower than the 75th
         percentile estimate.

H13.54   A number of New Zealand investment banks publish research on New Zealand listed
         companies. In particular, a number of brokers have estimated the post-tax WACC
         for Vector, as an input into valuing a share in the ownership of Vector. The post-tax
         WACC estimates range from 7.35% to 8.5% with an average of 8.0%. That is, the
         broker estimates for Vector's cost of capital are above the IM estimate of the post-
         tax WACC for EDBs. For at least two reasons, the Commission would expect the
         broker estimates to be higher than the IM estimates in respect of EDBs.

         •   First, the broker estimates of Vector's post-tax WACC cover all of Vector
             (including gas, electricity, telecoms, gas wholesaling, and metering), whereas
             the IM focuses solely on regulated services (electricity distribution and gas
             pipeline services). The post-tax WACC for the supply of electricity
             distribution services in particular would be expected to be lower than for the
             other services provided by Vector and lower than for the overall company.[1317]
             In this regard, the IM estimate for GPBs is 8.0% which is directly in line with
             the average broker estimate for all of Vector.

         •   Second, the brokers seek to estimate Vector's value over the life of the
             company's assets and cash flows. This requires a long-term estimate of the
             post-tax WACC, while the IM seeks to estimate Vector's post-tax WACC for
             the term of each regulatory period. Accordingly the broker reports use a
             longer risk-free rate (10 years), typically averaged over a long period, rather
             than a specified shorter period so as to best match the risk-free rate for the
             regulatory period. When interest rates are relatively low, the WACC under the
             IM will be lower than the broker estimates, but at other times it can be
             expected to be greater.[1318]

H13.55   Given those two contextual factors, the Commission considers the broker estimates
         of Vector's post-tax WACC generally support the reasonableness of the estimates
         produced using the IM, and therefore support a conclusion that the IM will produce
         estimates of the post-tax WACC that are commercially realistic.

[1316]   PricewaterhouseCoopers, *The Cost of Capital Report*, June 2010, p. 2.

[1317]   UBS estimates a Vector electricity cost of capital of 7.7% versus its estimate of Vector's company-wide cost of capital
         of 8.2%.

[1318]   This point is explicitly noted by some brokers, see paragraph H13.56.

H13.56   The New Zealand Treasury commissioned two New Zealand investment banks (Forsyth Barr and First NZ Capital) to prepare separate valuations of Transpower. Their valuations were publicly released in December 2010, and include estimates of the post-tax WACC for Transpower of 7.2% (Forsyth Barr) and 7.35% (First NZ Capital).[1319]   Like the broker reports on Vector the Transpower valuation reports estimate the long-term value of Transpower and therefore use an estimate of the long-term cost of capital. In light of the banks' view that the risk-free rate will trend higher, the Transpower valuation reports use estimates of the risk-free rate which are above current market risk-free rates.[1320]   Both valuations note that the IM provides for the WACC to be updated to reflect changed interest rates for Transpower's next regulatory period. Indeed, Forsyth Barr's estimate is that the post-tax WACC estimated under the IM for the regulatory period from 2015/16 to 2019/20 will be higher than Forsyth Barr's estimate of Transpower's WACC (due to its expectation that interest rates will rise).[1321]

H13.57   The closeness of these independent estimates of Transpower's WACC to the IM estimates supports the reasonableness of the cost of capital IM for Transpower. Further, as Transpower has a relatively small non-regulated business, (for example, as compared with Vector) the estimates provided by First NZ Capital and Forsyth Barr are a good indication of long-term cost of capital for a pure-play EDB (unlike the estimates of Vector's overall cost of capital). As such, they provide support also for the reasonableness of the cost of capital IM for EDBs (since the systematic risk of both is considered to be similar).

H13.58   The NZ Airways Corporation, like the EDBs, is a monopoly provider of essential services through its Air Navigation Service (ANS). The Airways Corporation estimates the ANS' post-tax WACC at 5.9% (Pricing Proposal June 2009). This is below the Commission's estimate of the post-tax WACC for EDBs, which could suggest the Commission's IM may be generous in favour of regulated suppliers.

H13.59   The independent post-tax WACC estimates for NZ monopoly suppliers are summarised in Table H27 below. The estimates produced via the IM are within the range of estimates made by independent parties range for EDBs and comparable New Zealand monopoly providers of essential services.

[1319]   Forsyth Barr, *Transpower - Powering up*, 5 November 2010, p. 5. First NZ Capital, *Transpower – A valuation perspective*, 29 October 2010, p. 14.

[1320]   Forsyth Barr, *Transpower - Powering up,* 5 November 2010, p. 5. First NZ Capital, *Transpower – A valuation perspective*, 29 October 2010, p. 14.

[1321]   Using parameters from the Draft IMs, Forsyth Barr estimated a post-tax WACC of 7.8% at the 75th percentile for the period 2015/16 to 2019/20 and a post-tax WACC of 7.1% at the 75th percentile for the period 2011/12 to 2014/15.

Table H27   Independent Estimates of Post-tax WACCs for NZ Monopolies

Approach	Post-tax WACC Estimate
PwC estimate for Horizon Distribution (an EDB, June 2010)	6.2%
PwC estimate for Vector Limited (June 2010)	6.5%
NZ Broker estimates for Vector (Aug-Sept 2010)	7.35%-8.5% Average 8.0%
NZ Broker estimates for Transpower (Oct-Nov 2010)	7.2%-7.35% Average 7.3%
Airways Corporation Air Navigation Service	5.9%
Estimate of the post-tax WACC for an EDB / Transpower (at the 50th percentile as at September 2010)	6.5%
Estimate of the post-tax WACC for an EDB / Transpower (at the 75th percentile as at September 2010)	7.2%

Testing reasonableness using other models

H13.60   Professor Myers and Professor Franks recommended the Commission estimate WACC using the classical CAPM. While not favoured by submissions, and not included in the IM, this can test the reasonableness of the results from the simplified Brennan-Lally CAPM.

H13.61   Using the same data as set out in Table H22 and an MRP of 5.8%, the classical CAPM produced a mid-point post-tax WACC of 6.8%. For the simplified Brennan-Lally CAPM the IM provides for a 75th percentile estimate of the WACC for application for DPPs and CPPs. The 75th percentile estimate of the post-tax WACC is 7.5% under the classical CAPM.

H13.62   The simplified Brennan-Lally CAPM results in post-tax WACC estimates which are approximately 0.3% below those resulting from an application of the classical CAPM. This is to be expected as the Classical CAPM assumes all forms of investment income are taxed at the same rate (e.g. it ignores the value of imputation credits and treats all capital gains as being taxed at 28%).

H13.63   Professors Myers and Franks recommended the use of the Fama-French three-factor model and the DCF model as reasonableness checks for CAPM estimates, "provided that necessary data are available and that the model's assumptions are reasonably satisfied".[1322] However, there is very little New Zealand data available to robustly estimate a cost of equity using these methods and the no submission provided estimates of the cost of equity in New Zealand using either of these models. Accordingly, it is not practical to use these models as reasonableness tests in a New Zealand context.

[1322]   Franks, J., Lally M., & Myers S., *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology*, 2008, p. 8.

H13.64   Professor Franks also recommended the use of the international CAPM. This would require estimates of the MRP appropriate to international investors, and the estimation of the relative riskiness of NZ regulated suppliers to an internationally diversified investor (i.e. beta). Such data is not readily available, and therefore the international CAPM cannot be readily or reliably used. As discussed in paragraphs 6.4.33 to 6.4.35, the best view of the estimates of the cost of equity from an international investor's perspective is that it is likely to be at or below the level estimated from a domestic investor's perspective.

H13.65   Table H28 below summarises the estimates of post-tax WACC for EDBs using methods and approaches other than those specified in the IM. The estimates produced via the other approaches are close to those estimated using the simplified Brennan-Lally CAPM (with leverage of 44% and no debt beta).

Table H28   Estimated WACCs using other models and approaches to estimate the cost of equity

Approach	Post-tax WACC Estimate
EDB WACC estimated using the classical CAPM (50th percentile)	6.8%
EDB WACC estimated using the classical CAPM (75th percentile)	7.5%
EDB WACC estimated using Fama French and dividend growth model	Not practical
EDB WACC estimated using International CAPM	Not practical but evidence suggests it is lower than domestic CAPM estimate
Commission's estimate of the post-tax WACC for an EDB / Transpower (at the 50th percentile as at September 2010)	6.5%
Commission's estimate of the post-tax WACC for an EDB / Transpower (at the 75th percentile as at September 2010)	7.2%

Conclusions – reasonableness of WACC estimates for EDBs

H13.66   Figure H14 below summarises the information outlined above to test the reasonableness of the post-tax WACC estimated under the IM as at September 2010.
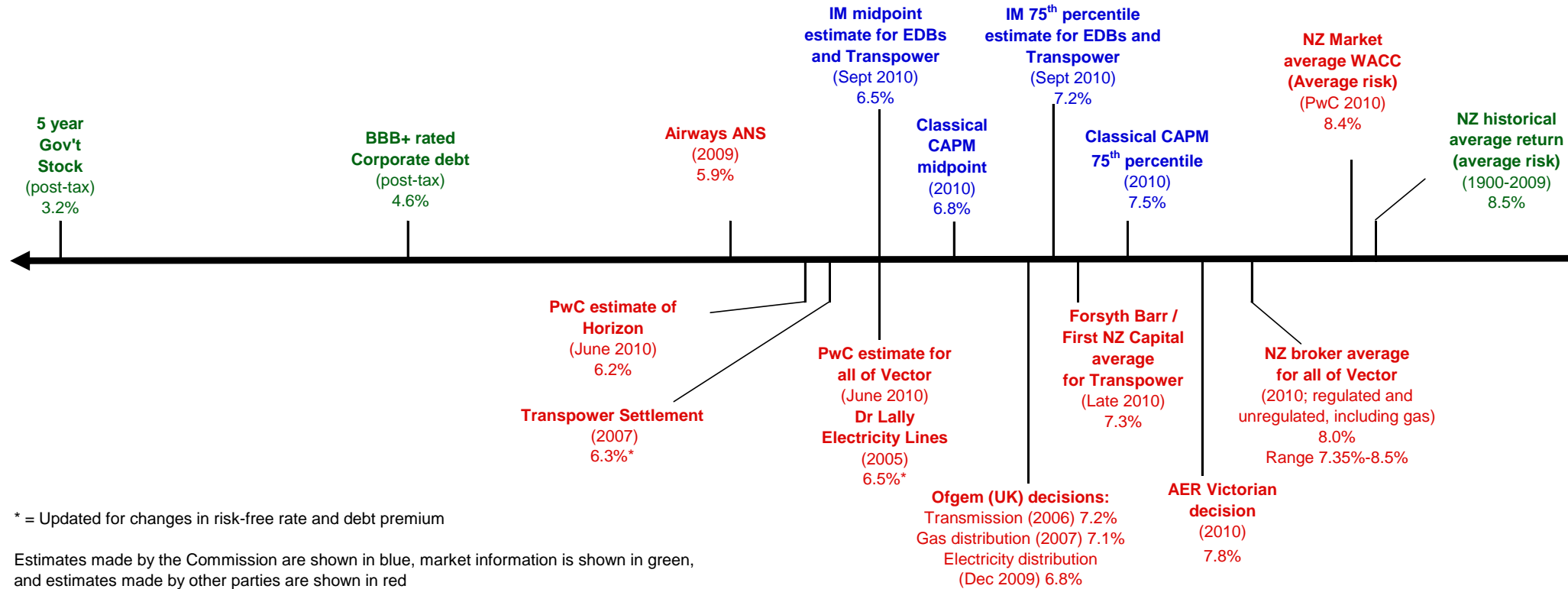
H13.67   The IM estimate of the post-tax WACC falls within the range of the comparative information. The 75th percentile estimate is above estimates from some other sources, notably PwC's estimates for Vector and Horizon's post-tax WACC, and Airway's estimate of the post-tax WACC for its monopoly essential service. It is in line with the independent estimates by First NZ Capital and Forsyth Barr used recently to value Transpower, but below the broker average long-term post-tax WACC for all of the Vector group (which includes a regulated gas business as well as other unregulated businesses). The estimate produced under the IM for application to DPPs and CPPs is close to the implied, post-tax WACC estimates used by Ofgem for price-setting in the UK electricity and gas sectors.

H13.68   The Commission's estimate of the post-tax WACC is below the historical estimates of the New Zealand market (an investment with average risk), and the expected

return for a New Zealand investment of average risk, as would be expected in respect of a regulated business of low relative risk, but comfortably above the post-tax cost of corporate debt.

H13.69	The IM's post-tax WACC is below that of the AER. The Commission has considered carefully the differences between its approach and that of the AER, and notes that part of the differences in post-tax WACC estimates is due to differences in taxation regimes and monetary conditions that reflect fundamental characteristics of the business environment which are outside the scope of regulatory decisions. Other differences between the IM and AER were in dealing with uncertainty in estimating the cost of equity – where the Commission's approach is more favourable to suppliers, and the term of the risk-free rate where the Commission prefers its approach to that currently adopted by the AER.

H13.70	In summary, this information, considered individually and as a whole, strongly supports the conclusion that the IM produces reasonable and commercially realistic estimates of the post-tax WACC for New Zealand EDBs and Transpower.

Figure H14   Summary of information considered in reasonableness tests

IM midpoint estimate for EDBs and Transpower (Sept 2010) 6.5%

IM 75th percentile estimate for EDBs and Transpower (Sept 2010) 7.2%

NZ Market average WACC (Average risk) (PwC 2010) 8.4%

5 year Gov't Stock (post-tax) 3.2%

BBB+ rated Corporate debt (post-tax) 4.6%

Airways ANS (2009) 5.9%

Classical CAPM midpoint (2010) 6.8%

Classical CAPM 75th percentile (2010) 7.5%

NZ historical average return (average risk) (1900-2009) 8.5%

PwC estimate of Horizon (June 2010) 6.2%

PwC estimate for all of Vector (June 2010)

Dr Lally Electricity Lines (2005) 6.5%*

Forsyth Barr / First NZ Capital average for Transpower (Late 2010) 7.3%

NZ broker average for all of Vector (2010; regulated and unregulated, including gas) 8.0% Range 7.35%-8.5%

Transpower Settlement (2007) 6.3%*

Ofgem (UK) decisions: Transmission (2006) 7.2% Gas distribution (2007) 7.1% Electricity distribution (Dec 2009) 6.8%

AER Victorian decision (2010) 7.8%

* = Updated for changes in risk-free rate and debt premium

Estimates made by the Commission are shown in blue, market information is shown in green, and estimates made by other parties are shown in red

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Commerce Commission

Reasonableness of IM WACC for GPBs

H13.71 The above discussion has concentrated on electricity lines services. The reasonableness of the post-tax WACC estimates in relation to GPBs under the cost of capital IM is now considered.

H13.72 New Zealand GPBs likely face greater systematic risks than suppliers of electricity lines businesses. Therefore, for the reasons set out in the asset beta section, the IM adopts a higher equity beta for GPBs. The practical consequence of this is that GPBs will have a higher post-tax WACC than electricity lines businesses for the same regulatory period (even assuming the same risk-free rate and debt premium).

H13.73 There is little information available to test the reasonableness of this approach. Indeed, the evidence that does exist suggests a similar equity beta and WACC that would normally be assumed for GPBs and EDBs. The Commission notes this evidence all relates to contexts outside of New Zealand. For example:

- the AER uses the same approach and equity beta for gas distribution companies as for electricity distribution businesses and uses WACC estimates that are very close for electricity and gas;[1323]

- Ofgem's estimate of the WACC for gas distribution companies is very similar to that for electricity distribution companies;[1324]

- the Commission's empirical estimates of the asset beta produced an asset beta that was lower, not higher, for predominantly gas companies than for predominantly electricity companies;[1325] and

- NERA note that the regulated equity premium for US electricity utilities was identical to that for US gas utilities over the past period 1996-2010.[1326]

H13.74 In light of this information, the IM may be considered favourable to GPBs. The Commission's approach to developing the IM is not mechanistic and, on balance, the Commission considers that there are good reasons in theory to consider that New Zealand GPBs face greater systematic risks than EDBs, and this justifies a higher beta, and therefore a higher WACC.

Comments on reasonableness discussions in submissions

H13.75 Some submissions included a discussion of reasonableness and comparative information on the WACC. These submissions included a submission from Cameron Partners on behalf of Transpower[1327] and an analysis of equity premiums

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[1323] See for instance: AER, *Jemena Gas Networks Access arrangement proposal for the NSW gas networks 1 July 2010 – 30 June 2015, Final decision*, June 2010. AER, *Victorian electricity distribution network service providers, Distribution determination 2011-2015, Final decision*, October 2010, p. 484. The two substantive differences between the WACC estimates in these reports relates to the prevailing risk-free rate and debt premium used in the analysis.

[1324] See paragraph H13.31. Ofgem, *Electricity Distribution Price Control Review Final Proposals, 7 December 2009. Ofgem, Gas Distribution Price Control Review*, 3 December 2007.

[1325] See the asset and equity beta appendix.

[1326] Orion New Zealand Ltd, *Cross Submission on EDBs (Input Methodologies) Draft Determination and Reasons Paper*, Attachment: NERA, *The Cost of Equity: a report prepared for Orion New Zealand Ltd*, 2 September 2010, footnote 27.

[1327] Cameron Partners, *Report to Transpower New Zealand Limited Relating to a market based rate of return assessment*, 16 August 2010.

in US rate-setting cases. Comments on the use of data from US regulatory decisions and on the submission of Cameron Partners (for Transpower) are outlined below.

H13.76   Typically these submissions concentrated on US data or headline comparisons with Australian data, and did not discuss or acknowledge relevant New Zealand comparative information. For example, none of these submissions discuss or acknowledge the reasonableness information outlined above, and in particular the New Zealand estimates of post-tax WACC.

The Submission of Cameron Partners

H13.77   Cameron Partners (on behalf of Transpower) submitted that use of the IM did not produce reasonable estimates of the WACC.[1328] The Cameron Partners submission did not seek to critique the Commission's methodology; rather it sought to use market benchmarks, published market analysis, and interviews to estimate the market rate of return for a company like Transpower. Based on this work, Cameron Partners concluded that the firm-wide rate of return for Transpower would range from 8.2% to 9.2% with an average of 8.7%.

H13.78   There are a number of issues with the Cameron Partners' approach and analysis which, in the Commission's view, largely undermine the estimates reported by Cameron Partners. These issues are outlined below.

H13.79   The Cameron Partners submission assumes an average cost of debt of between 7.4% and 8.4% (which is well above current market interest rates for corporate debt) on the basis that interest rates may trend higher as the economic recovery occurs. No explanation is provided for how this estimate was made. More fundamentally, however, it is not clear why consumers should bear a higher interest rate than the market rates when regulated firms can lock in the prevailing (lower) rates of interest. The higher than current interest rate assumed by Cameron Partners biases upwards its estimate of the return required by investors.

H13.80   While the Cameron Partners submission assumes interest rates will rise in future, it does not acknowledge that the IM provides for future estimates of WACC to reflect subsequent changes in interest rates and debt premiums. This point is acknowledged by other advisors.[1329]

H13.81   The Cameron Partners submission assumes, based on prior market transactions in New Zealand and Australia, that the market value for regulated firms is greater than the RAB values determined under regulation. However, Cameron Partners fail to acknowledge that by paying a price for a regulated asset that is above its RAB value, investors indicate their apparent willingness to accept lower returns than the regulator is allowing. That is, by paying more than the RAB, the investor will earn a return that is lower than the regulated WACC on those RAB values. In short, the evidence submitted by Cameron Partners on the prices paid relative to RAB for

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[1328]   ibid.

[1329]   See for example, Forsyth Barr, Transpower - Powering up, 5 November 2010, at p. 3 who estimate the Commissions WACC for the 2015/16-2019/20 regulatory period will be 70 basis points higher than in the initial regulatory period due to Forsyth Barr's forecast of a rise in interest rates (partly offset by their assumption of a decline in debt premiums). And First NZ Capital, Transpower – A valuation perspective, 29 October 2010, p. 15, which assumes the WACC increases by 0.3% in the regulatory period commencing in 2015.

regulated firms, implies the regulated WACC in Australia and New Zealand has typically been too favourable to regulated suppliers.

H13.82   The Cameron Partners submission relies on a single Australian broker report on the estimated required rate of return for infrastructure firms. No reference is made to New Zealand broker estimates of the cost of equity and the WACC for regulated and/or infrastructure firms (which the Commission understands are lower than the Australian estimates referenced in the Cameron Partners submission), even though Cameron Partners quotes such reports in support of other points made in its submission. The use of this Australian data biases upwards its estimate of the cost of equity for New Zealand EDBs.

H13.83   The Cameron Partners submission relies on a confidential discussion with a single fund manager and an analyst for the view that the required rate of return on equity is between 11 and 13%. The basis for determining this very small sample is not stated, and cannot be replicated since the participants are not identified. Further, Cameron Partners took the view expressed by the fund manager and analyst on the expected return on equity (10-12%) and add a further 1% (to 11-13%) without sufficiently justifying that this is appropriate and does not double-count for any factors already considered by the fund manager and analyst. Finally, it is not clear whether the expressed view on returns are updated to reflect the current reality of lower global economic growth, lower interest rates, and lowered return expectations. The practical result of this approach is likely to bias upwards the estimated cost of equity.[1330]

H13.84   Due to these and other issues, the Commission considers that little weight can be placed upon the Cameron Partners submission. In particular, the Cameron Partners submission does not provide any substantial unbiased insight into the reasonableness of the WACC produced by the IM. Instead, the Commission has relied on its own reasonableness tests described above.

Comparison with US results

H13.85   NERA (for Orion) and CEG (for Vector) both compare the cost of equity implied under the draft IM, with the return on equity set in US rate-setting cases. They conclude that the IM produces an equity premium (the cost of equity less the risk-free rate) that is too low relative to that allowed in US decisions.[1331]

H13.86   CEG's analysis focuses on equity premiums in US regulatory decisions since 2009 and states that the US equity premium averages 8.1%. CEG submit that this is more than twice the 75th percentile estimate provided using the IM and submits that the

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[1330]   Further, it is not close to the independent estimates of two investment banks who estimated Transpower's long-run post-tax WACC at 7.35% (First NZ Capital) and 7.2% (Forsyth Barr). See First NZ Capital, *Transpower – A valuation perspective*, 29 October 2010, p. 14. Forsyth Barr, *Transpower - Powering up*, 5 November 2010, p. 5.

[1331]   Orion New Zealand Ltd, *Cross Submission on EDBs (Input Methodologies) Draft Determination and Reasons Paper*, Attachment: NERA, *The Cost of Equity: a report prepared for Orion New Zealand Ltd*, 2 September 2010, pp. 20-22; Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, pp. 37-39.

"Commission's point estimate is a biased estimate and is well understood to be biased even by the Commission."[1332]

H13.87   The Commission does not accept that its estimate of the equity premium is biased, and it rejects the assertion that it understands the estimate to be biased. Rather, the clear conclusion from the reasonableness tests above is that the estimate of the overall WACC (including the cost of equity) produced under the IM is reasonable and commercially realistic.

H13.88   The Commission has identified two key concerns with CEG's analysis of implied US equity premiums in rate-setting cases.

H13.89   First, CEG's analysis ignores the very different approaches to estimating the cost of capital in practice adopted in the US compared to that in New Zealand. The New Zealand approach is to link explicitly the WACC to current interest rates. This results in greater variations of the estimate of the WACC in New Zealand, which are a direct and full reflection of the volatility of domestic interest rates.

H13.90   In contrast, the US regulatory approach buffers US regulated firms from the full impact of changes in interest rates. This reflects the substantial discretion exercised by US rate-setters, and the reliance in the US on the dividend growth model to estimate the cost of equity.[1333] Under this approach the implied equity premium increases as interest rates fall, and vice versa. This is illustrated in Figure H15 below of US equity premiums in regulatory decisions from 1996 to 2010 and the US five-year interest rate over this period.[1334]


[1332]   Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, 15 August 2010, p. 38.

[1333]   Some US (and Canadian) rate-setters also have a policy of not passing on the full impact of changes in interest rates onto regulated firms through their regulated rates of return. (See California Public Utilities Commission, Decision 00-12-062 December 21, 2000, re: Sierra Pacific Power Company).

[1334]   The data depicted in Figure H15 was submitted by NERA on behalf of Orion. Orion New Zealand Ltd, *Cross Submission on EDBs (Input Methodologies) Draft Determination and Reasons Paper*, Attachment: NERA, *The Cost of Equity: a report prepared for Orion New Zealand Ltd*, 2 September 2010, p. 21.

Figure H15   US interest rates and the implied US equity premium in rate-setting cases
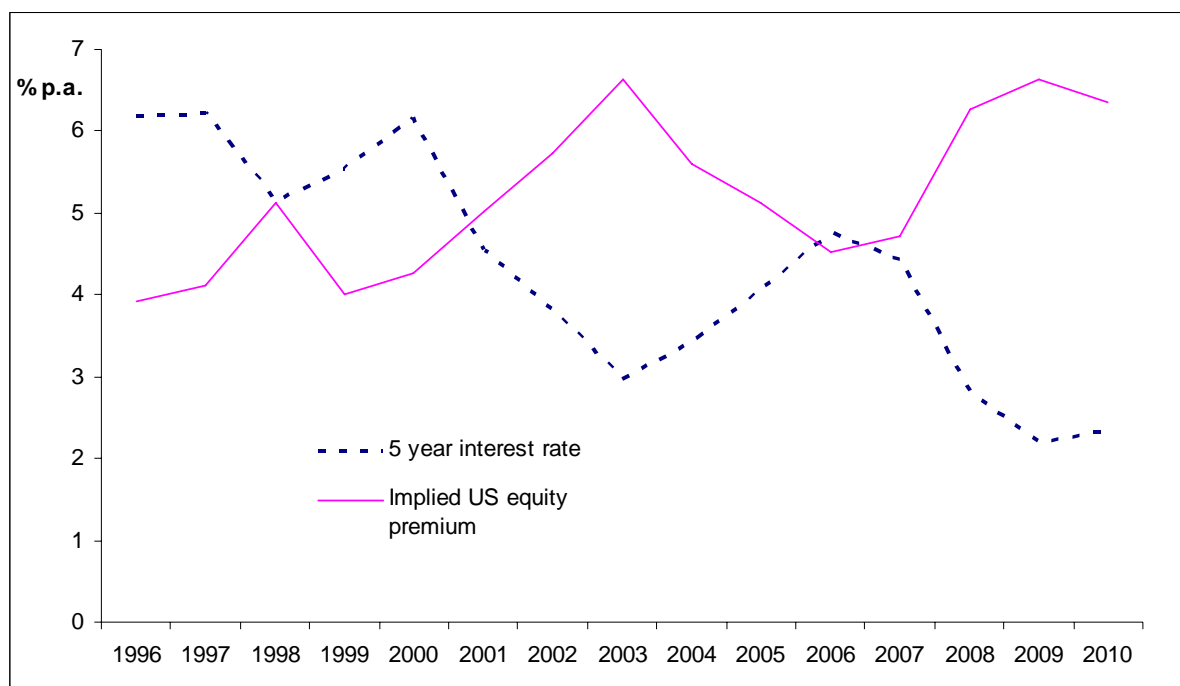
H13.91   The graph clearly illustrates that the implied US equity premium assumed under regulation is currently at historically high levels, whilst US interest rates are at very low levels of around 2%.[1335]

H13.92   CEG's analysis looks only at the implied equity premium since 2009, a period when US interest rates were at their lowest and US regulatory equity premiums at their highest. At other points in time, when US interest rates were higher, the implied US equity premium was much smaller (in 2000 it was 4%, approximately half the level estimated by CEG). Through its selection of an unrepresentative time period of analysis, CEG's analysis is biased.

H13.93   A second issue with CEG's analysis is that it makes no adjustment for the higher leverage of the US regulated firms. Higher leverage increases the return on equity, but should not increase the overall WACC (as discussed in Appendix H3 on leverage). The firms in the regulatory decisions identified by CEG had an average leverage of 52%, considerably above the 44% notional assumption specified in the IM.[1336] This increases the implied US equity premium. A proper comparison between the IM and US levels of implied equity premium would normalise for the different levels of leverage.

[1335]   The graph does not replicate CEG's estimate of an 8.1% equity premium since CEG's analysis appears to be based on a different (and inconsistent) leverage assumption. Refer paragraph H13.93.

[1336]   CEG's submission (on behalf of Vector) suggests the leverage of these firms is around 40%, and seems to rely on the Commission's work in estimating beta for these firms' listed parent group in support of this conclusion (see Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010). However, the leverage assumption that was used in each US rate-setting case is stated in each rate-setter's decision. To ensure consistency with the estimate of the return on equity used in the rate setting case, the estimate of leverage in the rate setting case should be used, rather than an estimate from another source.

H13.94 NERA adjusted for differing levels of leverage and estimated the implied US equity premium over a 15 year period (a long period would tend to average out the impact of periods with high and low interest rates).[1337] NERA estimated the average US re-levered equity premium in rate-setting cases at 5.39% over the period 1996-2010. NERA noted this was above its estimate of the equity premium under the IM (2.64%).

H13.95 The Commission notes, however, that NERA's estimate of the implied equity premium under the IM used the mid point estimate of post-tax WACC rather than the 75th percentile estimate. Since the 75th percentile estimate of the post-tax WACC will be used for setting price-quality paths, the Commission considers it is the more appropriate starting point for a comparative analysis with US rate setting cases.

H13.96 Using the parameters specified in Table H22, the equity premium under the IM at the 75th percentile estimate of post-tax WACC is 4.3%. While this is below NERA's estimate of the US equity premium over the period 1996-2010, it is above that allowed by the AER and Ofgem in their most recent decisions (after adjusting for leverage). This is summarised in Table H29 below.

Table H29   Implied Equity Premiums from Various Regulators at 44% Leverage

Regulatory decision	Implied equity premium
AER Victorian electricity distribution network service providers[1338]	3.7%
Ofgem average equity premium[1339]	3.3%
US regulated equity premiums 1996-2010 (NERA analysis)[1340]	5.6%
IM implied equity premium at the 75th percentile	4.3%

H13.97 The US approach to setting the rate of return for regulated firms is very different to the New Zealand approach, with a lesser reliance on formal methodologies in favour of greater discretion by the rate-setter, with cases considered in a more politicised environment. The New Zealand approach has more in common with the Australian and UK approaches and are therefore better comparators for testing the reasonableness of the New Zealand estimates than the US decisions. On balance, this information supports the reasonableness of the IM estimates of the cost of equity when appropriate account is taken of the impact of leverage on the cost of equity.

[1337] Orion New Zealand Ltd, *Cross Submission on EDBs (Input Methodologies) Draft Determination and Reasons Paper*, Attachment: NERA, *The Cost of Equity: a report prepared for Orion New Zealand Ltd*, 2 September 2010, pp. 20-22.

[1338] AER, *Victorian electricity distribution network service providers, Distribution determination 2011-2015, Final decision*, October 2010, p. 519.

[1339] Ofgem, *Electricity Distribution Price Control Review Final Proposals – Allowed Revenue and Financial Issues*, 7 December 2009, p. 16. Ofgem, *Gas Distribution Price Control Review Final Proposals (GDPCR)*, 3 December 2007, p. 105. Ofgem, *Transmission Price Control Review Final Proposals*, 4 December 2006, p. 54.

[1340] NERA's analysis assumed a 40% notional leverage under the IM. 44% is now specified so the Commission has re-estimated NERA's premium assuming 44% leverage. This increased the re-levered US equity premium to 5.6%.

H13.98　Finally, the Commission comments on three other cross-checks proposed by CEG. First, CEG submit that the proposed NZ equity premium should be compared against the debt premium on Australian BBB+ rated corporate bonds. CEG submit that the mid-point is less than debt premium on Australian BBB+ rated corporate bonds.[1341] However, the analysis takes a post-tax equity premium and compares this against pre-tax bond yields. Making the comparison on a consistent post-tax basis, the NZ equity premium is above the Australian BBB+ bond yield data submitted by CEG.

H13.99　Second, CEG submit a formula explained by Professor Grundy[1342] for the relationship between the equity risk premium[1343] and the debt premium.[1344] They observe that at a leverage of 60%, this formula implies that the equity risk premium will be at least 2.67 times the debt premium, and at a leverage of 40% the equity risk premium will be at least 3.5 times the debt premium.[1345]

H13.100　Earlier in its submission, CEG (for Vector) note that from January 2009 to July 2010 regulatory determinations have been made for 31 of the 48 US businesses in the Commission's sample. CEG observe that the average leverage of these US companies as listed in Appendix F of the Draft Reasons Paper was 41%, the average equity risk premium estimated by the US regulators was 8.1% and the average debt premium was 4.0%. CEG also provides data for Australian regulatory determinations over the same period, being notional regulatory leverage of 60% and an average debt premium of 3.4%.[1346]

H13.101　The Australian regulatory determinations referenced by CEG, apart from Queensland Rail, are based on a notional regulatory market risk premium of 6.5% and an equity beta of 0.80, which equates to an equity risk premium of 5.2%.

H13.102　No evidence has been placed before the Commission that the formula submitted by CEG is widely used.

H13.103　In addition, the data CEG submitted appears to violate the relationship CEG asserts must exist. For example, using CEG's US data, CEG assert that the equity risk

[1341]　Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, p. 39.

[1342]　Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, 15 August 2010, p. 41.

[1343]　The term 'equity risk premium', as used by CEG, is equivalent to the market risk premium multiplied by the equity beta. References to equity risk premium in this paper are to CEG's definition of this term.

[1344]　Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, p. 41.

[1345]　Presumably, consistent with theory, CEG is referring to the expected debt premium, which will be lower than the observable promised debt premium. CEG are silent on whether their analysis uses expected debt premiums or observed promised debt premium.

[1346]　Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, pp. 37, 40-42.

premium must be at least 14.0% (3.5 x 4.0%),[1347] whereas on CEG's own analysis US regulators estimated the average equity risk premium at 8.1%. Likewise, using CEG's Australian data, CEG assert that the equity risk premium must be at least 9.1% (2.67 x 3.4%),[1348] whereas Australian regulators used an implied equity risk premium of 5.2%. In sum, the CEG cross-check does not explain the relationship between US debt and equity premiums for a given level of leverage, nor the Australian data that was submitted by CEG.

H13.104 CEG submit that the reason for this is that the true risk free rate is above the government bond rate (which is widely used by practitioners and regulators as the proxy for the risk free rate).[1349] It is implicit from the determinations of the regulators quoted by CEG that none of the regulators support CEG's contention.

H13.105 The third additional cross-check CEG (for Vector) propose is the use of the Fama French three-factor model as a test of the results of the simplified Brennan-Lally CAPM used in the IM. In particular, CEG refer to NERA reports that were submitted to Australian regulators. No data specific to New Zealand was submitted. Rather, CEG compare NERA's Australian estimates against the IM mid-point estimate.

H13.106 In summary, the Commission does not accept the NERA estimates highlighted by CEG are a valid reasonableness test. First, CEG's approach overlooks any differences that may exist between New Zealand and Australia, for example the different leverage assumptions which will increase the NERA cost of equity, vis-à-vis the IM estimates. Adjustment for leverage differences is required to ensure a valid comparison with estimates produced using the IM. Second, CEG's submission uses the IM's midpoint estimate, when a more appropriate comparison would be the 75th percentile estimate (as both the NERA and IM estimates are to be used for price-setting). Third, the CEG submission does not address the significant issues and challenges identified by the AER in using the Fama-French model to estimate the cost of equity. The AER's conclusions in this regard are summarised above in paragraph H2.26. The Commission does not therefore consider any reliance can be placed on the Australian information from the Fama-French three-factor model that was submitted to the Commission.

[1347] Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, 15 August 2010, p. 42.

[1348] Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, 15 August 2010, p. 41.

[1349] Vector Limited, *Submission in response to the Commerce Commission's Input Methodologies Draft Reasons and Determinations for Electricity Distribution Businesses and Gas Pipeline Businesses Cost of Capital*, Attachment: Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, 15 August 2010, p. 42.

H14   Application of the Cost of Capital IM

Information disclosure

H14.1   The cost of capital IM comprises the WACC and an allowance for the term credit spread differential.

H14.2   The first component is the WACC. The IM requires the vanilla and post-tax WACC for EDBs and GPBs to be estimated as follows:

- the values of leverage, the tax-adjusted market risk premium, betas, and debt issuance costs are fixed in the IM Determination and will not be updated;

- corporate tax rates are linked to the prevailing rate of company tax rates as set by legislation;

- the investor tax rate is linked to the maximum prevailing rate of the prescribed investor rate as set by legislation;

- the WACC is estimated over a period of five years.

- the Commission's estimates of the risk-free rate and the debt premium will be for a five-year period. The Commission will update the estimates of the risk-free rate of return and the debt premium annually for each WACC estimation;

- the methodology for estimating the risk-free rate and the debt premium estimates is set out in the IM Determination. This methodology makes explicit allowance for the small number of New Zealand bonds that are publicly traded;

- the WACC estimates for EDBs for information disclosure (regardless of whether these are exempt or non-exempt from default/customised price-quality regulation) will be calculated by the Commission within one month of the start of the disclosure year in question;

- the WACC estimates for GPBs for information disclosure will be calculated by the Commission within one month of the start of the disclosure year in question; and

- the Commission will publish its annual estimates within one month of having made the estimate.

H14.3   The second component is the term credit spread differential. Suppliers of regulated services can calculate and disclose the amount of the term credit spread differential (including the costs of entering an interest rate swap) in respect of debt issues with a term which exceeds five years where the supplier's overall debt portfolio has an original tenor which exceeds five years. This is a separate allowance and is not part of the WACC.

H14.4   The Commission's estimates will be in the form of a WACC range for each of the
         vanilla and post-tax WACC. In the case of EDBs and GPBs, this range will be from
         the 25th to 75th percentile. The WACC ranges will be estimated in accordance with
         the methodology set out in the IM Determination.

Default/customised price-quality regulation

DPPs

H14.5   For the purposes of DPPs, the IM requires the Commission to estimate EDBs and
         GPBs' vanilla WACC when required as follows:

- for the purposes of DPPs, the Commission will apply the same methodology
  for calculating the vanilla WACC as estimated for EDBs and GPBs for
  information disclosure purposes;

- for EDBs the vanilla WACC will be calculated as at the first working day of
  the month seven months prior to the start of the first year of the DPP
  regulatory period;

- for GPBs the vanilla WACC will be calculated as at the first working day of
  the month seven months prior to the start of the first year of the DPP
  regulatory period;

- the Commission will select a single point estimate for the purposes of default
  price-quality path regulation. This point estimate will be the 75th percentile
  estimate of WACC; and

- for the purpose of making adjustments to EDBs' and GPBs' DPP starting
  price, the Commission will apply the vanilla WACC 75th percentile estimate
  in its assessment of an appropriate adjustment to EDBs' and GPBs' DPP
  starting price.

CPPs

H14.6   For the purposes of CPPs, the IM requires the Commission to estimate EDBs' and
         GPBs' vanilla WACC when required as follows:

- the values of leverage, the tax-adjusted market risk premium, betas, debt
  issuance costs are fixed in the IM Determination and will not be updated;

- the investor tax rate is linked to the maximum prevailing rate of the prescribed
  investor rate as set by legislation;

- the WACC is estimated over a period of three, four and five years
  commencing on the first day of the month seven months prior to the start of
  the disclosure year in question;

- the Commission's estimates of the risk-free rate and the debt premium will be
  for a three, four and five-year period. The Commission will update the
  estimates of the risk-free rate and the debt premium annually for each WACC
  estimation;

- the methodology for estimating the risk-free rate and the debt premium estimates is set out in the IM Determination. This methodology makes explicit allowance for the small number of New Zealand bonds that are publicly traded; and

- the Commission will publish its annual estimates within one month of making the estimate.

H14.7　The term credit spread differential is a separate allowance and is not part of the WACC. Suppliers can calculate and disclose the amount of the term credit spread differential (including the costs of entering an interest rate swap) in respect of a debt issue with a term which exceeds five years where the supplier's overall debt portfolio has an original tenor which exceeds five years.

H14.8　The Commission's WACC estimate for the purpose of CPPs will be the point estimate at the 75th percentile of the WACC range. The 75th percentile estimate of the WACC will be estimated in accordance with the methodology set out in the IM Determination.

H14.9　The WACC estimates for EDBs that apply for a CPP will be calculated as at the first working day of September the year preceding the regulatory period (i.e. 19 months in advance).

H14.10　GPBs that apply for a CPP should use the Commission's most recent published estimate of the WACC relevant to GPBs.

H14.11　The Commission will publish its WACC estimate no later than one month after the estimation date. This will allow suppliers four months between the publication of the WACC and the deadline for the CPP application.

Use of forward starting rates

H14.12　The Commission recognises that, due to the lag between estimating the WACC for CPP and the start date of the CPP regulatory period, the WACC estimate will be 19 months out of date by the time the CPP regulatory period commences. The Commission's Draft Reasons Paper invited comments on which of three options articulated in that paper was the preferred option of dealing with this lag.

H14.13　While most submissions did not discuss this issue, a small number of submissions did. These favoured the forward starting risk free rate.

H14.14　The Commission recognises that the use of forward starting interest free rates is a technically superior way of allowing for the impacts of this lag, than the use of spot rates. However, for the following reasons, the IM uses spot rates and does not incorporate the use of forward starting risk-free rates.

- The use of forward starting risk-free rates would introduce additional complexity into the Determination and the process of estimating the risk-free rate.

- There is no *ex ante* reason to expect that use of spot rates will systematically bias the estimate of the WACC upwards or downwards.

- There is no accepted methodology for estimating a forward starting risk-free rate.

- It is not apparent that there is any additional benefit from the use of forward starting rates that would offset the additional complexity resulting from their use.

H14.15 For these reasons, the Commission retains its preference as expressed in the draft reasons paper in favour of the use of spot rates and the IM is drafted accordingly.