

# INPUT METHODOLOGIES (AIRPORTS)

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## REASONS PAPER

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



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## 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.<sup>236</sup> 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 statement of information disclosure 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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<sup>236</sup> 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 IM specifies how the cost of capital will be determined. The cost of capital varies between different services.
- 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 (and is included in the ID Determination).
- 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.

### ***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 E to this document, which should be read together with this chapter. Similarly, detailed references to sources are set out in Appendix E and are kept to a minimum in this chapter.
- 6.1.11 Many issues affecting the development of the cost of capital IM affect all of the services regulated under Part 4. This Paper therefore discusses submissions from all sources, including EDBs, GPBs and Transpower, rather than focusing only on submissions from Airports and airport users.
- 6.1.12 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 Summary of IM for the Cost of Capital for Airports**

Approach in IM	Where discussed
The cost of capital is an estimate of firms' weighted average cost of capital (WACC) which reflects the cost of debt and the cost of equity used to fund investment.	Sections 6.1, E1, E2
The Commission will publish annually for Airports: <ul style="list-style-type: none"> <li>• a mid-point estimate of the five-year post-tax WACC and vanilla WACC; and</li> <li>• a 25<sup>th</sup> percentile and 75<sup>th</sup> percentile estimate of the five-year post-tax WACC and vanilla WACC.</li> </ul>	Sections 6.7, E14

Approach in IM	Where discussed
<p>The methodology for estimating a vanilla WACC is: <i>cost of debt</i> × <i>leverage</i> + <i>cost of equity</i> × (1- <i>leverage</i>)</p> <p>The methodology for estimating a post-tax WACC is: <i>cost of debt (after corporate tax)</i> × <i>leverage</i> + <i>cost of equity</i> × (1- <i>leverage</i>)</p>	<p>Sections 6.7, E2</p>
<p>For all regulated suppliers of airport services, the cost of debt is estimated as: <i>risk free rate</i> + <i>debt premium</i> + <i>debt issuance costs</i></p> <ul style="list-style-type: none"> <li>• 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 typical term of Airports' pricing agreements (five years);</li> <li>• 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 Airports with a Standard and Poors long-term credit rating of A- and a term to maturity which matches the pricing period (typically five years); and</li> <li>• debt issuance costs are 35 basis points (0.35%) p.a.</li> </ul>	<p>Sections 6.3, E2</p> <p>Sections 6.3, E4, E14</p> <p>Sections 6.3, E5, E14</p> <p>Sections 6.3, E5</p>
<p>The Airports ID Determination allows qualifying suppliers to disclose a separate allowance for the term credit spread differential, which reflects the additional costs associated with holding a longer-term debt portfolio. The term credit spread differential is used to adjust cash flows in information disclosure regulation. Qualifying suppliers are suppliers with a debt portfolio which has a weighted average original tenor debt portfolio which exceeds the pricing period (typically five years).</p>	<p>Sections 6.1, 6.3, E6</p>
<p>Cost of equity is estimated using the simplified Brennan-Lally CAPM as: <i>risk free rate</i> × (1- <i>investor tax rate</i>) + <i>equity beta</i> × <i>TAMRP</i></p> <ul style="list-style-type: none"> <li>• the risk free rate is the same as for the cost of debt;</li> <li>• the equity beta for Airports is 0.72, derived from: <ul style="list-style-type: none"> <li>○ an asset beta for Airports of 0.60; and</li> <li>○ leverage of 17%;</li> </ul> </li> <li>• 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</li> <li>• the tax adjusted market risk premium (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 pricing 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%.</li> </ul>	<p>Sections 6.4, 6.5, E2</p> <p>Section 6.3</p> <p>Sections 6.5, E8</p> <p>Sections 6.5, E8</p> <p>Sections 6.6, E3</p> <p>Sections 6.5, E10</p> <p>Sections 6.5, E7</p>

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, E10
The Commission has compared the expected WACC outputs 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 Airports.	Sections 6.8, E13

6.1.13 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 E;
- 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 E.
- 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.

6.1.14 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 such that the objectives outlined in s52A(1)(a)-(d) are achieved. 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

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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 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:

$$\text{Cost of debt} = \text{risk-free rate} + \text{debt premium} + \text{debt issuance costs}$$

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 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



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- due to the uncertainty about future short-term rates or an expectation that future rates will rise, or uncertainty about future inflation and thus the real return on Government bonds.
- 6.3.5 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.
- 6.3.6 The term of the risk-free rate should match the length of the pricing period because if the term of the risk-free rate is longer than the pricing 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 pricing period.
- 6.3.7 Submissions from regulated suppliers sought a term that was longer than the pricing or regulatory period (for example, a 10 year term). (While Airports do not have a regulatory period under Part 4, other services regulated under Part 4 do. The arguments around the term of the risk-free rate (and the debt premium) are very similar. For convenience, the rest of this discussion uses the term regulatory period, rather than pricing period, when considering the appropriate term of the risk-free rate.)
- 6.3.8 In essence, the arguments for a term of the risk-free rate that was longer than the regulatory period 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.<sup>237</sup>
- 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.

#### *The power to reset prices*

- 6.3.10 Airports can reset their prices at the end of each pricing agreement 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.

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<sup>237</sup> Based on data received from regulated suppliers during 2009, the Commission estimates 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.

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*The availability of interest rate swaps*

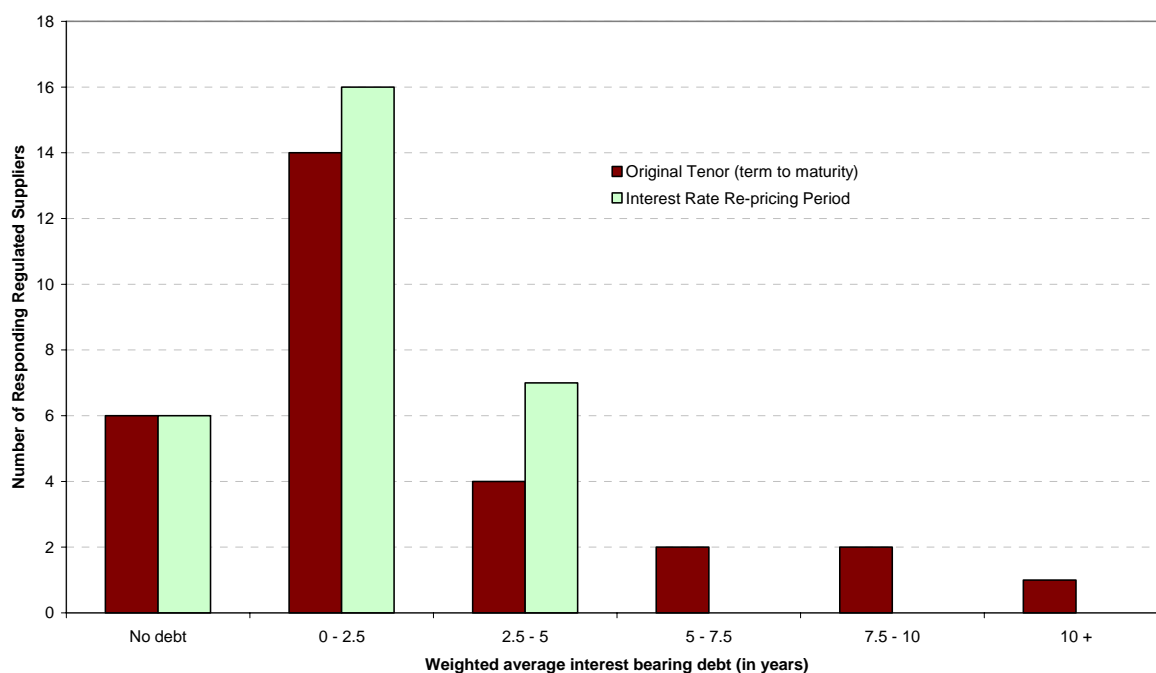
- 6.3.11 Firms have a mix of debt maturities to manage re-financing risk, including issuing long-term debt. This spreads a firm's re-financing requirements over a longer period and reduces the amount of debt that needs to be re-financed in any one year. Reducing re-financing risks has benefits for consumers, but long-term debt typically has a greater cost than medium or short-term debt.
- 6.3.12 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.<sup>238</sup> 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.
- 6.3.13 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.
- 6.3.14 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 re-pricing periods.
- 6.3.15 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.<sup>239</sup> 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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<sup>238</sup> A small number of New Zealand firms have issued bonds with floating rates of interest.

<sup>239</sup> 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 Re-pricing Period (2010)**



6.3.16 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 than 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.<sup>240</sup>

6.3.17 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<sup>241</sup> and a number of airports (e.g. Hamilton, AIAL, CIAL<sup>242</sup>) 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.

<sup>240</sup> 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 E6).

<sup>241</sup> 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.

<sup>242</sup> 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.

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

6.3.19 A more detailed discussion of issues around the risk-free rate is included in Appendix E4.

### ***Debt premium***

6.3.20 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.

6.3.21 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.

6.3.22 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.

6.3.23 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 A- (or equivalent rating from another recognised agency). A Standard & Poors' long-term credit rating of A- 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.

6.3.24 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 airport with a credit rating of A- 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 A- rated bonds issued by an airport, when estimating the debt premium for airports. This is discussed more fully in Appendix E5.

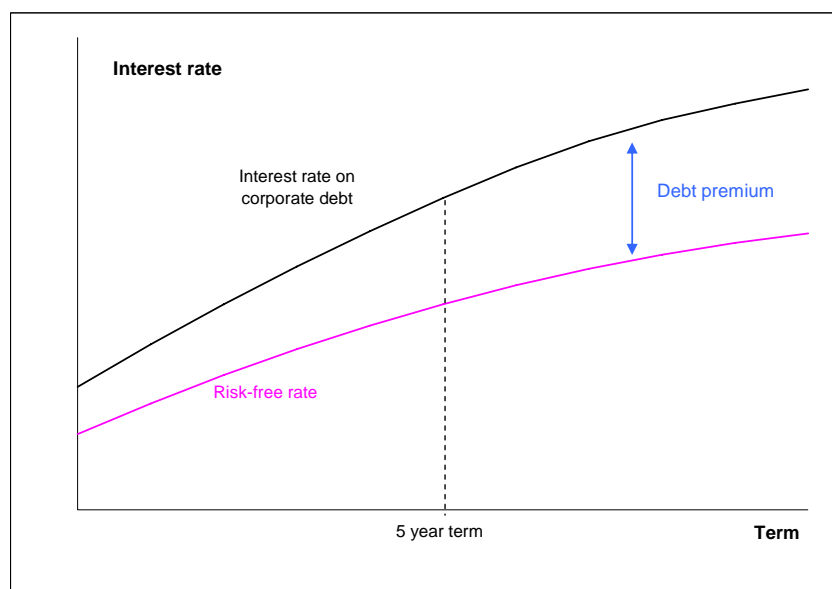
6.3.25 The debt premium is estimated by the Commission as part of publishing annual WACCs for all regulated suppliers.

### ***The greater debt premium on long-maturity debt***

6.3.26 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**



- 6.3.27 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.
- 6.3.28 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 Auckland International Airport and Wellington International Airport) have a debt portfolio whose weighted average tenor exceeds five years.
- 6.3.29 Where a supplier has a debt portfolio with a long average tenor, consumers benefit from the reduced re-financing risk and thus it is appropriate to recognise that part of the higher cost of issuing longer maturity debt which cannot be removed through the swap market. Therefore, there is an allowance for 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.
- 6.3.30 This allowance (called the term credit spread differential) is included in the Airport's ID Determination. It 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

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the regulatory period, the allowance will not apply. For such suppliers, a debt premium based on the term of the regulatory period is sufficient.<sup>243</sup>

- 6.3.31 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 E6.
- 6.3.32 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).
- 6.3.33 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.
- 6.3.34 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 E5. The term credit spread differential allowance is discussed in Appendix E6.

#### ***Debt issuance costs***

- 6.3.35 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.
- 6.3.36 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.
- 6.3.37 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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<sup>243</sup> 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 re-financing risk by relying more heavily on shorter term debt.

- 6.3.38 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.
- 6.3.39 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 costs 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.
- 6.3.40 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 E5. 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. Airports provide important services with relatively stable demand, face limited substitutes and limited competition. Users have few choices and limited 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 lower systematic risk than the average New Zealand firm. The expected return on equity in airports is lower than for a typical or average company.

### ***The Capital Asset Pricing Model***

- 6.4.3 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.
- 6.4.4 The use of the dividend growth model and the Fama-French three factor model to estimate the cost of equity is discussed in Appendix E2. 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

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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.<sup>244</sup>

- 6.4.5 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.<sup>245</sup>
- 6.4.6 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.
- 6.4.7 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.
- 6.4.8 Other models to estimate the cost of equity have not achieved any significant degree of usage or acceptance in practice in New Zealand.
- 6.4.9 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.<sup>246</sup>

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<sup>244</sup> 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 E2.26.

<sup>245</sup> Use of the dividend growth model to estimate the cost of equity is further discussed in paragraphs E2.28 to E2.30.

<sup>246</sup> Copeland, T., Weston, J., and Shastri K., *Financial Theory and Corporate Policy* 4th Edition, Pearson Education, 2005, chapter 6.



- 6.4.10 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 include relative firm size, book to market values, and share price momentum.
- 6.4.11 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,<sup>247</sup> or the difficulty of correctly observing the market portfolio.
- 6.4.12 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.<sup>248</sup> 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).
- 6.4.13 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”.<sup>249</sup> 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.<sup>250</sup>
- 6.4.14 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).<sup>251</sup>

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<sup>247</sup> See for example the discussion in paragraph E2.22.

<sup>248</sup> 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.

<sup>249</sup> *Auckland Bulk Gas Users v Commerce Commission 1* [1990] NZLR 448, p. 467.

<sup>250</sup> *Auckland Bulk Gas Users v Commerce Commission 1* [1990] NZLR 448, p. 467.

<sup>251</sup> 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.

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6.4.15 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***

6.4.16 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.

6.4.17 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.<sup>252</sup> 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.

6.4.18 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 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

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<sup>252</sup> 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.

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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;<sup>253</sup>

- 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;<sup>254</sup> and
- the continued use of the simplified Brennan-Lally CAPM was supported by most submissions on the Draft Reasons Paper, although submissions sought an allowance for model error and parameter error.

#### ***Ad hoc allowance for model error***

6.4.19 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.

6.4.20 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.

6.4.21 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 (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".<sup>255</sup>

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<sup>253</sup> Franks, J., Lally M., and Myers S, *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology*, 2008, p. 11.

<sup>254</sup> 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.

<sup>255</sup> Handley, J., *Further Comments on the Sharpe CAPM, Report Prepared for the Australian Energy Regulator*, 16 March 2009, p. 6.

6.4.22 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;<sup>256</sup>
- 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.

6.4.23 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***

6.4.24 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;<sup>257</sup>
- Professor Grundy, on behalf of Vector, proposed the use of the Black CAPM,<sup>258</sup> and

<sup>256</sup> 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.

<sup>257</sup> Charles River Associates, *Regulated Returns for Australian and New Zealand Electricity Distribution*, 15 August 2010. A report on behalf of Unison, pp. 5-14.

<sup>258</sup> 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.

- 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.

6.4.25 Each of these suggestions is discussed in turn.

#### Small company premium

6.4.26 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.

6.4.27 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”,<sup>259</sup> that “for the period since 1981, there appears to be no small companies premium”,<sup>260</sup> and “the use of a small companies premium is incompatible with the broad thrust of modern corporate finance theory”.<sup>261</sup>

6.4.28 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

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

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

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<sup>259</sup> 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.

<sup>260</sup> 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.

<sup>261</sup> 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.

- 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”)<sup>262</sup> nor does it address the criticisms of bias in a number of empirical tests of the CAPM that is made by Pettengill, Sundaram, & Mathur;<sup>263</sup>
- 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.

6.4.31 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

6.4.32 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 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

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<sup>262</sup> Black, F., Capital market equilibrium with restricted borrowing, *Journal of Business*, 1972 (45) p. 444, at p. 446.

<sup>263</sup> 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.

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the international investors cannot use the imputation credits distributed by New Zealand companies.

- 6.4.33 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.<sup>264</sup>
- 6.4.34 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.<sup>265</sup> That is, use of a domestic CAPM (such as the simplified Brennan-Lally CAPM) is therefore likely to be more 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.<sup>266</sup> 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.<sup>267</sup>

### ***Conclusion on choice of model for estimating the cost of equity***

- 6.4.35 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

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<sup>264</sup> 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.

<sup>265</sup> 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.

<sup>266</sup> Lally, M., *The Weighted Average Cost of Capital for Electricity Lines Businesses*, September 2005, pp. 63-66.

<sup>267</sup> 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.

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widespread support, and competing models such limited support, that there is currently no credible alternative.

- 6.4.36 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.
- 6.4.37 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 although the starting point for assessing profitability will remain the mid-point estimate of the cost of capital (this is discussed in Appendix E11). 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 E13 discusses these reasonableness tests in detail.
- 6.4.38 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).

$$\text{Cost of equity} = \text{Risk-free rate} \times (1 - \text{Investor tax rate}) + \text{Equity beta} \times \text{TAMRP}$$

- 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.<sup>268</sup>
- 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.<sup>269</sup> 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%.

**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%		

<sup>268</sup> 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.

<sup>269</sup> See for example Dimson, E., Marsh P. and Staunton M., *Triumph of the Optimists: 1001 Years of Global Investment Returns*, Princeton University Press, New Jersey, 2002; 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; and Arnott, R. and Bernstein P., What Risk Premium is 'Normal'?, *Financial Analysts Journal*, Vol. 58, No. 2, March/April 2002, pp. 64-85.

Methodology	NZ	US	Other	All
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.<sup>270</sup>
- 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

<sup>270</sup> The Commission comments on other issues raised by PwC regarding the TAMRP are in Appendix E7.

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performance of the New Zealand market, the estimate of the TAMRP would fall by approximately 0.5% to around 7%.<sup>271</sup>

- 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.<sup>272</sup> 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:
- the New Zealand share market and global share markets have stabilised and are at levels well above their GFC-induced lows;

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<sup>271</sup> This is discussed at paragraph E7.73.

<sup>272</sup> J. Franks, M. Lally, and 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 VIX, a key short-term indicator of investor risk aversion, has fallen significantly and is back to around its long-term trend levels;<sup>273</sup>
- 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;<sup>274</sup>
- annual surveys of the level of MRP companies and analysts use in their CAPM models indicate a decline since the GFC;<sup>275</sup> 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.<sup>276</sup> 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.

6.5.21 At the time of the Draft Reasons Paper the Commission estimated the asset beta of 0.65 for airports based on analysis of the monthly data over five years for 10 airports

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<sup>273</sup> 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.

<sup>274</sup> 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.

<sup>275</sup> 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 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).

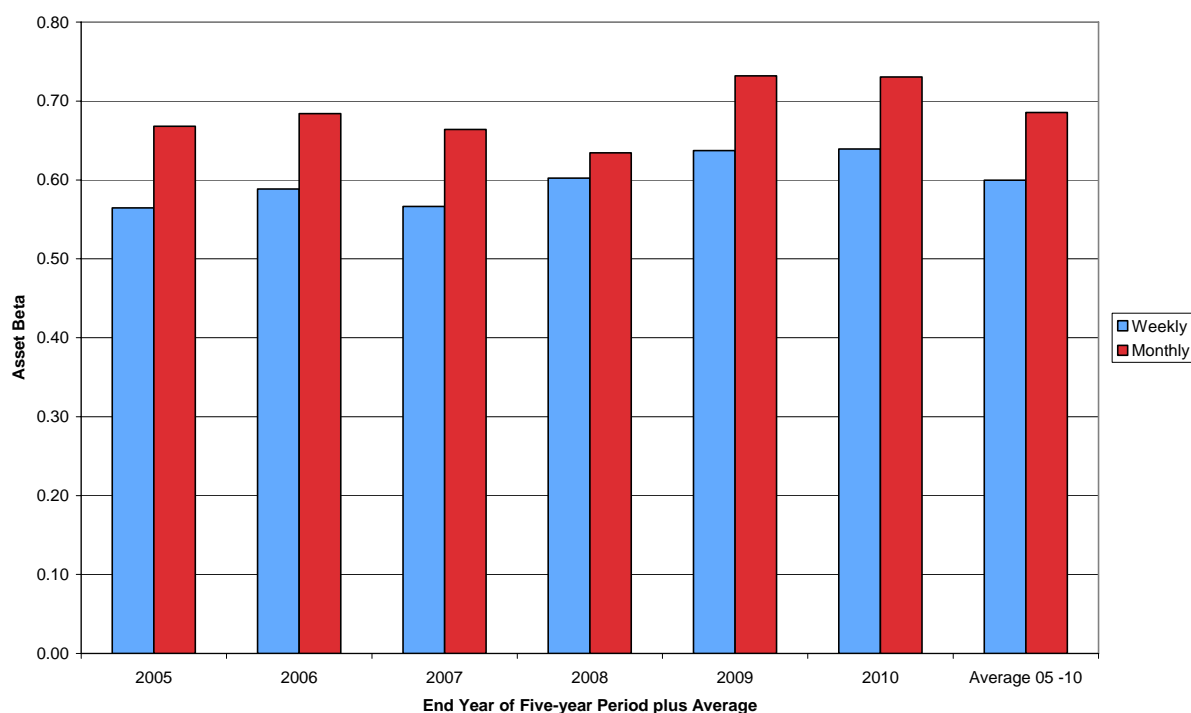
<sup>276</sup> The Commission is not aware of any company which has a beta of zero.

(AIAL plus nine overseas airports). 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 E8. 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;<sup>277</sup> and
- a much larger sample of 24 airports (AIAL plus 23 overseas airports). 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. As a result of the extensive further analysis undertaken by the Commission, with a much larger sample, the Commission concluded that a reasonable estimate of the asset beta for the larger sample of airports is 0.60.

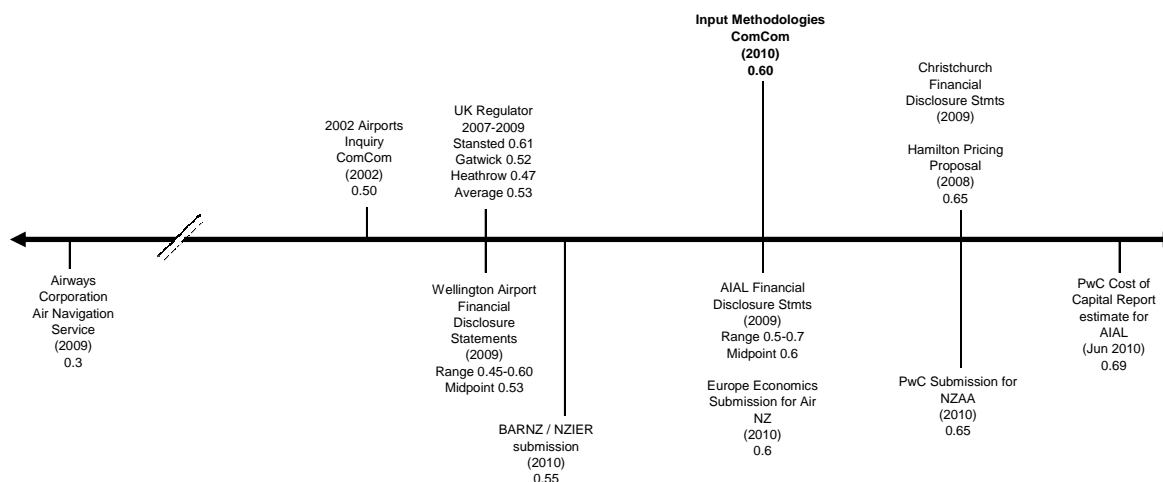
**Figure 6.3 Airports Comparable Companies Unadjusted Asset Betas**



<sup>277</sup> 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.

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 Airports with Other Asset Beta Estimates**



6.5.24 Figure 6.4 shows the Commission’s 0.60 estimate of the asset betas for airport services fall within the range of comparable information. The Commission also notes that despite the differing approaches to estimating the asset beta, most of the estimates reported above fall within a reasonably tight range, (and with the Commission's estimate near the middle of the range). This supports the Commission's view that its estimate of the asset beta for airport services is reasonable.

6.5.25 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 E8.

**Taxes**

6.5.26 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.

6.5.27 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.

6.5.28 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 to 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.

6.5.29 A more detailed discussion on taxation issues is included in Appendix E10.

## 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.<sup>278</sup> 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.<sup>279</sup> 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.<sup>280</sup> 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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<sup>278</sup> 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.

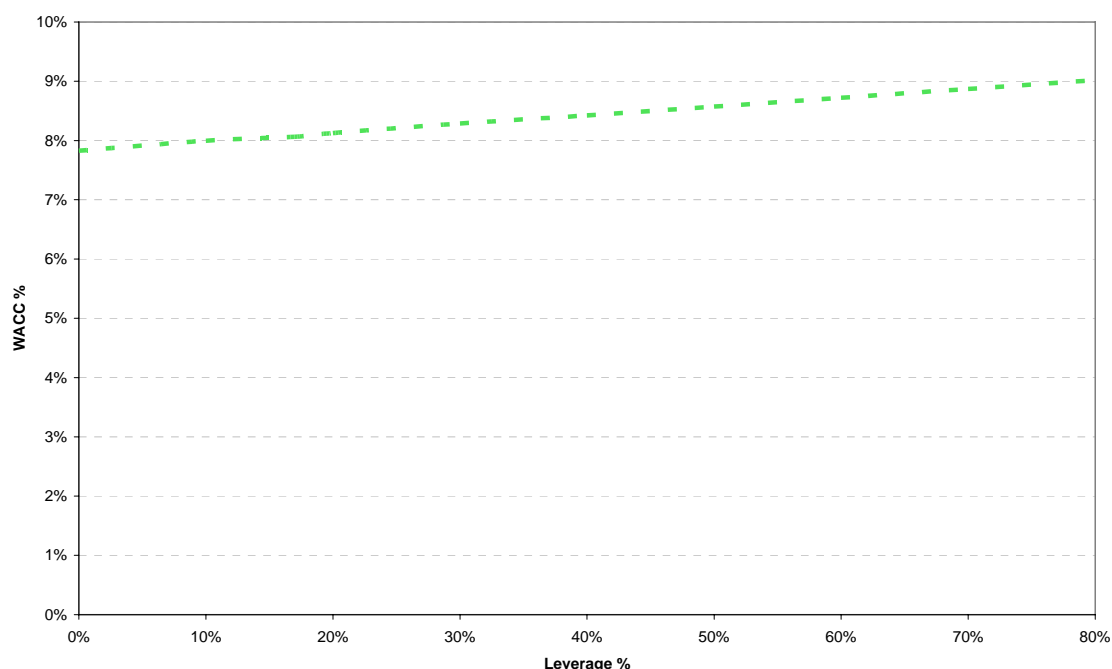
<sup>279</sup> The debt premium itself is a function of leverage. That is, the debt premium would be expected to increase as leverage increases.

<sup>280</sup> 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<sup>281</sup>**



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.

<sup>281</sup> Assuming a risk-free rate of 4.96%, a debt premium of 1.75%, debt issuance costs of 0.35%, an asset beta of 0.60, a TAMRP of 7.1%, average investor tax rate of 28.1% and average corporate tax rate of 28.4%. These parameter values are consistent with the reasonableness tests the Commission has undertaken. See Appendix E13.



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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 ....<sup>282</sup>

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.<sup>283</sup> The Draft Reasons Paper for Airports 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 Airport's Draft Reasons Paper 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.”<sup>284</sup>

6.6.11 While the technical issue identified by PwC (for ENA) was not discussed in submissions relating to Airports (by either Uniservices or PwC (for NZAA), or BARNZ and Air NZ or their experts), the Commission considers it is of greater

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<sup>282</sup> 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.

<sup>283</sup> A debt beta measures the systematic risk associated with a firm's debt. A detailed discussion on debt betas is included in Appendix E9.

<sup>284</sup> 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.

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concern for Airports than for EDBs, GPBs, and Transpower. This is because the average leverage for the sample of comparator airports is 17%, which is significantly below the 40% notional leverage assumption, whereas the sample average leverage for EDBs, GPBs and Transpower is only slightly above the notional leverage assumption (44% versus 40%).

- 6.6.12 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.
- 6.6.13 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)<sup>285</sup>, 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).
- 6.6.14 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, 17% for Airports), 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.
- 6.6.15 For these reasons, which are explained more fully in Appendix E3, the IM specifies leverage of 17% for Airports, and does not incorporate the use of non-zero debt betas (since for this leverage level the resulting WACC is the same for all values of debt beta).
- 6.6.16 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).
- 6.6.17 As the equity beta is calculated using leverage and an asset beta, a leverage of 17% applied to an asset beta for airports of 0.60 results in an equity beta of 0.72. The leverage assumption and 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.

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<sup>285</sup> 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*, 28 September 2007, paragraphs 88-90, pp. F21-F28.

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The former includes the after-tax cost of debt; the latter includes the cost of debt before tax, as shown in the following equations.

$$\text{Post-tax WACC} = \text{Cost of debt (after tax)} \times \text{Leverage} + \text{Cost of equity} \times (1 - \text{Leverage})$$

$$\text{Vanilla WACC} = \text{Cost of debt} \times \text{Leverage} + \text{Cost of equity} \times (1 - \text{Leverage})$$

- 6.7.2 The IM provides for both vanilla WACCs and post-tax WACCs to be specified for application under 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 Airports 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 IM 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 June 2010, these are estimated to be 4.96% and 1.75% respectively.

**Table 6.4 Parameter Point Estimates and their Standard Error**

<b>Parameter</b>	<b>Point estimate</b>	<b>Standard error</b>
<b>Leverage</b>	17%	0
<b>Debt issuance costs</b>	0.35%	0
<b>Asset beta</b>	0.60	0.16
<b>Tax-adjusted market risk premium*</b>	7.1%	0.015
<b>Average Corporate tax rate</b>	28.4%	0
<b>Average Investor tax rate</b>	28.1%	
<b>Risk-free rate (as at 1 July 2010)</b>	4.96%	0
<b>Debt premium (as at 1 July 2010)</b>	1.75%	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 July 2010.

**Table 6.5 Estimated WACCs using the Parameters Specified in Table 6.4**

<b>Parameter</b>	
<b>Vanilla WACC</b>	8.40%
<b>Post-tax WACC</b>	8.06%

6.7.9 For the purposes of information disclosure, these (mid-point) WACC estimates will enable interested parties to assess the profitability of a regulated service. The Commission will also estimate the WACC at the 25<sup>th</sup> and 75<sup>th</sup> percentiles.

6.7.10 On its website the Commission will publish annually for Airports:

- a mid-point estimate of the five year post-tax WACC to apply under ID regulation; and
- an estimate of five year vanilla WACC at the 25th and 75th percentile.

6.7.11 A more detailed discussion on estimating the WACC range is included in Appendix E11.

## **6.8 Does the Commission’s Methodology Produce Commercially Realistic Estimates of the Cost of Capital?**

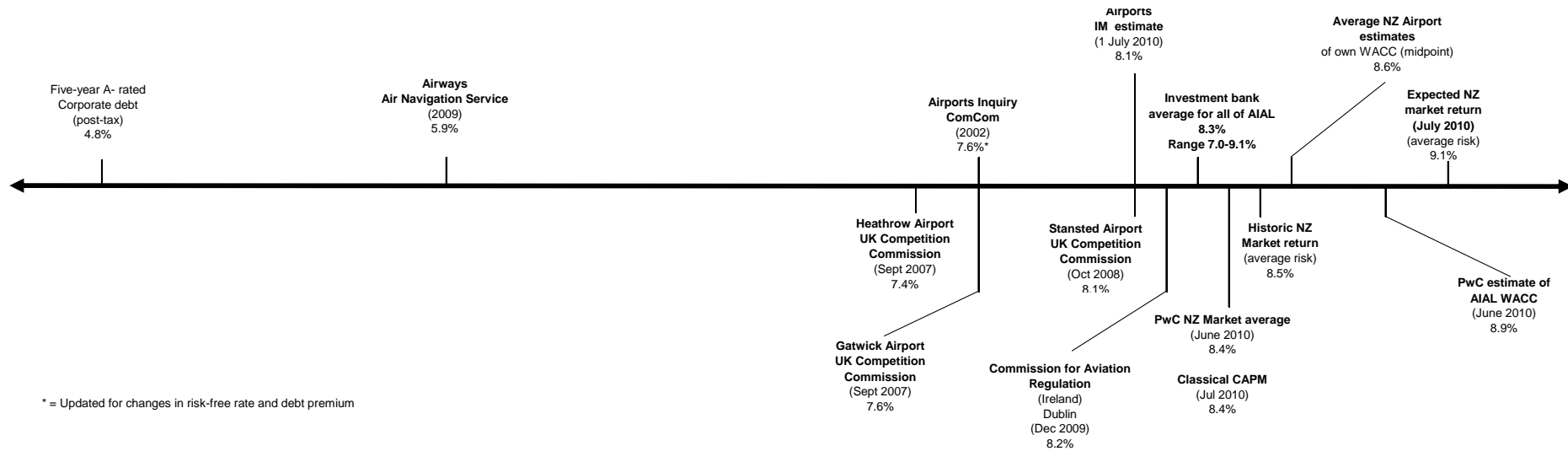
6.8.1 Airports provide important services, with relatively stable demand, face limited substitutes and limited competition. Users have few choices and limited bargaining power. Airports face lower systematic risk than the average firm in the economy. So the expected returns in airports are lower than for a typical or average company.

6.8.2 Figure 6.6 compares the estimates of the post-tax WACCs for Airports against a range of other information. In particular:

- current New Zealand post tax risk-free rates and post tax cost of corporate debt;
- historic and forecast estimates of the returns by New Zealand investors on investments of average risk;
- previous New Zealand regulatory decisions, and recent regulatory decisions in the United Kingdom for airports;
- external estimates of the post-tax WACC for New Zealand airports; and
- estimates of the WACC using other approaches, including using the classical CAPM.

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.

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



- 6.8.4 More detail on each of the data points in Figure 6.6 is included in Appendix E13.
- 6.8.5 The estimate of the post-tax WACC for Airports when applying the cost of capital IM is reasonable since:
- it is above the UK Competition Commission’s estimates of the cost of capital for Heathrow and Gatwick and similar to the estimate for Stansted and the Irish regulator’s estimate for Dublin airport;
  - it is above the cost of capital estimated by the self-regulating Air Navigation Service (part of Airways Corporation NZ) and the estimate implied in the Commerce Commission’s airport inquiry;
  - it is slightly below the New Zealand investment bank average estimate for all of AIAL’s business (including unregulated services which would be expected to have a higher WACC),<sup>286</sup> and the estimate using the classical CAPM (which assumes imputation credits have no value).
  - it is below the estimate of the historic returns on New Zealand investments of average market risk, the Airport’s average estimate of their own WACC, PwC’s estimate for all of AIAL’s business (including unregulated services which would be expected to have a higher WACC)<sup>287</sup> and the expected estimate for New Zealand average market risk.
- 6.8.6 Overall, the Commission considers this comparative information is largely consistent with the Commission’s estimates, and 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 ensures suppliers have incentives to invest and are limited in their ability to extract excessive profits.

#### Other potential reasonableness checks

- 6.8.7 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*

- 6.8.8 Some submissions included a discussion of reasonableness and comparative information on the cost of capital. These are discussed in Appendix E13. The

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<sup>286</sup> The investment bank estimates seek to estimate AIAL’s cost of capital over the life of its assets and some use a 10 year risk-free rate which is higher than the current market average, while the Commission’s IM is for a specified five year regulatory period, and is explicitly linked to market interest rates.

<sup>287</sup> PwC 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 was the most recent available at the time this Paper was finalised.

Commission has considered these submissions but, for the reasons set out in Appendix E13, the Commission does not consider that they are reliable tests into whether the IM estimates of WACC are reasonable.



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## **PART 2: APPENDICES**

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## APPENDIX E: COST OF CAPITAL

### E1 The Framework for Determining the Cost of Capital IM

#### *Overview of the decision-making framework*

E1.1 For firms to make investments, they need to raise money ('capital'). There are two generic sources of capital: debt and equity.<sup>355</sup> 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*

E1.2 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.

E1.3 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.

E1.4 The cost of equity capital to the firm is not directly observable.<sup>356</sup> The cost can however be deduced in a number of ways. As an illustration, one approach to

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<sup>355</sup> There are a variety of forms of both debt and equity capital.

<sup>356</sup> 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.

estimating the cost of equity capital is to consider the average returns actually 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 a long time period will provide an estimate of equity investors' expected return, and that is the cost of equity capital.

- E1.5 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.
- E1.6 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:

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

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).<sup>357</sup>

### ***Guidance from the Act – workably competitive markets***

- E1.7 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.
- E1.8 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.<sup>358</sup> The risk which cannot be reduced by diversification is

<sup>357</sup> 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.

<sup>358</sup> 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.

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systematic risk.<sup>359</sup> This is the exposure to overall market movements i.e. the 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.<sup>360</sup>

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

- E1.9 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 cover the cost of capital in order to attract the required investment funds.
- E1.10 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.
- E1.11 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.

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<sup>359</sup> In the context of the cost of capital, it is useful to distinguish between two types of risk, systematic risk and unsystematic risk:

**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.

<sup>360</sup> 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.

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### ***Implications for estimating the cost of capital for Airport services under Part 4***

#### **Cost of capital in the context of regulation**

- E1.12 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.
- E1.13 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 above, 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.
- E1.14 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.
- E1.15 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.
- E1.16 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).
- E1.17 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.
- E1.18 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

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economy,<sup>361</sup> 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.

- E1.19 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.<sup>362</sup>
- E1.20 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

- E1.21 Under Part 4, the Commission may set an IM for the estimation of the cost of capital for the purposes of monitoring and analysing information disclosed by the Airports. 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<sup>363</sup> 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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<sup>361</sup> 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.

<sup>362</sup> 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.

<sup>363</sup> 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.

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- E1.22 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.
- E1.23 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<sup>364</sup> 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.
- E1.24 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.<sup>365</sup> This would be inconsistent with s 52A(1)(d) of the Act.

#### Estimating the cost of capital

- E1.25 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.
- E1.26 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.
- E1.27 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.
- E1.28 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.
- E1.29 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.

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<sup>364</sup> 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.

<sup>365</sup> 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.

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### Cost of capital across different types of regulated services

- E1.30 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.
- E1.31 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.<sup>366</sup>

## **E2 Overall Approach**

### *The appropriate cost of capital framework*

- E2.1 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 Airport services for the purpose of information disclosure.
- E2.2 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).

- E2.3 The framework for the cost of capital IM includes that:
- a vanilla WACC and post-tax WACC will be estimated for Airports for the purpose of information disclosure;
  - the estimate of the expected cost of debt capital will be calculated as the risk-free rate plus the debt premium;

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<sup>366</sup> 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.



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- 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 capital asset pricing model (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 of the cost of capital using the IM,<sup>367</sup> against estimates using the classical CAPM, and a range of other information;
  - a service-specific, rather than supplier-specific, cost of capital will be estimated for airport services (i.e. the same cost of capital will apply to all Airports); 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***

- E2.4 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 cost of capital estimation, and firms are remunerated for their levered tax liabilities through a cash flow allowance. In the case of a post-tax WACC, the cost of debt is adjusted down by an interest tax deduction, and the company is remunerated for its unlevered tax liabilities through a cash flow allowance (i.e. the 'interest tax shield' is included).
- E2.5 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 WACC.
- E2.6 The IM's approach with regard to tax is consistent with the use of a vanilla WACC. 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.
- E2.7 For these reasons, the IM requires estimation of both a post-tax and vanilla WACC for the purposes of information disclosure.<sup>368</sup> The ID Determination includes an adjustment to the post-tax ROI for the notional interest tax shield (i.e. the notional deductible interest, as defined in the IM, multiplied by the corporate tax rate) to ensure consistency with a post-tax WACC.

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<sup>367</sup> This is discussed in Section E13 Reasonableness checks on the cost of capital.

<sup>368</sup> 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.

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### ***Commission's reasons - estimating the cost of debt***

#### **Cost of debt**

- E2.8 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 two components. The two components are: the risk-free rate, 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
- E2.9 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.
- E2.10 Thus, the cost of debt will be as follows:

$$\text{Cost of debt} = \text{risk-free rate} + \text{debt premium} + \text{debt issuance costs allowance}$$

- E2.11 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.
- E2.12 The Commission's approach to estimating the risk-free rate, the debt premium and debt issuance costs are discussed sections E4 and E5 of this appendix respectively.
- E2.13 The additional debt premium that firms incur on issuing long term debt is discussed in Section E6. The approach to estimating debt betas is discussed in Section E9.

### ***Commission's reasons - estimating the cost of equity***

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

##### ***Overview***

- E2.14 The cost of equity is the expected rate of return required by investors on equity capital that compensates them for the risk they bear, 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.
- E2.15 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.<sup>369</sup> The Commission considers that there are two main alternative asset pricing models to the CAPM: the Fama-French three-factor

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<sup>369</sup> 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.

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model;<sup>370</sup> and the group of models usually described as discounted cash flow (DCF) models. These models are discussed below.

*The capital asset pricing model (CAPM)*

- E2.16 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 E1.8.
- E2.17 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.
- E2.18 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.<sup>371</sup>
- E2.19 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.<sup>372</sup> 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.<sup>373</sup>
- E2.20 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.
- E2.21 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

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<sup>370</sup> 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.

<sup>371</sup> 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  $\beta$  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.

<sup>372</sup> Copeland, T., Weston, J., and Shastri K., *Financial Theory and Corporate Policy* 4th Edition, Pearson Education, 2005, chapter 6.

<sup>373</sup> See Grinblatt, M., Titman, S., *Financial Markets and Corporate Strategy*, 2<sup>nd</sup> 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.

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CAPM model fits the data.<sup>374</sup> They conclude, that “researchers have been working on tests of the CAPM for nearly 40 years, and no conclusive evidence has been published to date – the jury is still out”.<sup>375</sup>

- E2.22 An example of the methodological problems in robustly testing the CAPM is provided by Pettengill, Sundaram & Mathur (Pettengill et al.).<sup>376</sup> 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.
- E2.23 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.<sup>377</sup> 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.<sup>378</sup>

#### *Alternative asset pricing models*

- E2.24 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.
- E2.25 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.<sup>379</sup> However, the theoretical foundations of the Fama-French factors are less well-developed than that of the CAPM, and Fama and French have

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<sup>374</sup> Copeland, T., Weston, J., and Shastri K., *Financial Theory and Corporate Policy* 4th Edition, Pearson Education, 2005.

<sup>375</sup> *ibid*, p. 164.

<sup>376</sup> 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.

<sup>377</sup> Myers, S. C., On the Use of  $\beta$  in Regulatory Proceedings: A Comment, *Bell Journal of Economics and Management Science*, Vol. 3, 1972, pp. 622–627.

<sup>378</sup> 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 (Franks, Lally and Myers, Recommendations on Cost of Capital Methodology).

<sup>379</sup> Fama, E. F., French, K. R., Multifactor Explanations of Asset Pricing Anomalies, *Journal of Finance*, Vol. 51, 1996, pp. 55–84.

been criticised for ‘data mining’ — inferring the existence of relationships in the data that appear purely through chance.<sup>380</sup> 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.<sup>381</sup> Furthermore, the reliability of the model may vary between countries; the model has typically been applied to US or UK data.

E2.26 A specific application of the Fama-French model was considered in detail by the AER in the Jemena Gas decision.<sup>382</sup> The AER concluded that:

- The Fama-French three-factor model was not well accepted by academics, financial market practitioners, nor regulators;<sup>383</sup>
- The Fama-French three-factor model is empirically driven, without a strong theoretical grounding;<sup>384</sup>
- The estimates produced by the Fama-French three-factor model “are not arrived at on a reasonable basis”;<sup>385</sup> and
- The Fama-French three-factor model “does not produce a better estimate or forecast than the CAPM of the cost of equity”.<sup>386</sup>

E2.27 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*

E2.28 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.<sup>387</sup>

E2.29 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.<sup>388</sup>

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<sup>380</sup> 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.

<sup>381</sup> 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.

<sup>382</sup> AER, *Jemena Gas Networks, Access arrangement proposal for the NSW gas markets Final decision*, 1 July 2010- 30 June 2015, pp.108-172.

<sup>383</sup> *ibid*, pp. 108-172, pp. 119-134.

<sup>384</sup> *ibid*, pp. 108-172, pp. 134-138.

<sup>385</sup> *ibid*, pp. 108-172, p. 142.

<sup>386</sup> *ibid*, pp. 108-172, p. 148.

<sup>387</sup> Gordon, M., *The Investment, Financing, and Valuation of the Corporation*, Irwin: Homewood, 1962.

<sup>388</sup> Gordon, K., Makhholm, J. D., *Allowed Return on Equity in Canada and the United States: An Economic, Financial and Institutional Analysis*, NERA report, 2008.

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E2.30 There are a number of limitations with the DCF models:

- 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.<sup>389</sup> 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.<sup>390</sup> Multistage models described in the Expert Panel report and by Cornell, seek to overcome this problem,<sup>391</sup> and
- Finally, the model relies on the assumption that financial markets are efficient and correctly value investments.<sup>392</sup> The empirical evidence on that question has been mixed, at best.

E2.31 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".<sup>393</sup>

*Estimating the cost of equity in practice*

E2.32 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

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<sup>389</sup> See Grinblatt, M., Titman, S., *Financial Markets and Corporate Strategy*, 2nd edition, McGraw-Hill: New York, 2002, pp. 388-390.

<sup>390</sup> Cornell, B., *The Equity Risk Premium: the Long-run Future of the Stock Market*, Wiley: New York, 1999.

<sup>391</sup> 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.

<sup>392</sup> Independent Regulators Group (IRG), *Regulatory Accounting — Principles of Implementation and Best Practice for WACC Calculation*, February, 2007, p. 19.

<sup>393</sup> 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.

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).

- E2.33 In the New Zealand context, the Commission has considered the regulatory cost of capital for the Telecommunication Service Obligation ('TSO') net cost calculations determination,<sup>394</sup> the Airports Inquiry,<sup>395</sup> in the Gas Control Inquiry,<sup>396</sup> the Electricity Inquiry into Unison,<sup>397</sup> and the Gas Authorisation.<sup>398</sup> In these decisions, the Commission has consistently applied a CAPM framework.
- E2.34 The use of the CAPM was considered and accepted by the New Zealand High Court in the Auckland Bulk Gas Users case.<sup>399</sup> 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:<sup>400</sup>

...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.

#### *Challenges to regulators' use of the CAPM*

- E2.35 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.
- E2.36 The issue was considered in detail by Wright, Mason and Miles (Wright et al.)<sup>401</sup> for the U.K. economic regulators<sup>402</sup> and the Office of Fair Trading. Wright et al. concluded that:<sup>403</sup>

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<sup>394</sup> 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.

<sup>395</sup> Commerce Commission, *Final report Part IV Inquiry into Airfield Activities at Auckland, Wellington and Christchurch International Airports*, 1 August 2002.

<sup>396</sup> Commerce Commission, *Gas Control Inquiry*, Final Report, 29 November 2004 (Commerce Commission, Gas Control Inquiry).

<sup>397</sup> Commerce Commission, *Electricity Distribution - Regulation of Electricity Lines Businesses Targeted Control Regime Intention to Declare Control Unison Networks Limited*, September 2005.

<sup>398</sup> Commerce Commission, *Gas Authorisation Decisions Paper*, 30 October 2008.

<sup>399</sup> *Auckland Bulk Gas Users v Commerce Commission* [1990] 1 NZLR 448, see esp. pp. 466-467.

<sup>400</sup> *Auckland Bulk Gas Users v Commerce Commission* [1990] 1 NZLR 448, p. 467.

<sup>401</sup> 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.

<sup>402</sup> 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 (Ofcom), Office of the Rail Regulator (ORR) and Office for the Regulation of Electricity and Gas (OFREG).

<sup>403</sup> 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.

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[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.

E2.37 After reviewing some of the empirical research developments, Wright et al note:<sup>404</sup>

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.

E2.38 The issue has also been addressed by a number of Australian regulators, including the AER (2009 and 2010<sup>405</sup>), the QCA (2004) and most recently by IPART (Nov 2009, final Apr 2010<sup>406</sup>). All have continued to use the CAPM to estimate the cost of equity.

E2.39 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;<sup>407</sup> 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).<sup>408</sup>

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<sup>404</sup> *ibid*, p. 76.

<sup>405</sup> 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*, June 2010, pp.108-172.

<sup>406</sup> 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.

<sup>407</sup> *Auckland Bulk Gas Users v Commerce Commission* [1990] 1 NZLR 448, see esp. at pp. 466-467.

<sup>408</sup> 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.



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### *Submissions on use of the CAPM*

E2.40 In submissions on the Revised Draft Cost of Capital Guidelines (RDG)<sup>409</sup> and IM Discussion Paper<sup>410</sup> interested parties highlighted the CAPM's poor performance in under (over) estimating the cost of equity for low (high) beta firms.<sup>411</sup> LECG for 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.<sup>412</sup>

E2.41 PwC (for 17 EDBs) submitted that:<sup>413</sup>

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.

E2.42 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*

E2.43 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*

E2.44 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.

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<sup>409</sup> Commerce Commission *Revised Draft Guidelines - The Commerce Commission's Approach to Estimating the Cost of Capital*, 19 June 2009 (RDG).

<sup>410</sup> Commerce Commission, *IM Discussion Paper*, 19 June 2009.

<sup>411</sup> 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.

<sup>412</sup> 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).

<sup>413</sup> PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, Report on Behalf of 17 EDBs, 2 December 2009, p. 7.

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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.

E2.45 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 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.<sup>414</sup>

E2.46 The formula to calculate the cost of equity using the simplified Brennan-Lally CAPM is:

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

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

E2.47 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.

E2.48 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.<sup>415</sup>

E2.49 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.

E2.50 In this regard, Unison submitted that:<sup>416</sup>

... 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.

E2.51 The Commission notes that there are two alternatives to the classical and simplified Brennan Lally frameworks that attempt to take account of the partial integration of

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<sup>414</sup> 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.

<sup>415</sup> 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.

<sup>416</sup> Unison, *Appendix: Submission on Revised Draft Guidelines: The Commerce Commission’s Approach to Estimating the Cost of Capital*, 14 August 2009, p. 5.

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New Zealand with international markets. These alternatives are (i) the Officer model,<sup>417</sup> 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 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.

- E2.52 The Officer version of the CAPM model is widely used by regulators and finance practitioners in Australia.<sup>418</sup> 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.<sup>419</sup>
- E2.53 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.
- E2.54 A number of submissions highlighted that some international investors, in particular, cannot utilise the imputation credits distributed with dividends.<sup>420</sup> 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.
- E2.55 The Commission accepts that international investors are substantial investors in New Zealand, and with New Zealand’s limited level of domestic savings, international

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<sup>417</sup> Officer, R. R., The cost of capital of a company under an imputation tax system, *Accounting & Finance*, Vol. 34, 1994, pp. 1-17.

<sup>418</sup> 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.

<sup>419</sup> 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.

<sup>420</sup> 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 Determinations and Reasons Paper*, Attachment: NERA Report, 2 September 2010, pp. 7-9.

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

- E2.56 This matter was discussed by the Expert Panel Report.<sup>421</sup> 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.<sup>422</sup> 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 6.4.32 to 6.4.34.
- E2.57 The Commission notes that some investors in Airports may not be able to use imputation credits fully either, for example, certain types of trusts. However 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.
- E2.58 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*

- E2.59 All Australian regulators currently use the Officer CAPM framework for estimating the cost of equity capital.<sup>423</sup> UK regulators typically use the classical CAPM

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<sup>421</sup> 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.

<sup>422</sup> *ibid.*

<sup>423</sup> Similar to the simplified Brennan-Lally framework 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.

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framework as, in part, it is consistent with the UK tax regime.<sup>424</sup> Professor Franks in the Cost of Capital Expert Report notes that the UK had a partial imputation system in the late 1980s and early 1990s “... and most parties used a Brennan-Lally-type model.”<sup>425</sup>

- E2.60 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.
- E2.61 In its decisions in estimating the cost of equity capital, the Commission has consistently used the simplified Brennan-Lally CAPM<sup>426</sup> 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).<sup>427</sup> In the RDG and IM Discussion Paper, the Commission proposed continuing to use the simplified Brennan-Lally CAPM.
- E2.62 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.<sup>428</sup>

#### *Submissions on the form of the CAPM*

- E2.63 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 also Vector 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.<sup>429</sup>
- E2.64 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.<sup>430</sup> However, the Commission considers a decision to

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<sup>424</sup> 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.

<sup>425</sup> 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.

<sup>426</sup> 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*, 2002).

<sup>427</sup> 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.

<sup>428</sup> Commerce Commission, *Cost of Capital Workshop Transcript*, 12-13 November 2009, pp. 38-40.

<sup>429</sup> Vector, *Cross Submission to Commerce Commission on the Weighted Average Cost of Capital Workshop*, 2 December 2009, pp. 7-8.

<sup>430</sup> 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.

undertake such a review would be inconsistent with the statutory purpose of IMs, which is to “promote certainty for suppliers and consumers in relation to the rules, requirements and processes applying to regulation of services under [Part 4]”.<sup>431</sup> However, if a substantially improved model was to be 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.

E2.65 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.”<sup>432</sup> 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.<sup>433</sup>

E2.66 Some submitters considered the Commission should use a number of approaches and models, rather than just the simplified Brennan-Lally CAPM. NERA for Orion<sup>434</sup> 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.<sup>435</sup>

E2.67 LECG did not support that approach. LECG’s view was that:<sup>436</sup>

... 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.

<sup>431</sup> Section 52R of the Act.

<sup>432</sup> 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.

<sup>433</sup> 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. 21.

<sup>434</sup> 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.

<sup>435</sup> 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).

<sup>436</sup> 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.

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### *Leverage*

- E2.68 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 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.
- E2.69 The Commission has been aware of the counter-intuitive 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.
- E2.70 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.
- E2.71 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 E3 on leverage.

### *Conclusion - Cost of Equity - The form of the CAPM*

- E2.72 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 the counter-intuitive relationship between WACC 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.
- E2.73 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

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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);<sup>437</sup>

- Second, it has been adopted in previous regulatory determinations by the Commission,<sup>438</sup> 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;<sup>439</sup> 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.<sup>440</sup>

E2.74 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.

E2.75 As noted, the Commission recognises the significance of the relationship between WACC 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 counter-intuitive 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 E3).

E2.76 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.

E2.77 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

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<sup>437</sup> 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.

<sup>438</sup> See Commerce Commission, *Gas Control Inquiry, Final Report*, 29 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 2002; and any Commerce Commission TSO Decision Paper.

<sup>439</sup> New Zealand Treasury, *Estimating the Cost of Capital for Crown Entities and State-Owned Enterprises*, A handbook prepared for the Treasury, 1997.

<sup>440</sup> 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 publish a quarterly cost of capital report that uses the Brennan-Lally model. See <http://www.pwc.com/nz/en/cost-of-capital/index.jhtml>.



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

E2.78 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 E13.

### ***Ad hoc allowance for model error***

E2.79 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.<sup>441</sup> 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;<sup>442</sup>
- Professor Grundy (for Vector) argued for the use of the Black CAPM;<sup>443</sup>
- 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.<sup>444</sup>

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<sup>441</sup> See, for example, 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, 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.

<sup>442</sup> 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.

<sup>443</sup> Vector, *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.

<sup>444</sup> 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.

E2.80 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 6.4.19 - 6.4.34.

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

E2.81 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.<sup>445</sup> 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.

E2.82 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.<sup>446</sup> In making its decisions for airport 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.

## **E3 Leverage**

### *Decision - leverage*

E3.1 The IM specifies a service-wide notional leverage of 17% when estimating the cost of capital for Airport services.

### *Commission's reasons - leverage*

#### Overview

E3.2 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).

E3.3 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

<sup>445</sup> 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.

<sup>446</sup> 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.

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

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

- E3.4 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 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.<sup>447</sup>
- E3.5 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.<sup>448</sup> 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.<sup>449</sup>
- E3.6 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,<sup>450</sup> the reduction of underinvestment problems arising from the use of equity finance,<sup>451</sup> the reduction of agency costs due to the disciplinary effects of debt,<sup>452</sup> and the financial flexibility arising from debt.
- E3.7 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

- E3.8 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

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<sup>447</sup> 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.

<sup>448</sup> 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.

<sup>449</sup> 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 6.4.32 - 6.4.34.

<sup>450</sup> Ross, S., The Determination of Financial Structure: The Incentive Signalling Approach, *Bell Journal of Economics*, Spring, 1977, pp. 23-40.

<sup>451</sup> 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.

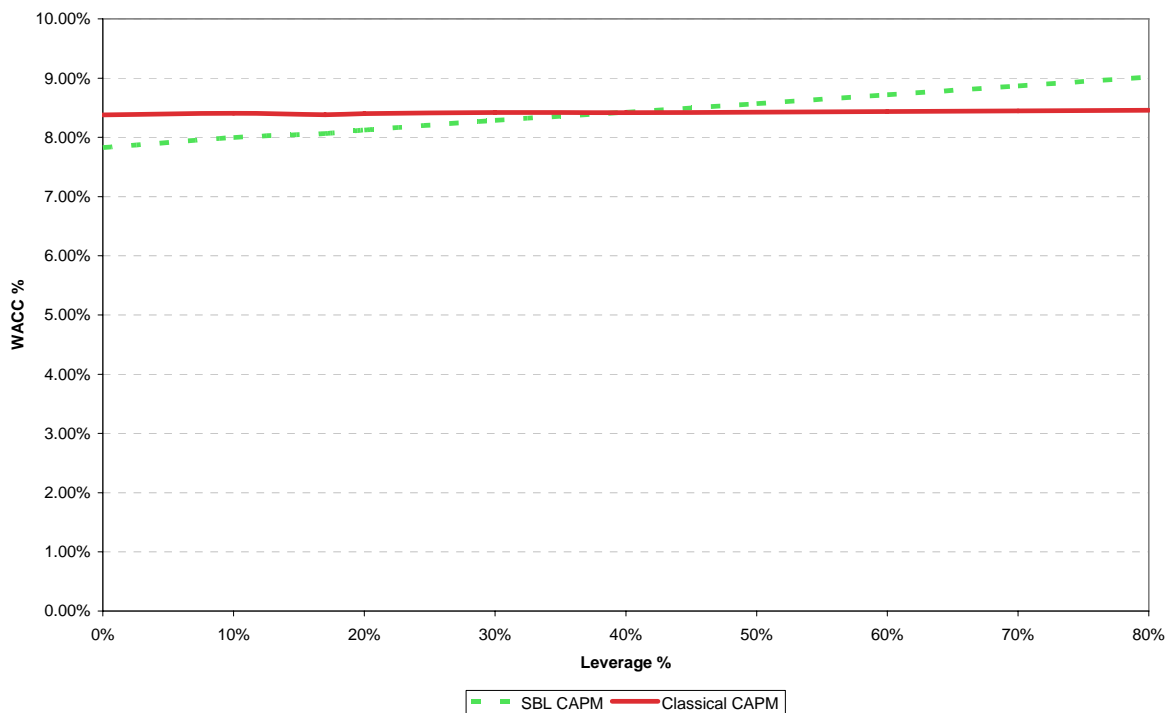
<sup>452</sup> Jensen, M., Meckling, W., Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure, *Journal of Financial Economics*, Vol. 3, 1976, pp. 305-360; Jensen, M., Agency Costs of Free Cash Flow, Corporate Finance and Takeovers, *American Economic Review*, Vol. 76, 1986, pp. 323-329.

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,<sup>453</sup> the magnitude of this anomaly in terms of changes in the post-tax WACC is illustrated in Table E1 and Figure E1 below. This contrasts the post-tax WACC estimated using the simplified Brennan-Lally CAPM and the classical CAPM.

**Table E1 Leverage and Post-tax Cost of Capital**

Leverage	Post-tax cost of capital estimated using the simplified Brennan-Lally CAPM	Post-tax cost of capital estimated using the classical CAPM
0%	7.83%	8.44%
20%	8.12%	8.46%
40%	8.42%	8.48%
60%	8.72%	8.50%

**Figure E1 Leverage and the Post-Tax WACC Estimated Using the Simplified Brennan-Lally CAPM Versus the Classical CAPM**



<sup>453</sup> This assumes a risk-free rate of 4.96%, a debt premium of 2.10% (including debt issuance cost of 0.35%), an asset beta of 0.60, a TAMRP of 7.1% (equivalent to an MRP of 5.8% for the classical CAPM), average investor tax rate of 28.1% and average corporate tax rate of 28.4%. For both WACC estimates the tax neutral formula for the effects of leverage on betas has been used. These parameters values are consistent with the reasonableness test the Commission has undertaken, (see Appendix E13).

- E3.9 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 7.8% assuming zero leverage. The post-tax WACC would increase to 8.1% at an assumed leverage of 20%. At an assumed leverage of 60%, the post-tax WACC would be approximately 8.7%.
- E3.10 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.
- E3.11 This increase in the cost of capital with higher levels of leverage under the simplified Brennan-Lally CAPM:
- 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.
- E3.12 Where the simplified Brennan-Lally CAPM is used in the context of information disclosure, suppliers of regulated airport 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.
- E3.13 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, 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.<sup>454</sup>
- E3.14 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

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<sup>454</sup> The Commission notes that the de-levering of the equity beta is based on the market value of leverage of the comparative firm sample. Therefore, to be consistent with the asset beta the re-levering should also be based on 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.

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Competition Commission in a recent price-setting review of Heathrow/Gatwick.  
The UK Competition Commission stated that:<sup>455</sup>

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.

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 ....

E3.15 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.<sup>456</sup> The use of debt betas was generally not supported by submissions in New Zealand,<sup>457</sup> or the Expert Panel, although the Expert Panel recommended the Commission consider debt betas if they are significant.<sup>458</sup>

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<sup>455</sup> 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.

<sup>456</sup> 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 E9).

<sup>457</sup> 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

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E3.16 At the Cost of Capital Workshop, representatives of the suppliers of regulated services recognised that the cost of capital increases with leverage under the 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

E3.17 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:<sup>459</sup>

- 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.)

E3.18 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):<sup>460</sup>

- accepting the anomaly and continuing to use the simplified Brennan-Lally CAPM (status quo);<sup>461</sup>
- 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.

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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.

<sup>458</sup> 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.

<sup>459</sup> Lally, M., *WACC and Leverage*, Report to the Commerce Commission, 17 November 2009, pp. 3-5.

<sup>460</sup> *ibid.*, p. 5.

<sup>461</sup> 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.

E3.19 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:<sup>462</sup>

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

### Possible solutions

E3.20 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 E1 and Figure E1 and the accompanying discussion). Therefore, the Commission considers that accepting the anomaly is not an appropriate solution.

E3.21 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

E3.22 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 E3.12 and E3.13. 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 E3.4 to E3.7).

<sup>462</sup> Lally, M., *WACC and Leverage*, Report to the Commerce Commission, 17 November 2009, p. 7.



- E3.23 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.<sup>463</sup>
- E3.24 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).<sup>464</sup> 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.
- E3.25 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

<sup>463</sup> 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*, 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.

<sup>464</sup> 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.

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theoretical framework for arguing for an extreme leverage assumption of zero leverage.<sup>465</sup>

E3.26 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.<sup>466</sup>

E3.27 Other considerations with a zero leverage assumption are that:

- 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;<sup>467</sup>
- 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;<sup>468</sup> and
- using zero leverage has implications for other parameters within the cost of capital framework, such as the equity beta.

E3.28 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

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<sup>465</sup> 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.

<sup>466</sup> 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.

<sup>467</sup> 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).

<sup>468</sup> See Lally, M., *WACC and Leverage*, Report to the Commerce Commission, 17 November 2009, pp. 5-6.

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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

E3.29 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:

- 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*

E3.30 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.<sup>469</sup>

E3.31 The Draft Reasons Papers discussed how the Commission could set the level of notional leverage for all services.<sup>470</sup> The Draft Reasons Papers noted that “[g]iven the variation of leverage levels among regulated suppliers, there is no one ‘right’ level of leverage”.<sup>471</sup> 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.

E3.32 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

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<sup>469</sup> 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.

<sup>470</sup> 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.

<sup>471</sup> 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.

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of these regulated services from the substantial consequences and costs if financial distress of a supplier of regulated services were to occur”<sup>472</sup>.

- E3.33 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.
- E3.34 Uniservices (for NZAA) agreed with the notional leverage assumption of 40% (the Airports made a similar point), whilst noting that the three Airports will have different leverage positions compared to the notional leverage assumption.<sup>473</sup>
- E3.35 On the other hand, BARNZ and Air NZ considered that notional leverage of 40% was inappropriately high. BARNZ submitted that the Commission should continue to apply its previous leverage of 25%.<sup>474</sup>
- E3.36 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 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.<sup>475</sup>

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<sup>472</sup> Commerce Commission, *Input Methodologies Airport Services, Draft Reasons Paper*, paragraph 6.5.58.

<sup>473</sup> 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; 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. 41.

<sup>474</sup> Board of Airline Representatives New Zealand Inc, *Submission on Commerce Commission Input Methodologies (Airport Services) Draft Reasons Paper and Draft Determination*, 12 July 2010, pp. 9-10 and 16; Air New Zealand Limited, *Submission to the Commerce Commission on the Input Methodologies Airport Services Draft Reasons Paper*, 12 July 2010, pp. 44-45.

<sup>475</sup> 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.

E3.37 PwC (for ENA and Telecom) submitted, in conjunction with a worked example to demonstrate, that the:<sup>476, 477</sup>

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.

E3.38 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).

E3.39 CEG (for Vector), ENA and Powerco made a similar point that the notional leverage assumption should be based on the sample of comparator suppliers.<sup>478</sup> Transpower submitted that as it was subject to IPP regulation there is no need to apply a service-wide notional leverage assumption and instead Transpower’s actual forward-looking leverage should be used.<sup>479</sup>

E3.40 In its cross-submissions for ENA, PwC submitted the Commission should use either a service-wide leverage assumption based on the comparator firms sample or use non-zero debt betas. PwC preferred the former.<sup>480</sup>

<sup>476</sup> 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.

<sup>477</sup> 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.

<sup>478</sup> 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.

<sup>479</sup> Transpower New Zealand Ltd., *Submission on Transpower (Input Methodologies) Draft Reasons Paper, Cost of Capital Decisions*, August 2010, p. 10.

<sup>480</sup> 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.

- E3.41 The technical issue identified by PwC (for ENA and Telecom) in the assumption of 40% notional leverage for all services was not discussed in submissions relating to Airports (by either Uniservices or PwC (for NZAA), or BARNZ and Air NZ or their experts). However, the Commission considers it is of greater significance for Airports than for EDBs, GPBs, and Transpower because the average leverage for the sample of comparator airports is 17%, which is significantly below the 40% notional leverage assumption. In contrast, the sample average leverage for EDBs, GPBs and Transpower was only slightly above the notional leverage assumption (44% versus 40%).
- E3.42 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.
- E3.43 PwC (for ENA) submitted that:<sup>481</sup>
- 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.
- E3.44 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*
- E3.45 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.
- E3.46 Appendix E8 identifies the comparative firms sample and the process for choosing the comparative firms sample for Airports. Table E2 displays the results of the individual firms' last five-year average (market value) leverage, which is consistent

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<sup>481</sup> 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.

with the leverage used to estimate the asset beta.<sup>482</sup> This results in an overall average leverage for the sample of 17%.<sup>483</sup>

**Table E2 List of Comparable Firms and the Average Market Leverage for 2005-2010**

Name	Average Leverage for 2005-2010
Aerodrom Ljubljana	0%
Aeroporto di Firenze	3%
Aeroports de Paris	27%
Airport Facilities	35%
Airports of Thailand	37%
AIAL	25%
Australian Infrastructure	5%
Beijing Capital International Airport	18%
Flughafen Wien	25%
Flughafen Zuerich	42%
Fraport	19%
Gemina	56%
Grupo Aeroportuario del Centro Norte	1%
Grupo Aeroportuario del Pacifico	0%
Grupo Aeroportuario del Sureste	0%
Kobenhavns Lufthavne	19%
Guangzhou Baiyun International Airport	10%
Hainan Meilan International Airport	0%
Japan Airport Terminal	15%
MAP Group	44%
Malta International Airport	17%
SAVE	15%
Shanghai International Airport	5%
Shenzhen Airport	0%
Xiamen International Airport	0%
<b>Mean market leverage</b>	<b>17%</b>

E3.47 Based on this analysis the airports-specific notional leverage should be 17%.

<sup>482</sup> Table E18 on page 303 includes a short description of each of these airports.

<sup>483</sup> The average leverage estimate is also 17% when using all observations for leverage used in each of the five-year periods used to estimate the asset beta.

E3.48 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 airports and the other regulated services.

Option c: Non-zero debt betas

E3.49 The use of non-zero debt betas is a third alternative to address the anomaly of WACC estimates rising with leverage. Dr Lally and PwC have both identified the use of a zero debt beta as a factor in the estimates of the cost of capital increasing with leverage.<sup>484</sup> 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.

E3.50 The use of a non-zero debt beta was discussed by a number of submitters during consultation on the IM.<sup>485</sup> However a majority of these submitters did not favour the

<sup>484</sup> 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 E9.

<sup>485</sup> 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



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- 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 E9).
- E3.51 Transpower and its experts Officer and Bishop favoured the use of debt betas in their submissions on the EDBs Draft Reasons Paper.<sup>486, 487</sup> 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.
- E3.52 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,<sup>488</sup> the resulting WACC too should not be biased.
- E3.53 Officer and Bishop asserted that the Commission should use a debt beta of 0.2 for Transpower.<sup>489</sup>
- E3.54 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.
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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.

<sup>486</sup> 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.

<sup>487</sup> 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.

<sup>488</sup> See Lally, M., *WACC and Leverage*, Report to the Commerce Commission, 17 November 2009.

<sup>489</sup> 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.

- E3.55 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.<sup>490</sup>
- E3.56 Dr Lally's advice is 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 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.
- E3.57 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*

- E3.58 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 (Option C) provide the same estimate of the post-tax WACC at the leverage from the sample of comparator companies. This is demonstrated below.
- E3.59 Table E3 and Figure E2 demonstrate the impact on the post-tax WACC estimated using the simplified Brennan-Lally CAPM to estimate the cost of equity, with debt betas of zero and 0.2 for Airports.<sup>491</sup>

**Table E3 Leverage, debt betas and the post-tax WACC for Airports<sup>492</sup>**

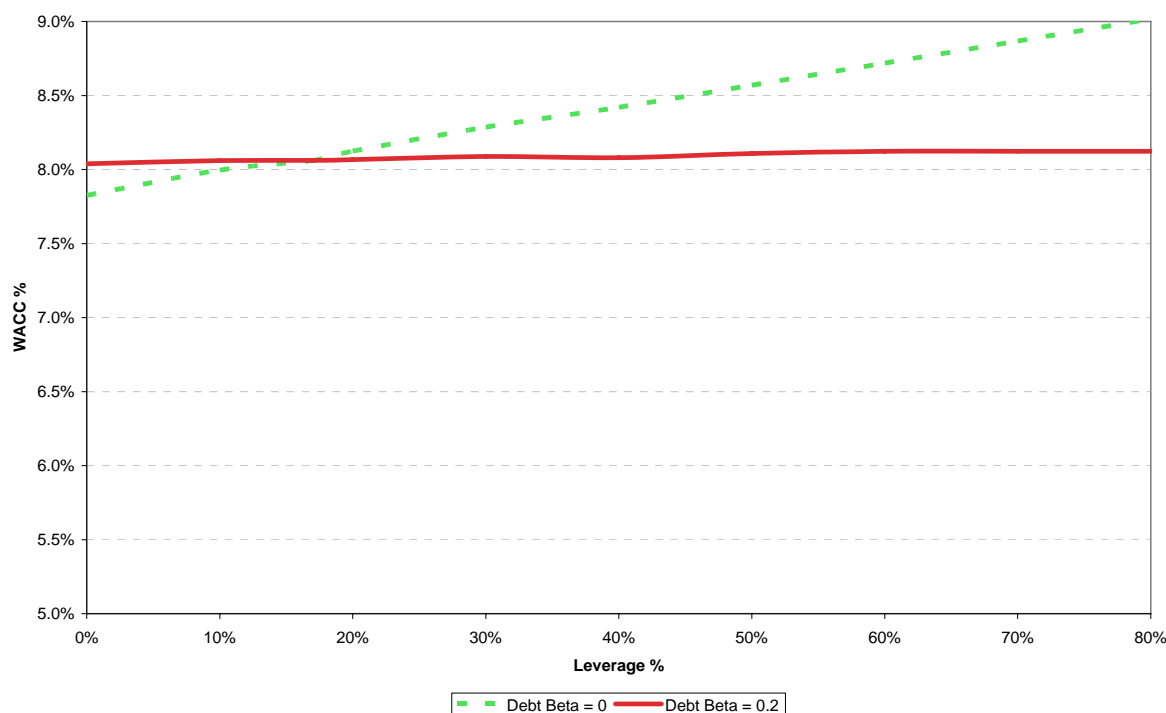
<b>Leverage</b>	<b>Post-tax cost of capital estimated using a zero debt beta</b>	<b>Post-tax cost of capital estimated using a debt beta of 0.2</b>
0%	7.83%	8.04%
<b>17%</b>	<b>8.06%</b>	<b>8.06%</b>
20%	8.12%	8.07%
40%	8.42%	8.08%
60%	8.72%	8.12%

<sup>490</sup> Lally, M., *WACC and Leverage*, Report to the Commerce Commission, 17 November 2009.

<sup>491</sup> This assumes a risk-free rate of 4.96%, a debt premium of 2.10% (including debt issuance cost of 0.35%), an asset beta of 0.60 for a debt beta of zero, an asset beta of 0.63 (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 28.1% and average corporate tax rate of 28.4%. These parameter values are consistent with the reasonableness tests the Commission has undertaken. See Appendix E13.

<sup>492</sup> The estimates in the table are mid-point estimates of the post-tax WACC.

**Figure E2 Leverage and the Post-Tax WACC Estimated for Airports, Using the Simplified Brennan-Lally CAPM and Different Values for the Debt Beta.**



E3.60 Assuming 17% 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. 8.06%).<sup>493</sup>

*Conclusion - Option B(ii) vs. Option C*

E3.61 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 estimates of the post-tax WACC that result from applying the IM in respect of a regulated service.

**Overall conclusion - Leverage**

E3.62 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 cost of capital is invariant to leverage in a more technically correct manner.

E3.63 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

<sup>493</sup> 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 8.06%.

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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.

- E3.64 Most submissions continue to prefer debt betas not be used (that is, they be set at zero), that most regulators do not use debt betas, the Commission has not done so in the past, and that there are practical difficulties in accurately estimating debt betas (but that 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.
- E3.65 Accordingly, the IM 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 was no incentive on firms to increase leverage to exploit the anomaly.
- E3.66 The Commission does not consider it is appropriate to use actual leverage for any regulated supplier as it 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. 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 (for example, for the airports) were used, however, 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.
- E3.67 The IM specifies a service-wide notional leverage of 17% when estimating the cost of capital for Airport services.

## **E4 Risk-free Rate**

### ***Decision - the risk-free rate***

- E4.1 In relation to the risk-free rate the IM specifies:
- the process and methodology for estimating the risk-free rate;
  - the term of the risk-free rate will be five years in the case of information disclosure regulation for Airport services and estimates of the five-year risk-free rate will be done on an annual basis;
  - 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; 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

- E4.2 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.
- E4.3 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 (term) of the rate. Each of these issues is discussed in turn below.

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

- E4.4 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.
- E4.5 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).<sup>494</sup> This was motivated by a widening of spreads between government securities and swap rate, across maturities.<sup>495</sup> However, this effect has diminished as a result of increased availability of government bonds after the recent GFC.
- E4.6 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.<sup>496</sup> However,

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<sup>494</sup> 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).

<sup>495</sup> 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.

<sup>496</sup> Commerce Commission, *Cost of Capital Workshop Transcript*, pp. 136-141.

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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.<sup>497</sup>

E4.7 PwC (for ENA) noted 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.<sup>498</sup>

*Conclusion - suitable proxy for the risk-free rate*

E4.8 The Commission considers that benchmark New Zealand government bonds best fulfil the conditions at paragraph E4.4. 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;
- 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;<sup>499</sup>
- 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.

Commission’s reasons - historical or current risk-free rates

E4.9 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

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<sup>497</sup> 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.

<sup>498</sup> 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.

<sup>499</sup> 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.

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approaches which reflect long-term historical average risk-free rates.<sup>500</sup> The Commission and the Australian regulators generally use current interest rates in regulatory determinations.

- E4.10 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.
- E4.11 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. 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*

- E4.12 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, 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

- E4.13 The Commission typically uses yields to maturity<sup>501</sup> on benchmark New Zealand government bonds as the proxy for the risk-free rate in the CAPM.<sup>502</sup> However, the theoretically correct approach would be 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.
- E4.14 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<sup>503</sup> of such investments is more sensitive to changes in the risk-free rate than for risky projects, which will have a larger risk premium.
- E4.15 In a submission on the RDG PwC (for 17 EDBs) argued that:<sup>504</sup>

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

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<sup>500</sup> 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.

<sup>501</sup> 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.

<sup>502</sup> Benchmark New Zealand government bonds usually pay coupons every six months.

<sup>503</sup> NPV refers to the present value of future cash flow less the initial investment.

<sup>504</sup> 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.

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pragmatic reasons, including obtaining data and the preference for the use of a single rate, using yields to maturity would be an appropriate approach.

- E4.16 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.
- E4.17 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.<sup>505</sup>

*Conclusion - yield to maturity versus spot rates*

- E4.18 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.
- E4.19 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

- E4.20 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.
- E4.21 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.<sup>506</sup>
- E4.22 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.<sup>507</sup>
- E4.23 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

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<sup>505</sup> 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.

<sup>506</sup> Commerce Commission, *Part IV Inquiry into Airfield Activities at Auckland, Wellington and Christchurch International Airports, Final report*, 2002, pp. 150-151.

<sup>507</sup> 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.



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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.

- E4.24 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:<sup>508</sup>

... 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.

- E4.25 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.<sup>509</sup>

#### *Conclusion - averaging period*

- E4.26 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

- E4.27 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.

#### Commission’s reasons - the appropriate term of the risk-free rate

- E4.28 The term of the risk-free rate should ensure the resulting estimate of the cost of capital is estimated with a term that is consistent with the pricing period.

#### *Previous decisions*

- E4.29 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.<sup>510</sup> In the case of the Airports Inquiry, the

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<sup>508</sup> 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.

<sup>509</sup> Commerce Commission, *Cost of Capital Workshop Transcript*, pp. 136-141.

<sup>510</sup> 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.

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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.<sup>511</sup> 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*

- E4.30 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.
- E4.31 In the regulatory context, the Commission will typically be evaluating returns over a given horizon — the pricing period. Matching the term of the risk-free rate to the term of the pricing period ensures that the cost of capital reflects an expectation that regulated suppliers will earn profits equivalent to a normal rate of return over the pricing period.<sup>512</sup>
- E4.32 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.
- E4.33 Setting the risk-free rate to a term longer (or shorter) than the regulatory (pricing) 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*

- E4.34 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:<sup>513</sup>

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<sup>511</sup> Commerce Commission, *Part IV Inquiry into Airfield Activities at Auckland, Wellington and Christchurch International Airports, Final report*, 2002, pp. 150-151.

<sup>512</sup> Lally, M., Regulation and the choice of the risk free rate, *Accounting Research Journal*, 2004, Vol. 17 (1), pp. 18-23. Lally, M., *Determining the Risk Free Rate for Regulated Companies*, August 2002.

<sup>513</sup> 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.

- 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.

E4.35 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).<sup>514</sup>

### Submissions

E4.36 In consultation, a number of suppliers of regulated services disagreed that the term of the risk-free rate should match the regulatory period.<sup>515</sup> These parties argued that

<sup>514</sup> 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 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.

<sup>515</sup> 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; PricewaterhouseCoopers, *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; PricewaterhouseCoopers, *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*

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.<sup>516</sup>

E4.37 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

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*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 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.

<sup>516</sup> 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 their 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.

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for changes in risk-free rates; and (ii) the widespread use of interest rate swaps. These are now discussed.

*The power to reset prices*

- E4.38 The interest rate on Government bonds 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.
- E4.39 Airports, like other regulated suppliers, can reset their prices at the end of each regulatory (pricing) 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 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.

*The availability of interest rate swaps*

- E4.40 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 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.
- E4.41 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.<sup>517</sup> 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.
- E4.42 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.
- E4.43 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

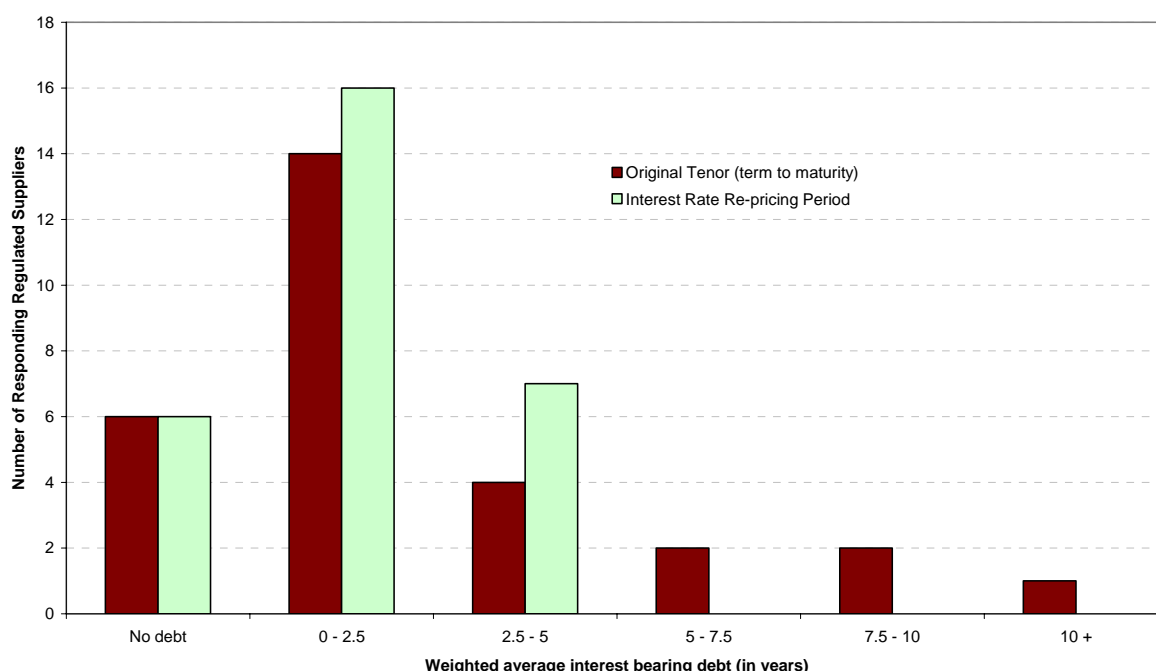
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<sup>517</sup> A small number of New Zealand firms have issued bonds with floating rates of interest.

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.

E4.44 Figure E3 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. 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.

**Figure E3 Regulated Suppliers' Debt Portfolios: Weighted Average Original Term to Maturity vs. Weighted Average Interest Rate Re-pricing Period (2010)**



E4.45 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.<sup>518</sup>

<sup>518</sup> 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).

- E4.46 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 (pricing) period (and should not be set at 10 years).
- E4.47 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.<sup>519</sup> The Commission notes that as regulated suppliers can use interest rate swaps to hedge the risk-free rate, this is however an argument 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.
- E4.48 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 E5 on the debt premium and Section E6 on the term credit spread differential.
- E4.49 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 E5 on the debt premium for a more detailed analysis). Thus, actual behaviour is not consistent with the claim.
- E4.50 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<sup>520</sup> and a number of airports (e.g. Hamilton, AIAL, CIAL<sup>521</sup>) 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*

- E4.51 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

<sup>519</sup> 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.

<sup>520</sup> 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.

<sup>521</sup> 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.

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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.

- E4.52 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.
- E4.53 When suppliers reset their prices at the end of each pricing 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 rate with a term longer than the pricing period would compensate suppliers for an uncertainty they do not bear.
- E4.54 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.
- E4.55 The term credit spread differential has been included in the Airports ID Determination to recognise and compensate for the greater debt premium some regulated suppliers may actually incur on their debt portfolio.<sup>522</sup> Regulated suppliers will qualify for this allowance where their average debt tenor (and therefore debt premium) is more than five years.
- E4.56 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.

## **E5 Debt Premium and Debt Issuance Costs**

### ***Decision - debt premium and debt issuance costs***

- E5.1 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.
- E5.2 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.
- E5.3 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.

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<sup>522</sup> It is an adjustment to the cash flows in the ROI that is calculated under information disclosure.



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E5.4 In relation to the debt premium for airport services, the IM specifies 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 a supplier of airport services that is neither majority owned by the government nor a local authority, with a Standard and Poors long-term credit rating of A-, or equivalent rating from Moody's or Fitch;
- to address the small number of bonds with a Standard and Poors long-term credit rating of A- that are publicly traded in New Zealand, this may involve, as required, progressively expanding the range of publicly traded bonds considered to include:
  - those which are not issued by a supplier of airport services;
  - those with a Standard and Poors long-term credit rating other than A-;
  - 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 NZ\$ denominated bonds (refer Section E4);
- the five-year estimate of the debt premium will be updated annually; 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.

E5.5 Unlike the risk-free rate which can be hedged, the greater debt premium on long term debt cannot be hedged economically. The ID Determination 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 ID Determination 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).

E5.6 The IM provides that debt issuance costs will be included in the cost of capital estimation for airport services, 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.

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## ***Commission's reasons - debt premium***

### **The term of the debt premium**

- E5.7 As with the risk-free rate, the term of the debt premium will match the regulatory period.<sup>523</sup> This ensures internal consistency.
- E5.8 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.<sup>524</sup>
- E5.9 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.<sup>525</sup> Many of these

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<sup>523</sup> Appendix E4 includes further discussion on the risk-free rate.

<sup>524</sup> 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.

<sup>525</sup> Christchurch International Airport Limited, *Submission on the Revised Draft Cost of Capital Guidelines*, 3 August 2009, p. 2; PricewaterhouseCoopers, *Submission on 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; PricewaterhouseCoopers, *Cross Submission to the Commerce Commission on the Cost of Capital Workshop*, Report on Behalf of 17 EDBs, 2 December 2009, p. 12; PricewaterhouseCoopers, *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 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

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submitters recommended that the Commission should assume a 10 year term for estimating the debt premium.

- E5.10 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.<sup>526</sup>
- E5.11 In 2009 and 2010 the Commission surveyed suppliers of services regulated under Part 4. In 2010 (2009) only five (four) of the 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.<sup>527</sup> The responses are shown in Figure E4. 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 the 2009 survey it was 7.3 years). For suppliers of airports services the weighted average original period was approximately five years in 2009 and 2010.

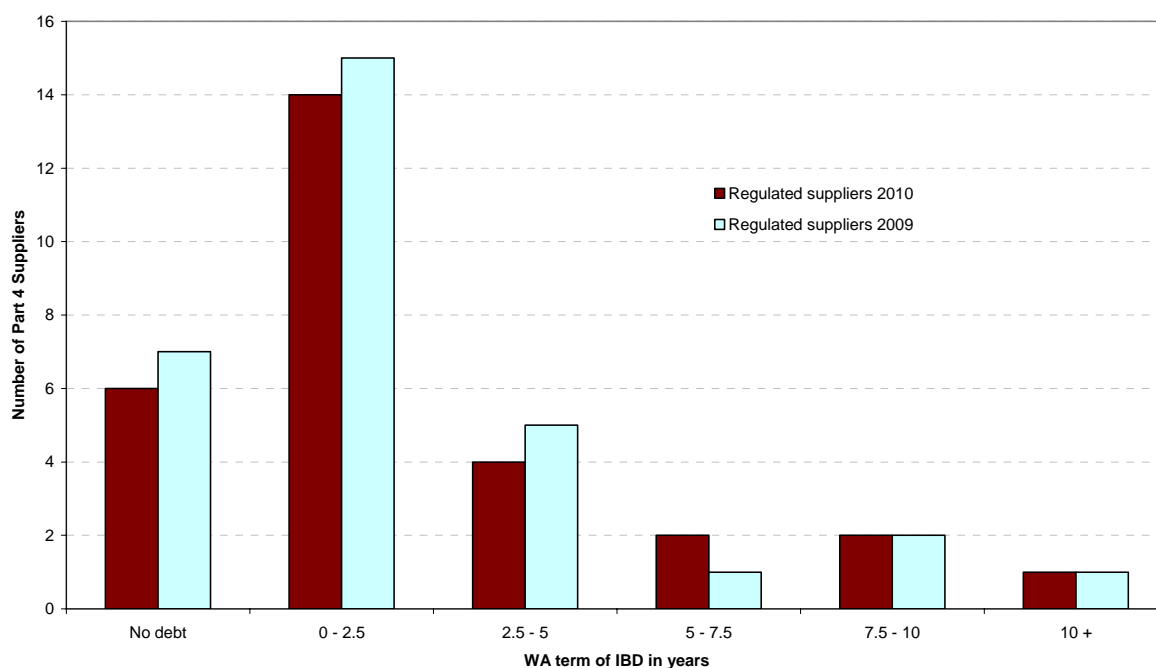
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Infrastructure, *Submission on EDBs (Input Methodology) Reasons Paper, Cost of Capital - The Investor Perspective*, 13 August 2010, p. 10; Transpower New Zealand Ltd., *Submission on Transpower (Input Methodologies) Draft Reasons Paper, Cost of Capital 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.

<sup>526</sup> 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.

<sup>527</sup> 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.

**Figure E4 Regulated Suppliers' Debt Portfolios: Weighted Average Original Term to Maturity of Interest Bearing Debt**



E5.12 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 they do not actually incur.

E5.13 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.

E5.14 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 further in paragraphs E5.16 to E5.19 and in more detail in Appendix E6.

Conclusion - term of the debt premium

E5.15 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.

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### Term credit spread differential

- E5.16 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.
- E5.17 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 Commission considers 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 five years.
- E5.18 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.
- E5.19 A more detailed explanation of the term credit spread differential and how it works is set out in Appendix E6.

### Australian 10 year debt premium

- E5.20 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 Commission too should adopt a 10 year term for estimating the debt premium.<sup>528</sup> The Australian adoption of the 10 year term is often linked to the Gasnet decision by the Australian Competition Tribunal.<sup>529</sup> 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.
- E5.21 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 over-compensate suppliers was not discussed in the Tribunal's decision.

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<sup>528</sup> 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.

<sup>529</sup> 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.

E5.22 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.

E5.23 More recently in Australia, 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;<sup>530</sup>
- 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,<sup>531</sup>
- IPART issued a public discussion document which discusses, among other things, whether to shorten the 10 year term to align with the regulatory period;<sup>532</sup> and
- the Australian Competition Tribunal, in a September 2010 decision, questioned the continued appropriateness of a 10 year bond. 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. Further, there seems to be little point in attempting to estimate the yield on a bond which is not commonly issued.<sup>533</sup>

E5.24 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

E5.25 The interest cost of borrowing may vary between suppliers of airport services. However, the use of notional leverage requires that the debt premium 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

<sup>530</sup> AER, *Electricity transmission and distribution network service providers Review of the weighted average cost of capital (WACC) parameters*, May 2009, p. 173.

<sup>531</sup> 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.

<sup>532</sup> IPART, *Developing the approach to estimating the debt margin Other industries – Discussion Paper*, November 2010, Chapter 8, pp. 57-60.

<sup>533</sup> Australian Competition Tribunal, *Application by ActewAGL Distribution [2010] ACompT 4*, 17 September 2010, paragraph 72.

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assessment of a Standard and Poors long-term credit rating of A- for airport services.<sup>534</sup>

#### Approach to estimating the debt premium

E5.26 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.

E5.27 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'*

E5.28 The simple approach to estimating the debt premium involves three steps:

- i. identify credit-rated publicly traded vanilla<sup>535</sup> 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 Standard and Poors long-term credit rating, or equivalent rating from Moody's or Fitch, for bonds issued by suppliers of the regulated service in question.

E5.29 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.

E5.30 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'*

E5.31 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

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<sup>534</sup> The appropriate credit rating is discussed below, commencing at paragraph E5.44.

<sup>535</sup> Vanilla bonds are defined as senior unsecured nominal debt obligations denominated in NZ\$ without callable, puttable, conversion, profit participation, credit enhanced or collateral features.

- debt premium by making assumptions about the weighting of each borrowing option in a notional debt portfolio.
- E5.32 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.<sup>536</sup>
- E5.33 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 (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.<sup>537</sup>
- E5.34 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.
- E5.35 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.

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<sup>536</sup> Auckland Energy Consumer Trust, *Cross Submission to the Commerce Commission on Cost of Capital Workshop*, 2 December 2009, p. 21; PricewaterhouseCoopers, *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.

<sup>537</sup> Unison, *Unison Networks Limited Cost of Debt Model*, 22 December 2009.



- E5.36 In terms of the ability to obtain the necessary data for this approach, the Commission notes that 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).
- E5.37 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, this information, by its nature, 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.
- E5.38 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. Secondly, it 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.
- E5.39 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.

*Conclusion - approach to estimating the debt premium*

- E5.40 On balance, the Commission considers that it should continue to use the simple approach to estimating debt premiums.<sup>538</sup> 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

<sup>538</sup> PwC (for ENA) accepted that there were valid arguments in favour of the simple approach, but 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.

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interested persons 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.

- E5.41 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 it, 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.
- E5.42 The Commission, like the Australian regulators (for example, AER, IPART, QCA), has consistently adopted the simple approach to estimating debt premiums.
- E5.43 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.<sup>539</sup> In practice, firms including regulated suppliers 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

- E5.44 As discussed above, the IM provides that the debt premium will be estimated using publicly traded corporate bonds denominated in New Zealand 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.
- E5.45 In the Revised Draft Guidelines and the 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. Standard and Poors / Moody's ratings A-/A3 or BBB+/Baa1.
- E5.46 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.<sup>540</sup> 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

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<sup>539</sup> 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.

<sup>540</sup> Commerce Commission, *Cost of Capital Workshop Transcript*, pp. 143-158.

to undertake, the extra borrowing required may lead to a reduction in credit ratings and if the suppliers 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.<sup>541</sup>

- E5.47 In submissions on the Draft Reasons Papers suppliers of regulated services considered the benchmark credit rating was too high. Airports proposed a Standard and Poors BBB+ long-term credit rating rather than an A-.<sup>542</sup> EDBs and GPBs proposed a BBB long-term credit rating rather than BBB+.<sup>543</sup> 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.
- E5.48 In previous regulatory decisions, the Commission has considered advice from Dr Lally on the appropriate debt premium.
- E5.49 Dr Lally in his advice on the Airports Inquiry and the Electricity Distribution – Control of Unison, did not reference a credit rating in order to estimate the debt premium.<sup>544</sup> In the Airports Inquiry Dr Lally relied on evidence from submissions and in the electricity decision he relied on the estimate used in the Airports Inquiry, supplemented by data from Powerco and Vector.<sup>545</sup>
- E5.50 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.<sup>546</sup>

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<sup>541</sup> *ibid*, p. 145 and p. 148.

<sup>542</sup> 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. 28-30; Christchurch International Airport Ltd., *Submission on Input Methodologies and Information Disclosure Draft Determinations and Reasons Papers for Airport Services*, 12 July 2010, p. 42.

<sup>543</sup> 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.

<sup>544</sup> Lally, M., *The weighted average cost of capital for electricity lines businesses*, September 2005, pp. 55-57.

<sup>545</sup> Powerco and Vector currently have publicly traded bonds with a Standard and Poors long-term credit rating of BBB and BBB+ respectively.

<sup>546</sup> 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.

- E5.51 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.<sup>547</sup>
- E5.52 The UK Competition Commission's approach, for airports, is to base the cost of debt on the yield from a mixture of bonds of utility companies with a Standard and Poors long-term credit rating of BBB and A. The UK Competition Commission noted that the choice of the credit rating can never be entirely scientific.<sup>548</sup>
- E5.53 In its 2007 price control review of Heathrow and Gatwick the UK Competition Commission, using a number of different considerations, took the view that these airports should be able to obtain a Standard and Poors rating of BBB+.<sup>549</sup>
- E5.54 The issue was considered again in the price control review for Stansted. The UK Competition Commission decided that Stansted should have a Standard and Poors long-term credit rating of A-.<sup>550</sup>

#### *Conclusion - credit rating*

- E5.55 The Commission considers that a Standard and Poors long-term credit rating of A- (or equivalent rating from Moody's or Fitch) is appropriate for benchmarking the allowed regulated service wide debt premium on the debt of airport services. 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 Standard and Poors long-term credit rating of A- (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 Airport services. 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.
- E5.56 A Standard and Poors long-term credit rating of A- is consistent with the approach adopted by the UK Competition Commission in a recent decision on Stansted.

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<sup>547</sup> AER, *Final decision: Electricity transmission and distribution network service providers – Review of the weighted average cost 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, *Review of Stansted Airport Q5 price control*); 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.

<sup>548</sup> Competition Commission, *Stansted Airport Ltd - Q5 price control review*, 23 October 2008, Appendix L, p. L5.

<sup>549</sup> 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.

<sup>550</sup> Competition Commission, *Stansted Airport Ltd - Q5 price control review*, 23 October 2008, Appendix L, pp. L5-L7.

E5.57 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

E5.58 The Airports Draft Determination specified that the debt premium was to be estimated based only on the observed yields of publicly traded bonds with a Standard and Poors long-term credit rating of A-.

E5.59 There are only a limited number of publicly traded vanilla New Zealand dollar denominated corporate bonds that are issued by an Airport that is neither majority owned by the government nor a local authority, with a Standard and Poors long-term credit rating of A-, or equivalent rating from Moody’s or Fitch. Some submitters on the Draft Reasons Paper considered that reliance only on A- bonds may not be workable or feasible in practice.

E5.60 As discussed in the Update Paper, the Commission has amended the Determination to progressively expand the range of publicly traded bonds considered to include:

- those which are not issued by a supplier of airport services;
- those with a Standard and Poors long-term credit rating other than A-; and
- those issued by an entity majority owned by the government or a local authority.<sup>551</sup>

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 E5.59. In short, the IM 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 credit rating of A-.

E5.61 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,<sup>552</sup> and Powerco submitted that the IM “should provide more detail” as under the draft IM (as released for technical consultation in October 2010)

<sup>551</sup> Commerce Commission, *Revised Draft Commerce Act (Airport Services Input Methodologies) Determination*, 1 October 2010; and Commerce Commission, *Input Methodologies (Airport Services) Consultation Update Paper*, 1 October 2010.

<sup>552</sup> 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.

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Powerco “cannot estimate the material effects of the methodology”.<sup>553</sup> Vector describes the proposed methodology as “unsatisfactory in that it is almost completely subjective”,<sup>554</sup> 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 available 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”.<sup>555</sup>

E5.62 Other submissions supported the revised approach. For example, NZAA submitted that:<sup>556</sup>

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.

E5.63 Telecom submitted that:<sup>557</sup>

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.

E5.64 In light of submissions on technical consultation, the IM 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.

E5.65 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 that it 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.

E5.66 A worked example on the estimation of the debt premium for EDBs is included from paragraph E5.107. The approach for estimating the debt premium for Airport Services would be very similar.

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<sup>553</sup> 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.

<sup>554</sup> 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.

<sup>555</sup> 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.

<sup>556</sup> NZ Airports Association, *Technical consultation: Submission on revised draft input methodology determinations*, 22 October 2010, p. 14.

<sup>557</sup> Telecom, *Input methodologies electricity distribution services – WACC (cost of capital)*, 12 November 2010, p. 2.

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### Averaging period

- E5.67 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.
- E5.68 In previous regulatory decisions, the Commission has used the month end corporate borrowing rate for the two or three preceding month ends.
- E5.69 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 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

- E5.70 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.

### Standard error of the debt premium

- E5.71 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.
- E5.72 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).

- E5.73 In estimating the standard error of the debt premium the Commission will have regard to bonds rated A- that are issued by a supplier of airport services that are neither majority owned by the Crown nor a local authority.<sup>558</sup>
- E5.74 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 p.a. As AIAL is currently the only issuer that meet the criteria, the standard error for estimating the cost of capital for airport services will likely be 0.0015.

### ***Commission's reasons - debt issuance costs***

- E5.75 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

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<sup>558</sup> By Standard and Poors or an equivalent rating by Moody's or Fitch.

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Commission considers that debt issuance costs to re-finance debt capital are a legitimate expense that ought to be compensated.<sup>559</sup> As the IM adopts a notional debt premium a notional allowance is also made for debt issuance costs.

- E5.76 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.
- E5.77 In advice on the Gas Authorisation Dr Lally considered that the allowance for debt issuance cost 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.
- E5.78 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.<sup>560</sup>
- E5.79 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.<sup>561</sup> 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%).<sup>562</sup> 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%).
- E5.80 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;<sup>563</sup>

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<sup>559</sup> 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.

<sup>560</sup> 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.

<sup>561</sup> 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 TSP, report prepared for the Commerce Commission*, 25 June 2009.

<sup>562</sup> 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.

<sup>563</sup> 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.



- Asia Pacific Risk Management (for Unison) did not provide a separate analysis but stated that they agreed with PwC's conclusions; and<sup>564</sup>
  - 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.<sup>565</sup>
- E5.81 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-subscriptions were accepted). These over-subscriptions 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.<sup>566</sup>
- E5.82 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.<sup>567</sup>
- E5.83 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 provides 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. However, the Commission considers this is reasonable as New Zealand entities tend to have smaller debt issues than their overseas counterparts.
- E5.84 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.
- E5.85 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

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<sup>564</sup> 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.

<sup>565</sup> 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.

<sup>566</sup> 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.

<sup>567</sup> The average actual debt issuance costs are likely to have been slightly higher due to the higher amount of debt actually raised.

(1.60%) per annum.<sup>568</sup> The Commission does not consider that this evidence is relevant to Airports. None of these small firms identified by PwC are subject to regulation under Part 4 or have a similar risk profile to Airports. These firms are not comparable to Airports. 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 regulated services should be required to pay the costs of decisions by small firms to remain inefficiently small.

- E5.86 Asia Pacific Risk Management (for Unison) and Bancorp (for Vector), submitted that allowance should also be made for the costs of maintaining committed bank liquidity lines.<sup>569</sup> 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.<sup>570</sup> 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.
- E5.87 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.<sup>571</sup>

<sup>568</sup> 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.

<sup>569</sup> 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.

<sup>570</sup> 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.

<sup>571</sup> 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*

E5.88 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.<sup>572</sup> 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.<sup>573</sup>

E5.89 In contrast, Bancorp (for Vector) submitted that:

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.<sup>574</sup>

E5.90 An Airport may decide to obtain a portion of its funding from offshore, where the cost of such funding is 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*

E5.91 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.

E5.92 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.

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*Businesses Cost of Capital*, Attachment: Bancorp Treasury Services Limited, *Expert Report to Vector Limited*, August 2010, pp. 42-43.

<sup>572</sup> 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.

<sup>573</sup> 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. 2.

<sup>574</sup> 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.

- E5.93 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.
- E5.94 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.

***Will the IM produce commercially realistic estimates of the debt premium and debt issuance costs?***

- E5.95 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.
- E5.96 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 A- rating is the New Zealand A fair value curve. As at 1 September 2010, the Commission estimates the debt premium on a A- rated bond with a five-year remaining term to maturity as 1.75% p.a., while the corresponding Bloomberg fair value 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 1.75% p.a. debt premium for an A- rated bond is appropriate in the Commission's view.
- E5.97 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.
- E5.98 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 were 0.22% p.a. This implies the 0.35% p.a. allowance for debt issuance costs in the IM is appropriate, if not generous in favour of suppliers.

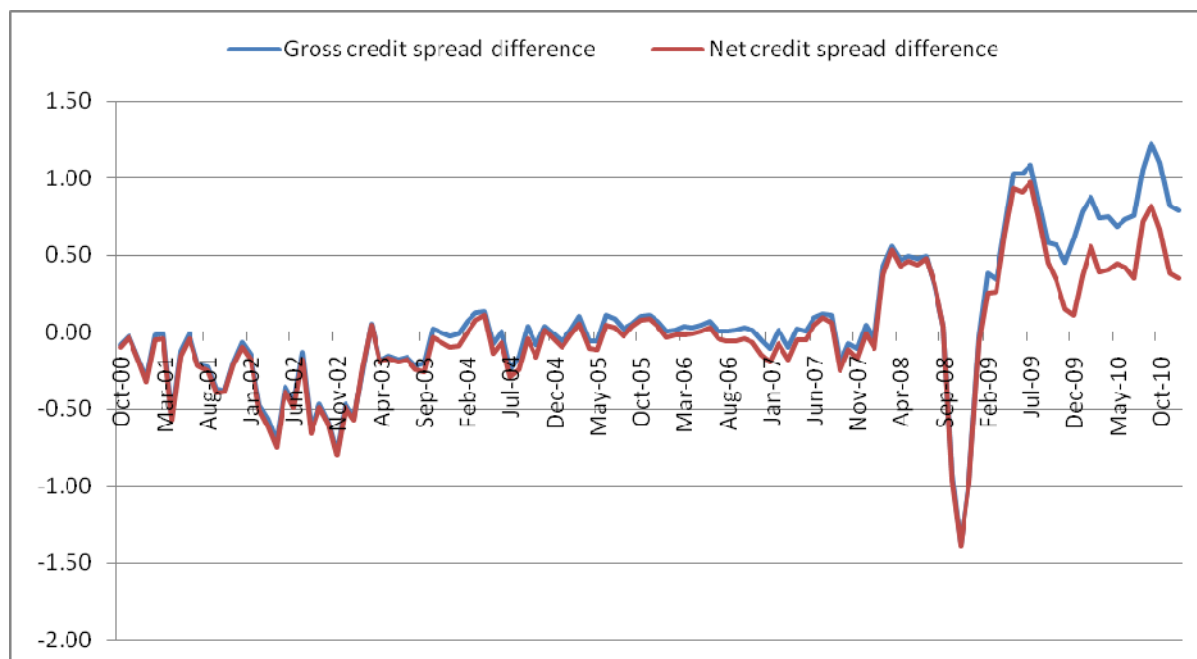
- E5.99 Bancorp (for Vector) submitted an analysis of debt issuance costs and proposed a considerably higher allowance for debt issuance costs.<sup>575</sup> However, Bancorp's analysis makes little reference to the costs actually incurred by Vector with respect to raising its own debt capital. In light of the confidential information received from EDBs, GPBs and Transpower 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.
- E5.100 The IM estimates the debt premium by reference to the yields on New Zealand publicly traded bonds. 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 adjusting for costs; and second by reference to recent transactions involving AIAL. Each is discussed in turn.
- E5.101 Figure E5 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.<sup>576</sup>
- E5.102 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.

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<sup>575</sup> Bancorp (for Vector), *Debt Issuance Cost Analysis*, 16 November 2010.

<sup>576</sup> 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+ (EDBs, GPBs, and Transpower) rating specified under the IM.

**Figure E5 Raising US Debt – Gross and Net Credit Spread Difference**



E5.103 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, and issue costs), and the 0.35% allowance for debt issuance costs specified under the IM.

E5.104 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 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).

E5.105 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.<sup>577</sup> 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

<sup>577</sup> Auckland Airport, *Inaugural USPP Issuance for Auckland Airport*, NZX Market Release, 19 November 2010.

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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 AIAL on its recent US issue is similar to the debt premium that would be estimated under the IM. (For example, based on the yield to maturity of AIAL'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).

E5.106 Based on the forgoing discussion of actual costs of debt incurred by New Zealand regulated suppliers, the Commission concludes 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***

E5.107 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 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.

E5.108 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<sup>578</sup> 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 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 Standard and Poors long-term credit rating, or equivalent rating from Moody's or Fitch, for bonds issued by the regulated service in question.

E5.109 The IM Determinations provide a more detailed description of the approach. For Airports see Part 5, Clause 5.4.<sup>579</sup>

E5.110 To address the small number of bonds with the specified Standard and Poors (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:

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<sup>578</sup> Vanilla bonds are defined as senior unsecured nominal debt obligations denominated in NZ\$ without callable, puttable, conversion, profit participation, credit enhanced or collateral features.

<sup>579</sup> Commerce Commission, *Commerce Act (Specified Airport Services Input Methodologies) Determination*, 22 December 2010.

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- i. those which are not issued by the regulated service in question;
  - ii. those with a Standard and Poors 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.

E5.111 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.

E5.112 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. The methodology for estimating the debt premium for inclusion in the estimated WACC for Airport services is highly similar, and the worked example outlined below is instructive for airports also.

*Estimating the debt premium for EDBs, GPBs and Transpower*

E5.113 For EDBs, GPBs and Transpower the IM specifies that the appropriate Standard and Poors long-term credit rating for setting the debt premium is BBB+. This example estimates the debt premium as at 1 September 2010.

E5.114 The EDBs IM Determination (see Part 2, subpart 4, clause 2.4.4, subclause 3(d)) indicates that the debt premium is the average spread that would be expected to apply to a vanilla NZ\$ denominated bond that:<sup>580</sup>

- 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.

E5.115 Based on data from Bloomberg, Table E4 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.

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<sup>580</sup> There is a difference between the estimation periods of the cost of capital between the various regulatory instruments. For the process for Airport Services see Part 5, clause 5.4 in the Airport IM Determinations. Commerce Commission, *Commerce Act (Specified Airport Services Input Methodologies) Determination*, 22 December 2010.



**Table E4 Bond Issuers and Debt Premiums Under Consideration**

<b>Bond Issuer</b>	<b>S&amp;P long-term Credit Rating</b>	<b>Remaining Term to Maturity (years)</b>	<b>Estimated Debt Premium (% p.a.)</b>
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.

E5.116 Each IM Determination sets out the order in which the Commission will have regard to the debt premium estimates.<sup>581</sup>

E5.117 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.

E5.118 In Table E4 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.

E5.119 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.

E5.120 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.

E5.121 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.

E5.122 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

<sup>581</sup> For Airports see Part 5, clause 5.4 and especially subclauses 4 and 5.

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not considered to meet the criteria of subclause 5(b) as it appears to be anomalous 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. As a result, there are no results considered from subclause 4(b).

E5.123 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.

E5.124 There is one debt premium estimate that meets these criteria, the result from Powerco bonds with a BBB Standard and Poors 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.

E5.125 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.

E5.126 There are two bonds that meet these criteria, the bonds issued by:

- AIAL which has bonds with a A- Standard and Poors long-term credit rating and a five-year debt premium estimate of 1.75% p.a.; and
- Contact which has bonds with a BBB Standard and Poors long-term credit rating and a five-year debt premium estimate of 2.10% p.a.

E5.127 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.<sup>582</sup>

E5.128 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

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<sup>582</sup> Taking a simple average of these three estimates also results in an estimated debt premium of 2.0% p.a.

- ii. issued by an entity that is majority owned by the Crown or a local authority.

E5.129 There are three entities with bonds that meet these criteria. These bonds were issued by:

- Transpower, which has bonds with a Standard and Poors 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 Standard and Poors 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 Standard and Poors long-term credit rating of BBB+ and a five-year debt premium estimate of 1.73% p.a.

E5.130 Clause 2.4.4(5)(a) establishes a hierarchy with progressively lesser regard given 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.

E5.131 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 premium 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

E5.132 Following the EDBs IM Determination Part 2, subpart 4, clause 2.4.4 the Commission estimates a debt premium to apply to EDB, GPB and Transpower as at 1 September 2010 is 2.0% p.a.

## **E6 Term Credit Spread Differential**

E6.1 The cost of capital IM uses a risk-free rate and debt premium estimated over a term that matches the pricing period, generally five years. .

E6.2 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 to enter into interest rate swaps to reduce their initial interest rate re-pricing period from the length of the bond, to a shorter period.

E6.3 The ID Determination recognises the additional debt premium and the interest rate swap execution costs that are incurred from issuing longer term debt, to the extent

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that such debt is issued. This will be achieved through an allowance – the allowance for long-term credit spread.

E6.4 This allowance will not apply to all suppliers. Rather, it will apply 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').

E6.5 The allowance is not part of the WACC, but in the context of information disclosure, it will be reflected in the expenses and ROI disclosed in accordance with the ID Determination.

E6.6 In respect of qualifying debt issues, the allowance represents:

- the additional term credit spread difference over swap on long-term debt versus that on five year debt as at the date of pricing;<sup>583</sup>
- 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.

### ***The term credit spread difference***

E6.7 Like the methodology for estimating the debt premium, the term credit spread difference is estimated based on debt with an assumed Standard and Poors long-term credit rating of 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 use of 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 avoids the need to extrapolate).

E6.8 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.

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<sup>583</sup> By convention, interest rate swaps reference the swap rate rather than the government bond rate.

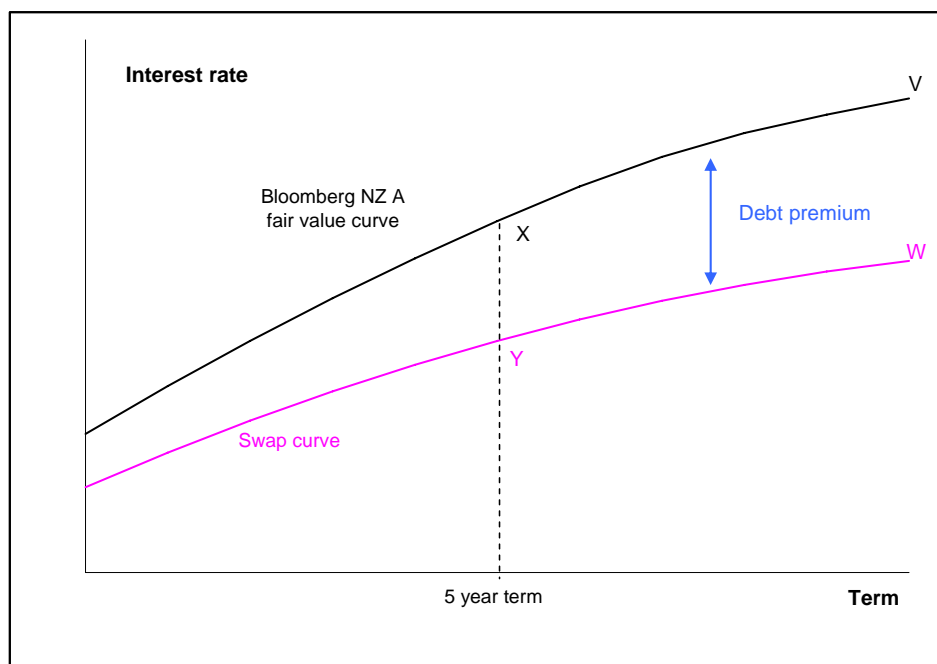
**Table E5 Additional Credit Spread over Swap between Five-year and 10-year Debt**

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, Commission analysis

- E6.9 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.
- E6.10 Bloomberg does not currently offer a New Zealand fair value curve with a Standard and Poors 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 Standard and Poors 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 difference on A-bonds. The ID Determination therefore specifies that the term credit spread difference should be estimated by reference to the Bloomberg NZ A fair value curve.
- E6.11 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 Airport'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 term credit spread difference 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 E6 Illustration of the Term Credit Spread**



- E6.12 It is apparent in the Table E5 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.
- E6.13 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.

***Execution cost of an interest rate swap***

- E6.14 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) on qualifying debt as at the date of pricing.

***Notional debt issue cost readjustment***

- E6.15 There will also be a re-allocation of the annual notional debt issuance costs to reflect the longer tenor of the qualifying debt issue. An allowance for debt issuance costs is 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 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 allowance for long term credit spread, while the 0.35% allowance for issuance costs will be included in the WACC. The notional debt issue cost readjustment will be a negative number.

## E7 TAMRP

### *Approach - TAMRP*

- E7.1 The IM provides that the TAMRP, relative to a five-year risk-free rate, is 7%.
- E7.2 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%.
- E7.3 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%.<sup>584</sup>

### *Commission's reasons - approach to estimating the long-term TAMRP*

#### Overview

- E7.4 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.
- E7.5 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 has been converted to the TAMRP equivalent.<sup>585</sup> In the interest of brevity, the term

<sup>584</sup> 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  $(7.5 \times 1 + 7.0 \times (5 - 1)) \div 5$ ).

<sup>585</sup> 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 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

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‘TAMRP’ is used in the text that follows except where there is specific reference to a MRP value.

E7.6 The TAMRP is not directly observable and therefore needs to be estimated. This is because:

- the TAMRP is an *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).

E7.7 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.

E7.8 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

E7.9 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 to adopt an *ex post* (historic) or *ex ante* (forward-looking) estimate for the cost of capital, or some combination of both;
- whether to 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

E7.10 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 decades), regulators have typically used or placed weight on long-term historical estimates. Dimson, Marsh and Staunton is widely regarded by both

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simplified Brennan-Lally CAPM explicitly assumes that the utilisation rate is 1 and this should extend to the estimate used in the present circumstances.



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- practitioners and regulators as being one of the most authoritative sources of historical estimates.<sup>586</sup>
- E7.11 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<sup>587</sup> and Merton.<sup>588</sup>
- E7.12 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.
- E7.13 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.
- E7.14 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.<sup>589</sup> Thus, prospective MRP estimates based on unadjusted historical averages may be biased upwards.<sup>590</sup>
- E7.15 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.<sup>591</sup> Removing the contribution of these trends from historical MRP averages causes their MRP estimates to fall.
- E7.16 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

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<sup>586</sup> 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 cost of capital (WACC) parameters, May 2009, pp. 191-192.

<sup>587</sup> Siegel, J., The Equity Premium: Stock and Bond Returns since 1802, *Journal of Economic Theory*, Vol. 8, 1992, pp. 28-38.

<sup>588</sup> Merton, R., On Estimating the Expected return on the Market. An Exploratory Investigation, *Journal of Financial Economics*, Vol. 8, 1980, pp. 323-361.

<sup>589</sup> Dimson, E., Marsh, P. and Staunton, M., *Triumph of the Optimists: 101 Years of Global Investment Returns*, Princeton University Press, New Jersey, 2002.

<sup>590</sup> 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.

<sup>591</sup> *ibid.*

of risk faced by investors, and therefore, the premium they expect for bearing such risk.

- E7.17 The results from Dimson, Marsh and Staunton,<sup>592</sup> 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.<sup>593</sup> 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.<sup>594</sup> 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.<sup>595</sup>
- E7.18 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.<sup>596</sup>
- E7.19 In advice on the appropriate TAMRP on the Gas Authorisation, Dr Lally considered results from Credit Suisse First Boston<sup>597</sup> and Boyle<sup>598</sup> who had used the Merton methodology to estimate the MRP.<sup>599</sup> Boyle concluded that the results from his analysis could not be relied on. In advice on the Gas Authorisation Dr Lally noted that:<sup>600</sup>

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.

<sup>592</sup> 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.

<sup>593</sup> 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.

<sup>594</sup> 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.

<sup>595</sup> 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.

<sup>596</sup> For example, MRP estimates are available for the US using data from as far back as the 1800s. These estimates 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.

<sup>597</sup> Credit Suisse First Boston, *Equity Valuation Methodology*, 1998.

<sup>598</sup> Boyle, G., Risk, Expected return, and the cost of equity capital. *New Zealand Economic Papers*, Vol. 39, 2005, pp. 181-194.

<sup>599</sup> 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.

<sup>600</sup> Lally, M., *The weighted average cost of capital for gas pipeline businesses*, 28 October 2008, p. 18.

E7.20 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.

E7.21 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.<sup>601</sup>

#### *Ex ante* approaches

E7.22 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<sup>602</sup> are the DCF model and the results from surveys of academics and practitioners. These approaches have their own drawbacks.

E7.23 There are a number of well known limitations with the DCF model, which were previously noted under the Overall Approach (see Appendix E2). 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.

E7.24 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 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.<sup>603</sup>

#### *Conclusion - ex post versus ex ante approaches for estimating the TAMRP*

E7.25 In light of the above discussion, both *ex post* and *ex ante* approaches are used to estimate the TAMRP for the IM.

E7.26 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

<sup>601</sup> 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.

<sup>602</sup> 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.

<sup>603</sup> Commerce Commission, *Gas Control Inquiry*, Final Report, 29 November 2004, pp. 12-13.

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weight that should be given to each approach.<sup>604</sup> 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.<sup>605</sup> However, CIAL submitted that standard practice is to use only *ex post* results.<sup>606</sup>

E7.27 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.

E7.28 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*

E7.29 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.

E7.30 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.

E7.31 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.

E7.32 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 geometric average was another example of the Commission taking what was a favourable decision from the point of view of suppliers'.<sup>607</sup> 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.<sup>608</sup>

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<sup>604</sup> 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.

<sup>605</sup> 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; 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. 9-10.

<sup>606</sup> Christchurch International Airport Limited, *CIAL Submission on Revised Draft Guidelines*, 3 August 2009, p. 2.

<sup>607</sup> 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.

<sup>608</sup> 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*

E7.33 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.<sup>609</sup> The arithmetic approach is used by most other regulators when estimating the MRP though the UK Competition Commission and the UK CAA use geometric averages. The geometric MRP estimates range from 2.5% to 4.5%,<sup>610</sup> whereas arithmetic estimates are typically between 4% and 5.4%.

*Term of the risk-free rate used in estimating the TAMRP*

E7.34 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).

E7.35 Appendix E4 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.

E7.36 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.

E7.37 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.<sup>611</sup>

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*its Input Methodologies Draft Reasons Paper: report prepared for New Zealand Airports Association, 3 August 2010, p. 12.*

<sup>609</sup> Lally, M., *Comments on Input Methodologies (EDS) Draft Reasons Paper*, 3 September 2010, p. 2.

<sup>610</sup> 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.

<sup>611</sup> 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; 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. 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.

- E7.38 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).<sup>612</sup>
- E7.39 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.<sup>613</sup> However, although PwC uses a term of five years for the risk-free rate in its quarterly cost of capital publication in conjunction with their 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.<sup>614</sup>

*Conclusion - term of the risk-free rate used in estimating the TAMRP*

- E7.40 The Commission has set the term of the risk-free rate in the IM to be 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.
- E7.41 Given that regulatory periods can be from three to five years under Part 4 price-quality regulation, multiple TAMRP estimates may be required.
- E7.42 In previous decisions, the Commission has used an estimate of the TAMRP above the 10 year risk-free rate. The IM continues the approach of estimating only one 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 cost of capital and that it (generally) matches the term of the regulatory period .
- E7.43 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*

- E7.44 In setting the TAMRP estimate, 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.

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<sup>612</sup> 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.

<sup>613</sup> 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.

<sup>614</sup> PricewaterhouseCoopers, *The Cost of Capital Report: As at 30 June 2010*. This report and previous reports can be obtained from the PwC New Zealand web site (<http://www.pwc.com/nz/en/cost-of-capital>).

Previous estimates of the TAMRP used by the Commission

E7.45 The Commission has estimated a TAMRP in a number of previous regulatory decisions. These are summarised in Table E6 below.

**Table E6 Estimates of the TAMRP used by the Commission**

Decision	Year of Decision	TAMRP Estimate
Airports Inquiry <sup>615</sup>	2002	8%
TSO determinations - 2001-2002	2003	8%
TSO determinations - 2002-2003 onwards	2005 - 2008	7%
Gas Control Inquiry <sup>616</sup>	2004	7%
Unison Post-breach Inquiry <sup>617</sup>	2007	7%
Gas Authorisation <sup>618</sup>	2008	7%

E7.46 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%.

E7.47 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.<sup>619</sup> No single approach to estimating the TAMRP was considered by the Commission to be necessarily better than any other approach. Having considered submissions and advice from Dr Lally, the Commission's view was to adopt a TAMRP of 8%, within the range of 7% to 9%, in recognition of the uncertainty surrounding the estimate.

E7.48 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 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, the *ex ante* approach of Cornell; and survey evidence, based on information from both New Zealand and foreign markets.<sup>620</sup> On this basis Dr Lally recommended an estimate of 7% for the TAMRP. Table E7 displays the results from Dr Lally's advice.

<sup>615</sup> Commerce Commission, *Part IV Inquiry into Airfield Activities at Auckland, Wellington and Christchurch International Airports*, Final report, 2002.

<sup>616</sup> Commerce Commission, *Gas Control Inquiry*, Final Report, 29 November 2004.

<sup>617</sup> Commerce Commission, *Regulation of Electricity Lines Businesses - Targeted Control Regime - Reasons for Not Declaring Control - Unison Networks Limited*, 11 May 2007, pp. 38-39.

<sup>618</sup> Commerce Commission, *Gas Authorisation Decisions Paper*, 30 October 2008.

<sup>619</sup> Lally, M., *The cost of capital for the airfield activities of New Zealand's international airports*, November 2001 (Lally, WACC for Airports).

<sup>620</sup> For a more detailed analysis see Lally, M., *The weighted average cost of capital for gas pipeline businesses*, 28 October 2008, pp. 16-38.

**Table E7 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%

E7.49 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*

E7.50 The TAMRP estimates displayed in Table E7 are based on a term for the risk-free rate of 10 years. As outlined above, in the context of regulation under Part 4, the term for the risk-free rate is five years. Table E8 displays the result for the TAMRP estimates based on advice provided to the Commission by Dr Lally in 2008<sup>621</sup> updated for a five year term for the risk-free rate.

**Table E8 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.				

E7.51 The results in the above table for the Ibbotson and Siegel-type estimates are unchanged as Dr Lally did not convert these estimates into an estimate relative to a five year term for the risk-free rate.

E7.52 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.

<sup>621</sup> Lally, M., *The weighted average cost of capital for gas pipeline businesses*, 28 October 2008, pp. 24-25.



- E7.53 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.
- E7.54 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. The TAMRP estimated using the five-year risk-free rate is therefore 0.22% lower than that estimated using the 10 year risk-free rate.
- E7.55 This suggests that Ibbotson and Siegel-type estimates of the TAMRP for the US would be higher.
- E7.56 To ensure consistency between the TAMRP and the term of the risk-free rate, Table E8 is restated in Table E9 to reflect a risk-free rate term of five-years for the New Zealand and US Ibbotson estimates.

**Table E9 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.				

- E7.57 This results in the average TAMRP for New Zealand of 6.86% and an average TAMRP from all estimates of 7.14%.<sup>622</sup>
- E7.58 In its submission on the EDB Draft Reasons Paper and using data from 1931 to 2010, PwC (for ENA) and PwC (for Telecom) estimates the adjustment to the 10

<sup>622</sup> 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 is obtained from Bloomberg and is the average for the month of December 2007.

Conversion of US Ibbotson estimate to five-years

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%

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- year TAMRP to convert to a five-year TAMRP is 0.04% and using data from 1962 to 2010 estimates the US difference at 0.08%.<sup>623</sup> Updating the Ibbotson estimates for New Zealand and the US resulted in a mean TAMRP of 7.11%.
- E7.59 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%.<sup>624</sup>
- E7.60 However, the results from the PwC analysis concerning the period for the adjustments are neither consistent with the data in Table E8 nor Table E9. These tables provide evidence based on Dr Lally's 2008 advice in 2008, rather than in 2010.
- E7.61 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 measurement. Accordingly, the appropriate rounded value for the expected TAMRP remains at 7%.<sup>625</sup>
- E7.62 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%. PwC's submission to the Commission to alter the TAMRP by 0.1% is therefore at odds with their own approach.<sup>626</sup>
- E7.63 In light of 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.

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<sup>623</sup> 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.

<sup>624</sup> 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.

<sup>625</sup> Lally, M., *Comments on Input Methodologies (EDS) Draft Reasons Paper*, 3 September 2010, p. 4.

<sup>626</sup> PricewaterhouseCoopers, *New Zealand Equity Market Risk Premium*, September 2002, p. 10.

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*Expert Panel's view – TAMRP estimate*

E7.64 The Expert Panel's recommendation on the TAMRP was that the Commission's estimate of 7% (for the simplified Brennan-Lally CAPM) was reasonable.<sup>627</sup>

*Views of submitters – TAMRP estimate*

E7.65 In submissions on the Revised Draft Guidelines and draft IMs, Air NZ, BARNZ and MEUG, agreed that the Commission's estimate of 7% for the TAMRP was appropriate.<sup>628</sup> Transpower submitted that the TAMRP should be 7% in normal conditions.<sup>629</sup>

E7.66 Suppliers of regulated services disagreed with the Commission's use of 7% as the estimate of the TAMRP and stated that the Commission's estimate was too low.<sup>630</sup>

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<sup>627</sup> 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.

<sup>628</sup> 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.

<sup>629</sup> Transpower New Zealand Ltd., *Submission on Transpower (Input Methodologies) Draft Reasons Paper, Cost of Capital Decisions*, August 2010, p. 11.

<sup>630</sup> 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, *Submission 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 Paper*, 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; 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. 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; 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; PricewaterhouseCoopers, *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; PricewaterhouseCoopers, *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

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Some of these submitters contended that the TAMRP proposed by the 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.

- E7.67 Officer and Bishop (for Transpower), using historical data estimated an MRP for New Zealand under normal conditions in the range of 6%-8%.<sup>631</sup> However, Officer and Bishop considered that the MRP is not constant and properly cannot be adequately represented by a stable distribution.
- E7.68 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.
- E7.69 In its submission on the EDB Draft Reasons Paper PwC (for ENA) and PwC (for Telecom) submits that some of the estimates were outdated<sup>632</sup> and TAMRP estimates of the Siegel and Cornell type should be excluded on the grounds of being ad hoc and outdated respectively.<sup>633</sup>

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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.

<sup>631</sup> 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.

<sup>632</sup> 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.

<sup>633</sup> 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*

- E7.70 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 while PwC updates the US survey-based estimates it has not made use of the most up to date version of the surveys referenced. In addition, PwC also does not update 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%.<sup>634</sup>
- E7.71 A number of advisors at the Cost of Capital Workshop favoured a TAMRP of 7.5%. Those advisors appear to rely on research undertaken by PwC on the New Zealand TAMRP. 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.<sup>635</sup> This implies PwC's TAMRP estimate of 7.5% would be lower if estimated against a five-year risk-free rate.
- E7.72 The Commission understands that PwC's research in support of its 7.5% estimate of the TAMRP was last publicly updated in 2002,<sup>636</sup> and therefore 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).
- E7.73 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. That is, if PwC's unrounded estimate of the TAMRP 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%.

#### Updating the TAMRP for 2010

- E7.74 Table E10 summarises what advisors indicated at the Cost of Capital Workshop was their current advice on the TAMRP to clients (November 2009).

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*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.*

<sup>634</sup> Lally, M., *Comments on Input Methodologies (EDS) Draft Reasons Paper*, 3 September 2010, pp. 4-7.

<sup>635</sup> Commerce Commission, *Cost of Capital Workshop Transcript*, pp. 89 and 177-178.

<sup>636</sup> PricewaterhouseCoopers, *New Zealand Equity Market Risk Premium*, September 2002.

**Table E10 Summary of Workshop Advisors' Current TAMRP Advice to Clients**

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%

E7.75 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 who are major 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 E11 below.

**Table E11 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)

E7.76 The Commission has updated the analysis undertaken in the Gas Authorisation where possible, and in particular it has updated the Ibbotson estimate and survey evidence reported in Table E9 (i.e. 2010 Ibbotson estimates from Dimson, Marsh and Staunton and new survey evidence from the US<sup>637</sup>).

<sup>637</sup> The analysis includes 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

- E7.77 The Commission estimates 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%.<sup>638</sup> This continues to suggest that Ibbotson and Siegel-type estimates of the TAMRP for New Zealand would be very similar assuming either a five year or 10 year term for the risk-free rate.
- E7.78 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 estimates this adjustment to be 0.08%.<sup>639</sup> This suggests that Ibbotson and Siegel-type estimates of the TAMRP for the US would be higher.
- E7.79 Table E12 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%.

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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.

<sup>638</sup> 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.

<sup>639</sup> 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 E12 Estimates of the TAMRP - Assuming a 5-Year Term (where possible) of the Risk-free Rate for 2010**

Methodology	NZ	US	Other	All
Ibbotson <sup>640</sup> *	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.				

E7.80 As a reasonableness check on the results from Table E12, 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%.<sup>641</sup>

Overseas regulators current estimates of the MRP

E7.81 Table E13 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.

<sup>640</sup> 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%). The Dimson et al estimate for the US MRP of 6.0% is adjusted by 0.24 to reflect a five year MRP (Commission 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%

<sup>641</sup> 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 E13 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%

E7.82 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

E7.83 The Commission considers that Dr Lally’s estimate of 7% for the expected TAMRP derived in the context of the Gas Authorisation in 2008 is 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 advised that a TAMRP estimate of 7% is reasonable in the New Zealand context.

E7.84 In deriving and updating the 2008 estimate the Commission considers there is no evidence to support changing the TAMRP estimate of 7%.

E7.85 For these reasons, the IM specifies a TAMRP relative to five-year risk-free rate of 7%. However, it is possible that the GFC has, 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

E7.86 Submitters sought an increase in the TAMRP due to the GFC. A number of submitters on the Revised Draft Guidelines 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%.<sup>642</sup> As support for this increase, submitters

<sup>642</sup> 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 Commerce Commission’s proposed approach to estimating the cost of capital*, Report prepared for the NZAA, 31 July

referenced the AER's increase in the MRP estimate from 6% to 6.5% as a consequence of the GFC.<sup>643</sup>

- E7.87 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 suggested that the Commission should not conclude prematurely that markets have returned to their long-term historical averages.<sup>644</sup>
- E7.88 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 TAMRP that it had previously used when advising clients.
- E7.89 Table E14 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.

**Table E14 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

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; PricewaterhouseCoopers, *Revised Draft Guidelines - Submission to Commerce Commission, Report on behalf of Powerco*, August 2009, pp. 14-17; 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. 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.

<sup>643</sup> 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.

<sup>644</sup> Commerce Commission, *Cost of Capital Workshop Transcript*, pp. 88-96.

Organisation	TAMRP Recommendation	Was TAMRP adjusted due to the GFC?
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

E7.90 In post-workshop submissions, suppliers suggested that there was persuasive evidence for a higher TAMRP due to the GFC.<sup>645</sup> These suggestions are displayed in Table E15.

**Table E15 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%)

E7.91 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.<sup>646</sup>

<sup>645</sup> 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.

<sup>646</sup> 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 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*,

- E7.92 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%.<sup>647</sup>
- E7.93 The Commission considers that Officer and Bishop's measure provide 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.<sup>648</sup>

#### Expert Panel's view - Impact of the GFC

- E7.94 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.<sup>649</sup>
- E7.95 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.
- E7.96 The Expert Panel prepared a report for the Commission addressing this issue.<sup>650</sup> 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 backward-looking versus forward-looking estimation techniques in light of the GFC.
- E7.97 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

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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.

<sup>647</sup> 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.

<sup>648</sup> AER, *Final decision: Electricity transmission and distribution network service providers – Review of the weighted average cost of capital (WACC) parameters*, May 2009, pp. 233-234.

<sup>649</sup> Commerce Commission, *Cost of Capital Workshop Transcript*, p. 95.

<sup>650</sup> 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.

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- a result of the GFC.<sup>651</sup> They also agreed that forward-looking models are problematic to apply.
- E7.98 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.
- E7.99 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.
- E7.100 Professor Myers commented that since the height of the recent GFC approximately one year before (at the time of his advice), financial market volatility has decreased markedly and asset prices have recovered. However, Professor Myers considered that investors still faced substantial macro economic uncertainties. Professor Myers considered that the MRP remains above its long-term historical average.
- E7.101 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%).<sup>652</sup> 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 Dr Lally's estimate of the upper bound, the recommendation of Professor Myers yields a proposed MRP of between 5% and 5.7%, which implied a range for the TAMRP of 6.8% to 7.5%.
- E7.102 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 adjustment. Professor Franks did not provide a timeframe for the temporary increase.
- E7.103 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 historical level. Dr Lally noted that quantitative models (for example as proposed by Merton<sup>653</sup>) could potentially be used for this purpose.

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<sup>651</sup> 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.

<sup>652</sup> 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.

<sup>653</sup> 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.

However, there would be serious questions around the reliability of any such model and its parameter values.

E7.104 The alternative is to use judgement, but Dr Lally is wary about doing so because of the inevitable lack of transparency in such a process. Dr Lally also noted that making 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 is temporarily understated (through not temporarily raising the estimate) would tend to be offset by periods in which the TAMRP is 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

E7.105 UK and Australia. regulators have also considered the impact of the GFC on the cost of capital. In each of these decisions consideration has been given as to whether the MRP should be adjusted in light of the effect of the GFC. Table E16 summarises the MRP outcomes in recent decisions taking into account the GFC.

**Table E16 MRP for Regulators in the UK and Australia**

Regulator	MRP: Previous Views (Pre GFC)	MRP: Recent Views (Post GFC)	TAMRP equivalent (Post GFC)
Ofgem <sup>654</sup>	4-5%	No range quoted, but figure appears the same	5.8-6.8%
Competition Commission/CAA	2.5-4.5% Heathrow/Gatwick Airport <sup>655</sup>	3-5% Stansted Airport <sup>656</sup>	4.8-6.8%
Ofcom <sup>657</sup>	4-5%, 4.5% used	4-5%, 5% used	6.8%
Ofwat <sup>658</sup>	4-5%	5.4%	7.2%
AER <sup>659</sup>	6%	6.5%	6.9%
ACCC (Rail) and QCA <sup>660</sup>	6%	6%	6.4%
IPART (NSW) <sup>661</sup>	5.5-6.5%	6% (Preliminary view)	5.9-6.9%

<sup>654</sup> Ofgem, *Electricity Price Control Review Final Proposal*, 7 December 2009, pp. 52-53.

<sup>655</sup> 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.

<sup>656</sup> 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.

<sup>657</sup> 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.

<sup>658</sup> Ofwat, *Future Water and Sewerage Charges 2010-2015 – Final Determination*, April 2009, pp. 128-129.

<sup>659</sup> AER, *Final decision: Electricity transmission and distribution network service providers – Review of the weighted average cost of capital (WACC) parameters*, May 2009, pp. 46-47.

<sup>660</sup> 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.

<sup>661</sup> 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.

E7.106 The regulators in Australia and the UK appear to have used 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%;<sup>662</sup>
- 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 is above its 2005 point estimate of 4.5%;<sup>663</sup>
- Ofwat (April 2009) used a figure of 5.4%, which is 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 it had used;<sup>664</sup>
- 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;<sup>665</sup>
- 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.<sup>666</sup>
- 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

<sup>662</sup> Ofgem, *Electricity Price Control Review Final Proposal*, 7 December 2009, pp. 52-53.

<sup>663</sup> Ofcom, *A New Pricing Framework for Openreach – Annexes*, 22 May 2009, pp. 161-162.

<sup>664</sup> Ofwat, *Future Water and Sewerage Charges 2010-2015 – Final Determination*, April 2009, pp. 128-129.

<sup>665</sup> AER, *Final decision: Electricity transmission and distribution network service providers – Review of the weighted average cost of capital (WACC) parameters*, May 2009, pp. 46-47.

<sup>666</sup> AER, *Final decision Victorian electricity distribution network service providers Distribution determination 2011-2015*, October 2010, pp. 484 and 489.

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%.<sup>667</sup>

- 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;<sup>668</sup>
- 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 does 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 is 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 regulatory certainty;<sup>669</sup>
- 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 is inherently subjective, in terms of both the scale of the adjustment that is required and the period of the adjustment over which the adjustment is made. The QCA 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.<sup>670</sup>

E7.107 Table E16 shows that some regulators increased their MRP estimates as a result of the GFC. However, when calculating the equivalent TAMRP corresponding to the post GFC MRPs set by overseas regulators, in all but one instance these estimates would have been below the 7% estimate suggested by the Commission as being appropriate in the RDG and the IM Discussion Paper. Further, in 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.

E7.108 Despite the increase in the estimated MRP to take into account the GFC by regulators, it appears in most instances the overall cost of capital has either remained unchanged or decreased between regulatory decisions. This has been due to

<sup>667</sup> ACCC, *Australian Rail Track Corporation Limited – Hunter Valley Coal Network Access Undertaking – Draft Decision*, 5 March 2010, pp. 565-570.

<sup>668</sup> 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.

<sup>669</sup> IPART, *IPART's Cost of Capital after the AER's WACC Review – Lessons from the GFC*, November 2009, pp. 39-40.

<sup>670</sup> QCA, *Draft Decision – QR Network 2009 Draft Access Undertaking*, December 2009, pp. 13-15.



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reductions in other parameters, such as the estimated risk-free rate, and in the case of the AER, the estimated equity beta.

E7.109 Finally, 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. (For more on the range of the cost of capital, see Appendix E11).

#### Options for the Commission in dealing with the TAMRP for the GFC

E7.110 In light of submissions, the Expert Panel advice and the approach taken by other regulators in response to the GFC, the Commission considered the following two options:

- keep the TAMRP at 7.0%, as recommended by Dr Lally;
- raise the TAMRP temporarily to (i.e. for a fixed duration), as recommended by both Professor Myers and Professor Franks.

E7.111 The IM provides for a temporary adjustment to 7.5%.

E7.112 Despite the GFC there are strong arguments for maintaining a long-term TAMRP estimate at 7% (see evidence in Table E14 post GFC). That is, while other regulators 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, a number of more recent decisions have reverted to historical per-GFC estimates of the MRP. 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.

E7.113 However, that there are good arguments for temporarily increasing the TAMRP to 7.5% in response to the GFC. Whilst there was no 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.

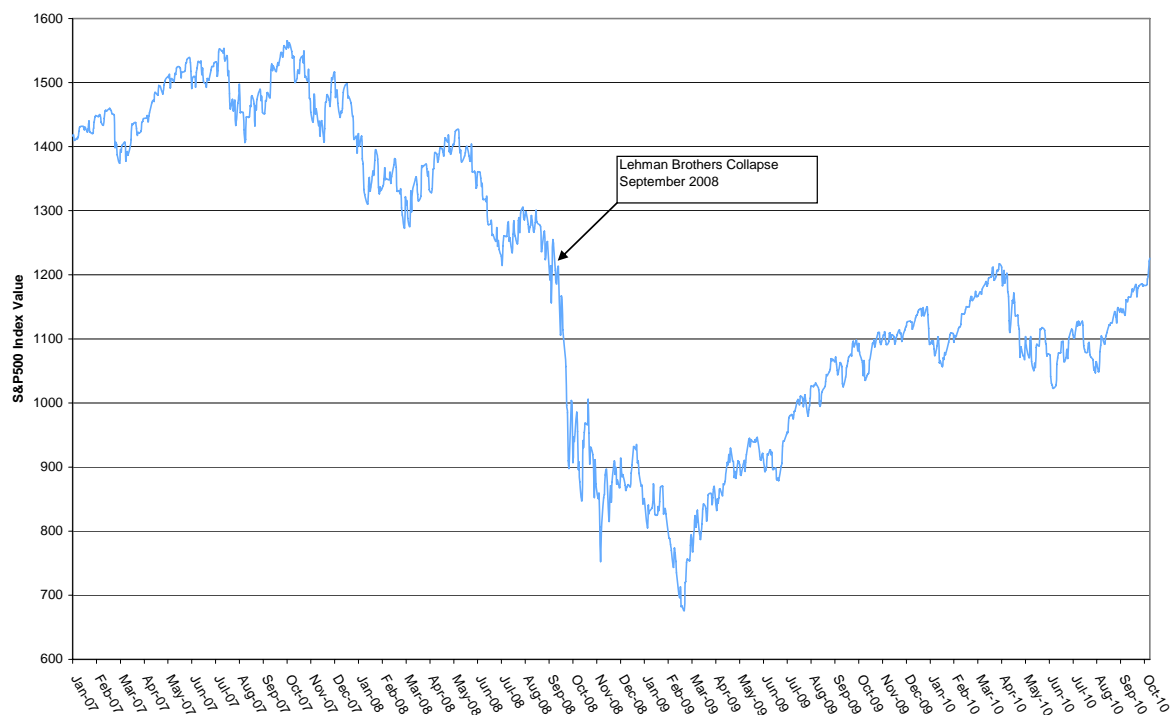
E7.114 Crises eventually pass but the timing of the return to normalcy is uncertain. When estimating the TAMRP for a regulatory period, the Commission needs to reflect its best estimate of the average conditions over the complete disclosure/regulatory period.

E7.115 Taking into account the original shock and the subsequent partial recovery of the markets, in the context of the regulatory period over which the TAMRP will apply, 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.

E7.116 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 Figure E7 below.

**Figure E7 Value of the S & P 500 January 2007 to October 2010**



Source: Yahoo Finance <http://finance.yahoo.com/>

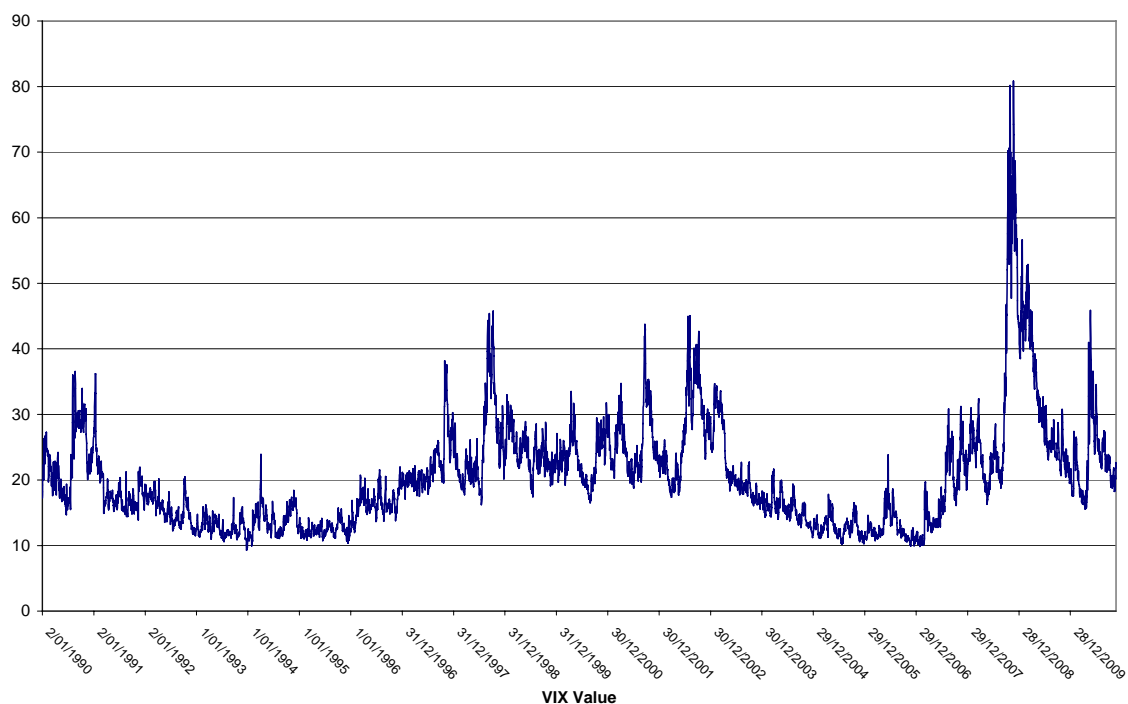
E7.117 Whilst the events in the debt capital markets commencing in July 2007 and the events surrounding Bear Stern in March 2008 had some (relatively short lived) effect on the equity capital markets, it is the events surrounding Lehman Brothers in September 2008 (leading to Lehman Brothers filing for bankruptcy on 15 September 2008) which triggered the massive fall in the equity capital markets.

E7.118 From the low point reached in March 2009, the S&P 500 equity index has since recovered almost to the level that it was at immediately prior to Lehman Brothers filing for bankruptcy. In light of the above events, the GFC effect on the equity markets essentially began on the date when Lehman Brothers filed for bankruptcy. The market has also recovered quickly from other subsequent shocks such as the default by Greece, with no apparent lasting effect.

E7.119 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 E8.<sup>671</sup>

<sup>671</sup> 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.

**Figure E8 Volatility of the S&P500 Index (VIX)**



Source: Yahoo Finance <http://finance.yahoo.com/>

E7.120 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, insofar as they affect the TAMRP, are now behind us. Therefore, consistent with the Commission erring on the side of caution, 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 point in time. 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. On this, 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 its average longer-term 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 (specifically the ACCC);

- annual surveys of the level of MRP among companies and analysts who use in their CAPM models exhibit a decline since GFC;<sup>672</sup> 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

E7.121 The long-term TAMRP is set at 7%. However, due to the effect that the GFC has had on the equity markets, 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%.

E7.122 The TAMRP is expressed as a composite rate over a five-year period. Further, the higher TAMRP only applies if the regulatory period covers 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 is 7.1% (estimated by  $(7.5 \times 1 + 7.0 \times (5 - 1)) \div 5$ ).

E7.123 Following this approach in the context of information disclosure in 2010 - 2011 the five-year TAMRP is 7.1%, and in 2011-2012 would be 7%.

### ***Approach - Standard Error of the TAMRP***

E7.124 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

E7.125 To estimate the TAMRP and its standard deviation<sup>673</sup> in the Gas Control Inquiry, Electricity Distribution – Control of Unison and the Gas Authorisation, Dr Lally reviewed *ex post* approaches,<sup>674</sup> *ex ante* approaches,<sup>675</sup> and survey evidence from both New Zealand and foreign markets.<sup>676</sup>

E7.126 Dr Lally, in Appendix 2 of the Gas Authorisation, demonstrates the process to estimate the standard deviation of the TAMRP estimate.<sup>677</sup> As with the TAMRP

<sup>672</sup> 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 had reduced their MRP estimates in 2010 when compared to their estimates in 2009, than those that had increased their estimates (at pp.3-4, and 6-7).

<sup>673</sup> The Commission notes that the estimates of the standard deviations referred to by Dr Lally are standard errors.

<sup>674</sup> *Ex post* estimation techniques evaluated were Morningstar (Ibbotson) and Siegel types, the constant reward to risk methodology of Merton.

<sup>675</sup> *Ex ante* approaches were Cornell, and survey evidence.

<sup>676</sup> 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.

<sup>677</sup> Lally, M., *The weighted average cost of capital for gas pipeline businesses*, 28 October 2008, Appendix 2, pp. 166-169.

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estimate, Dr Lally has concerns with the reliability of the standard deviation estimate from the Merton methodology and therefore does 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.

E7.127 From this information Dr Lally estimates a standard deviation of 1.5% for the estimated TAMRP.<sup>678</sup> As this estimate is relatively recent the Commission adopts that estimate as the standard error of the TAMRP in the IM.

E7.128 Research by Fernandez and del Campo provides an estimate of standard deviation of the MRP in a survey of analysts and companies. For US analysts, the standard deviation of the MRP is 1.1%. For US companies, the standard deviation of the MRP is 1.8%.<sup>679</sup> This supports the reasonableness of the 1.5% estimate of the standard error specified in the IM.

#### Views of submitters – standard error of the TAMRP

E7.129 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 provides his own estimate of 3.1% for the standard deviation of the TAMRP.<sup>680</sup>

E7.130 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.<sup>681</sup>

#### ***Conclusion – standard error of the TAMRP***

E7.131 The standard error of the TAMRP is 1.5%.

## **E8 Asset and Equity Betas**

### ***Decision - asset and equity betas***

E8.1 The IM specifies an asset beta for Airports of 0.60. Combining this estimate with a notional leverage of 17% equates to an equity beta for Airports of 0.72.

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<sup>678</sup> 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.

<sup>679</sup> 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).

<sup>680</sup> 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.

<sup>681</sup> Lally, M., *Comments on Measurement Error and Regulated Firms' Allowed Rates of Return*, 13 September 2010, pp. 2-11.

E8.2 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 equity beta estimates are drawn;
- makes no adjustment for regulatory differences to Airports' asset beta estimates, although these have been derived using some overseas comparators;
- makes no adjustments of a Blume or Vasicek type;
- performs a sense check of the resulting asset beta estimate against other estimates of Airports' asset betas; and
- determines the standard error for Airports' asset beta is 0.16.

*Commission's reasons - asset and equity betas*

E8.3 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.

E8.4 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 multipart company - the supplier of regulated services.

E8.5 Moreover, even when traded returns are available, firm-specific beta estimates are often statistically imprecise. To help overcome these problems, the Commission estimates a regulated service wide equity beta using individual beta estimates of a portfolio of comparable businesses.

E8.6 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*

E8.7 In the Expert Panel report Professor Myers and Dr Lally recommended that service-specific<sup>682</sup> betas should be estimated, i.e. separate betas for Airports, EDBs, GPBs and Transpower. Dr Lally was doubtful whether reliable adjustments could be made

<sup>682</sup> 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.

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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.<sup>683</sup>

#### *Submitters' views*

E8.8 In submissions on the RDG and IM Discussion Paper all submitters associated with the Airports sector disagreed with an Airport service-wide cost of capital.<sup>684</sup> They argued that there are differences in each Airport. These differences relate to risk profiles, customer base, pricing structures and leverage.<sup>685</sup>

#### *Commission decision*

E8.9 The Commission agrees that as the equity beta measures an asset's or a security's sensitivity to market risk and airport services may face different levels of systematic risk, different equity betas could apply, in principle, to different airports.

E8.10 However, the Commission notes that estimating asset betas for an industry (or specific service) is inherently imprecise and involves a significant degree of judgement. Estimating supplier-specific equity betas would require an even greater degree of judgement than estimating service-specific equity betas.

E8.11 Two of the three airports, subject to regulation under Part 4, are not listed and there is no reliable information available to the Commission to enable it to estimate supplier-specific beta estimates.

E8.12 The Commission notes too that no submission attempted to estimate supplier-specific betas.

E8.13 In the context of information disclosure for Airports, the Commission considers a service or Airport-specific asset/equity beta to be more appropriate as making supplier-specific estimates is not practical or necessary, and would require even greater judgement than making service-specific estimates.

#### Commission's approach to estimating equity betas

E8.14 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 may include:
  - New Zealand firms from the service in question;
  - New Zealand firms from industries with a similar risk profile;

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<sup>683</sup> 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.

<sup>684</sup> Air New Zealand Limited, *Submission on the Input Methodologies Discussion Paper*, 31 July 2009, p. 69; NZ Airports Association, *Submission on the Input Methodologies Discussion Paper*, 31 July 2009, p. 79; Auckland International Airport Limited, *Submission on the Input Methodologies Discussion Paper*, 7 August 2009, p. 74; Wellington International Airport Limited, *Submission on the Input Methodologies Discussion Paper*, 7 August 2009, p. 58; Board of Airline Representatives New Zealand Incorporated, *Submission on the Input Methodologies Discussion Paper*, 31 July 2009, p. 58.

<sup>685</sup> Commerce Commission, *Cost of Capital Workshop Transcript*, p. 41 and p. 43; New Zealand Institute of Economic Research, *Cost of Capital – Report for Post-Workshop Submission*, Report to BARNZ, 28 November 2009, p. 8; 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, pp. 17-18.

- overseas firms from the service; and
- 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.

Asset betas – draft reasons

E8.15 In the Airports Draft Reasons Paper the Commission followed the six step process outlined above.<sup>686</sup> This resulted in 10 comparator airport companies identified (as shown in) and analysed over one five-year period using monthly frequency data. This analysis estimated an asset beta of 0.65 as the average asset beta for these Airports

E8.16 Combining this estimate with the notional leverage of 40% equated to an equity beta for Airports of 1.08.

**Table E17 Comparative Airports from Drafts Reasons Paper**

Country	Name
France	Aeroports de Paris
Thailand	Airports of Thailand
New Zealand	Auckland International Airport
Germany	Fraport
Austria	Flughafen Wien
Switzerland	Flughafen Zuerich
Mexico	Grupo Aeroportuario del Centro Norte
Mexico	Grupo Aeroportuario del Pacifico
Mexico	Grupo Aeroportuario del Sureste
Australia	Macquarie Airports

*Standard error of the asset beta*

E8.17 In the Airports Draft Reasons Paper the Commission estimated the standard error for the asset beta. This estimate used the Lally (2008) methodology, and using the comparative companies sample the Commission estimated a standard error of 0.04 for Airports asset beta.

<sup>686</sup> See Commerce Commission, *Input Methodologies Airport Services, Draft Reasons Paper*, paragraphs 6.9.1-6.9.64.



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Submitters views on the Commission's approach to estimating the asset beta.

E8.18 The Commission received a number of submissions discussing the Commission's approach and results for the asset beta in the Airports Draft Reasons Papers. These are summarised below.

*Submitters views on comparative sample selection (Step 1)*

E8.19 NZIER (for BARNZ) considered that the Commission should not use comparator airports from countries where there is low gross domestic product (GDP) per capita (namely Thailand and Mexico). NZIER argued that such countries are more sensitive to macroeconomic risk factors. NZIER and BARNZ considered that using comparative companies from these countries would overstate the unadjusted systematic risk faced by New Zealand Airports.<sup>687</sup>

E8.20 In a cross submission, PwC (for NZAA) considered the evidence provided by NZIER for the exclusion of Mexican airports was indirect and inadequate. PwC considered that NZIER's analysis provided no direct, reliable evidence that Mexican airport betas were inappropriate comparators for New Zealand airports.<sup>688</sup>

*Submitters views on estimating the asset beta (Steps 2-4)*

E8.21 In submissions on the Draft Reasons Papers a number of the submitters highlighted that when estimating betas there are a number of issues to be aware of. These issues included: the choice of the market index; size of the comparable firms; thin trading; estimation period which may include market stress events or outliers (i.e. tech bubble); day of the week or month the estimation is taken on; and estimation period.<sup>689</sup>

E8.22 In submissions of the Airports Draft Reason paper, CIAL and Uniservices (for NZAA) welcomed the focus on empirical evidence on asset betas for Airports and that the recognition that the cost of capital may vary materially across regulated sectors.<sup>690</sup>

E8.23 Suppliers of airport services considered that the Commission's estimate of the asset beta (0.65) was appropriate.<sup>691</sup>

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<sup>687</sup> Board of Airline Representatives New Zealand Inc, *Submission on Commerce Commission Information Disclosure (Airport Services) Draft Reasons Paper and Draft Determination*, Attachment: NZIER, *Asset Beta for New Zealand's International Airports - Comments on the Commerce Commission's Airport Draft Reasons Paper - Report to BARNZ*, 11 July 2010, pp. 8-11 ; 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.

<sup>688</sup> 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, pp. 12-13.

<sup>689</sup> 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. 47-48.

<sup>690</sup> 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 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. 35-36.

<sup>691</sup> 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 Association, *Submission on Draft Information Disclosure Determination and Draft Reasons Paper*, Attachment: Uniservices, *Comments on the*

- E8.24 Air NZ and BARNZ were concerned about the asset beta estimate provided by the Commission considering it was too high, and that therefore it would overstate the cost of capital for airport services.<sup>692</sup>
- E8.25 Air NZ submitted two expert reports, from Europe Economics and SFG, which evaluated the Commission's estimation of the airports asset beta.<sup>693</sup>
- E8.26 Europe Economics (for Air NZ) mirrored the Commission's analysis and concluded that the asset beta would be more likely be around 0.66 but recommended 0.60 was more reflective of the asset beta used by other regulators.
- E8.27 SFG (for Air NZ) increased the size of the comparator sample (from that used by the Commission in the Draft Reasons Paper). Using the same approach as outlined by the Commission SFG concluded that the Commission's estimate of beta was overstated and that a more appropriate asset beta value was in the order of 0.50.
- E8.28 In its cross-submission NZZA supplied an expert report from PwC which critiqued Air NZ's expert reports on the asset beta.<sup>694</sup>
- E8.29 PwC found two technical errors in the SFG analysis, a gearing measurement that was not consistent with the Commission's approach and anomalies in a number of SFG's beta estimates. PwC considered that remedying these errors alone would raise the asset beta estimate using SFG's preferred method and Air NZ's preferred sample from approximately 0.50 to approximately 0.70. PwC also disagreed with SFG's estimation of equity betas using a very long period of observations and using its preferred set of comparable entities, generated an asset beta estimate of approximately 0.70 (this was also comparable to the asset betas derived by the Commission and Europe Economics). The Commission identified similar technical issues with the NZIER and SFG expert reports on the asset beta analysis.

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*Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper - Report for NZAA, 12 July 2010, pp. 35-36; 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.*

<sup>692</sup> Air New Zealand Limited, *Submission to the Commerce Commission on the Input Methodologies Airport Services Draft Reasons Paper*, 12 July 2010, pp. 45-46; Board of Airline Representatives New Zealand Inc, *Submission on Commerce Commission Input Methodologies (Airport Services) Draft Reasons Paper and Draft Determination*, 12 July 2010, pp. 10 and 17.

<sup>693</sup> Air New Zealand Limited, *Submission to the Commerce Commission on the Input Methodologies Airport Services Draft Reasons Paper*, Attachment: Europe Economics, *Report for Air New Zealand - Critique of Commerce Commission's asset beta analysis*, 9 July 2010; Air New Zealand Limited, *Submission to the Commerce Commission on the Input Methodologies Airport Services Draft Reasons Paper*, Attachment: Strategic Finance Group, *Airport beta estimates - Report prepared for Air New Zealand*, 11 July 2010.

<sup>694</sup> 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.

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*The GFC and the asset beta*

- E8.30 In consultation on the cost of capital for IM some submissions recommended the Commission should adjust its asset beta estimate in light of the impact of the GFC.
- E8.31 In the context of airports, BARNZ obtained advice from NZIER who recommended that the global financial crisis has likely led to short-term increases in airport asset betas suggesting that the rise in the average unadjusted asset betas of airport companies measured post 2007 was unrepresentative of their likely future performance. NZIER considered that the five year period adopted by the Commission in the Draft Reasons Paper for measuring airport asset betas arguably has an unrepresentative higher asset beta period without an offsetting lower period.<sup>695</sup>
- E8.32 In other submissions relating to beta estimates PwC (for ENA) submitted that the sample period chosen by the Commission, in the EDBs and GPBs Draft Reasons Paper (2005-2010), encompasses the GFC (same period as that for the airports estimate). This raises the possibility of producing unrepresentative beta estimates. PwC recommended that in line with best practice of other regulators that the Commission should exclude the period of the GFC when estimating the asset beta.<sup>696</sup>
- E8.33 The Commission notes that the report from PwC (for NZAA) used the same sample period as the Commission's Draft Reasons Paper, which incorporates the GFC, and did not make any recommendations concerning adjustments for the GFC.<sup>697</sup> PwC did not provide any reasons for its different approach to the GFC in estimating asset betas for Airports.
- E8.34 In contrast to the PwC (for ENA) submission, CEG (for 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.<sup>698</sup>

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<sup>695</sup> Board of Airline Representatives New Zealand Inc, *Submission on Commerce Commission Information Disclosure (Airport Services) Draft Reasons Paper and Draft Determination*, Attachment: NZIER, *Asset Beta for New Zealand's International Airports - Comments on the Commerce Commission's Airport Draft Reasons Paper - Report to BARNZ*, 11 July 2010, pp. 13-15 ; Board of Airline Representatives New Zealand Inc, *Submission on Airports Draft Reasons Paper and Draft Determination - Effect of valuation date*, 12 July 2010, p. 17.

<sup>696</sup> 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. The Commission notes, however, PwC advice is inconsistent with advice from its colleagues' from other countries. That is 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 PwC Australia 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).

<sup>697</sup> 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.

<sup>698</sup> 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:

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*Submitters views on making adjustments to the estimated the asset beta (Step 5)*

E8.35 Uniservices (for NZAA) agreed that adjustments for different regulatory regimes may not be necessary when determining a service-specific cost of capital estimate for Airports for the purpose of information disclosure only.<sup>699</sup>

E8.36 PwC (for NZAA) noted that there was an absence of empirical evidence to support either the proposition for, or magnitude of, any such adjustment for the difference between the asset beta of an airports regulated aeronautical services and an airports non-regulated services.<sup>700</sup>

*Submitters views on the standard error of the asset beta*

E8.37 CIAL, NZAA and Uniservices (for NZAA) considered that the Commission had understated the uncertainty associated with the cost of capital, as it had proposed to use an implausibly low standard error for the asset beta of 0.04. CIAL and Uniservices (for NZAA) suggested that 0.15 would be more reasonable.<sup>701</sup>

E8.38 Uniservices (for NZAA) considered the Commission should not rely solely on its empirical estimate of the standard error for beta drawn from its comparable company analysis, but exercise some judgement in its choice of the standard error for the asset beta.<sup>702</sup>

Commission's response to submissions

E8.39 The Commission has carefully considered the submissions received and has undertaken further analysis on the appropriate beta, and the standard error for the asset beta. In particular, the Commission has:

- explained in greater detail its approach to applying its six-step process;
- identified additional comparable airport companies for inclusion in the analysis;

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Competition Economists Group, *Cost of Capital Input Methodologies: a report prepared for Vector Limited*, 15 August 2010, pp. 15-23.

<sup>699</sup> 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. 36.

<sup>700</sup> 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, pp. 2-3.

<sup>701</sup> 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 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. 45-46; 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. 5 and 17-18.

<sup>702</sup> 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. 46.

- 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.

E8.40 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**

E8.41 The first step is to identify relevant comparable firms for inclusion in the sample. Here, ‘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 natural monopoly supplier. As a result, it is likely that the sample of comparable firms will include similar firms from overseas jurisdictions. This may include firms from the industry in question, or other sectors with a comparable risk profile.

E8.42 The only New Zealand airport that is listed on a stock exchange is Auckland International Airport Ltd. The Commission therefore included overseas firms that operate airports in its sample of comparable firms. Given the size of the resulting sample, the Commission did not consider it necessary to consider overseas firms from other industries with a similar risk profile.

*Comparative sample selection*

E8.43 Overseas firm that operate airports were identified based upon the Bloomberg classifications “Airport Development/Maintenance” and “Transport – Services”. 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.<sup>703</sup>

E8.44 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 aeronautical versus non-aeronautical services provided. As a result, any firms which the Commission did not consider were sufficiently comparable were also excluded from the sample. Table E18 displays the selected comparative airports sample.

**Table E18 List of Comparable Firms**

Name	Country	Why is it Comparable?
Aerodrom Ljubljana	Slovenia	Operates Ljubljana airport, providing a range of airport and ground handling services
Aeroporto di Firenze	Italy	Manages Florence airport and provides services to airlines, retailers and other concessionaires

<sup>703</sup> Small firms may affect the empirical estimates of the asset beta due to the potential effect from thin trading volumes.

<b>Name</b>	<b>Country</b>	<b>Why is it Comparable?</b>
Aeroports de Paris	France	Manages all of the civil airports near Paris and provides air transport related services and business related services
Airport Facilities	Japan	Manages and leases airport facilities at Haneda airport (Tokyo city), and manages Narita airport facilities
Airports of Thailand	Thailand	Operates Bangkok airport and the main provincial airports, and provides services to airlines, retailers and other concessionaires
Auckland International Airport Limited	New Zealand	Operates Auckland airport and provides a range of services to airlines, retailers and other concessionaires
Australian Infrastructure	Australia	Principally owns a number of Australian provincial airports
Beijing Capital International Airport	China	Provides both aeronautical and non-aeronautical services at Beijing airport
Flughafen Wien	Austria	Manages, maintains and operates Vienna airport, providing terminal, air-side and ground-side services
Flughafen Zuerich	Switzerland	Operates Zurich airport, providing flight operation and security services and leasing airport facilities to commercial entities
Fraport	Germany	Operates Frankfurt airport, providing traffic and terminal management, ground handling, security and facilities management services
Gemina	Italy	Operates Rome airports (Fiumicino and Ciampino), providing airport rights, handling, security, retail and parking services
Grupo Aeroportuario del Centro Norte	Mexico	Operates international airports in the northern and central regions of Mexico, providing aeronautical and non-aeronautical services
Grupo Aeroportuario del Pacifico	Mexico	Operates airports in the Pacific and central regions of Mexico, providing air transport support and commercial services
Grupo Aeroportuario del Sureste	Mexico	Manages airports in southern Mexico, providing a range of airport and commercial services

Name	Country	Why is it Comparable?
Kobenhavns Lufthavne	Denmark	Owens and operates Copenhagen airport providing services to airlines and concessionaires
Guangzhou Baiyun International Airport	China	Operates Guangzhou Baiyun airport, providing ground, passenger, aircraft maintenance, food and space rental services
Hainan Meilan International Airport	China	Operates Hainan Meilan airport, providing airfield, terminal facilities, ground handling, passenger, cargo, retail and car parking services
Japan Airport Terminal	Japan	Manages and maintains passenger terminals and airport facilities at Haneda and Narita airports
MAP Group	Australia	Owens Sydney airport and stakes in some other airports
Malta International Airport	Malta	Manages Malta airport, providing aircraft landing / parking, ground handling and concessionaire services
SAVE	Italy	Operates Venice airport, providing airport, infrastructure management and retail services
Shanghai International Airport	China	Operates Shanghai airport, providing air traffic control, terminal management, ground handling and space rental services
Shenzhen Airport	China	Operates Shenzhen airport, providing ground operation, logistics and space rental services
Xiamen International Airport	China	Operates and maintains Gaoqi airport, providing air transport support, space rental, logistics and car parking services

### Step 2: Estimating the equity beta of comparable firms

E8.45 The second step in the estimation process is to estimate econometrically the equity beta of each firm in the sample by regressing historical individual firm returns on historical market returns.<sup>704</sup> 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.

<sup>704</sup> 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.

- E8.46 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.<sup>705</sup>
- E8.47 This is consistent with previous advice to the Commission on estimating asset betas by Dr Lally.<sup>706</sup> In previous advice Dr Lally used different periods to evaluate the asset beta. Ultimately the Commission considers it is important to ensure that the beta is a fair measure of the underlying risk associated with the supply of a service and not a product of a host of other possible measurement problems, such as infrequent trading.
- E8.48 Therefore, for each firm in the sample of comparable firms, the Commission obtained from Bloomberg<sup>707</sup> the unadjusted<sup>708</sup> equity beta estimate, the standard error of the estimate and the reported average leverage,<sup>709</sup> for the following periods and observation intervals:<sup>710</sup>
- 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.
- E8.49 The Commission's overall approach is to estimate the equity 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 equity betas showed some

<sup>705</sup> 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.

<sup>706</sup> 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.

<sup>707</sup> Bloomberg is a worldwide provider of financial and market information.

<sup>708</sup> The term 'unadjusted' refers to the absence of a Blume or Vasicek adjustment.

<sup>709</sup> 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).

<sup>710</sup> Prior to the five year period to 31 May 2005, the number of entities for which data is available rapidly declines to a very small sample. The following table briefly summarises the number of entities by period:

Five year period to:	Entities
31 May 1995	2
31 May 2000	6
31 May 2005	15
31 May 2010	24



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modest increases during the GFC, the equity betas were generally stable across the period. This is consistent with the approach for estimating the equity beta for EDBs, GPBs and Transpower.

### Step 3: Turning the equity betas into asset betas

- E8.50 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 arrive at an estimate of the firm's unadjusted asset beta. Having an asset beta estimate for each firm allows the asset beta estimates to be directly compared with each other without the effects of different leverage levels.
- E8.51 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.
- E8.52 The two principal formulae that could be used in the current context are the Hamada formula and the tax-neutral formula.
- E8.53 The formula advocated by Hamada<sup>711</sup> 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<sup>712</sup> 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 the Miles and Ezzell formula results in a tax neutral formula.
- E8.54 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.<sup>713</sup>

### *Conclusion - the approach to de-levering and re-levering*

- E8.55 The Commission has previously used the Hamada formula to de-lever overseas betas, and a tax-neutral formula (equivalent to the Miles and Ezzell formula without taxes) to re-lever New Zealand betas, based upon the respective tax systems in New Zealand. The Commission has however reconsidered this issue taking into account the assumptions used in the respective formulae regarding debt policy.
- E8.56 The Commission now considers that a formula without a tax term is appropriate because:
- i. 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

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<sup>711</sup> Hamada, R. S., The Effect of the Firm's Capital Structure on the Systematic Risk of Common Stocks, *Journal of Finance*, Vol. 27, No. 2, 1972, pp. 435-452.

<sup>712</sup> Miles, J. A. and Ezzell, J. R., 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.

<sup>713</sup> 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, pp. 2-5; Uniservices, *Comments on the Commerce Commission's Approach to estimate the Cost of Capital*, Report on Behalf of NZAA, 2 December 2009, Appendix 2 and 3, pp. 82-91.

- ii. the assumption that leverage rather than the dollar level of debt being fixed is the better assumption, which leads to the Miles-Ezzell model, and this model in turn is close to a model without a tax term.

E8.57 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:

$$\beta_a = \beta_e(1-L) + \beta_d L$$

where  $B_a$  is the asset beta,  $\beta_e$  is the equity beta,  $\beta_d$  is the debt beta, and L is the leverage.

E8.58 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:

$$\beta_e = \beta_a + (\beta_a - \beta_d)L/(1-L)$$

E8.59 Applying this approach results in the average unadjusted asset beta estimates, over all sampling periods, set out in the Table E19 below.

**Table E19 Airports Comparable Companies Average Unadjusted Asset Betas**

Name	Average Unadjusted Asset Beta Monthly Observations	Average Unadjusted Asset Beta Weekly Observations
Aerodrom Ljubljana	1.08	0.88
Aeroporto di Firenze	0.59	0.34
Aeroports de Paris	0.69	0.71
Airport Facilities	0.32	0.37
Airports of Thailand	0.74	0.69
AIAL	0.75	0.79
Australian Infrastructure	0.76	0.65
Beijing Capital International Airport	1.02	1.19
Flughafen Wien	0.78	0.59
Flughafen Zuerich	0.49	0.25
Fraport	0.62	0.60
Gemina	0.49	0.35
Grupo Aeroportuario del Centro Norte	1.04	0.82
Grupo Aeroportuario del Pacifico	0.64	0.74
Grupo Aeroportuario del Sureste	0.85	0.51
Kobenhavns Lufthavne	0.39	0.30
Guangzhou Baiyun International Airport	0.56	0.54

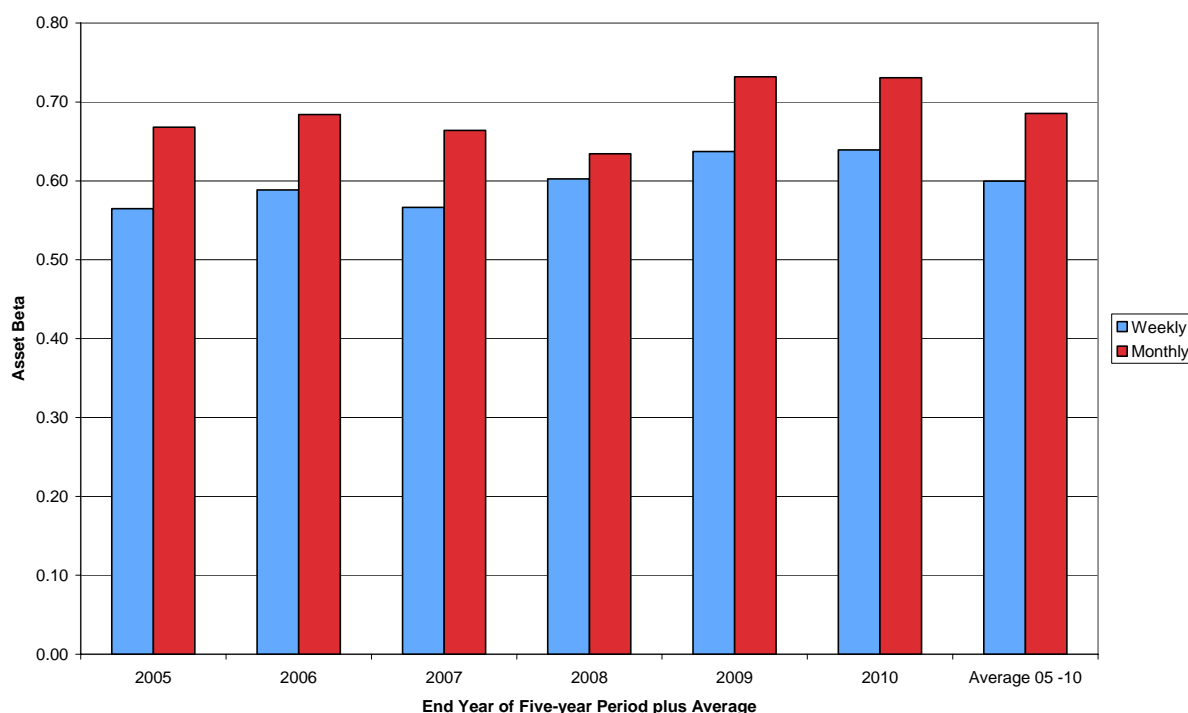
<b>Name</b>	<b>Average Unadjusted Asset Beta Monthly Observations</b>	<b>Average Unadjusted Asset Beta Weekly Observations</b>
Hainan Meilan International Airport	1.29	0.62
Japan Airport Terminal	0.58	0.72
MAP Group	0.66	0.61
Malta International Airport	0.47	0.39
SAVE	0.82	0.54
Shanghai International Airport	0.70	0.73
Shenzhen Airport	0.82	0.84
Xiamen International Airport	0.75	0.74
<b>Mean (of all observations)</b>	<b>0.72</b>	<b>0.62</b>

Step 4: Calculate the average asset beta of comparable firms

E8.60 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.

E8.61 As outlined in paragraph E8.48 above, the Commission investigated the effect on the asset beta estimate of different time periods and different observation intervals within each time period. These results are displayed in Figure E9 below.

**Figure E9 Airports Comparable Companies Unadjusted Asset Betas**



E8.62 This analysis results in an average of the unadjusted asset beta estimates using monthly observations of 0.69 and using weekly observations, 0.60. The monthly (weekly) asset beta estimate ranged from 0.63 to 0.73 (0.57-0.64).

E8.63 Applying equal weight to the monthly and weekly estimates derived from the above analysis results in an asset beta of 0.65 for the systematic risk of aeronautical services.

*Previous decisions - Airports' asset betas*

E8.64 The Commission received expert advice on the asset beta for the Airports Inquiry by Dr Lally.<sup>714</sup> Dr Lally estimated the asset betas for all three Airports to be 0.50 (with a band of 0.40 to 0.60). Dr Lally considered asset betas from New Zealand publicly listed international airports, foreign international airports, publicly listed ports and other transport services and a combination of US electricity utilities. Dr Lally relied primarily on the US utilities companies for his estimate of the Airports' asset beta. The approach was used as there was a lack of data for airports, and Dr Lally had concerns about the effect of regulation for the airports that were available. The Commission adopted an asset beta of 0.5.<sup>715</sup>

*Overseas regulators - airports' asset betas*

E8.65 In the 2007 Heathrow and Gatwick price control review, the UK Competition Commission estimated the asset betas (using debt beta of 0.1) of the two airports to

<sup>714</sup> Lally, M., *The cost of capital for the airfield activities of New Zealand's international airports*, June 2001.

<sup>715</sup> Commerce Commission, *Final report Part IV Inquiry into Airfield Activities at Auckland, Wellington and Christchurch International Airports*, 1 August 2002.

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be 0.47 and 0.52 respectively.<sup>716</sup> As a cross check, the UK Competition Commission evaluated asset betas from other international airports. The average asset beta from these other international airports was 0.44 with a range of 0.20 to 0.88.<sup>717</sup>

- E8.66 The Commission notes that its own beta estimates for airports differ from those estimated by the UK Competition Commission. Although all estimates have been derived using the same econometric techniques, the time horizons and periodicities differ. Specifically, the UK Competition Commission used one year worth of weekly observation covering the period July 2006 to July 2007.
- E8.67 In a report to the UK CAA on the 2008 Stansted price control review, the UK Competition Commission estimated the asset betas of Stansted to be 0.61.<sup>718</sup> As a cross check, the Competition Commission evaluated asset betas from other international airports. The average asset beta from these other international airports was 0.46.<sup>719</sup>
- E8.68 In its 2009 price review of the Dublin Airport Authority the Commission for Airport Regulation decided that an asset beta for airports was in the range of 0.5 to 0.7 and decided on a 0.61 point estimate of the asset beta in estimating the cost of capital for Dublin Airport Authority.<sup>720</sup>

### *Conclusion*

- E8.69 In coming to its decision on the value of the unadjusted asset beta for Airports (and before any adjustments reviewed in Step 5) the Commission puts primary weight on the analysis from this paper using a range of time periods and monthly and weekly observation intervals within each time period.
- E8.70 The Commission notes that the empirical analysis includes periods covering the GFC.
- E8.71 In order to ensure that the asset beta is a fair measure of the underlying risk associated with Airport services, the IMs considers it appropriate to accept an unadjusted asset beta monthly estimate of 0.69 (weekly of 0.60) before any other adjustments are considered.

### Step 5: Undertaking adjustments

- E8.72 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

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<sup>716</sup> The UK Competition Commission estimate the historical equity beta for BAA to be approximately 0.74, combining this with leverage of 0.34 and the debt beta of 0.1 resulted in an asset beta of 0.52. If the equity beta is de-levered without the use of the debt beta the resulting asset beta is 0.49. See 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*, 28 September 2007, pp. F27-F29.

<sup>717</sup> *ibid*, Appendix F, Table 7, p. F30.

<sup>718</sup> Competition Commission, *Review of Stansted Airport Q5 price control*, October 2008, Appendix L, p. L24.

<sup>719</sup> *ibid*, Appendix L, Table 8, p. L21.

<sup>720</sup> Commission for Aviation Regulation, *Determination on Maximum Levels of Airport Charges at Dublin Airport*, 4 December 2009, pp. 116-118.

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differences, and (c) adjusting asset beta estimates due to differences in systematic risk between services.

- E8.73 In the case of Airports, an adjustment for (c) is not required as the Commission has made its decision by using comparators that are exclusively suppliers of airport services. The Commission in the following sub-sections outlines how each of the considerations (i.e. Step 5(a) and Step 5(b)), 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

- E8.74 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 analysis, it may be necessary to extract an estimate of beta for a specific type of regulated service from the overall group beta.
- E8.75 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.<sup>721</sup> 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.
- E8.76 Under the 'pure play' approach, the Commission would identify traded standalone firms<sup>722</sup> 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 standalone firms. The main drawback of the 'pure-play' approach is that it requires 'pure-play' companies. In the case of Airports, such 'pure-play' companies do not exist.
- E8.77 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 unobservable betas of its individual business units.<sup>723</sup> The asset betas are then estimated using econometric techniques.
- E8.78 The third technique—the econometric investigation of risk-drivers—involves estimating a beta equation, specified as a function of potential drivers of asset betas.

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<sup>721</sup> See, for example, Fuller, R. J., and Kerr, H. S., 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 Bhagwat, Y. N., A Full-Information Approach for Estimating Divisional Betas, *Financial Management*, Vol. 20, No. 2, 1991, pp. 60–69; Grinblatt, M., and Titman, S., *Financial Markets and Corporate Strategy*, 2<sup>nd</sup> edition, McGraw-Hill: New York, 2002, pp. 390-391; Brealey, R., and Myers, S. C., *Principles of Corporate Finance*, 7<sup>th</sup> ed., McGraw-Hill/Irwin: New York, 2003, pp. 237-238.

<sup>722</sup> Stand-alone firm refers to a firm that only supplies the service that is being considered and no other.

<sup>723</sup> Ehrhardt, M. C., and Bhagwat, Y. N., A Full-Information Approach for Estimating Divisional Betas', *Financial Management*, vol.20, Summer, 1991, pp. 60–69; Wood, R. A., Mcinish, T. H., and Lawrence, K. D., 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 Peterson, J. D., Full-Information Industry Betas, *Financial Management*, Vol. 27, No. 2, 1998, pp. 85–93.

- E8.79 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.
- E8.80 The applicability and performance of these techniques will depend on the data available, so no one approach can be recommended in all instances.
- E8.81 In the case of Airports, the Commission considers the comparative firms are generally not pure plays. That is, they have a mix of regulated and non-regulated activities. The services that would not be subject to regulation under part 4 are a significant proportion of an airports total business risk. On average, therefore, the asset beta for these comparative firms is likely to reflect a higher degree of systematic risk as could be expected for stand-alone airport services.
- E8.82 However, the Commission considers that the necessary data is not available for any of the available options above to estimate the difference in systematic risk between the unregulated and regulated services.
- E8.83 Therefore, the Commission considers that the multi-divisional asset beta of 0.65 for Airports is likely to overstate the asset beta associated with the provision of regulated services. The Commission considers this is too high as the estimates include both regulated and unregulated services. Unregulated services such as retail shopping services are generally considered more risky than regulated services such as provision of airfields as there is less demand uncertainty. This requires a downward adjustment of the average asset beta for the regulated service.
- E8.84 This view is consistent with the view expressed by AIAL in an issues brief concerning its 2006/2007 pricing consultation with airline customers and their representative BARNZ. AIAL stated:<sup>724</sup>
- ... over 50 per cent of AIAL's revenue is sourced from its non-aeronautical (market contestable) business activities where earnings are potentially higher than aeronautical activities because of the higher WACC hurdle rate associated with the higher risk, commercial side of the airport business. Aeronautical activities, on the other hand, demand a much higher proportion of an airport's fixed assets and operating expenses, but are capped at a lower aeronautical WACC return.
- E8.85 In forming its view on the appropriate downward adjustment to the average asset beta for New Zealand Airports, the Commission has exercised its judgement having regard to the following:
- previous Commission regulatory decisions that considered Airports' asset betas;
  - overseas regulatory experience in considering airports' asset betas; and
  - evidence from submitters.

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<sup>724</sup> Auckland International Airport Limited, *Airport regulation and pricing, Issue Brief*, November 2006, p. 5 ([http://www.aucklandairport.co.nz/Corporate/NewsAndMedia/Publications/~/\\_media/Files/Corporate/Project%20Profiles/Regulation%20and%20pricing%202006.ashx](http://www.aucklandairport.co.nz/Corporate/NewsAndMedia/Publications/~/_media/Files/Corporate/Project%20Profiles/Regulation%20and%20pricing%202006.ashx)).

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*Previous decisions - Airports' asset betas*

E8.86 The Commission received expert advice on the asset beta for the Airports Inquiry by Dr Lally.<sup>725</sup> Dr Lally estimated the asset betas for all three Airports to be 0.50 (with a band of 0.40 to 0.60). Dr Lally considered asset betas from New Zealand publicly listed international airports, foreign international airports, publicly listed ports and other transport services and a combination of US electricity utilities. Dr Lally relied primarily on the US utilities companies for his estimate of the Airports' asset beta. The approach was used as there was a lack of data for airports, and Dr Lally had concerns about the effect of regulation for the airports that were available. The Commission adopted an asset beta of 0.5.<sup>726</sup>

*Overseas regulators - airports' asset betas*

E8.87 In its 2007 Heathrow and Gatwick review the UK Competition Commission had to set an asset beta for each of the two individual airports.<sup>727</sup> The UK Competition Commission considered that the estimated beta for the combined entity, BAA group, was not reflective of the individual risks faced by the aeronautical services of Heathrow and Gatwick.

E8.88 The UK Competition Commission disaggregated BAA group into three components parts, Heathrow, Gatwick and BAA's other activities and estimated the asset beta for each component. In assessing the asset beta for each component the UK Competition Commission considered a number of relevant factors that affect the systematic risk of each component part.

E8.89 Pulling the evidence together, the UK Competition Commission considered that Heathrow was likely to be perceived as the lowest risk BAA airport. After Heathrow, Gatwick was likely to be perceived as less risky than the remainder of the BAA group. Both airports were considered to be less risky as they were both regulated business, subject to five-yearly resets of price caps.

E8.90 The UK Competition Commission considered that, together with the 0.52 estimate for the BAA group asset beta as a whole, it was sufficient to estimate asset betas for the individual component businesses, as follows:<sup>728</sup>

- i. Heathrow – 0.47, with a standard error of +/-0.025;
- ii. Gatwick – 0.52, with a standard error of +/-0.03; and
- iii. other businesses – 0.61.

Step 5(b): Adjusting for differences in systematic risk due to regulatory differences

E8.91 Because of the very limited number of relevant listed firms in New Zealand, i.e. one airport operator, the Commission has also looked to comparable firms listed overseas. The Commission has considered the asset betas of twenty four overseas airports. These overseas airports are likely to be subject to regulatory regimes in

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<sup>725</sup> Lally, M., The cost of capital for the airfield activities of New Zealand's international airports, 2001.

<sup>726</sup> Commerce Commission, *Part IV Inquiry into Airfield Activities at Auckland, Wellington and Christchurch International Airports, Final report, 2002.*

<sup>727</sup> Competition Commission, *Report on the economic regulation of the London airport companies*, September 2007, Appendix F, pp. F28-F29.

<sup>728</sup> The Commission notes that the asset betas reported of 0.52 was estimated using a debt beta of 0.1. Therefore, the individual asset betas reported also reflects this.



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their own country. Inevitably, the regulatory regimes applied to a sector differ between different countries. A key question relevant to beta estimation, and the transportability of these beta estimates, is whether these differences in regulatory regime affect the supplier of regulated services in terms of their sensitivity to systematic risk and, if so, in what way. In theory, if the structure of the regulatory regime has the effect of lowering the systematic risk faced by the supplier of regulated services then the asset beta should also be lower, and vice versa.<sup>729</sup>

- E8.92 The Commission considers it is not feasible to: (a) adequately assess the structure of the regulatory regime that each of these airports is subject to; and (b) meaningfully compare those regimes against the one that applies to New Zealand Airports with sufficient precision to robustly inform the magnitude of an adjustment for differences in regulatory regimes. The Commission does not consider it necessary to make an adjustment to the unadjusted asset beta estimates for Airports for differences in systematic risk due to regulatory differences. The Commission's decision is to not make any adjustments for regulatory differences.

*Conclusion – Airports asset beta from Step 5*

- E8.93 The Commission notes that there are a wide range of estimates. Using its own analysis, with monthly and weekly frequency data, the Commission arrived at an average asset beta for airports of 0.65. The Commission considers this estimate to be an upper bound as it includes both regulated and unregulated services, the latter of which it considers to be more risky than the former.
- E8.94 The UK Competition Commission has previously estimated an average asset beta for international airports of 0.44 (in 2007) to 0.46 (in 2008). It has also applied asset beta estimates for Heathrow, Gatwick (in 2007), and Stansted (in 2008) of 0.47, 0.52, and 0.61, respectively. As outlined previously, the Commission considers that these estimates are based on data covering a rather short timeframe.
- E8.95 In its 2007 review of Heathrow and Gatwick the UK Competition Commission applied lower asset beta estimates for the regulated aeronautical services of BAA group (Heathrow and Gatwick airports) relative to the other non-regulated services of the BAA group.
- E8.96 In making its decision on the asset beta for airports services the Commission has attributed primary consideration to:
- i. the more recent beta estimates for overseas airports;
  - ii. the analysis on the difference of the beta estimate between regulated aeronautical services relative to non-aeronautical services from the UK; and
  - iii. the extensive unregulated activities of airports which are considered by other regulators and suppliers of airports services to have a higher asset beta.

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<sup>729</sup> For a summary of the effect of regulation on the systematic risk see Commerce Commission, *Input Methodologies Reasons paper for EDBs and GPB*, 2010, Appendix H8.

E8.97 Therefore, the Commission considers that an asset beta estimate for airport services of 0.60 is appropriate. The Commission notes that this is the same as the estimated asset beta using the weekly frequency data.

*Step 6: Turning the adjusted asset betas into equity betas*

E8.98 The final step in estimating equity betas 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 Airports, 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

E8.99 Blume and Vasicek (together referred to as ‘Bayesian’) 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. Again, this says nothing about the tendencies of the asset beta, particularly for a specific regulated service.

E8.100 Neither the Blume nor the Vasicek adjustment has been applied in any of the Commission’s previous regulatory decisions.

E8.101 Of the Expert Panel, Dr Lally considered Bayesian 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.<sup>730</sup>

E8.102 Professors Franks and Myers agreed that some form of Bayesian adjustment to beta estimates may be sensible, “but did not strongly recommend a specific adjustment method”.<sup>731</sup>

E8.103 In submissions on the RDG, some submitters considered that the Commission should either apply, or at least maintain an open mind, to using Bayesian adjustments to beta estimates.<sup>732</sup> Unison submitted:<sup>733</sup>

... 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 this downward bias would be to employ blume adjusted betas. Blume adjusted betas

<sup>730</sup> 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.

<sup>731</sup> *ibid.*

<sup>732</sup> 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.

<sup>733</sup> Unison, *Post-Conference Submission on the Weighted Average Cost of Capital*, 2 December 2009.

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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*

- E8.104 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.
- E8.105 The equity beta for Airports is 1.0 therefore no adjustment is needed.
- E8.106 For this reason, the Commission's decision is that Blume or Vasicek adjustments should not be made in determining the cost of capital for suppliers of airport services.

*Standard error of the asset beta*

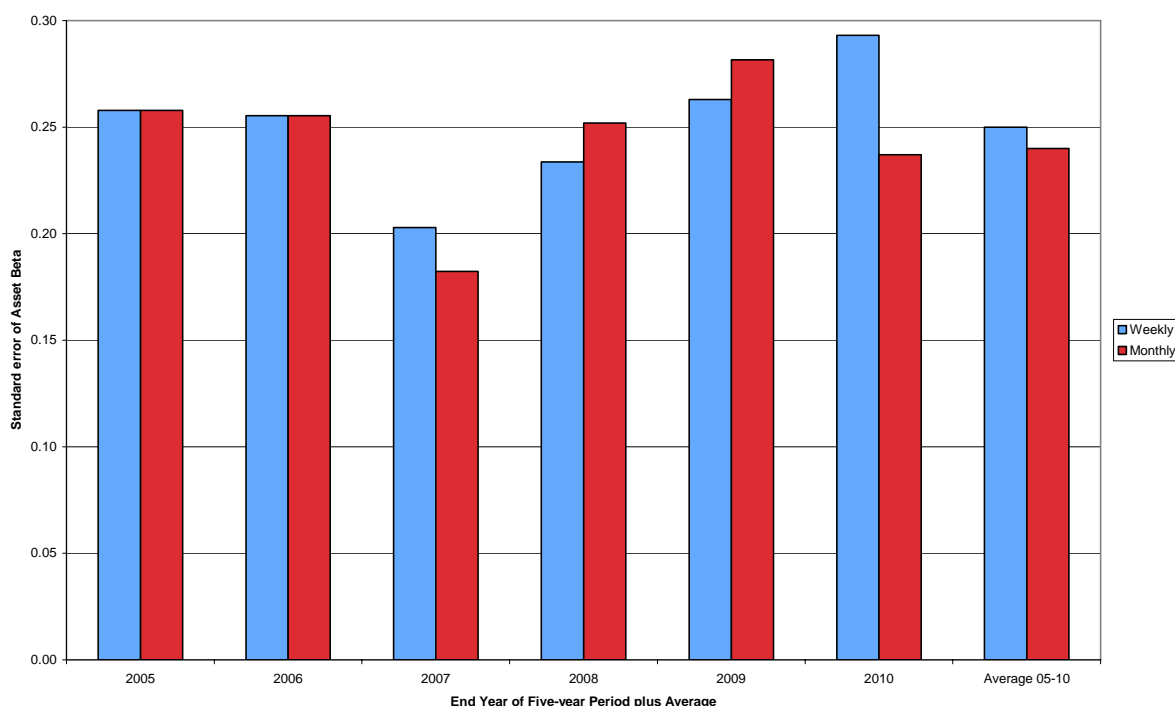
- E8.107 Due to the uncertainty associated with the asset beta estimation the Commission has estimated a standard error for the asset beta based on quantitative and qualitative judgement.
- E8.108 Dr Lally, in Appendix 3 of the Gas Authorisation, demonstrates the process to estimate the standard error of the asset beta estimate.<sup>734</sup> The Commission followed this process to estimate the standard error of the asset beta for Airports. In the Draft Reasons Paper, the Commission estimated a standard error for the asset beta of 0.04.
- E8.109 The Commission notes that the standard error of the asset beta in the Draft Reasons Paper was comparable to the standard error of the asset beta applied to London airports by the UK Competition Commission in its review of BAA in 2007 (i.e. Heathrow standard error 0.025, Gatwick standard error 0.03).<sup>735</sup>
- E8.110 Uniservices (for NZAA) called this estimate "implausibly low". The Commission has re-checked this estimate and confirms that the original sample of 10 comparator airport companies did have a standard error of 0.04.
- E8.111 Subsequent to the Draft Reasons Paper, the Commission has also estimated the standard error of the asset beta using the enlarged sample, data frequencies, and sampling periods identified above. This produced a range of estimates, which are displayed in for each of the five-year periods and total average.

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<sup>734</sup> Lally, M., *Weighted average cost of capital for gas pipeline businesses*, 28 October 2008, Appendix 3, pp. 170-178.

<sup>735</sup> 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*, 28 September 2007, p. F29.

**Figure E1 Asset Beta Standard Errors from Comparative Firms Analysis**



E8.112 In advice on the Gas Authorisation, Dr Lally considered that the estimate of the standard error of the asset beta requires data on a set of firms over a period of years. However, the results in are for all of the comparative firms where some firms have limited data periods available.

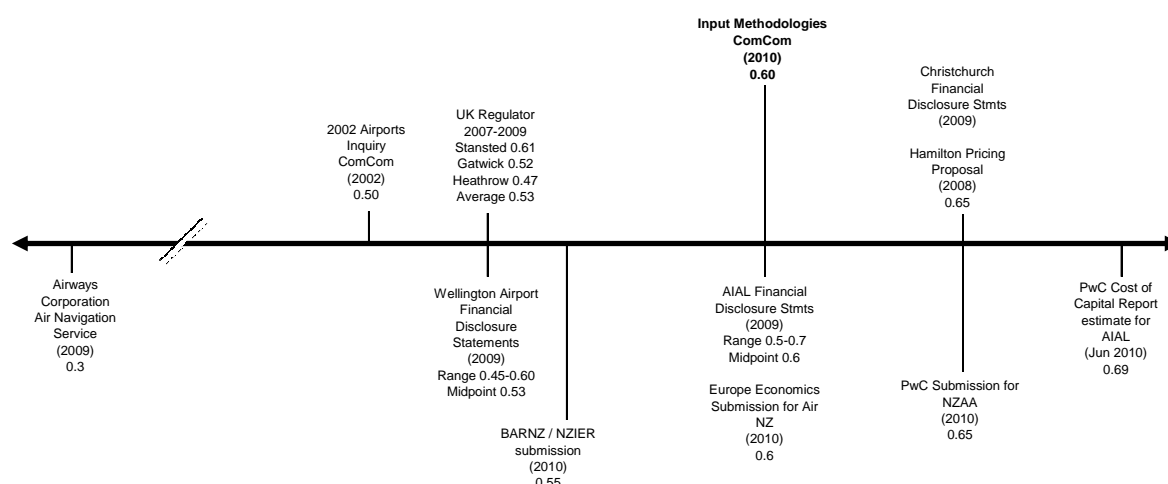
E8.113 The Commission estimated the standard error of the comparative firms that had data for every period. The average estimate was approximately 0.24, versus the 0.04 estimated at the time of the Draft Reasons Paper.

E8.114 The Commission accepts the original estimate of 0.04 is too low, but considers a revised estimate of 0.24 is too high and would provide an implausible result. Having regard to these estimates, the purpose of information disclosure, and submissions from airports, the Commission proposes to adopt an estimate of the standard error for the asset beta of 0.16.

Reasonableness checks on the estimated asset beta

E8.115 The Commission compares the results of its asset beta analysis between services, and across a range of estimates of the asset beta from other sources. The result of this comparison is shown in the below.

**Table E20 Reasonableness Checks on the Asset Beta**



E8.116 The above diagram shows the Commission’s 0.60 estimate of the asset betas for Airport services fall within the range of comparable information. The Commission also notes that despite the differing approaches to estimating the asset beta, most of the estimates reported above fall within a reasonably tight range, (and with the Commission’s estimate near the middle of the range). This supports the Commission’s view that its estimate of the asset beta for airport services is reasonable.

**Overall conclusion - equity betas**

E8.117 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 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;
- 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 2000 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.

E8.118 Having considered the above factors, which include previous advice, decisions and its current analysis, the Commission through using Steps 1-4 has estimated an unadjusted asset beta of 0.65 (using monthly data an asset beta of 0.69 and 0.60 using weekly data from its comparative firm’s sample).

E8.119 Taking into account the potential adjustments to the asset beta (i.e. Step 5), the Commission considers that no adjustments should be made for regulatory differences between New Zealand and overseas. It does consider an adjustment is required for the difference in risk between the regulated aeronautical services and

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non-regulated service of suppliers of airports services. Therefore, an adjustment downwards is appropriate to reflect this difference in systematic risk between the regulated and non-regulated activities of Airports.

- E8.120 Applying the 6 step approach outlined above for airport services results in an asset beta estimate for Airports of 0.60. Combining this asset beta estimate with a notional leverage of 40% equates to an equity beta for Airports of 1.00 with a standard error of 0.16.

## **E9 Debt Beta**

### ***Decision - debt beta***

- E9.1 The IM assumes a debt beta of zero.

### ***Commission's reasons – debt beta***

#### Overview

- E9.2 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.<sup>736</sup>
- E9.3 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).
- E9.4 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.
- E9.5 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.<sup>737</sup>
- E9.6 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 Appendix E3 (from paragraph E3.49). 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

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<sup>736</sup> 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.

<sup>737</sup> 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.

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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

E9.7 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.

E9.8 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.

E9.9 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.

E9.10 In its 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.<sup>738</sup>

E9.11 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.<sup>739</sup>

E9.12 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.

E9.13 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

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<sup>738</sup> 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.

<sup>739</sup> Lally, M., *WACC and Leverage*, Report to the Commerce Commission, 17 November 2009.

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premium that lenders require as compensation for bearing systematic risk (approach ii).<sup>740</sup> The debt beta estimate would be decomposed using the following formula:

$$\begin{aligned}\text{Debt premium} &= \text{liquidity premium} + \text{default premium} + \text{systematic risk premium} \\ &= \text{liquidity premium} + \text{default premium} + \beta_d \cdot \text{MRP}\end{aligned}$$

- E9.14 This method involves a significant degree of judgement as it would require the Commission to attribute values to each of the parameters used.
- E9.15 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.
- E9.16 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.<sup>741</sup>
- E9.17 The Commission notes that the majority of Australian and UK regulators apply a debt beta of zero in regulatory determinations.
- E9.18 In Australia, the Queensland Competition Authority 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.<sup>742</sup>
- E9.19 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.<sup>743</sup> 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.

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<sup>740</sup> 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).

<sup>741</sup> Lally, M., *WACC and Leverage*, Report to the Commerce Commission, 17 November 2009.

<sup>742</sup> 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.

<sup>743</sup> 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, 28 September 2007, pp. F21-F26; UK Competition Commission, *Stansted Airport Ltd - Q5 price control review*, 23 October 2008, Appendix L, pp. L33-L35.



E9.20 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.<sup>744</sup>

#### A non-zero debt beta

E9.21 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.<sup>745</sup>

E9.22 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.<sup>746</sup>

E9.23 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.<sup>747</sup> However, as discussed above, the UK Competition Commission used a debt beta of 0.1.<sup>748</sup>

#### ***Overall Conclusion - debt beta***

E9.24 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 addresses the anomaly that post-tax WACC can increase with leverage. That is, non-zero debt betas make the post-tax WACC estimate for an individual service less variant or invariant to leverage.

E9.25 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.

E9.26 For the reasons set out in the Leverage section (see paragraphs E3.49 to E3.67), the Commission has assumed a zero debt beta in the cost of capital IM.

## **E10 Taxation**

### ***Decision - taxation***

E10.1 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).

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<sup>744</sup> References to submissions on debt betas are noted in paragraph E3.50.

<sup>745</sup> 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.

<sup>746</sup> 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.

<sup>747</sup> 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*, 28 September 2007, paragraphs 88-90, Table 1, p. F6.

<sup>748</sup> 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*, 28 September 2007, paragraphs 88-90, pp. F24-26.

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- E10.2 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.
- E10.3 The IM Determination allows for any future changes in tax rates to flow through to the calculation of the cost of capital.
- E10.4 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 to 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***

- E10.5 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.
- E10.6 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.
- E10.7 A provision has been added to the IM Determination 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***

- E10.8 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.
- E10.9 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**

- E10.10 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

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28% from 1 October 2010.<sup>749</sup> The Commission's decision is to lower the investor tax rate from 1 October 2011.

- E10.11 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.
- E10.12 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%.
- E10.13 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

- E10.14 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.
- E10.15 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.
- E10.16 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.
- E10.17 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.

## **E11 The Cost of Capital Range**

### ***Decision - the cost of capital range***

- E11.1 The IM estimates a cost of capital range by estimating and combining individual parameters' standard error.

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<sup>749</sup> 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>.

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E11.2 In the case of Airports, for information disclosure, the Commission considers it appropriate to take a range between the 25th to 75th percentiles. In assessing profitability for the Airports an appropriate starting point for any assessment is the 50th percentile (mid-point) on the range.

***Commission's reasons - the cost of capital range***

E11.3 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 judgment call as to how the IM should address the consequences of potential error.

E11.4 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.

E11.5 When the true value of an estimate is unknown 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.

E11.6 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 addressed model error through its reasonableness checking in section E13. It considers reasonableness checking preferable to adding an ad hoc margin for model error.

E11.7 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**

E11.8 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.

E11.9 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.

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E11.10 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.

E11.11 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'*

E11.12 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 judgment.

E11.13 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.

E11.14 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.

E11.15 The main disadvantages of this approach are that:

- i. it relies on judgment 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.

E11.16 The simple analytical approach is the approach used by UK regulators e.g. Ofgem.

*The 'complex analytical approach'*

E11.17 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);<sup>750</sup>
- 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.

E11.18 The standard error of the post-tax cost of capital is estimated using the following formula:<sup>751</sup>

$$\sqrt{\text{var}(TAM\hat{MRP})\text{var}(\hat{B}_a) + E^2(TAM\hat{MRP})\text{var}(\hat{B}_a) + E^2(\hat{B}_a)\text{var}(TAM\hat{MRP}) + (1 - T_c)^2 [\text{var}(\hat{p})\text{var}(\hat{L}) + E^2(\hat{p})\text{var}(\hat{L}) + E^2(\hat{L})\text{var}(\hat{p})]}$$

where:

$\text{var}(TAM\hat{MRP})$  is the square of the standard error of the estimated tax-adjusted market risk premium;

$E^2(TAM\hat{MRP})$  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;

<sup>750</sup> 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.

<sup>751</sup> 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.

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$\text{var}(\hat{L})$  is the square of the standard error of leverage; and

$E^2(\hat{L})$  is the square of leverage.

- E11.19 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.
- E11.20 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.<sup>752</sup>
- E11.21 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.
- E11.22 This is the approach favoured by the Commission in recent energy related decisions e.g. Gas Authorisation and Electricity Control Inquiry of Unison.

#### *Simulation approach*

- E11.23 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.<sup>753</sup>

#### *The 'simple simulation approach'*

- E11.24 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.

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<sup>752</sup> 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.

<sup>753</sup> 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.

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- E11.25 Similar to the complex analytical approach, the simple simulation approach assumes that the underlying cost of capital parameters are not correlated.
- E11.26 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.
- E11.27 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'*

- E11.28 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.
- E11.29 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.
- E11.30 The Commission is not aware of any UK or Australian regulator that uses a Monte Carlo or other simulation approach.

Expert advice

- E11.31 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 approach) in employing a simulation approach to estimate cost of capital distributions.<sup>754</sup>

Submissions

- E11.32 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.<sup>755</sup>

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<sup>754</sup> 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.

<sup>755</sup> 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*



E11.33 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,<sup>756</sup> some favoured the complex analytical approach,<sup>757</sup> while other favoured the complex simulation approach.<sup>758</sup>

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*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; 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; 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.

<sup>756</sup> 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.

<sup>757</sup> 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 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.

<sup>758</sup> 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; 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*

- E11.34 Some submissions criticised the Commission's approach as implying greater precision than was possible in practice.<sup>759</sup>
- E11.35 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.<sup>760</sup>
- E11.36 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 Commission employing Monte Carlo simulation techniques to estimate the cost of capital.

#### Conclusion - calculating the cost of capital range

- E11.37 As evidence 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.
- E11.38 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.
- E11.39 The Commission considers that a simple simulation approach would add no significant gains for the purpose of estimating the cost of capital. Simulation

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*Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited*, 13 August 2010, p. 56.

<sup>759</sup> 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

<sup>760</sup> 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 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. 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.

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.

E11.40 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’

E11.41 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 judgment to specify plausible values.<sup>761</sup>
- 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.
- 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 Airports

E11.42 Estimating each of the individual cost of capital parameters and their associated standard errors using the procedures discussed above gives the following results:

**Table E21 Parameter Point Estimates and their Standard Error**

Parameter	Point estimate	Standard error
Leverage	17%	0
Risk-free rate	To be estimated	0

<sup>761</sup> 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.

Parameter	Point estimate	Standard error
Debt premium	To be estimated	To be estimated, with a minimum value of 0.0015
Debt issuance cost	0.35%	0
Asset beta	0.60	0.16
Tax-adjusted market risk premium	7% -7.5%	0.015
Corporate and investor tax rate	28% - 30%	0

E11.43 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 judgment to specify plausible values.

#### *Leverage*

E11.44 In the case of leverage, the IM assumes a standard error of zero.<sup>762</sup>

E11.45 As discussed in Section E3 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 firm sample. This notional level of leverage is necessary to make the cost of capital invariant to 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*

E11.46 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.

E11.47 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

<sup>762</sup> 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, p10-11; 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.

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the cost of capital was affected by intra-cycle variance in the risk-free rate during the regulatory period.<sup>763</sup>

E11.48 Dr Lally reviewed Professor Guthrie's submission. He concludes that intra-cycle variations 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."<sup>764</sup> 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*

E11.49 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*

E11.50 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 are covered in their respective appendices:

- i. debt premium (see paragraphs E5.71 to E5.74);
- ii. TAMRP (see paragraphs E7.124 to E7.131); and
- iii. Asset beta (see paragraphs E8.107 to E8.114).

Selecting the cost of capital range

E11.51 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 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.<sup>765</sup> This would be inconsistent with s 52A(1)(d) of the Act.

E11.52 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

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<sup>763</sup> 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. 6-11.

<sup>764</sup> Lally, M., *Comments on measurement error and regulated firms' allowed rates of return*, 13 September 2010, pp. 11-13.

<sup>765</sup> 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.

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capital is being used. In some regulatory contexts a cost of capital estimate below the midpoint might be considered,<sup>766</sup> in other contexts the midpoint is appropriate, in other contexts a cost of capital estimate that is above the midpoint maybe recommended.

E11.53 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;
  - ii. ensuring suppliers of regulated services are limited in their ability to extract excessive profits;
- 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 underestimate 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 view as the key marginal investors;
- the impact on potential subsequent investment by service users and the potential impacts on dynamic efficiency; and
- 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 Airports

E11.54 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.

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<sup>766</sup> IPART notes this point in their cost of capital review, see IPART, *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.

- E11.55 In the Draft Reasons Paper the Commission considered that the appropriate range for information disclosure would be between the 25th to 75th percentiles.
- E11.56 Suppliers of regulated services considered the range was too narrow and did not adequately cover risks, and market frictions.<sup>767</sup> Some recommended a range between the 5th to the 95th percentile.<sup>768</sup>
- E11.57 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.
- E11.58 Airports are subject to information disclosure regulation. 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. In assessing profitability for the Airports an appropriate starting point for any assessment is the 50th percentile (mid-point) on the range.
- E11.59 Given the uncertainty associated with some of the parameters, as well as the measurement of suppliers' actual level of profitability, the Commission considers it appropriate to take a range between the 25th to 75th percentiles.
- E11.60 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.

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<sup>767</sup> 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.

<sup>768</sup> 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.

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## **E12 Possible Adjustments to the Cost of Capital for Asymmetric Risk**

### *Decision - possible adjustments to the cost of capital*

E12.1 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*

- E12.2 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 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 possibly under-compensate other suppliers.
- E12.3 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 with sunk costs 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.
- E12.4 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.
- E12.5 The treatment for each of these types of risk differs, and so the discussion below deals with each separately.



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### Type I asymmetric risk

- E12.6 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.<sup>769</sup>
- E12.7 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.
- E12.8 A number of suppliers of regulated services have put to the Commission that an allowance for asymmetric risks should be included within the cost of capital.<sup>770</sup> Some of these 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 on the higher end of the range did not make any allowance for asymmetric risks.<sup>771</sup>
- E12.9 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.

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<sup>769</sup> Froot, K. A., *The Financing of Catastrophic Risk*, NBER Project Report Series, University of Chicago Press: Chicago & London, 1999, p. 3.

<sup>770</sup> 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 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.

<sup>771</sup> 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.

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The Commission's decision is therefore to not make any adjustments to the cost of capital for Type I asymmetric risk.

- E12.10 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.
- E12.11 The Commission considers that 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. In addition, it will need to explore further the practicalities of creating such a fund under existing legislation.
- E12.12 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*

- E12.13 The Commission's decision is not to make any adjustments to the cost of capital for Type I asymmetric risk. However, the Commission may in some circumstances make an allowance for such risk in the cash flows.

Type II asymmetric risk and real options

- E12.14 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.
- E12.15 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.<sup>772</sup> 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.
- E12.16 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.<sup>773</sup> LECG further submitted that the

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<sup>772</sup> 'Conventionally calculated' refers to ordinary procedures, which assume symmetric payoff distributions.

<sup>773</sup> 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.

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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.

E12.17 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.

E12.18 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.<sup>774</sup> 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.

E12.19 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:<sup>775</sup>

- 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.

E12.20 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

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<sup>774</sup> McDonald, R., and Siegel, D., The Value of Waiting to Invest, *Quarterly Journal of Economics*, Vol. 101, 1986, pp. 707–728.

<sup>775</sup> 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.

- the cost of capital as a regulated supplier would only ever be earning its cost of capital.<sup>776</sup>
- E12.21 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.<sup>777</sup>
- E12.22 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.<sup>778</sup>
- E12.23 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, 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.<sup>779</sup>
- E12.24 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.
- E12.25 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,

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<sup>776</sup> 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-%2020881160\\_1.pdf](http://www.comcom.govt.nz/IndustryRegulation/Part4/ContentFiles/Documents/Telecom%20-%20Graeme%20Guthrie%20-%20WACC%20sub%20-%2020881160_1.pdf)

<sup>777</sup> 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.

<sup>778</sup> NZIER, *Cost of Capital, Report for Post-Workshop Submission, Report on behalf of BARNZ*, 28 November 2009, pp. 4-5.

<sup>779</sup> 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.

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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.<sup>780</sup>

- E12.26 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.<sup>781</sup>
- E12.27 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.
- E12.28 Even if there were risks such as asset stranding for the Commission to consider, 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.
- E12.29 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 investments, the real option value of waiting will be equal to zero.<sup>782</sup> 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.<sup>783</sup>
- E12.30 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

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<sup>780</sup> 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.

<sup>781</sup> 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.

<sup>782</sup> 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.

<sup>783</sup> 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.

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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.

- E12.31 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, it does not consider that any party has met this threshold.<sup>784</sup>
- E12.32 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.<sup>785</sup> The Commission maintains the view that this burden of proof is appropriate. The Commission considers that 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 other regulators that have considered this issue.<sup>786</sup>

*Conclusion - compensating supplier for Type II asymmetric risk and real options*

- E12.33 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 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.
- E12.34 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.
- E12.35 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

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<sup>784</sup> Commerce Commission, *Revised Draft Guidelines - The Commerce Commission's Approach to Estimating the Cost of Capital*, 19 June 2009, p. 59.

<sup>785</sup> 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.

<sup>786</sup> Ofcom, *Ofcom's Approach to Risk in the Assessment of the Cost of Capital: Final Statement*, 18 August 2005, p. 43.

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(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;
- there is no regulatory precedent for taking into account real options in the cost of capital (or asset base) even though other regulators have previously considered such arguments; 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.

E12.36 The Draft Reasons Paper noted the Commission remained open to receiving evidence from regulated suppliers, that Type II risks exist in the case of Airports and that real options are a particular concern for them. However, Airports 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.

### **E13 Reasonableness Checks on the WACC**

E13.1 This section reports the estimates of the WACC as at July 2010 when applying the IM and then compares these with a range of comparative information to test the IM estimate are reasonable and realistic in light of the other available information.

#### ***The estimated WACC for Airports as at July 2010***

E13.2 Each regulatory instrument specifies when the WACC is to be calculated under that regulatory instrument. For AIAL and CIAL, the WACC is to be calculated as at 1 July 2010.

E13.3 For the purposes of testing the reasonableness of the WACC estimates produced by applying the IM, the Commission estimates the WACC as at 1 July 2010. This coincides with the period of the first estimate for AIAL and CIAL under information disclosure. If the IM produces reasonable estimates at that date, the Commission considers it is also likely to produce reasonable estimates at other dates since the risk-free rate and debt premium will be linked to market rates and updated annually.

E13.4 Table E22 summarises the values of the fixed parameter as specified in the IM and shows estimates of the five year risk-free rate and five year debt premium as at 1 July 2010 (using data from the month of June 2010).

**Table E22 Parameter Point Estimates and their Standard Error as at 1 July 2010**

Parameter	Point estimate	Standard error
Leverage	17%	
Debt issuance costs	0.35%	
Asset beta	0.60	0.16
Equity beta	0.72	
Tax-adjusted market risk premium	7.1%	0.015
Average corporate tax rate	28.4%	
Average investor tax rate	28.1%	
Debt premium (as at 1 July 2010)	1.75%	0.0015 (minimum)
Risk-free rate (as at 1 July 2010)	4.96%	

E13.5 Based on the parameter estimates in Table E22, Table E23 displays the resulting estimates of the mid-point (i.e. 50<sup>th</sup> percentile) vanilla and post-tax WACCs as at 1 July 2010.

**Table E23 Estimated WACCs Using the Parameters Specified**

Type of WACC	WACC estimate
Vanilla WACC	8.4%
Post-tax WACC	8.1%

E13.6 Most New Zealand market participants use the post-tax WACC and most comparative information is of post-tax WACC estimates. To assist easy comparability, the reasonableness discussion below focuses on the post-tax WACC estimate reported in the above table.

***Will the cost of capital IM produce reasonable and commercially realistic estimates of the WACC?***

E13.7 The Commission has tested the estimate of the post-tax WACC of 8.1% for airport services produced using the IM against a range of other information to ensure those estimates are reasonable and commercially realistic.

E13.8 The comparative information the Commission tested the IM estimates of the post-tax WACC against 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 for airports regulated services in other regulatory contexts especially in New Zealand and the United Kingdom;
- independent estimates of the post-tax WACC for New Zealand airports; and
- estimates of the post-tax WACC using other approaches, including using the classical CAPM.

E13.9 The conclusions from this comparative analysis are that the estimate of the post-tax WACC for Airports using the IM is reasonable and commercially realistic for suppliers of regulated airport services. This is because the post-tax WACC estimate of 8.1% produced under the IM:

- is below the long-term historical and the forecast return on New Zealand investments of average risk (which are 8.5% and 9.0% respectively). This is consistent with expectations, as specified airport services have a below average exposure to systematic risks;
- is within the range of estimates for airports regulated services by overseas regulators (7.4% - 8.2%);
- is close to the range of publicly available independent estimates of post-tax WACC for AIAL's entire business (including unregulated services which would be expected to have a higher post-tax WACC, as AIAL itself has acknowledged in the past<sup>787</sup>). For example, the IM post-tax WACC estimate is below PwC's estimate of the post-tax WACC for AIAL (8.9%) and its estimate for the ports sector (comprising seaports and airports) of 8.6%, close to the average broker forecast of 8.3%, but above Airways Corporation's estimate of its post-tax WACC for its Air Navigation Service monopoly; and
- is close to the estimate produced when applying the classical CAPM (8.4%).

***Long-run returns earned by New Zealand investors on investments of average risk***

E13.10 The actual returns earned historically by New Zealand investors provides one means of testing whether an estimate of a future rate of return (post-tax 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 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.

E13.11 Dimson, Marsh and Staunton of the London Business School are generally regarded as having produced the most authoritative source of historical returns to investors.<sup>788</sup> 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.

<sup>787</sup> Auckland International Airport Limited, *Airport regulation and pricing - Issues Brief*, November 2006, p. 5.

<sup>788</sup> Dimson, E., P. Marsh, and M. Staunton, *2010 Global Investment Returns Yearbook 2010*.

- E13.12 Dimson, Marsh and Staunton estimate that the average return to New Zealand equity investors over the period 1900-2009 was 9.8%.<sup>789</sup> This is a nominal, pre-investor tax return. Over the same period, the return on government bonds was 5.8%.<sup>790</sup> 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%). At a corporate tax rate of 30%, assuming market-wide leverage of 30%, and no investor taxes on equity returns, this implies a WACC estimate of around 8.5% for an investment of average risk.<sup>791</sup>
- E13.13 This approach makes no adjustment to the nominal returns on New Zealand investments despite these having likely been inflated during periods when New Zealand experienced high rates of inflation.
- E13.14 This implies the historic New Zealand market average return, at 8.5%, is slightly above the estimated post-tax WACC for airports (8.1%).

***Future returns expected by New Zealand investors on investments of average risk***

- E13.15 The future return expected from the market can be estimated using CAPM. By definition, the market has an average equity beta of 1. The analysis also assumes a TAMRP of 7.1%, market-wide leverage of 30%, a risk-free rate of 4.96%, a debt premium of 2.5%, issue costs of 0.35% per annum and a corporate and investor tax rate of 28%. The higher leverage and debt premiums reflect those for an average listed New Zealand firm. Under these assumptions, the estimated post-tax WACC as at 1 July 2010 is 9.1% (under both the classical and simplified Brennan-Lally CAPM).
- E13.16 The Cost of Capital Report is published quarterly by PwC and is a long-standing and well-known report to many users.<sup>792</sup> 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 and a five year term for the risk-rate (of 4.9% as at June 2010).
- E13.17 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%.
- E13.18 Table E24 below summarises the information discussed above on the market average post-tax WACC, on a historic and forecast basis. It also shows the current five year government bond post-tax rate (that is a proxy of the return on an investment with no default risk) and the post-tax cost of A- corporate bonds.

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<sup>789</sup> *ibid*, p. 27.

<sup>790</sup> *ibid*.

<sup>791</sup> This assumes a return on debt halfway between the return on government debt and the return on an equity investment of average risk.

<sup>792</sup> The report can be found at <http://www.pwc.com/nz/en/cost-of-capital>.

**Table E24 Market Estimates of Return on NZ Investments of Average Risk**

<b>Approach</b>	<b>Estimate of post-tax WACC</b>
Historical returns on New Zealand market for a firm of average risk	8.5%
Expected return on New Zealand market for a firm of average risk (using a five year risk-free rate as at 1 July 2010)	9.1%
New Zealand market weighted average post-tax WACC (PwC calculation). i.e. average risk	8.4%
Five year government bond (post-tax)	3.5%
Five year A- rated corporate debt (post-tax)	4.8%
Commission's estimate of the post-tax WACC for an Airport (as at 1 July 2010).	8.1%

E13.19 The estimates shown in the top part of Table E24 relate to the market average firm. That is, they are indicative of the post-tax WACC for a firm of average risk. The IM estimate of Airport's WACC is shown in the bottom line.

E13.20 Airports regulated services have below average risk. While they have considerable pricing power, and have users with limited alternatives, they are exposed to a number of demand risks which are a function of systematic factors.

E13.21 As would be expected, the estimates of the post-tax WACC for Airports using the IM are below the estimates of the post-tax WACC for a New Zealand firm of average risk. This is consistent with the Commission's expectations.

***Estimates of the WACC in other regulatory contexts***

E13.22 This section looks at estimates of the WACC for airports in prior regulatory decisions, in New Zealand, the United Kingdom, and Ireland.

***New Zealand***

E13.23 The estimated post-tax WACC for Airports was previously considered by the Commission in 2002 in the Airports Inquiry. The Commission has updated this estimate to reflect the estimate of the five-year risk-free rate and the debt premium as at 1 July 2010. The resulting updated estimate of the post-tax WACC was 7.6%, or around 0.5% below the estimate produced when applying the IM. This reflects the assumptions in the IM for a higher asset beta, lower leverage, and lower taxes, which is partly offset by a lower TAMRP. The Commission prefers the estimates for these values in the IM, over those used in the 2002 Inquiry, as:

- the asset beta in the 2002 Inquiry was based on making adjustments to the estimated asset beta for EDBs, rather than a direct (empirical) estimate of the asset beta for Airports;

- the notional leverage assumption in the IM relies on a direct (empirical) observation of the average leverage of the comparator company sample of airports;
- New Zealand's statutory tax rates have fallen since 2002; and
- most applications of the simplified Brennan-Lally CAPM use estimates of the TAMRP below 8% and the evidence is that the TAMRP is around 7%.

E13.24 The Commission has also produced cost of capital IMs for EDBs and Transpower. The estimated post-tax WACC for those companies is 6.7% (mid-point estimate) and 7.4% (at the 75th percentile) based on the risk-free rate as at 1 July 2010. Regulated airport services face greater systematic risks than EDBs and Transpower. In particular, Airports are much more exposed to volume risk than EDBs and Transpower as air travel has a higher income elasticity of demand. The Commission therefore considers the higher post-tax WACC for Airports relative to EDBs and Transpower to be appropriate.

#### *United Kingdom*

E13.25 The UK Competition Commission has issued three point estimates of WACC for UK airports in recent years, namely for Heathrow,<sup>793</sup> Gatwick,<sup>794</sup> and for Stansted.<sup>795</sup> To enable comparison, the Commission has converted these estimates (which used the classical CAPM) into nominal post-tax WACCs.<sup>796</sup> The resulting nominal, post-tax WACCs are 7.4% for Heathrow, 7.6% for Gatwick, and 8.1% for Stansted.

#### *Ireland*

E13.26 In Ireland, the Commission for Aviation Regulation set a WACC for Dublin Airport.<sup>797</sup> This converts to a nominal, post-tax WACC of 8.2%.<sup>798</sup>

E13.27 The post-tax WACC from applying the IM is 8.1%. The IM estimate of post-tax WACC is around the estimate for Stansted and Dublin, but above that for the other UK airports.

E13.28 Table E25 summarises the estimates from the regulatory decisions discussed above. The estimates produced via the IM are comparable to, or slightly above, the estimates in other regulatory decisions.

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<sup>793</sup> Competition Commission, *Report on economic regulation of Heathrow and Gatwick airports*, September 2007, Appendix F, p. F36.

<sup>794</sup> *ibid.*

<sup>795</sup> Competition Commission, *Stansted Airport Ltd - Q5 price control review*, presented to the CAA, 23 October 2008, Appendix L, p. L27.

<sup>796</sup> Using a taxation rate of 28%, the Fisher function and an inflation rate of 2.8% consistent with the inflation expectation noted in the UK Competition Commission's report on Stansted (see p. L8), and its report on Heathrow/Gatwick (see p. F10).

<sup>797</sup> Commission for Aviation Regulation, *Determination on Maximum Levels of Airport Charges at Dublin Airport*, Dec 2009.

<sup>798</sup> Assuming taxation of 12.5% an Irish inflation expectation of 2%, and uses the Fisher function. The Commission for Aviation Regulation does not state an inflation expectation in its report, but NERA in a submission to the Commission for Aviation Regulation suggested this was around 2%, hence that estimate is used. See, NERA, *The Cost of Capital for Dublin Airport, A Report for Dublin Airport Authority*, March 2009, Appendix A2.

**Table E25 WACCs in Previous Airport Regulatory Decisions**

Approach	Estimate of post-tax WACC
Updated Airports Inquiry (2002)	7.6%
UK Competition Commission - Heathrow	7.4%
UK Competition Commission - Gatwick	7.6%
UK Competition Commission - Stansted	8.1%
Commission for Aviation Regulation – Dublin Airport	8.2%
Commission’s estimate of the post-tax WACC for an Airport (as at 1 July 2010).	8.1%

***Independent estimates of the WACC for NZ airports and related companies***

- E13.29 The Commission is aware of several publicly-available estimates of the post-tax WACC for New Zealand airports and related companies that have been produced independently of the regulatory context. These are discussed below.
- E13.30 PwC includes estimates of the post-tax WACC for AIAL in its June 2010 Cost of Capital Report. PwC estimates an 8.9% post-tax WACC for AIAL's entire business (including unregulated services which would be expected to have a higher post-tax WACC<sup>799</sup>). For the ports sector (comprising AIAL and four seaports) PwC estimate an average post-tax WACC of 8.6%.<sup>800</sup> These estimates are above the IM mid-point estimate of the post-tax WACC (of 8.1%).
- E13.31 A number of New Zealand investment banks publish research on New Zealand listed companies. A number of brokers have estimated the post-tax WACC of AIAL, as an input into valuing a share in the ownership of that company. The post-tax WACC estimates range from 7.0% to 9.1% with an average of 8.3%. The average is similar to the Commission’s mid-point estimate. The broker’s post-tax WACC estimates covers all of AIAL including unregulated activities (the post-tax WACC of the regulated services would be expected to be lower than for the overall company) and is for the life of AIAL’s cash flows (while the IM seeks to estimate the post-tax WACC for the term of the regulatory period). Therefore, the Commission considers the brokers estimates of AIAL’s post-tax WACC would likely be higher than the IM estimates of the post-tax WACC for a five year period.
- E13.32 The broker estimates support the reasonableness of the estimate produced using the IM.
- E13.33 The NZ Airways Corporation, through its Air Navigation Service (ANS), is a monopoly provider of essential air transportation services. The Airways Corporation estimates the ANS’ post-tax WACC at 5.9% (Pricing Proposal June 2009). This is significantly below the Commission’s estimate of the post-tax WACC for Airports.

<sup>799</sup> A point AIAL itself has acknowledged. See, Auckland International Airport Limited, *Airport regulation and pricing - Issues Brief*, November 2006, p. 5.

<sup>800</sup> PricewaterhouseCoopers, *The Cost of Capital Report*, June 2010, p. 3.

E13.34 Independent post-tax WACC estimates for New Zealand airports are summarised in below. The estimates produced via the IM are within the range of estimates made by independent parties for AIAL and similar companies.

**Table E26 Independent Estimates of Post-tax WACCs for New Zealand Airports**

Approach	Post-tax WACC Estimate
PwC estimate for AIAL (June 2010)	8.9%
PwC estimate for NZ ports sector (June 2010)	8.6%
New Zealand Broker estimates for AIAL (Jun-Jul 2010)	7.0%-9.1% Average 8.3%
Airways Corporation Air Navigation Service	5.9%
Commission's estimate of the post-tax WACC for an Airport (as at 1 July 2010).	8.1%

***New Zealand Airport's estimates of their own WACC***

E13.35 New Zealand airports also disclose estimates of their own post-tax WACC in their annual financial disclosure statements, and in pricing proposals to airport users. Many of these post-tax WACCs were estimated at the start of their current pricing agreements when risk-free interest rates were higher than they are currently.

E13.36 Table E27 below summarises the estimates of post-tax WACCs by AIAL, CIAL, WIAL, and Hamilton International Airport and an updated estimate based on the Commission's estimate of the current risk-free rate.

**Table E27 New Zealand Airports Estimates of their own Post-tax WACCs**

Approach	Post-tax WACC Estimate	Estimate updated to reflect July 2010 risk-free rate
AIAL estimate <sup>801</sup>	8.7% - 11.0%	7.3% - 9.5%
CIAL estimate <sup>802</sup>	9.7%	8.7%
Hamilton Airport estimate <sup>803</sup>	8.7% - 10.2%	8.6% - 10.2%
WIAL estimate <sup>804</sup>	8.3% - 9.5%	7.9% - 9.1%
Commission's estimate of the post-tax WACC for an Airport (as at 1 July 2010)		8.1%

<sup>801</sup> Auckland International Airport Limited, *Auckland International Airport Limited Identified Airport Activities Disclosure Financial Statements*, 30 June 2010, p. 49. This uses a 7.26% risk-free rate and a 1.29-1.38% debt premium.

<sup>802</sup> Christchurch International Airport Limited, *Disclosure Financial Statements for the year ended 30 June 2009*, p. 42. Uses a 6.4% risk-free rate and 1.5% debt premium.

<sup>803</sup> Hamilton International Airport Limited, *Landing Charges Pricing Methodology*, March 2008, p. 15. Uses a 5.97% risk-free rate and 1.25% debt premium.

<sup>804</sup> Wellington International Airport Limited, *Identified Airport Activities Disclosure Financial Statements*, 31 March 2010, p. 30.

*Testing reasonableness using other models*

E13.37 Professor Myers and Professor Franks recommended the Commission estimate the post-tax WACC using the classical CAPM. While not favoured by submissions, and not adopted by the Commission as the model specified in the IM, this is a potentially useful reasonableness test on the results from the Simplified Brennan-Lally CAPM.

E13.38 Using the same data as set out in Table E22 and an MRP of 5.7%, the classical CAPM produced a mid-point post-tax WACC estimate of 8.4%. As expected, given the classical CAPM assumes all forms of investment income are taxed at the same rate (e.g. it ignores the value of imputation credits), this is modestly above the estimate from the simplified Brennan-Lally CAPM.

E13.39 Professors Myers and Franks recommended the use of the Fama-French three-factor model 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”.<sup>805</sup> However, there is very little New Zealand data available to robustly estimate a cost of equity using these methods and the Commission notes that no submission provided estimates of the cost of equity in New Zealand using either of these models. Accordingly, the Commission does not believe that it is practical to use either of these models as reasonableness tests in a New Zealand context.

E13.40 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 New Zealand regulated suppliers to an internationally diversified investor (beta). Such data is not readily available, and the Commission therefore does not consider that the international CAPM can be readily or reliably used. As discussed in paragraphs 6.4.32 to 6.4.34, 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.

E13.41 Table E28 below summarises the estimates of post-tax WACC for Airports using methods and approaches other than that 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 17% and no debt beta).

**Table E28 Estimated WACCs Using Other Models and Approaches to Estimate the Cost of Equity**

Approach	Post-tax WACC Estimate
Airports WACC estimated using the classical CAPM (50th percentile)	8.4%
Airports WACC estimated using Fama French and dividend growth model	Not practical
Airports WACC estimated using International CAPM	Not practical but evidence suggests it will be lower than domestic CAPM estimate
Commission’s estimate of the post-tax WACC for an Airport (as at 1 July 2010)	8.1%

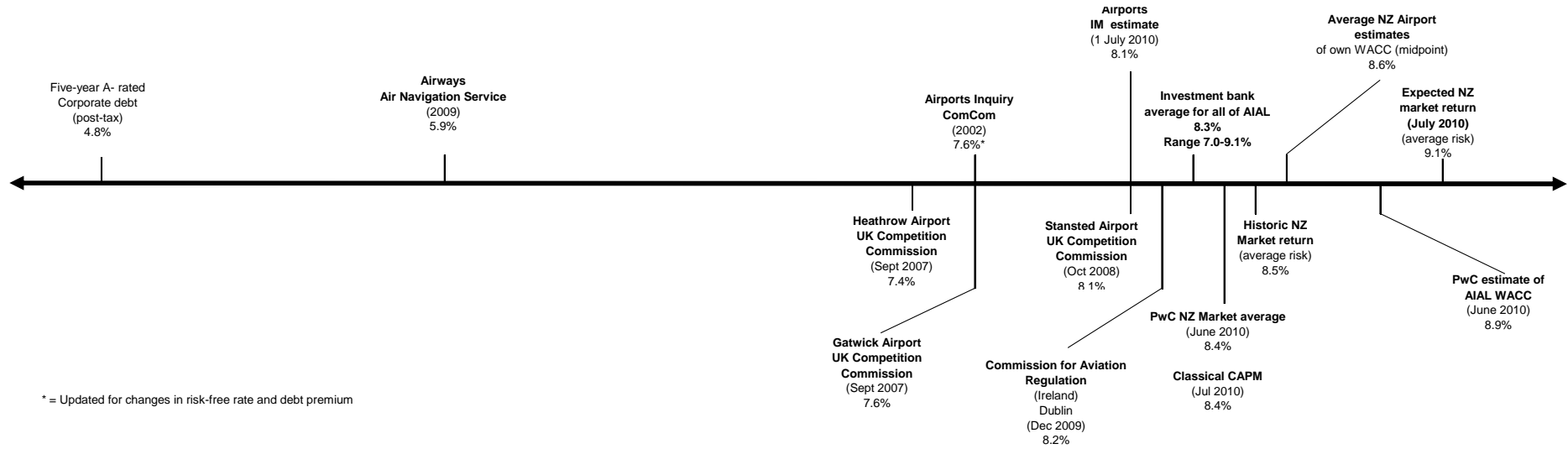
<sup>805</sup> Franks, J., Lally M., & Myers S, *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology*, 2008, p. 8.

*Conclusions – reasonableness of WACC estimates for regulated airports*

- E13.42 Figure E2 below summarises the information outlined above to test the reasonableness of the post-tax WACC estimated under the IM as at 1 July 2010.
- E13.43 The IM estimate of the post-tax WACC falls within the range of the comparative information. The mid point estimate of post-tax WACC is above estimates from a number of other sources, including UK regulatory decisions for Heathrow and Gatwick, and close to that for Stansted and Dublin airports. It is below the estimated post-tax WACC for a New Zealand firm of average risk based on historic and expected return information. It is also above the estimated post-tax WACC for EDBs and Transpower, reflects the lower systematic risks faced by EDBs and Transpower compared to Airports.
- E13.44 The estimated post-tax WACC is close to the average New Zealand broker estimate of the post-tax WACC for AIAL, below PwC's estimate of the post-tax WACC for AIAL and the port sector, but above the estimated post-tax WACC for the Air Navigation Service.
- E13.45 On balance, the Commission considers this information supports the conclusion that the IM produces reasonable and commercially realistic estimates of the post-tax WACC for the regulated services of Airports.



**Figure E2 Summary of Information Considered in Reasonableness Tests**



## **E14 Application of the Cost of Capital IM to Information Disclosure**

### *Information disclosure*

E14.1 The IM requires the vanilla and post-tax WACC for Airports 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 of return 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 of return 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 Airports will be estimated by the Commission as at the first working day of the disclosure period for each airport. This is the first working day of April in the case of WIAL, and the first working day of July for AIAL and CIAL; and
- the Commission will publish its annual estimates within one month of the start of the disclosure period.

E14.2 Airports 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 initial tenor which exceeds five years. This is a separate allowance under information disclosure and is not part of the cost of capital IM. This allowance is defined in the ID Determination.

E14.3 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 Airports, 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. In assessing profitability for the Airports an appropriate starting point for any assessment is the 50th percentile (mid-point) on the range.

## APPENDIX F: RESPONSE TO TECHNICAL SUBMISSIONS ON SCHEDULE A OF THE IM DETERMINATION (AIRPORT LAND VALUATION METHODOLOGY)

Key Issue Raised	Commission's Response
<b>MVAU Valuation Guidelines – Schedule A</b>	
<p>Chung, Seagar and Stanley on behalf of NZAA provided a redlined Land Valuation Schedule A and submitted that:</p> <ul style="list-style-type: none"> <li>▪ the definition of MVAU and Highest and Best Alternative Use (HBAU) can be extended;</li> <li>▪ the applicable professional valuation standards is IVS 1 rather than IVS 2 as specified by the Commission;</li> <li>▪ Explanatory Notes are required in respect of the Commission's directions for an orderly sale of land in economically manageable parcels, and other practical valuation steps.<sup>i</sup></li> </ul>	<p>The Commission agreed that this was a helpful clarification and therefore it has been included.</p> <p>The Commission considers that the appropriate standard is IVS 2</p> <p>The Commission noted that some clarification was required and therefore some of the drafting suggestions were adopted.</p>
<p>Air NZ identified five factors which in its view raise problems, by providing scope for subjectivity and manipulation.<sup>ii</sup></p>	<p>The Commission is satisfied that the processes involved in the professional valuations were as objective as could be reasonably expected and notes that valuations will be scrutinised by interested parties under the ID requirements.</p>
<p>Dougal Smith from Property Advisory Limited on behalf of BARNZ and BARNZ<sup>iii</sup> identified four areas where Schedule A could be improved:</p> <ul style="list-style-type: none"> <li>▪ the definition of MVAU. Mr Smith has recommended an alternative definition;<sup>iv</sup></li> <li>▪ aggregation of land. Mr Smith considers that the MVAU valuation of land cannot be carried out in isolation from other development land held. He recommends the addition of a clause to the Explanatory Notes that valuers need to explicitly include and reference other development holdings held by the Airport;<sup>v</sup></li> <li>▪ contingent liabilities. Mr Smith recommends that existing quantified liabilities for remediation and cleanup costs of contamination and transformation costs associated with surplus or redundant assets be able to be taken into account by the valuer when preparing the valuation;<sup>vi</sup> and</li> </ul>	<p>The Commission accepted the suggestions and made the relevant changes.</p> <p>The Commission has provided that development land holdings attributable to specified airport services are to be aggregated.</p> <p>This part of the submission is addressed in paragraphs 4.3.73 to 4.3.75</p>

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| <ul style="list-style-type: none"><li>▪ use of tainted sales. Mr Smith recommends an additional Explanatory Note be added to direct that sales transactions should be used that are unaffected by existing airport influences.<sup>vii</sup></li></ul> | The Commission accepted this suggestion and the relevant changes have been made. |
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- <sup>i</sup> Chung, Seagar and Stanley, *Expert Valuation Advisors Response Draft Commerce Act (Specified Airport Services Input Methodologies) Determination 2010: Schedule A – Airport Land Valuation on Behalf of NZAA*, 12 July 2010, pp. 1-4.
- <sup>ii</sup> Air New Zealand, *Submission to the Commerce Commission on the Input Methodologies Airport Services Draft Reasons Paper*, 12 July 2010, pp. 39-41, paragraphs 150-152.
- <sup>iii</sup> BARNZ, *Submission on Commerce Commission Input Methodologies (Airport Services) Draft Reasons Paper and Draft Determination*, 12 July 2010, p. 20.
- <sup>iv</sup> Property Advisory Group, *Schedule A – Draft Airport Land Valuation for BARNZ*, 8 July 2010, p. 2, paragraph 9.
- <sup>v</sup> Property Advisory Group, *Schedule A – Draft Airport Land Valuation for BARNZ*, 8 July 2010, p. 4, paragraphs 16-19.
- <sup>vi</sup> Property Advisory Group, *Schedule A – Draft Airport Land Valuation for BARNZ*, 8 July 2010, p. 5, paragraphs 20-25.
- <sup>vii</sup> Property Advisory Group, *Schedule A – Draft Airport Land Valuation for BARNZ*, 8 July 2010, p. 5, paragraph 26.