# Review of the beta and gearing for UCLL and UBA services

Evidence and recommendations

Prepared for

New Zealand Commerce Commission

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# Contents

# Executive summary

In New Zealand, under the regulatory framework for Chorus' access services, stakeholders can request a determination under the 'Final Pricing Principle'. This requires the Commerce Commission (the Commission) to determine the relevant costs for the access services, using a total-service long-run incremental cost (TSLRIC) approach. This is not based on Chorus' actual services, but on those of a hypothetically efficient operator. The analysis has not previously been required, but is now being undertaken for the first time, following requests from stakeholders.

As part of this analysis, the Commission must determine what return on investment such an operator would require. To do this, the cost of capital for the relevant investments will need to be assessed. This may not be the same as Chorus' cost of capital, but does need to be consistent with the risks associated with investment in services similar to those offered by Chorus.

The Commission asked Oxera to review the evidence around the company-specific elements of the cost of capital, assuming the use of the CAPM, and specifically the Brennan–Lally CAPM applied in other Commission decisions. In particular, Oxera has reviewed:

- the **asset beta** for a fixed access telecommunications operator. This was the primary area of analysis undertaken by Oxera, as it has the greatest impact on the assumed return for UCLL (unbundled copper local loop) and UBA (unbundled bitstream access) investments, and therefore the greatest impact on charges;
- the **gearing and long-term credit rating** for a fixed access telecommunications operator;
- the **debt beta and equity beta** that would be assumed for the hypothetical operator;
- whether the **UCLL and UBA services** should have a different beta to the hypothetical operator as a whole.

Oxera's approach to the analysis of the beta has been to work from financial market data for a relevant set of comparator organisations. The analysis has suggested three potential sources of data for the asset beta and equity beta to be used for UCLL and UBA, as illustrated in the table below.

**Table 1 Potential data sources**

| Data source | Relevance to UCLL and UBA | Approach applied in Oxera's report |
|---|---|---|
| Chorus beta | Strongly relevant, as it represents a separated fixed asset operator, comparable to the hypothetical operator used in the TSLRIC approach. It may be affected by fibre broadband roll-out | Chorus' beta is used as a focal point for our analysis, as it represents the most relevant datapoint, but only to the extent that it can be tested for consistency with the alternative sources below |
| International comparators | Some relevance as source of market evidence on telecommunications-specific risk. However, in general, fixed access services represent only a minority of these businesses' revenues, and they take other risks that would be expected to affect the cost of capital | A comparator set is developed, and is used as an additional source of data to support the estimate of the asset beta for UCLL and UBA |
| Regional comparators | As there are no other traded fixed access telecommunications operators in New Zealand, and only Telstra in Australia, there are limitations on the relevance of these as a measure of beta for UCLL/UBA | The observed betas of companies that would be expected to have lower risk (e.g. Vector) and higher risk (e.g. integrated retail/wholesale operators) are useful in testing both the scale of the Chorus beta and its robustness, relative to other infrastructure businesses |
| Regulatory precedent | A cross-check of the primary evidence against the conclusions of other regulators | Our recommendations are compared with precedent, to test whether the evidence appears to be indicating a comparable approach |

Oxera's analysis identified some key conclusions, which appear to be relevant in coming to a view on the beta and the WACC for UCLL and UBA, as follows.

- The Chorus beta appears to represent a robust and relevant datapoint. While Chorus' share price has been falling over the period, the evidence suggests that the level of the beta for Chorus is reasonably reliable.
- This appears to be supported by the evidence from the relative betas of other regional infrastructure businesses.
- We identified a comparator set of around 20 international telecommunications operators. These international comparators are not as directly comparable as Chorus for UCLL and UBA. The comparators face a range of risks which are potentially very different to those of UCLL and UBA. For example, several of the comparators include significant retail and mobile businesses, which are likely to face different business risks to fixed access. There are no obviously comparable businesses that, like Chorus, focus on fixed access only.
- However, there is a range of comparators, and, where possible, it is valuable to consider a comparator dataset in preference to a single datapoint.
- Chorus, together with a number of the comparators, has higher gearing and a lower credit rating than we would expect the Commission to assume within

the WACC for UCLL and UBA. Thus, Chorus is more likely to have a positive debt beta, as the debt beta will increase with gearing and credit risk.

- Chorus is a dedicated fixed access operator which both owns the copper network and is managing the project to replace the copper network with the Ultra Fast Broadband fibre network. The combination of this and the design of the regulatory framework means that the technology risk it faces will be at least partially mitigated. Our analysis indicates that it would therefore be appropriate to assume that the beta for Chorus (or for a comparable hypothetical integrated access operator) will be the same as for UCLL and UBA.

Based on our analysis, we propose **a range for the equity beta of 0.55–0.85, assuming a gearing ratio of 40%**. This range is calculated as follows:

- market data on the Chorus beta indicates that the equity beta is around 1.0, and that a range for the asset beta, assuming zero debt beta, would be about 0.3–0.45. We have used this as an anchor point for the assessment of the Chorus beta;
- the international comparator set would suggest a similar range for the asset beta. While there may be differences in the risks faced by the comparator set, the evidence is therefore also consistent with the conclusions from the Chorus data;
- both regulatory precedent and actual comparator data point to gearing of around 40%, and this would be consistent with an A-/BBB+ investment-grade credit rating;
- an assessment of debt betas for companies with ratings more comparable to Chorus at the present time, which suggests that the actual observed debt betas are likely to be non-zero, with a plausible estimate in the range of 0.05–0.10. The adoption of these estimates for debt beta would increase the notional equity beta.

Applying the CAPM formula, this would suggest a range for the equity beta for UCLL and UBA of 0.55–0.85, based on the market data for Chorus and supported by an international comparator set, as indicated in the table below.

**Table 2 Oxera's assessment of the equity beta for UCLL and UBA**

| | Low | Mid | High |
|---|---|---|---|
| Equity beta at actual gearing | 0.8 | 1 | 1.2 |
| Actual gearing (average) | 62.50% | 62.50% | 62.50% |
| Debt beta at actual gearing | 0.05 | 0.075 | 0.10 |
| Asset beta | 0.33 | 0.42 | 0.51 |
| Notional gearing | 40% | 40% | 40% |
| Debt beta at notional gearing | 0.00 | 0.00 | 0.00 |
| Equity beta at notional gearing | 0.55 | 0.70 | 0.85 |

Source: Oxera.

If the Commission were to give equal weight across this range, this would indicate an appropriate point estimate from around the middle of the range—i.e. an equity beta of 0.7.

# 1 Background

The New Zealand Commerce Commission (the Commission) asked Oxera to review the company-specific components of the WACC to be used for setting charges for UCLL (unbundled copper local loop) and UBA (unbundled bitstream access) pricing reviews—i.e. the equity beta and the leverage (including a choice of long-term credit rating). This report provides Oxera's conclusions about the potential ranges for these parameters, and the evidence used to reach them.

## 1.1 Regulatory context

If an access seeker, or Chorus, is not satisfied with the price for either the UCLL or UBA services established under the Initial Pricing Principle, the Telecommunications Act 2001 allows the party to request that the price is calculated under the Final Pricing Principle (FPP). It is understood that, under the Commission's framework, the FPP for both UCLL and UBA services is based on a total-service long-run incremental cost (TSLRIC) model. This model is based on the costs incurred by a hypothetic efficient operator, rather than the actual costs of Chorus in operating the actual network.

It is understood that the Commission has received FPP requests from five parties in relation to both the UCLL and UBA services. The Commission is therefore required to set forward-looking cost-based prices for UCLL and UBA services using the TSLRIC cost model.

In New Zealand, airports, electricity line services and gas pipeline services are regulated under Part 4 of the Commerce Act. In contrast, telecommunications services are regulated under the 2001 Telecommunications Act and the 2011 Telecommunications Amendment Act.

Part 4 of the Commerce Act requires the Commission to determine 'input methodologies' (IMs), which establish upfront rules, requirements and processes that apply to economic regulation. The IMs were established in December 2010, and describe the Commission's approach to regulatory finance issues, including the cost of capital, asset valuation, the allocation of common costs, and the treatment of taxation.

The cost of capital IMs establish the upfront rules that the Commission must apply when estimating the cost of capital for services that are regulated under Part 4 of the Commerce Act. It is understood that the approaches set out in the IMs have been developed through a consultation process involving a range of sectors, including telecommunications.[1]

## 1.2 Relevant documents

In addition to the sources specifically quoted within the text, in coming to our conclusions in this report, Oxera has considered:

- the Commission consultations and stakeholder responses in respect of the UCLL and UBA FPP process;
- previous consultations, Decisions and expert reports from the Commission in respect of the cost of capital;
- various analyst reports of Chorus' performance.

[1] Commerce Commission (2013), 'Process and issues paper for determining a TSLRIC price for Chorus' unbundled copper local loop service in accordance with the Final Pricing Principle', 6 December, p. 44.

### 1.3 Oxera's approach

Our analysis is presented as follows.

- **Section 2: what is the observed beta for Chorus?** This section reviews the evidence on the beta of Chorus since its flotation. We consider a range of tests for the appropriate level of the beta and the range around the beta. As part of this analysis, we test the betas of other New Zealand businesses as a useful cross-check.
- **Section 3: what lessons can be learned from international telecommunications betas?** This section reviews the betas of telecommunications operators across a range of comparable international economies. We review the levels of the betas for the comparators, and also the relationship between the level of beta and the differences between the operating characteristics of the different businesses.
- **Section 4: leverage and long-term credit rating.** As part of our analysis of Chorus' equity beta, we consider the observed gearing and credit rating of Chorus. However, we note that Chorus' actual gearing is influenced by a range of factors including the current fibre roll-out, and therefore that the notional efficient gearing of the UCLL and UBA assets may be different. We estimate a notional leverage for UCLL and UBA. In the context of the notional leverage, we highlight the relevant long-term credit rating which we would expect to be targeted for Chorus.
- **Section 5: what is the role of the debt beta?** Here we consider whether the debt beta is likely to be zero. We propose that a non-zero debt beta is likely to be appropriate in estimating Chorus' actual asset beta and, in that context, what the impact of such a non-zero debt beta would be on the estimation of the equity beta for UCLL and UBA.
- **Section 6: what is the difference between the betas for Chorus as a whole, and for UCLL and UBA?** We consider the role of fibre investment within the evidence that supports an estimate of the Chorus beta, and the implications for whether the betas for UCLL and UBA are likely to be different.
- **Section 7: recommendations for the UCLL and UBA equity beta.** Based on the evidence in the report, we make a recommendation for the estimate of the UCLL and UBA betas.

# 2 What is the observed Chorus beta?

This section reviews the evidence around the beta of Chorus, and the implication of that evidence for the appropriate choice of a beta to be used within the TSLRIC model which the Commission will apply in estimating the costs of UCLL and UBA.

Under the Commission's IMs, beta estimation for businesses such as operators of electricity and gas transmission/distribution networks, and airports, primarily relies on analysis of the betas for a set of close comparators. In the case of estimating a beta for UCLL and UBA, a particular difficulty is the lack of other publicly listed fixed access network operators, either in the New Zealand telecommunications industry or beyond. Chorus is the only 'pure-play' fixed telecommunications operator. Whilst the TSLRC model does not directly model Chorus' costs, the market risks taken by Chorus' actual businesses and those taken by a hypothetical efficient operator are likely to be very similar.

Chorus' shares have been traded for only 2.5 years, since its demerger from Telecom New Zealand (TNZ). Since the demerger, TNZ and Chorus' shares have traded separately. Chorus operates the local access network, and TNZ operates the remainder of the New Zealand telecommunications network, and also operates in a range of retail markets. Therefore, in the absence of direct comparators, Oxera's analysis takes a three-step approach.

- **Step 1: what is the best estimate of the Chorus beta?** We review the direct evidence of Chorus' share price, and the observed beta estimate that results.
- **Step 2: is the evidence from the Chorus beta robust?** Chorus has been traded for only 2.5 years; it is on a small index; and its share price has fluctuated sharply over this period. We assess the robustness of the estimate of the Chorus beta by testing the Chorus data against available evidence from a set of New Zealand, Australian and international comparators.
- **Step 3: how does the Chorus beta estimate compare to the international comparators that do exist?** While Chorus may be the closest 'pure-play' comparator to UCLL and UBA, there are a wide range of telecommunications operators, many of which take risks that include those similar to Chorus. It is therefore appropriate to validate the Chorus estimate relative to that sample, and, potentially, to use that sample in interpreting the analysis of Chorus.

**Assessment of market price data for Chorus**

Over the period since demerger, Chorus' shares have fallen. As a result, its leverage has risen.[2] It is important to assess not only what Chorus' beta has been, but whether this provides evidence that Chorus' forward-looking beta could be different to its observed beta. This section considers the assessment of the beta for Chorus given this wider market context, with a discussion of the following.

- What is the market evidence on the level, and standard error, of the Chorus beta? We perform statistical tests to assess the robustness of the Chorus beta, and to assess the impact of the specific issues faced by Chorus over the last two years on the reliability of the Chorus beta estimates.

[2] Where leverage is measured as debt / (debt + equity), with both debt and equity values being calculated on a market value basis.

- Based on analysis of the New Zealand market, how does the reliability of the Chorus beta estimate compare to beta estimates for other New Zealand utilities, and do New Zealand betas appear to be robust against relevant statistical tests?

- What does the Chorus-specific beta analysis, together with the analysis of betas for other New Zealand companies, suggest as a range for the beta of Chorus?

Within this section we focus on the estimates of the equity beta, and we assume that the debt beta is zero when presenting equivalent numbers for asset betas. We return to this assumption in section 5, when assessing the impact of the choice of debt beta on the asset beta and equity beta to be assumed for UCLL and UBA.

### 2.1 Market evidence on Chorus equity and asset betas

The approach that the Commission uses to estimate a required return on equity for Chorus is the capital asset pricing model (CAPM).[3] This model is the standard approach taken by regulators in estimating a required return for equity investors (also described as the cost of equity). The theoretical model within the CAPM is well understood, but the estimation of the different parameters can be difficult and is subject to uncertainty.

According to the CAPM, equity investors require compensation for systematic risk only (risk that cannot be diversified away by holding a portfolio of assets). This exposure to systematic risk is measured by the equity beta.

For a company listed on the stock market, the equity beta, and the related asset beta (which reflects the underlying market risk of the assets and excludes the impact of financial leverage), can be estimated using information on actual share returns, market returns and capital structure. Chorus is listed on the New Zealand Stock Exchange, and an equity beta can therefore be derived from this stock price data.[4]

However, the estimation of a beta from market data is not straightforward. The formula for deriving the equity beta $\beta_E$ is:

$$E(R_{E_i}) = \beta_E \times E(R_{M_i}) + \varepsilon_i$$

where:

$E(R_{E_i})$ is the expected return on assets;

$E(R_{M_i})$ is the expected return on a market portfolio;

$\beta_E$ is the equity beta;

$\varepsilon_i$ is an error term reflecting the size of the market movement that is not explained by the equity beta in period *i*;

[3] For the cost of equity calculation, the Commission uses the simplified version of the Brennan–Lally CAPM that assumes that dividends are fully imputed and the investor receives full benefits from dividend imputation tax credits; the investor incurs no tax on capital gains; and the New Zealand capital markets are completely segregated from overseas capital markets.

[4] Chorus is also listed on the Australian Stock Exchange. However, since its stock price is largely linked to activities in New Zealand, the relevance of the relationship between Chorus' price and the Australian Stock Index is more limited.

*i* = 1,...,n is the number of time observations in the sample.

While this formula can be readily assessed through a regression of market and stock price data, there are a range of assumptions which need to be considered and can have an impact on the analysis of the equity beta:[5]

- the choice of market index;
- the period over which the data is assessed;
- whether data should be assessed on a daily, weekly or monthly basis.

In addition, the CAPM framework requires a forward-looking assessment of expected returns, whereas data is available on past trading performance only. The beta derived from past trading performance is only a best estimate, with a statistical uncertainty over its accuracy. An uncertainty therefore remains when using the results of this analysis in deriving the cost of equity.[6]

As a result, part of the Commission's calculation involves deriving a **standard error** as discussed below. This standard error can be used to understand the level of robustness of the beta estimate. It is also helpful in understanding whether the assumptions underlying the CAPM hold in practice.[7]

In addition, it is standard practice to review a **comparator set** to test whether a single company beta estimate appears to be consistent with those of comparable companies.

### 2.2 Initial results—Chorus' equity beta since the demerger

Step 1 of Oxera's analysis is to estimate the beta of Chorus. We have made the following assumptions when determining an estimate of Chorus' equity beta.

- **Choice of market index**. Oxera uses the Datastream database as a primary source of market index data series. The indices representing the most liquid equity at the New Zealand and Australian markets and available on Datastream are NZX 50 and ASX 300, respectively. Generally, the equity beta measured against broad indices should capture the risk of exposure to the market better than the beta measured against narrower indices. However, the use of a wider index can have disadvantages. In the case of New Zealand, 10% of the shares on the NZ All Share index have been traded extremely thinly or not at all within the last month of data within Oxera's sample. This will create a bias in the beta estimate. The difference in equity betas obtained using the NZX 50 and NZX All Share is modest (around 0.05–

[5] There are also detailed points about the way in which the regression is performed, which can have a small impact on the derivation of beta—including, for example, the use of simple returns or returns relative to a risk-free rate. Generally, the impact of these is small, particularly relative to the standard error discussed below.

[6] The confidence interval (or statistical range) is derived using properties of standard normal distribution, and is calculated as 'point estimate (e.g. beta) +/– 1.96*standard error'. This interval indicates a range of values of the estimate that it can take in 95% of cases. The 95% confidence interval is a standard output of major statistical tools such as Stata and is a range typically used in statistical and econometric analysis.

[7] Assumptions of CAPM such as homoscedasticity (no change of variance over time) of error terms and no alpha have also been tested. The latter implies no alpha in a regression with returns relative to the risk-free rate. This comes from the formula $E(R_E) - R_F = \beta * E(R_M) + \varepsilon$. Since most regulators assume that the effect of alpha on the cost of equity is minimal, Oxera does not include the alpha term in its approach used throughout the report. None of the statistical tests provided evidence that the use of the CAPM model is not statistically robust or appropriate.

0.10). On this basis, Oxera's analysis is based on the more liquid NZX 50 Index.[8]

- **Choice of period and frequency of dataset**. There is no single preferred method for determining the optimal sample size in a linear regression such as that applied in estimating the equity beta. However, a larger number of observations implies a smaller variance of regression estimate and, hence, a more robust estimate for the equity beta. Taking into account the relatively short history of Chorus share trading of 2.5 years, the use of daily returns will have advantages in terms of sample size relative to the use of weekly and monthly data, and the daily data available on Chorus prices appears to be sufficient to support the use of a daily statistic. For example, an analysis of auto-correlation between daily prices suggests a limited effect in respect of prices on consecutive days only, which would not materially affect our conclusions.[9] Throughout this report, beta estimates are assessed on a daily basis, and a two-year period has been applied for assessing the regional data.[10]

Since Chorus' shares started trading in November 2011, its price trend has diverged from the NZX market. This effect has been marked over the last six-month period and is largely due to a significant price drop in October–November 2013.[11]

This fall in the share price of Chorus has been accompanied by a decline of its six-month rolling equity beta (Figure 2.1); and the standard error of the equity beta has also increased, as would be expected when prices are volatile relative to their longer-term trends (Figure 2.2). However, the two-year beta has proved to be relatively stable at around 1.0.[12]

[8] This is different from the methodology published in Ofcom (2014), 'Fixed access market reviews 2014: draft statement', 20 May, where the NZX All index was chosen.

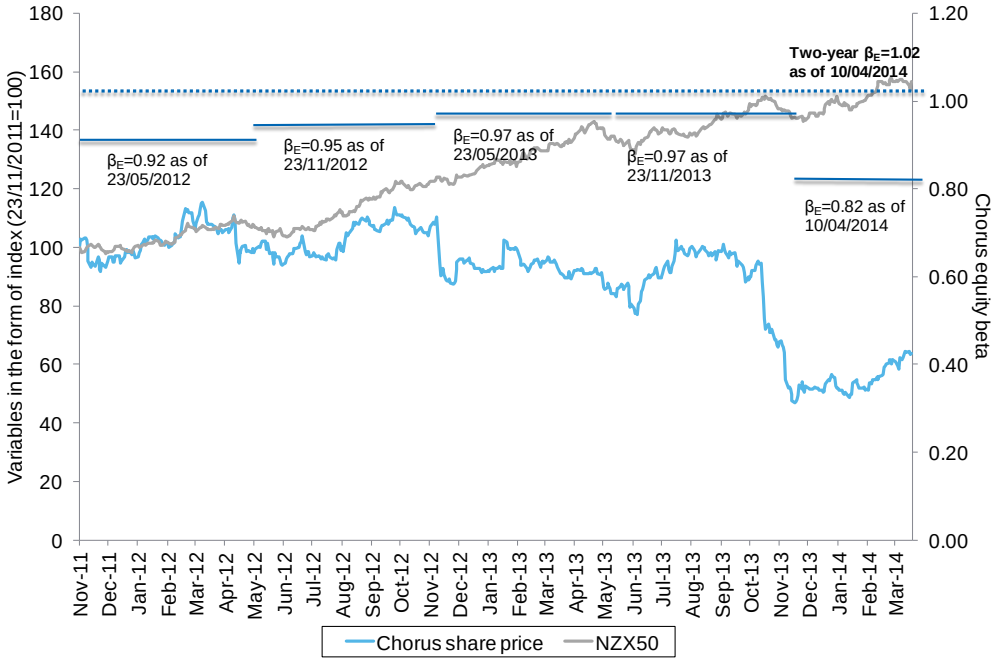
[9] An additional check of intraday trading data showed that, over the last six months, Chorus' shares have been traded every single hour during the NZX trading hours. This means that the daily (closing) price data does not suffer from an illiquidity bias—i.e. Chorus' closing share price can be used for the analysis along with closing value of the NZX 50 index. There is a very small auto-correlation effect between prices on consecutive days only, and this would not have a material effect on the conclusions of the analysis.

[10] This is different from the approach applied in the Commission's IMs, which uses five-year rolling betas on a weekly and monthly basis, over a 20-year period. The shorter period used in this section is primarily due to Chorus' short share price history. However, in section 3 of the report, we estimate daily, weekly and monthly equity betas for international comparators based on longer periods where the data is available, but conclude that, given the changes within the telecommunications market, the 20-year approach is less appropriate than in the other relevant regulated industries. A two-year period may be less appropriate if some of that period were likely to not reflect the future—for example, as may have been the case during the financial crisis. However, the evidence in this section illustrates no systematic instability or unexpected results which would indicate that this is the case during the relevant period.

[11] According to Bloomberg, the reason for the fall in Chorus' share price was likely to be the announcement of the Commission's decision to reduce the price of copper services that could reduce Chorus' revenues and influence the user choice of fibre over copper-based services. See Bloomberg (2013), 'Chorus Plunges After Pricing Override Blocked: Wellington Mover', 28 November (http://www.bloomberg.com/news/2013-11-28/chorus-plunges-after-pricing-override-blocked-wellington-mover.html).

[12] While the six-month beta is lower in each period than 1.02, the two-year beta is not necessarily linked to the average of the six monthly betas. The standard error of a two-year beta is always likely to be lower than the six monthly betas, as there is a greater sample size.

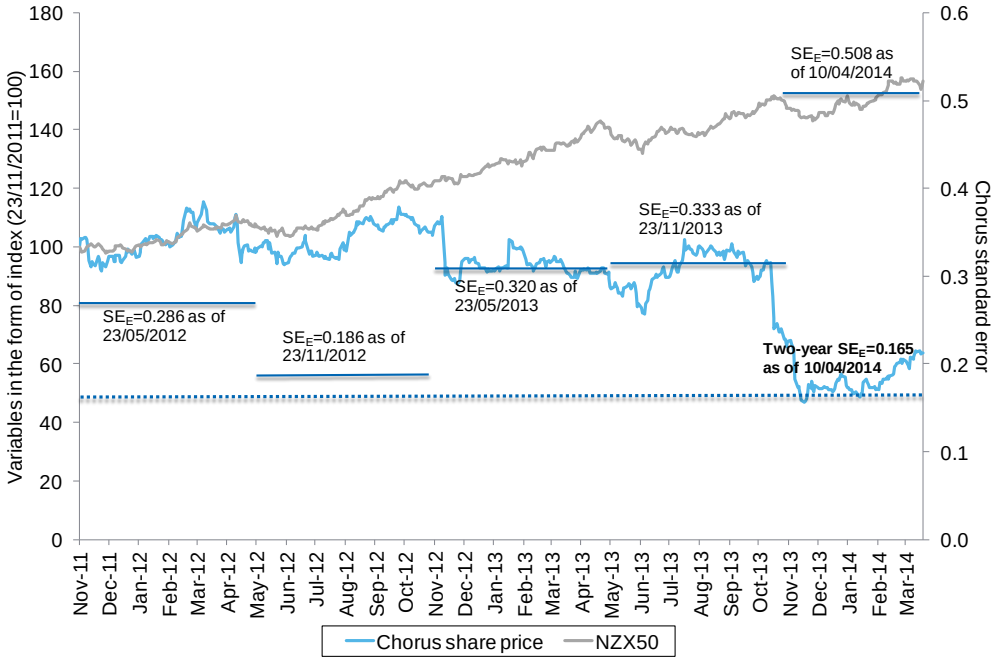
**Figure 2.1 Chorus historical equity betas and share price post demerger**




Note: The dotted line indicates the last two-year equity beta level; the short horizontal lines indicate the levels of six-month equity beta for the relevant periods.

Source: Datastream, Bloomberg, Oxera analysis.

**Figure 2.2 Chorus historical standard errors for equity betas**




Note: The dotted line indicates the last two-year standard error level; the short horizontal lines indicate the levels of six-month standard errors for the relevant periods.

Source: Datastream, Bloomberg, Oxera analysis.

These trends may imply that the Chorus equity beta estimate has become lower and less reliable over time. However, this has been largely driven by specific events, including the impact of the Commission's UCLL and UBA decisions

under the Initial Pricing Principle, which have also increased the range of error around short-term beta estimates. Any evidence of a falling beta appears to be limited to a short period and subject to a high range of uncertainty.

Overall, while Chorus' share price may have been declining, the Chorus share price data appears to be robust for estimating the beta. The confidence interval around the beta level indicates that there is clear evidence that the CAPM relationship holds, and there has been an equity beta of the order of 1.0. The observed beta estimate, together with the standard error analysis, can then be applied to construct a range.[13]

### 2.3 Assessment of the Chorus asset beta based on market data

The asset beta represents the relationship between the value of a firm's assets, which are funded through a combination of equity and debt, and the equity market more generally. It is generally derived as a weighted average of an equity beta and a debt beta. The debt beta is generally assumed to be small or zero.

Oxera has derived Chorus' asset beta by adjusting its equity beta to reflect the average level of gearing over the period of estimation (i.e. two years). This is a generally accepted approach among regulators that smoothes the effect of any sharp changes in debt over the period on the estimate.[14]

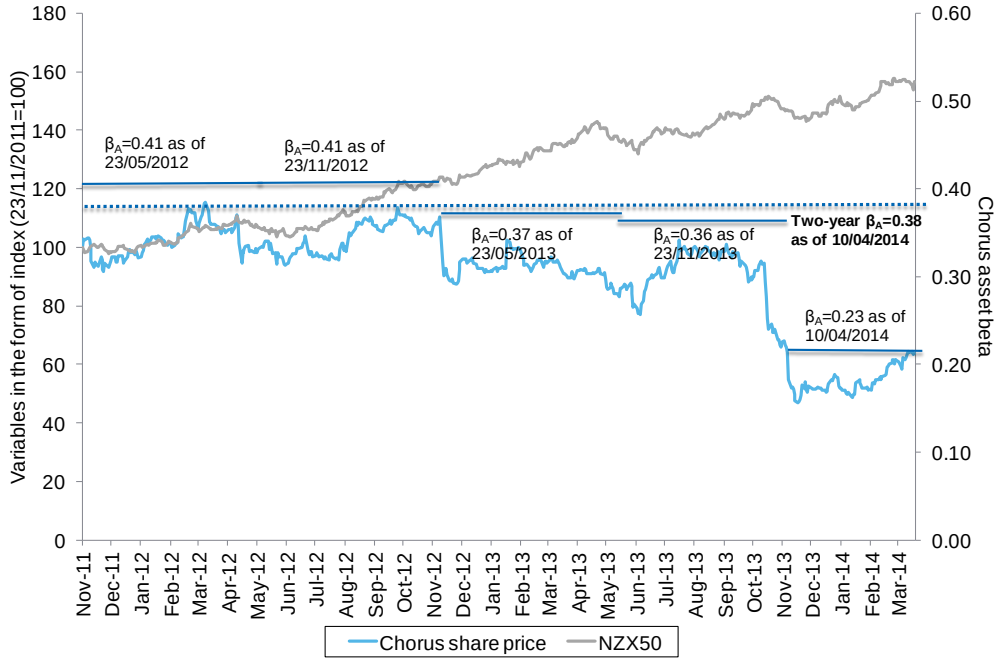
It can be seen from Figure 2.3 that whilst the short term asset beta (assuming a zero debt beta) has been lower during the last six months, in a manner comparable to the equity beta, the two-year asset beta has been around 0.35–0.4, with a point estimate of 0.38 over the period.[15]

[13] Oxera also conducted additional tests for heteroscedasticity of errors and autocorrelation in the Chorus returns series. It appears that there is autocorrelation of the first order in the series—i.e. return at time T does depend on return at time T-1. Since the mitigation of this issue seems to have a very limited effect on the beta estimates, only the results for the core CAPM-based estimation are reported.

[14] An alternative theoretical approach to determining the asset beta would be to calculate the change in daily values of the business (debt + equity) relative to the market. Oxera also estimated Chorus asset beta by regressing the daily changes in its asset values against the market returns as per the CAPM. However, because companies such as Chorus issue only quarterly reports on the size of their debt, our analysis suggests that this is a less reliable approach. Such directly estimated asset betas appeared to be very sensitive to changes in leverage, due to the fact that reported debt might increase quite sharply and create overstated volatility. This effect can be offset through the smoothing of debt effects across the period, but this requires assumptions on the market's knowledge of actual trends in debt.

[15] In coming to an estimate of the asset beta, it is necessary to estimate the market view of gearing, which depends on the appropriate interpretation of the combination of market prices for equity and published levels of debt which are only refreshed quarterly. Our point estimate is based on the average level of gearing over the period, relative to the actual book level of gearing. Other interpretations are possible, but would have only a small impact on the asset beta estimate.

**Figure 2.3 Chorus historical asset beta since demerger**

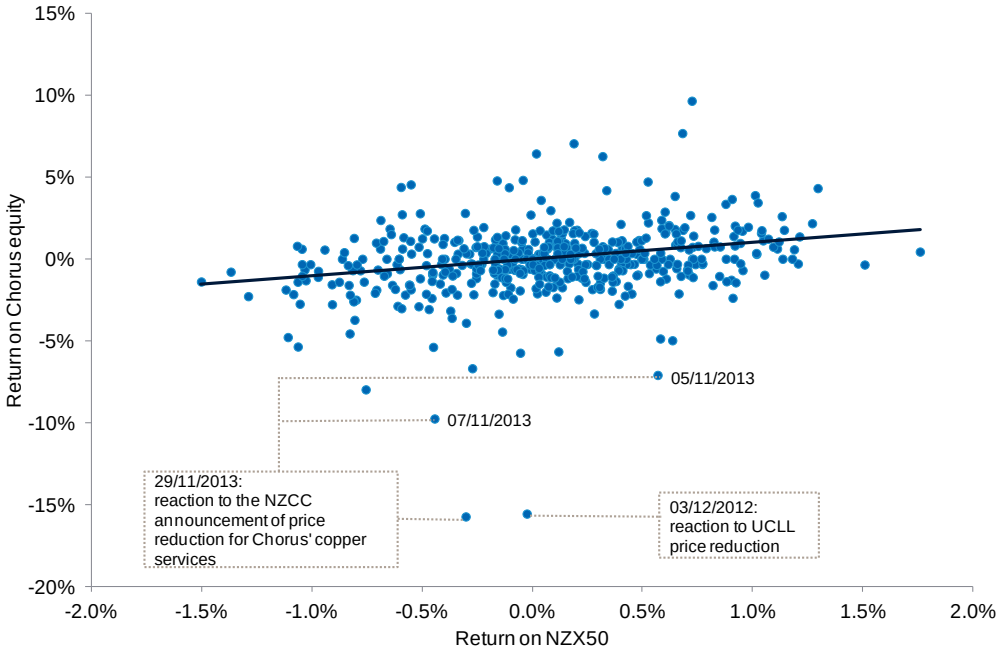



Note: The dotted line indicates the last two-year asset beta level; the short horizontal lines indicate the levels of six-month asset beta for the relevant periods.

Source: Datastream, Bloomberg, Oxera analysis.

As can be seen in Figure 2.3, there have been periods of sharp one-off changes in the Chorus share price. Moreover, the largest of the falls in the share price were related not to general market conditions but to the sensitivity of Chorus equity value to the regulatory Decisions in respect of its copper business. This is illustrated in Figure 2.4, which shows the range of actual returns on each day within the last two years.

**Figure 2.4 Chorus and market returns**




Note: The black regression line is an output of the regression of the Chorus equity returns against the market returns. The slope of this line is defined by the beta coeffcient estimate.

Source: Datastream, Oxera analysis.

Such material changes can bias the results of the analysis of beta, and will increase the standard error of Chorus' beta based on past share price performance, in a way that might not be expected to recur into the future. This does not mean that it is correct to adjust the beta estimate to exclude these periods.

However, it may nevertheless be instructive to test the extent to which the beta or the standard error is affected by the significant effects in these periods. Oxera has performed a set of sensitivity tests to measure this effect. Table 2.1 demonstrates the effects on the Chorus two-year equity beta statistic of excluding the two periods of greatest market instability, or of focusing entirely on the period prior to the market uncertainty since November 2013.

**Table 2.1 Sensitivity test results for Chorus equity beta**

| Parameter | All data | Prior to period 1 | Excl. period 1 | Excl. period 2 | Excl. periods 1 and 2 |
|---|---|---|---|---|---|
| Equity beta | 1.019[1] | 0.966 | 1.015 | 1.007 | 0.972 |
| Standard error | 0.165 | 0.133 | 0.139 | 0.156 | 0.126 |
| 2.5th percentile | 0.695 | 0.705 | 0.742 | 0.701 | 0.724 |
| 97.5th percentile | 1.343 | 1.227 | 1.287 | 1.314 | 1.212 |
| RSS | 0.211 | 0.131 | 0.153 | 0.185 | 0.125 |

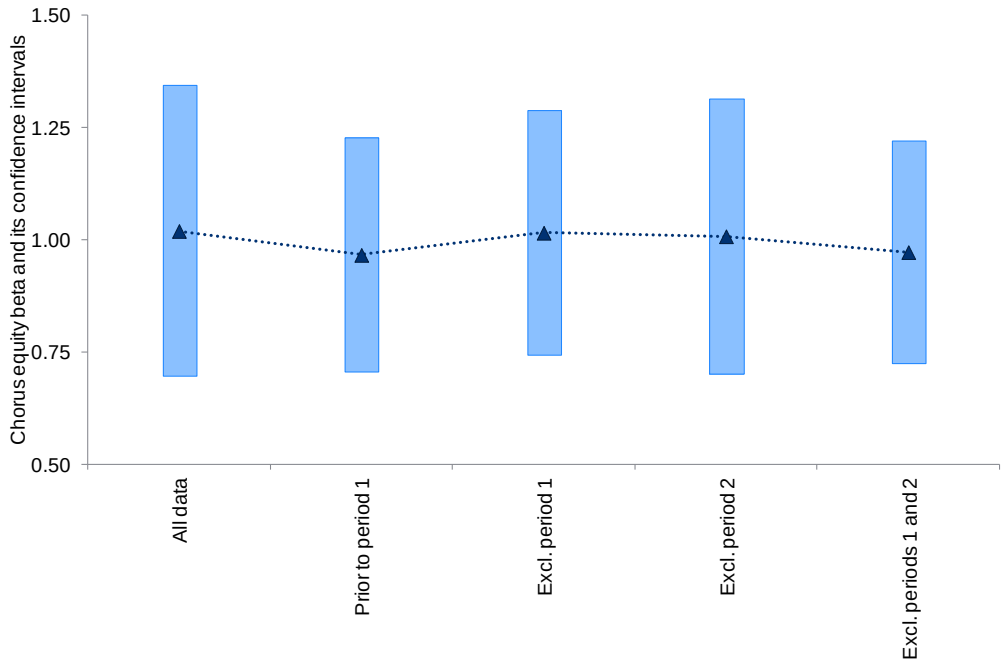
Note: All tested series consist of the last two available years of data. Period 1 is from 01/11/2013 to 16/12/2013; period 2 is from 30/11/2012 to 24/12/2012. RSS stands for residual sum of squares, an alternative measure of the discrepancy between the data and the estimation model. It is calculated as the sum of squared differences between the observed and predicted values of beta.
[1] The equity beta of 1.02 is different to the recent estimate of 1.17 by the UK telecommunications regulator, Ofcom. This discrepancy is caused mainly by the following methodological differences: 1. Ofcom has used a different estimation window of two years prior to 16 January 2014 (this drives a difference of 0.05); 2. Ofcom has used NZX All Share as a market return reference (this drives a difference of an additional 0.06). The rest of the discrepancy (0.06) could be related to the use of

simple returns (Oxera used log returns) or rounding. Nevertheless, Ofcom's beta of 1.17 is within the confidence limits of Oxera's estimates in the table.

Source: Datastream, Bloomberg, Oxera analysis.

The exclusion of the two periods of significant shifts in market price leads to only a small shift in the equity beta (from 1.02 to 0.97) but a more significant reduction in the error terms (standard error reduces from 0.165 to 0.125; RSS reduces from 0.21 to 0.125). This effect is illustrated in Figure 2.5.

**Figure 2.5 Chorus equity beta within confidence limits**




Note: The dark-blue triangles indicate the equity beta point estimates for the relevant periods. The light-blue areas indicate their 95% confidence itnervals.

Source: Datastream, Bloomberg, Oxera analysis.

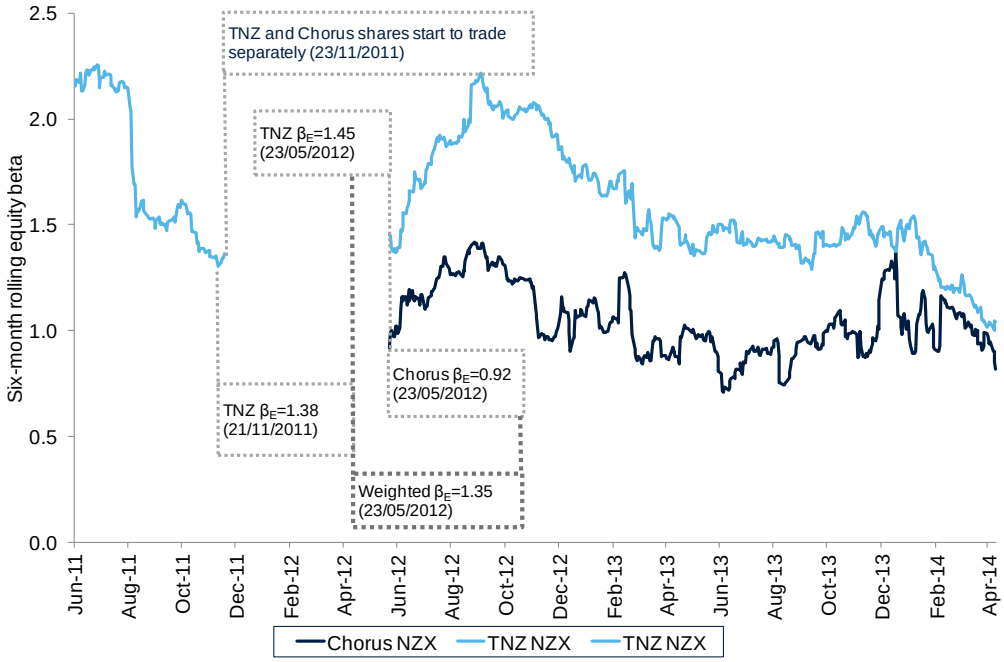
The period prior to November 2013, before the recent apparent reduction in the short-term beta estimate, is not characterised by a material difference in the two-year beta. As in the case of exclusion of the periods of instability, there is more certainty around the beta estimate compared to the full two-year period, and the 95% confidence interval shrinks by approximately 0.13.

## 2.4 Analysis of Telecom New Zealand data

This section provides a further robustness check on the assessment of Chorus' equity and asset beta estimates, through a test of the differences between the betas observed before and after the demerger in 2011 and the creation of a separate Chorus. In principle, unless the underlying business risk has changed, the TNZ beta prior to the demerger should be comparable to the beta following the demerger, weighted by Chorus and TNZ assets. This is therefore a relevant test of the robustness of the observed Chorus beta relative to longer-term data.

The equity betas can be weighted by the companies' market capitalisation, and asset betas by enterprise value. As shown in Figure 2.6 and Figure 2.7, the betas before and after disaggregation appear to be very similar (1.35 for equity and 0.94 for asset).

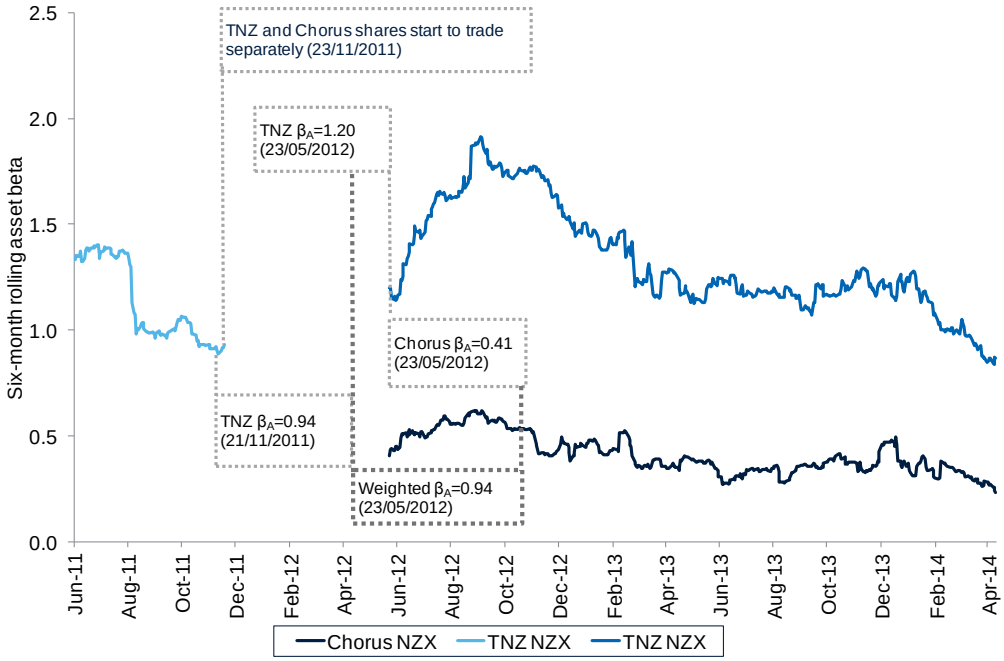
**Figure 2.6 Chorus/TNZ equity betas: before and after demerger**




Note: A six-month period has been chosen in order to estimate betas over a shorter period of time before and after the demerger.

Source: Datastream, Bloomberg, Oxera analysis.

**Figure 2.7 Chorus/TNZ asset betas: before and after demerger**




Note: A minimum six-month period has been chosen in order to estimate betas over a shorter period of time before and after the demerger.

Source: Datastream, Bloomberg, Oxera analysis.

This implies that the Chorus equity and asset beta estimates over the last 2.5 years appear to be consistent with the pre-demerger data.

## 2.5 Regional comparators: analysis of asset and equity betas

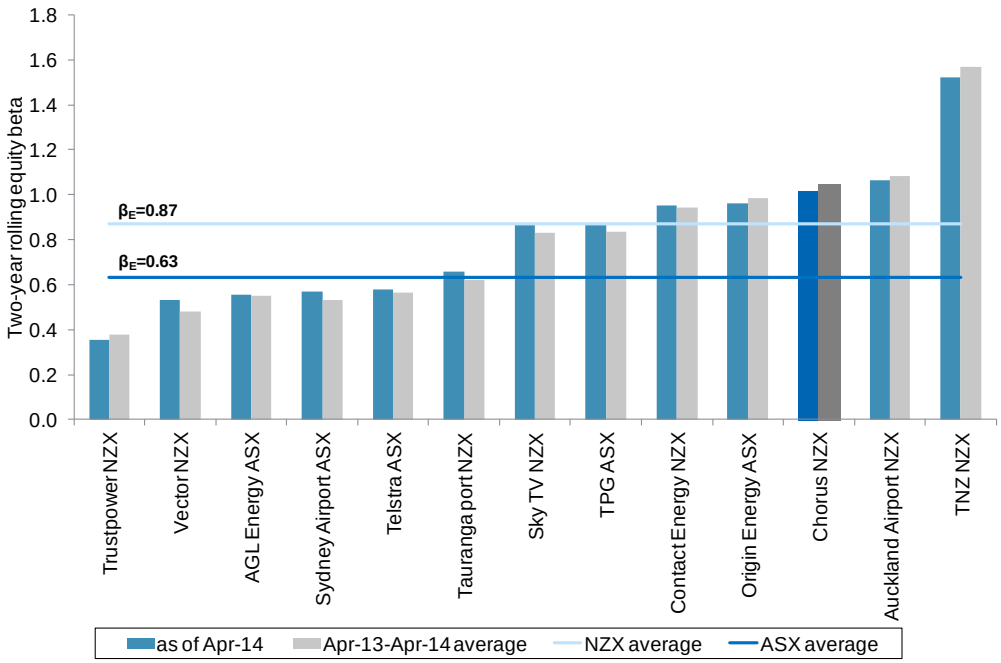
The analysis above indicates that the observed Chorus beta appears to be robust, and therefore represents an appropriate focal point for the assessment of a beta for UCLL and UBA. However, it remains important to validate this estimate through comparison of the estimate of the beta against relevant comparators.

Section 3 compares the Chorus beta assessment against international telecommunications comparators. The remainder of this section tests the robustness of the Chorus observed beta against regional comparators.

There are no other publicly listed fixed access network operators in New Zealand. Therefore, in this section, we assess Chorus against a set of the closest regional comparators, focusing on utilities within the telecommunications, energy and airport sectors which are traded on NZX or ASX.

Figure 2.8 shows the equity beta of this comparator set. It demonstrates that, on average, Chorus equity beta has been 0.4 higher than the average of its Australian comparators, and 0.1 higher than New Zealand comparators.

**Figure 2.8 Current and historical equity beta estimates for the New Zealand comparators**

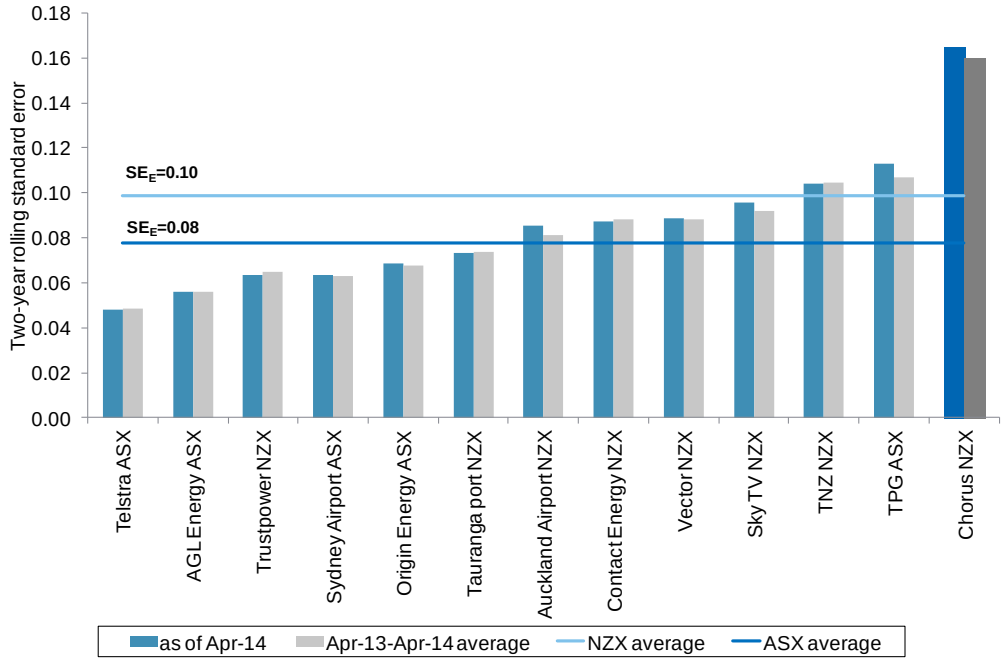



Note: The horizontal lines indicate averages as of April 2014.

Source: Datastream, Bloomberg, Oxera analysis.

At the same time, the standard error for Chorus' equity beta appears to be also at the top of the range. It is significantly higher than those of Chorus' Australian (by 0.09) and New Zealand (by 0.07) peers. It therefore appears that, on average, Chorus' equity has had higher and less reliable beta than its comparators.

**Figure 2.9 Current and historical standard errors for the New Zealand and Australian comparators' equity betas**

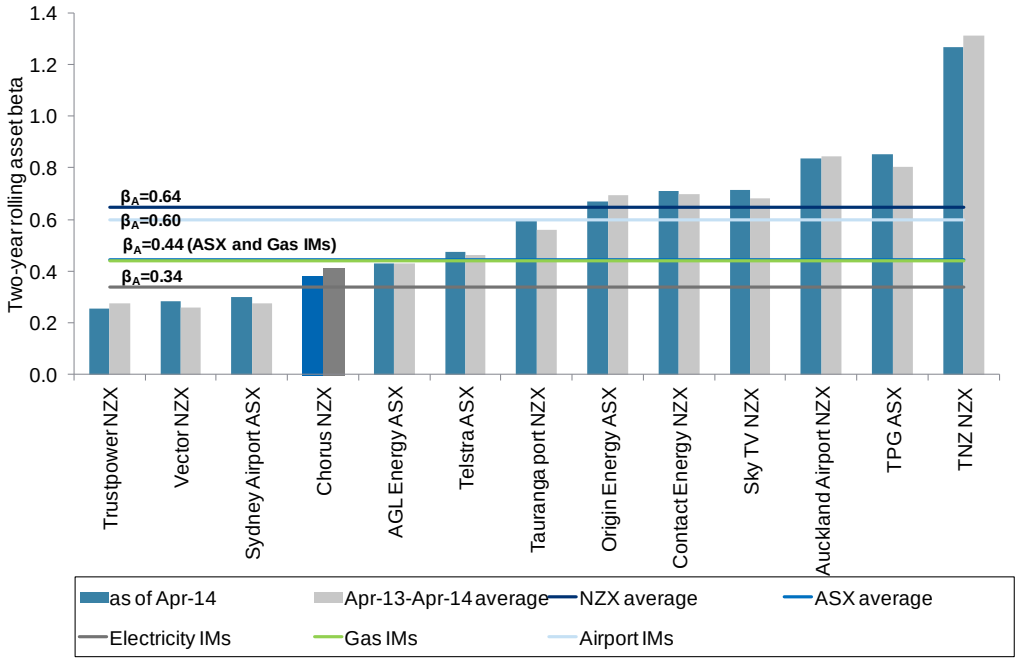



Note: The horizontal lines indicate averages as of April 2014.

Source: Datastream, Bloomberg, Oxera analysis.

However, at the asset beta level (again assuming a zero debt beta for all comparators), the picture is different. Due to the company's high leverage level, its asset beta of around 0.38 can be found towards the lower end of the comparator range. In particular, Chorus' asset beta is, on average, lower by 0.06 and 0.27 than the average of the Australian and New Zealand companies, respectively, within the sample. The New Zealand data is however affected by the high asset beta for TNZ. In the next section, we observe that TNZ has the highest beta of all the international telecommunications comparators. If the beta for TNZ were to be excluded, the comparison for New Zealand would be more comparable to that for Australia. The level of the Chorus beta is only slightly higher than the asset beta of 0.34 under the IMs for electricity distribution businesses.

**Figure 2.10 Current and historical asset beta estimates for the New Zealand and Australian comparators**

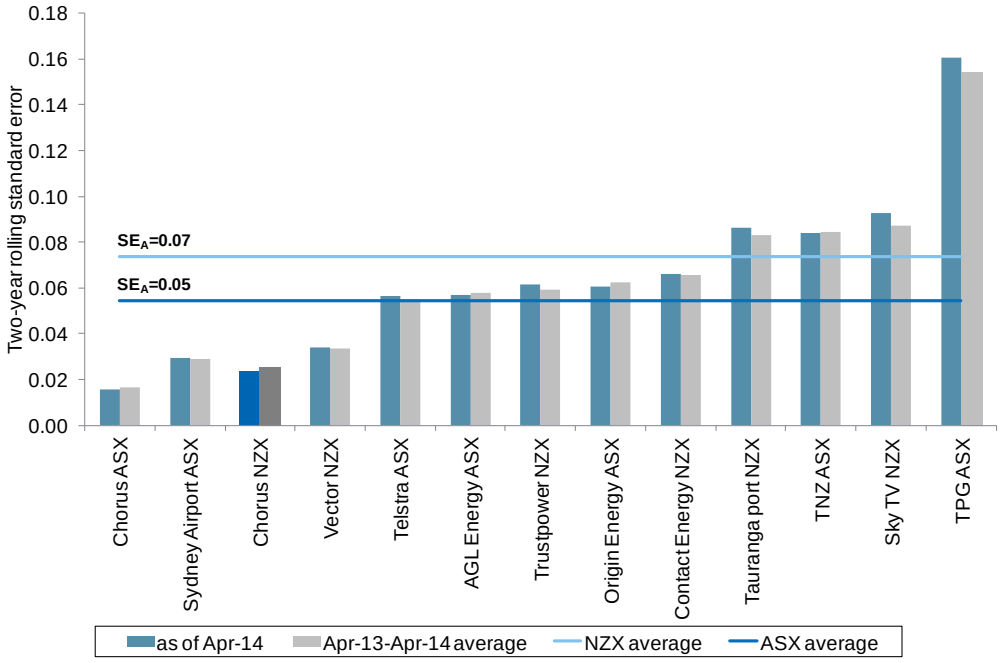



Note: The horizontal ASX and NZX lines indicate averages as of April 2014; the horizontal Electricity, Gas and Airport IMs indicate the Commission's 2010 Decisions.

Source: Datastream, Bloomberg, Oxera analysis.

In addition, if the standard error for the asset beta is assumed to be able to be derived directly from the standard error of the equity beta, then Chorus' asset beta standard error is also towards the bottom of the range.

**Figure 2.11 Current and historical standard errors for the New Zealand and Australian comparators' asset betas**




Note: The horizontal lines indicate averages as of April 2014. Asset beta's standard error was derived by multiplying equity beta's standard error by (1 – average gearing) for the relevant period.

Source: Datastream, Bloomberg, Oxera analysis.

In general, network asset owners in the telecommunications, energy and airport sectors with similar capital structures should represent the closest comparators to Chorus.

Table 2.2 below shows the asset betas, separated between asset operators and utilities with a greater focus on retail activities. In both categories, the range of beta is relatively wide, and the betas of these firms may not be directly comparable to Chorus. If anything, the level of differential between the observed Chorus beta and the energy network data and precedent may be lower than might be expected.

This suggests that Chorus' beta is broadly consistent with New Zealand betas more generally, and, as might be expected, is higher than that for Vector, which is arguably the closest comparator as a regulated network operator.

**Table 2.2 Regional comparators data (assuming zero debt beta)**

| Company | Exchange | Sector | Details | Gearing | Two-year asset beta |
|---|---|---|---|---|---|
| Chorus | NZX, ASX | Telecommunications | Access, fixed line, network builder/operator | 71% | 0.38 |
| Other asset owners—potentially similar risks | | | | | |
| Auckland Airport | NZX | Airports | – | 19% | 0.84 |
| Sydney Airport | ASX | Airports | – | 40% | 0.30 |
| Tauranga Port | NZX | Ports | – | 11% | 0.60 |
| Contact Energy | NZX | Energy | Electricity generation, gas wholesale, retail, power stations owner | 24% | 0.71 |
| Trustpower | NZX | Energy | Electricity generation and retail from renewables, power stations owner | 34% | 0.26 |
| Vector | NZX | Energy | Electricity distribution, gas transmission and distribution (network assets owner), retail | 49% | 0.28 |
| Average (asset owners) | | | | | 0.50 |
| Integrated utilities including retail (higher risk) | | | | | |
| TNZ | NZX, ASX | Telecommunications | Access, fixed line, mobile, network builder/operator | 20% | 1.27 |
| Telstra | ASX | Telecommunications | Access, mobile, TV, network builder/operator | 18% | 0.48 |
| TPG Telecom | ASX | Telecommunications | Access, mobile, software, networking, network owner | negative | 0.85 |
| Sky Television | NZX | Telecommunications | Satellite TV | 14% | 0.72 |
| AGL Energy | ASX | Energy | Electricity and gas supply, renewables operator/builder | 23% | 0.43 |
| Origin Energy | ASX | Energy | Oil/gas exploration, production, electricity generation, retail | 34% | 0.67 |
| Average (integrated utilities) | | | | | 0.74 |

Note: Asset betas are given as of 10 April 2014; for the companies whose shares are traded on both ASX and NZX, the figures are given for NZX.

Source: Datastream, Bloomberg, Oxera analysis.

This comparison also supports the conclusion that Chorus' observed beta appears to be a robust estimate, and therefore in the following sections as a suitable focal point for the assessment of the beta for UCLL and UBA.

## 2.6 Conclusion

Oxera has analysed a wide range of data, both Chorus-specific price data and regional data. The data indicates the following.

- **Chorus' observed equity beta is around 1.0**, with a wide range of around 0.8–1.2. It has a high standard error relative to its peers, but much of this can be explained through a subset of one-off shocks to the share price.
- **If the debt beta is assumed to be zero, this translates to a point estimate for the asset beta within the range of 0.35–0.40**, from a wider range of

around 0.30–0.45. Section 5 below considers whether the debt beta is likely to be zero.

- **Statistical testing suggests that the observable Chorus beta is robust for use in estimating the equity beta for UCLL and UBA**, and the estimates are broadly comparable with the limited dataset that is available from regional comparators. We therefore propose that the Chorus beta estimates are reliable as a focal point for testing against a wider comparator set.

# 3 Lessons from international telecommunications betas

Section 2 determined the potential value of the equity beta that would be derived from an assessment of the Chorus beta.

In estimating the beta for a regulated firm such as Chorus, there are generally some limitations on the number of direct comparators. In the case of Chorus, there is only one copper access operator in New Zealand, and one integrated telecommunications access provider in Australia. It is therefore consistent with best practice to also assess whether a wider international comparator set can be used to develop additional evidence against which to test the level of asset beta indicated by the Chorus analysis—i.e. around 0.3–0.45 (assuming zero debt beta).

In addition, as part of its response to the Commission's consultation, Chorus provided a submission by Dr Hird, which we have reviewed and considered alongside our own analysis.[16] Dr Hird's submission also sought to provide evidence as to a suitable comparator set, and as to the beta that would be applied based on that comparator set. Dr Hird's comparator set is extensive, and identifies the companies that our own analysis highlighted as being the best comparators. For reasons outlined below, Oxera's analysis resulted in a smaller comparator set. In this section we outline the conclusions of our analysis relative to Dr Hird's comparator set, and relative to the Chorus and regional data.

## 3.1 Overview of Oxera's approach

This section reviews the data on international telecommunications comparators. It is structured as follows.

- **Selecting comparator companies**—we define a comparator set by reviewing globally listed telecommunications firms to assist in determining an asset beta for Chorus. There is no direct comparator to Chorus—i.e. no other 'pure-play' fixed network access operator. The aim is therefore to identify, from the global comparator set of operators, which have characteristics that are the most comparable to Chorus. We have sought, where possible, to ensure that the analysis is not biased by asset risks that are not relevant to Chorus.

- **Calculating asset betas**—we outline the methodology and the market evidence on the levels of asset beta within the comparator set. We test the asset betas on a like-for-like basis with our analysis for Chorus in the previous section, and also over a five-year period, as used by the Commission in its IMs alongside a longer-term average.[17]

- **Further analysis**—we then explore the possibility of relationships between the asset beta estimates and factors relating to the scale of business activities, characteristics of the company's demand profile, and the nature of the regulatory regime. This section also presents evidence from regulatory precedent

[16] See Hird, T. (2014), 'Response to Commerce Commission UCLL/UBA WACC consultation paper', March, p. 13.
[17] Commerce Commission (2010), 'Input Methodologies (Electricity Distribution and Gas Pipeline Services)', Reasons Paper, December.

Based on this analysis, together with the analysis in section 2, we propose a range for the asset beta for UCLL and UBA.

### 3.2 Identifying comparator companies

To identify comparators that are likely to face business risks similar to those faced by Chorus, a broad search of listed telecommunications companies in Asia Pacific, Europe and the USA was undertaken. This is consistent with the Commission's approach adopted in its IM Final Reasons Paper for electricity and gas companies.

While there are several good examples of energy companies with network-only businesses, telecommunications companies with legacy network assets are typically vertically integrated, with several of them engaging in large-scale mobile telephony activities. As such, Oxera has not identified any pure-play fixed telecommunications network firms.

Having researched suitable comparators from around the world, Oxera's list of comparator firms broadly aligns with those adopted by other regulators and stakeholder responses. In particular, Dr Hird's submission analyses a comprehensive set of comparator firms.[18] Table 3.1 below presents the 30 comparator firms identified by Dr Hird in addition to Chorus.

**Table 3.1 Universal set of comparator fims**

| USA | Europe | Europe | Asia Pacific |
|---|---|---|---|
| AT&T | Belgacom | TDC | **Chorus** |
| CenturyLink | BT Group | Telecom Italia | Telecom Corporation of New Zealand |
| Cincinnati Bell | Colt Group | Telefónica | Telstra |
| Cogent Communications | Deutsche Telekom | Telekom Austria | |
| FairPoint Communications | Elisa | Telenor | |
| Frontier Communications | Hellenic Telecommunications Org. | TeliaSonera | |
| Hawaiian Telecom | Iliad | | |
| Lumos Networks | Koninklijke KPN | | |
| TW Telecom | Orange | | |
| Verizon Communications | Portugal Telecom | | |
| Windstream Holdings | Swisscom | | |

Source: Oxera analysis, and Hird, T. (2014), 'Response to Commerce Commission UCLL/UBA WACC consultation paper', March, p. 13.

In identifying a comparator set, we considered Chorus' range of business activities, and whether they point to these comparators being similar in their business risk. Chorus' business can be characterised as follows:

- Chorus' main activity relates to building and maintaining a telecommunications network made up of local telephone exchanges, cabinets and cables;

[18] Dr Hird's set excludes comparators from Asia, possibly because the publicly traded incumbent telecommunications firms such as Telegraph & Telephone Corporation and KT Corporation are not particularly suitable comparators, given their diversity of business activities and geographies of operation.

- Chorus' revenues and profits currently largely relate to copper assets, but it is engaging in a major fibre investment programme;
- Chorus has no retail operations;
- Chorus has no presence in the mobile telephony market;
- Chorus' revenues primarily arise from regulated business activities;
- the risks of Chorus' fibre investment are partly offset by the access it has to loans and grants from the government for infrastructure development.

Unlike Chorus, all the comparator firms presented in Table 3.1 have retail operations, and a majority of them derive a significant proportion of their revenues from mobile operations. Where data is available, the dependence on fixed-line business revenues varies significantly. In addition, the firms have varying levels of exposure to regulation, and the specific nature of Chorus' fibre investment, partly funded by the government, is unique to Chorus.

Dr Hird identifies BT Group as the single most comparable firm to Chorus, on the basis of absence of mobile ownership and similar regulatory risk profiles.[19] While it may be the case that, within the comparator set, the characteristics of BT Group are most aligned to those of Chorus, there are major differences between the two firms which would require any read-across from the asset beta of BT Group to be viewed with a degree of caution. BT Group is a vertically integrated telecommunications company with a large retail business, and it also has interests in television and sports television businesses (which are considerably riskier than providing network access). Its retail operations account for more than 60% of total revenues. In comparison, Chorus is a vertically separated telecommunications network provider with no retail business.

It may be more appropriate to argue that, within BT Group, BT Openreach is most comparable to Chorus. However, there are some key differences between these two network operators that need to be considered. For example:

- Chorus supplies only unbundled loops and backhaul, and owns the network assets required to provide these services. In contrast, BT Openreach's wholesale services include active supply of wholesale line rental (WLR) and ISDN services;
- Chorus has some degree of overlap of information and technology systems with Telecom Corporation of New Zealand, whereas Openreach and BT have separate systems;[20]
- As is identified later in this section, BT's beta is generally higher than that identified within the comparator set, in part because of specific factors such as its significant level of pension risk;
- BT Openreach is not publicly traded, and its asset beta is determined by the regulator by disaggregating the observed BT Group asset beta.

[19] See Hird, T. (2014), 'Response to Commerce Commission UCLL/UBA WACC consultation paper', March, p. 14.
[20] See Gilbert Tobin, 'Separation regulation of dominant telecommunications operators in today's legacy networks and tomorrow's next generation networks' (http://www.gtlaw.com.au/wp-content/uploads/Separation-regulation.pdf, accessed 22 May 2014).

Hence, although Dr Hird's suggestion may be true within the set of available comparators, on a stand-alone basis, the BT Group asset beta does not appear to accurately reflect the asset risks for Chorus.

The interplay of all these factors suggests that the asset risks faced by these firms may be different. There is no perfect comparator to Chorus. However, there are certain firms in the comparator set that are more similar in their operations to Chorus than others. Oxera has therefore sought to analyse the asset beta for these most directly comparable firms, as a cross-check to the asset beta of Chorus assessed in section 2, which was based on Chorus-specific data and regional data.

### 3.2.1 Refining the comparator set

Given the diversity in operations of the comparator firms, a detailed assessment was undertaken to ascertain the extent of comparability to Chorus. There is no precise methodology or criteria to exclude comparator firms. However, while conducting a comparator asset beta analysis there are certain general desirable characteristics that provide robustness to the analysis. The following criteria were tested against the list of comparator firms in Table 3.1 above.

- **Availability of data**—data on each comparator must be available, at least for the time since Chorus started trading on 25 November 2011.
- **Nature of network**—comparators with no copper network assets were excluded. This represents a fundamental difference in the core assets of the comparator firm, and therefore in the nature of the business risk.
- **Share of revenues in country of main operation**—comparators with a majority of revenues from overseas operations were excluded. The exposure to exchange rate risks and various regulatory regimes is likely to pollute the asset beta analysis.
- **Liquidity**—a necessary condition for beta estimates is that markets for their securities are sufficiently liquid.[21] There are several possible measures of liquidity, each with its own limitations. For the purposes of simplicity, only those companies with non-zero trading volumes on at least 80% of all trading days were included in the sample.

In addition, the share of revenues from fixed-line operations was considered. However, given the differences between the forms of reporting implemented by the different firms, this distinction cannot be made very clearly.[22]

All comparator firms met the availability of data criterion, and only one firm did not pass the liquidity test. Table 3.2 below lists the comparator firms that were excluded during the refinement, and the associated reasoning. For example, a firm such as TNZ (post-split from Chorus) has a fundamentally different set of assets, and therefore business risks, from an asset owner such as Chorus.

[21] Illiquidity imposes additional trading costs on investors, breaching the assumption in the CAPM of zero transaction costs.

[22] Lastly, gearing ratios for comparator firms were observed. Although, in theory, the asset risk of the firm should be invariant to the capital structure, we considered that firms with very low or negative gearing might not be good comparators at the level of the asset beta. The principle of the irrelevance of capital structure was developed by Modigliani and Miller, and is discussed further in section 6 below on the debt beta. In practice, possibly due to non-zero debt betas, asset betas may be different for firms with different levels of gearing. However, while we considered the gearing ratio as a potential factor that could affect the choice of the comparator set, in practice, no firms were excluded purely on the basis of their gearing.

**Table 3.2 Firms excluded from the final comparator analysis**

| Firm | Reasons for exclusion |
|---|---|
| Cogent Communications | Primarily fibre optic network |
| Colt Group | Primarily fibre optic network providing business communication services[1] |
| Lumos Networks | Primarily fibre optic network |
| Telecom Corporation of New Zealand | No copper wire core network assets; does not pass liquidity threshold[2] |
| Telefónica | Approximately 22% of revenues from Spanish operations[3] |
| Telenor | Approximately 24% of revenues from Norwegian operations[3] |
| Teliasonera | Approximately 35% of revenues from Swedish operations[3] |
| TW Telecom | Primarily fibre optic network serving metropolitan areas in the USA |

Note: [1] Colt Group also has negative gearing which may impact the reliability of the beta estimates. [2] TNZ does have technology including switches to allow it to convert the Chorus copper network products into services for end users. The liquidity threshold is passed on a short-term basis—i.e. five years. However, on a longer-term basis, the liquidity threshold is not passed. [3] Indicates data sourced from 2013 annual report. Although Deutsche Telekom earns approximately 42% of its revenues in Germany, when combined with revenues in other eurozonecountries, this is well over 50%.

Source: Oxera analysis based on company annual reports for the year 2013 and various company websites.

As discussed above, even after these adjustments to the dataset, there are limitations on the reliability of the refined comparator set, as many of these firms have significant operational differences to Chorus. However, most of the remaining firms in the dataset have some relevant overlap in their core activities.

Therefore, the Oxera refined comparator set is valid as a cross-check to the Chorus beta analysis discussed in section 2 above. The full comparator set applied by Dr Hird includes some comparators that our analysis suggests are less reliable as comparators for Chorus.

### 3.3 Evidence from comparator companies

Our approach to assessing the beta of the comparator set is largely the same as that taken in the regional dataset, including Chorus' beta. However, in respect of the period applied, this would be a divergence from precedent in New Zealand.

In order to estimate the equity betas, the Commission has previously adopted a long-term average of five-year weekly and monthly betas sourced from Bloomberg. Weekly and monthly data is often used when a reliable long-term dataset is available, as this approach can avoid some of the 'noise' associated with higher-frequency data (i.e. daily betas). It can also be argued that the robustness of regression analysis is directly proportional to the number of observed datapoints, which would point to the use of daily betas.

Furthermore, data on the Chorus stock price is available only since November 2011, and therefore two-year betas are the only option that can be calculated in order to enable a comparison of the Chorus asset beta and those of the comparator firms over the same period.

We therefore present both two-year and five-year betas, on a daily basis, a weekly basis, and, in the case of the five-year data, on a monthly basis, in order to assess whether the choice of period materially affects the conclusions about an appropriate range. Given the number of raw datapoints for two-year monthly equity beta calculations, it is not possible to obtain robust beta estimates, and these have been excluded.

### 3.3.1 Betas for the comparator set

Table 3.3 and Table 3.4 present the five- and two-year asset beta calculations. Five-year asset betas are presented for monthly, weekly and daily frequencies. For the sake of completeness, results have been presented for all companies in the superset of comparators. The tables present the betas over a 20-year period, consistent with the Commission precedent and with the analysis in Dr Hird's submission.

These results assume the debt beta to be zero.[23]

[23] A discussion of the impact of a non-zero debt beta is presented in section 5.

## Table 3.3 Five-year asset beta calculations (assuming a zero debt beta), 1994–2014

| Comparator firm | Daily | | | | Weekly | | | | Monthly | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1999 | 2004 | 2009 | 2014 | 1999 | 2004 | 2009 | 2014 | 1999 | 2004 | 2009 | 2014 |
| AT&T | 0.63 | 0.70 | 0.70 | **0.43** | 0.60 | 0.63 | 0.67 | 0.41 | 0.66 | 0.68 | 0.66 | 0.39 |
| Belgacom | | | 0.46 | **0.42** | | | 0.36 | 0.44 | | | 0.45 | 0.35 |
| BT Group | 1.09 | 0.98 | 0.56 | **0.61** | 0.91 | 0.82 | 0.48 | 0.64 | 0.82 | 1.15 | 0.53 | 0.58 |
| CenturyLink | 0.43 | 0.50 | 0.46 | **0.37** | 0.56 | 0.50 | 0.43 | 0.37 | 0.67 | 0.49 | 0.35 | 0.42 |
| Chorus | | | | | | | | | | | | |
| Cincinnati Bell | 0.40 | 0.72 | 0.37 | **0.26** | 0.58 | 0.76 | 0.40 | 0.28 | 1.04 | 1.00 | 0.52 | 0.33 |
| *Cogent Communications* | | | *0.90* | ***1.01*** | | | *1.12* | *1.08* | | | *1.14* | *1.17* |
| *Colt Group* | | | *0.78* | ***0.80*** | | | *0.73* | *0.87* | | | *0.98* | *1.05* |
| Deutsche Telekom | | 0.85 | 0.29 | **0.22** | | 0.45 | 0.27 | 0.21 | | 0.41 | 0.24 | 0.19 |
| Elisa | | | 0.52 | **0.39** | | | 0.49 | 0.44 | | | 0.65 | 0.37 |
| FairPoint Communications | | | | | | | | | | | | |
| Frontier Communications | 0.17 | 0.33 | 0.44 | **0.29** | 0.16 | 0.34 | 0.52 | 0.32 | 0.15 | 0.78 | 0.56 | 0.30 |
| Hawaiian Telecom | | | | | | | | | | | | |
| Hellenic Telecommunications Org. | | | 0.61 | **0.45** | | | 0.57 | 0.51 | | | 0.55 | 0.57 |
| Iliad | | | 0.65 | **0.35** | | | 0.85 | 0.34 | | | 1.26 | 0.46 |
| Koninklijke KPN | | 0.62 | 0.37 | **0.25** | | 0.52 | 0.37 | 0.26 | | 0.65 | 0.45 | 0.13 |
| *Lumos Networks* | | | | | | | | | | | | |
| Orange | | 0.67 | 0.35 | **0.38** | | 0.55 | 0.32 | 0.37 | | 0.73 | 0.26 | 0.34 |
| Portugal Telecom | | 1.45 | 0.66 | **0.45** | | 1.34 | 0.63 | 0.49 | | 1.27 | 0.51 | 0.35 |
| Swisscom | | 0.43 | 0.46 | **0.34** | | 0.29 | 0.49 | 0.33 | | 0.13 | 0.50 | 0.34 |

| Comparator firm | Daily | | | | Weekly | | | | Monthly | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1999 | 2004 | 2009 | 2014 | 1999 | 2004 | 2009 | 2014 | 1999 | 2004 | 2009 | 2014 |
| TDC | | | 0.13 | **0.23** | | | 0.23 | 0.22 | | | 0.25 | 0.21 |
| *Telecom Corporation of New Zealand* | | | *0.94* | ***1.13*** | | | *0.82* | *0.83* | | | *0.64* | *0.69* |
| Telecom Italia | | 0.37 | 0.37 | **0.22** | | 0.37 | 0.38 | 0.21 | | 0.51 | 0.37 | 0.13 |
| *Telefónica* | *0.80* | *0.99* | *0.52* | ***0.48*** | *0.80* | *1.01* | *0.53* | *0.46* | *0.76* | *1.06* | *0.44* | *0.43* |
| Telekom Austria | | | 0.50 | **0.33** | | | 0.49 | 0.37 | | | 0.38 | 0.22 |
| *Telenor* | | | *0.56* | ***0.65*** | | | *0.46* | *0.66* | | | *0.54* | *0.70* |
| *TeliaSonera* | | | *0.68* | ***0.55*** | | | *0.65* | *0.55* | | | *0.73* | *0.46* |
| Telstra | | 0.72 | 0.36 | **0.34** | | 0.51 | 0.35 | 0.23 | | 0.64 | 0.36 | 0.12 |
| *TW Telecom* | | | *0.68* | ***0.81*** | | | *0.95* | *0.80* | | | *0.90* | *1.05* |
| Verizon Communications | 0.51 | 0.57 | 0.59 | **0.38** | 0.57 | 0.41 | 0.62 | 0.32 | 0.53 | 0.41 | 0.61 | 0.40 |
| Windstream Holdings | | | | **0.30** | | | | 0.35 | | | | 0.31 |
| Average (all comparators) | 0.58 | 0.71 | 0.54 | 0.46 | 0.60 | 0.61 | 0.55 | 0.46 | 0.66 | 0.71 | 0.57 | 0.45 |
| Average (refined comparators) | 0.54 | 0.69 | 0.47 | **0.35** | 0.56 | 0.58 | 0.47 | **0.36** | 0.65 | 0.68 | 0.50 | **0.33** |
| **Average across time for refined comparator set** | 0.48 | | | | 0.46 | | | | 0.49 | | | |
| **Average across all comparators and time** | 0.57 | | | | 0.55 | | | | 0.60 | | | |
| **Average (Dr Hird)** | 0.58 | | | | n.a. | | | | n.a. | | | |

Note: Italics indicate firms that are excluded from the refined comparator set. The cut-off date for the analysis is 10 April in each relevant year of the analysis.

Source: Oxera analysis based on Bloomberg, Datastream and Hird, T. (2014), 'Response to Commerce Commission UCLL/UBA WACC consultation paper', March, p. 13.

As can be observed from the data in the table above, Oxera's average daily asset beta analysis (0.57) is consistent with that presented by Dr Hird (0.58). The marginal difference in estimates can be attributed to the small difference in the cut-off data for the two sets of analysis.[24] However, relative to the beta of this wider comparator set, the average daily asset beta for the refined comparator set is significantly lower, with an estimate of 0.48. This falls to 0.35 over the most recent five-year period.

Furthermore, some companies, including Chorus, do not have sufficient trading history to obtain five-year asset betas. Table 3.4 presents a comparable range of betas, but in each case based on a two-year horizon.

[24] Dr Hird's cut-off date is 13 March in each relevant year.

## Table 3.4 Two-year asset beta calculations, 1999–2014

| Comparator firm | Daily | | | | Weekly | | | |
|---|---|---|---|---|---|---|---|---|
| | 1999 | 2004 | 2009 | 2014 | 1999 | 2004 | 2009 | 2014 |
| AT&T | 0.59 | 0.91 | 0.67 | **0.50** | 0.55 | 0.94 | 0.63 | 0.51 |
| Belgacom | | | 0.41 | **0.52** | | | 0.36 | 0.47 |
| BT Group | 1.03 | 0.76 | 0.54 | **0.74** | 0.95 | 0.70 | 0.45 | 0.66 |
| CenturyLink | 0.39 | 0.51 | 0.44 | **0.34** | 0.58 | 0.54 | 0.41 | 0.35 |
| Chorus | | | | **0.39** | | | | 0.38 |
| Cincinnati Bell | 0.39 | 0.45 | 0.34 | **0.23** | 0.56 | 0.47 | 0.38 | 0.32 |
| *Cogent Communications* | | *0.00* | *1.15* | ***0.96*** | | *0.13* | *1.28* | *0.87* |
| *Colt Group* | | | *0.71* | ***0.69*** | | | *0.66* | *0.58* |
| Deutsche Telekom | | 0.74 | 0.29 | **0.30** | | 0.36 | 0.26 | 0.31 |
| Elisa | | 0.39 | 0.48 | **0.38** | | 0.43 | 0.43 | 0.47 |
| FairPoint Communications | | | | **0.26** | | | | 0.17 |
| Frontier Communications | 0.19 | 0.38 | 0.42 | **0.26** | 0.14 | 0.42 | 0.50 | 0.36 |
| Hawaiian Telecom | | | | **0.36** | | | | 0.28 |
| Hellenic Telecommunications Org. | | 0.88 | 0.54 | **0.69** | | 0.91 | 0.49 | 0.75 |
| Iliad | | | 0.49 | **0.38** | | | 0.70 | 0.11 |
| Koninklijke KPN | | 0.44 | 0.34 | **0.35** | | 0.35 | 0.34 | 0.45 |
| *Lumos Networks* | | | | ***0.48*** | | | | *0.28* |
| Orange | | 0.52 | 0.34 | **0.44** | | 0.36 | 0.30 | 0.45 |
| Portugal Telecom | 1.16 | 1.22 | 0.54 | **0.33** | 1.06 | 1.26 | 0.54 | 0.38 |
| Swisscom | | 0.32 | 0.38 | **0.42** | | 0.32 | 0.40 | 0.45 |

| Comparator firm | Daily | | | | Weekly | | | |
|---|---|---|---|---|---|---|---|---|
| | 1999 | 2004 | 2009 | 2014 | 1999 | 2004 | 2009 | 2014 |
| TDC | | 0.64 | 0.07 | **0.30** | | 0.69 | 0.15 | 0.34 |
| *Telecom Corporation of New Zealand* | | | *0.89* | ***1.27*** | | | *0.76* | *0.92* |
| Telecom Italia | | 0.28 | 0.31 | **0.23** | | 0.25 | 0.33 | 0.26 |
| *Telefónica* | *0.83* | *0.86* | *0.49* | ***0.47*** | *0.82* | *0.90* | *0.49* | *0.47* |
| Telekom Austria | | 0.54 | 0.47 | **0.33** | | 0.36 | 0.48 | 0.47 |
| *Telenor* | | *0.80* | *0.51* | ***0.63*** | | *0.63* | *0.42* | *0.63* |
| *TeliaSonera* | | *0.98* | *0.60* | ***0.54*** | | *0.64* | *0.59* | *0.56* |
| Telstra | | 0.56 | 0.33 | **0.48** | | 0.29 | 0.34 | 0.50 |
| *TW Telecom* | | *0.33* | *0.82* | ***0.61*** | | *0.34* | *1.17* | *0.58* |
| Verizon Communications | 0.47 | 0.72 | 0.60 | **0.47** | 0.46 | 0.55 | 0.62 | 0.54 |
| Windstream Holdings | | | 0.45 | **0.29** | | | 0.46 | 0.44 |
| Average (all comparators) | 0.63 | 0.60 | 0.50 | 0.47 | 0.64 | 0.54 | 0.52 | 0.46 |
| Average (refined comparators) | 0.60 | 0.60 | 0.42 | **0.39** | 0.61 | 0.54 | 0.43 | 0.41 |
| **Average across time for refined comparator set** | 0.48 | | | | 0.47 | | | |
| **Average across all comparators and time** | 0.55 | | | | 0.54 | | | |
| **Average (Dr Hird)** | n.a. | | | | n.a. | | | |

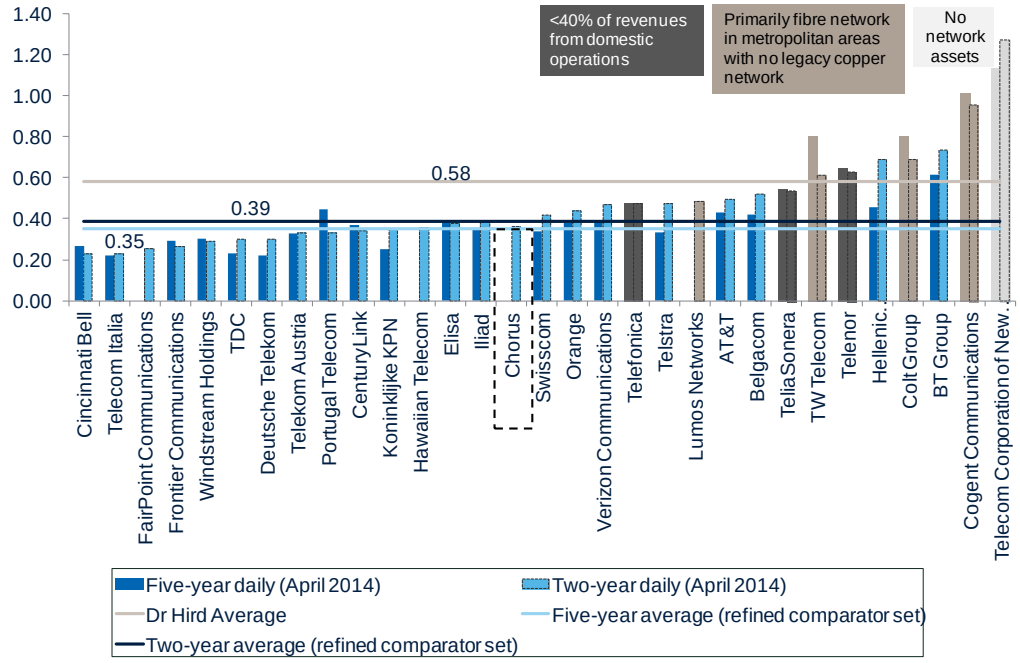
Note: Italics indicate firms that are excluded from the refined comparator set. The cut-off date for the analysis is 10 April in each relevant year for the analysis.

Source: Oxera analysis based on Bloomberg, Datastream and Hird, T. (2014), 'Response to Commerce Commission UCLL/UBA WACC consultation paper', March, p. 13.

The estimates of two-year betas are broadly consistent with the five-year beta analysis, and indicate that the choice of period has only a small effect on the conclusions.

Figure 3.1 below summarises the betas presented in the two tables above, and the difference between the betas of the refined comparator set and the wider set included in Dr Hird's submission.

**Figure 3.1 Summary of comparator asset beta analysis**

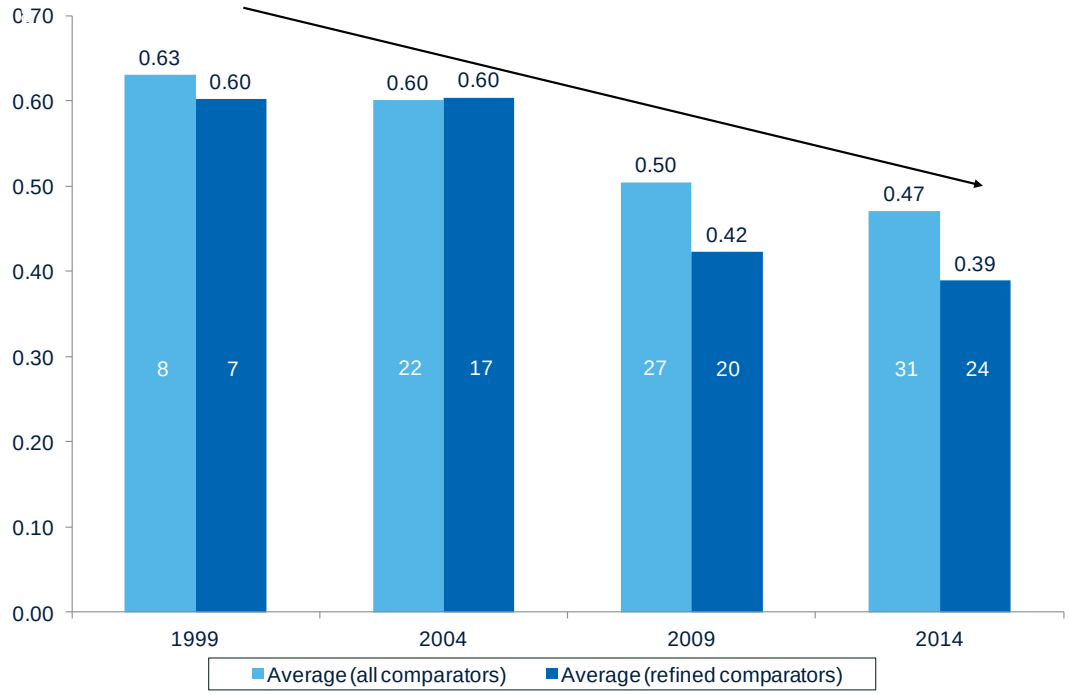



Note: The cut-off date for the analysis is 10 April 2014 in the data presented above.

Source: Oxera analysis based on Bloomberg and Datastream.

We have considered whether the longer-term approach used by the Commission in energy is likely to be appropriate for telecommunications. Figure 3.2 below illustrates the trend in asset beta values within the sample set over the 20-year period.

**Figure 3.2 Average two-year daily asset betas for the comparator set over time**




Note: The cut-off date for the analysis is 10 April in each relevant year for the analysis. Values in white indicate the number of comparator firms in each average asset beta value.

Source: Oxera analysis based on Bloomberg and Datastream.

As shown in the figure above, there is a clear trend of the asset beta for telecommunications firms which declines over time. One potential explanation for this is that average gearing for the comparators has been rising over time. Average two-year gearing across all comparators rose from 19% to 40%. The number of observations increases over time, indicating that more recent calculations are likely to provide the widest range of evidence for the asset risk faced by a representative firm operating and maintaining copper network assets.

It is not straightforward to ascertain the most appropriate averaging period, and which frequency of data should be analysed in order to determine the asset beta. This varies between sectors and is also related to the rate of innovation in an industry.

Guidance from statistical principles would suggest that the error term in regression analysis reduces as the number of datapoints increases. As observed in section 2, standard error terms are lowest for daily beta analysis.[25]

In the past, the Commission has chosen to observe weekly and monthly asset betas for energy utilities over the long term (as set out in the IMs). While this method may be appropriate for energy networks that have long-lived assets in an industry experiencing relatively moderate innovation, it may not be relevant for the telecommunications sector. The telecommunications industry has witnessed a rapid pace of innovation in the last 20 years, and the tariff norms across all markets have shifted their emphasis from user charges to access charges. These factors would suggest that any historical data for

[25] Ofcom's advisers are The Brattle Group, which last updated the analysis for BT's equity beta in April 2013. See The Brattle Group (2013), 'Estimate of BT's equity beta', April, p. 4.

telecommunications companies needs to be interpreted with caution. While, in a stable long-term industry such as energy, the long-term asset beta may be a relevant datapoint, the telecommunications industry continues to develop, and the longer-term data is likely to be less relevant within the telecommunications industry.

### 3.4 The link between asset beta estimates and risk factors

In assessing the relevance of this comparator set for Chorus, Oxera has considered the impact of the following factors to determine whether they influence the asset beta:

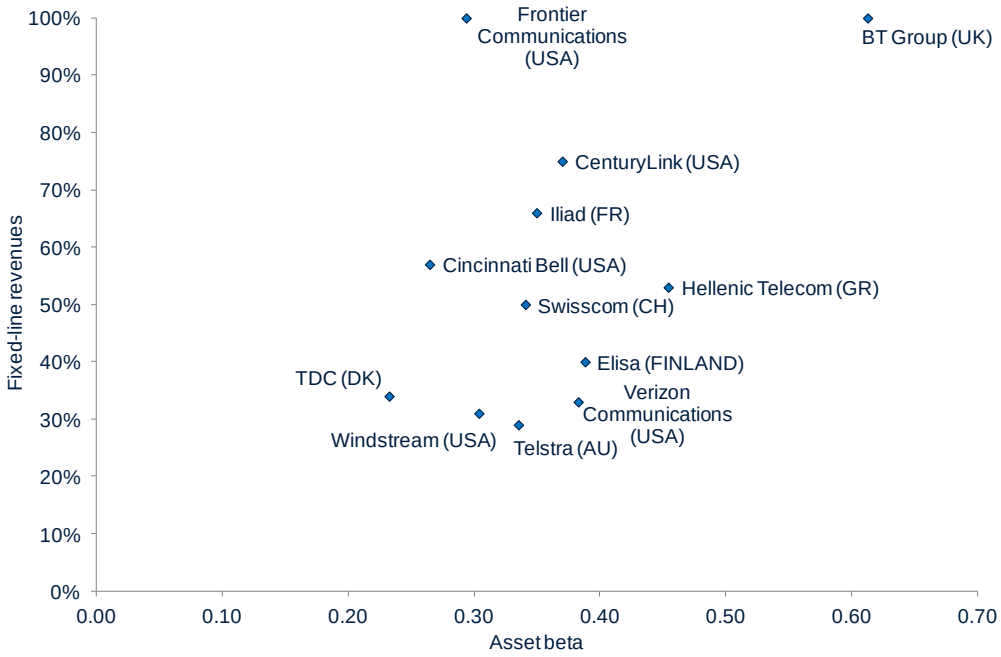
- the characteristics of the company's demand profile;
- the scale of the company's activities;
- the regulatory regime;
- the taxation system.

Neither qualitative nor quantitative analysis has indicated any significant relationship between these factors and the estimate of the asset beta. This may be partly due to the low number of datapoints available, and is also likely to reflect other factors such as a low proportion of heavily regulated business, where betas would be most subject to influence by the nature of that regulation, and the vertical integration of operations for many firms.

For example, for the demand profile of comparator firms, Oxera considered the percentage of revenues attributable to fixed-line activities. This information is not available for all firms. Furthermore, firms segment their business activities differently and it is not straightforward to infer the exact sums for fixed-line activities. Nevertheless, based on the data available, Figure 3.3 plots the share of fixed activities against the five-year daily asset beta estimates above.[26]

[26] This is based on five-year data to 2014.

**Figure 3.3 Relationship between asset beta and proportion of fixed-line business**




Source: Oxera analysis based on company annual reports and websites, Bloomberg and Datastream.

As can be seen from the figure, no single relationship emerges. In practice, this is partly because, with the exception of BT, all the firms lie within a fairly narrow range for the level of the asset beta.

Table 3.5 also summarises the asset beta values for the refined comparator set by geographical location of the firm.

**Table 3.5 Summary of comparator asset beta ranges**

| **USA** | | **Europe** | |
|---|---|---|---|
| AT&T | 0.50 | Belgacom | 0.52 |
| CenturyLink | 0.34 | BT Group | 0.74 |
| Cincinnati Bell | 0.23 | Deutsche Telekom | 0.30 |
| FairPoint Communications[1] | 0.26 | Elisa | 0.38 |
| Frontier Communications | 0.26 | Hellenic Telecommunications Org. | 0.69 |
| Hawaiian Telecom[1] | 0.36 | Iliad[1] | 0.38 |
| Verizon Communications | 0.47 | Koninklijke KPN | 0.35 |
| Windstream Holdings | 0.29 | Orange | 0.44 |
| **Range (average)** | **0.23–0.50 (0.34)** | Portugal Telecom | 0.33 |
| | | Swisscom | 0.42 |
| **Asia Pacific** | | TDC | 0.30 |
| **Chorus[1]** | **0.39** | Telecom Italia | 0.23 |
| Telstra | 0.48 | Telekom Austria | 0.33 |
| **Range (average)** | **0.39–0.48 (0.44)** | **Range (average)** | **0.23–0.74 (0.41)** |

Note: Asset beta values are derived from two-year daily asset betas, assuming zero debt beta, with the cut-off date being 10 April 2014.

Source: Oxera analysis based on Bloomberg and Datastream.

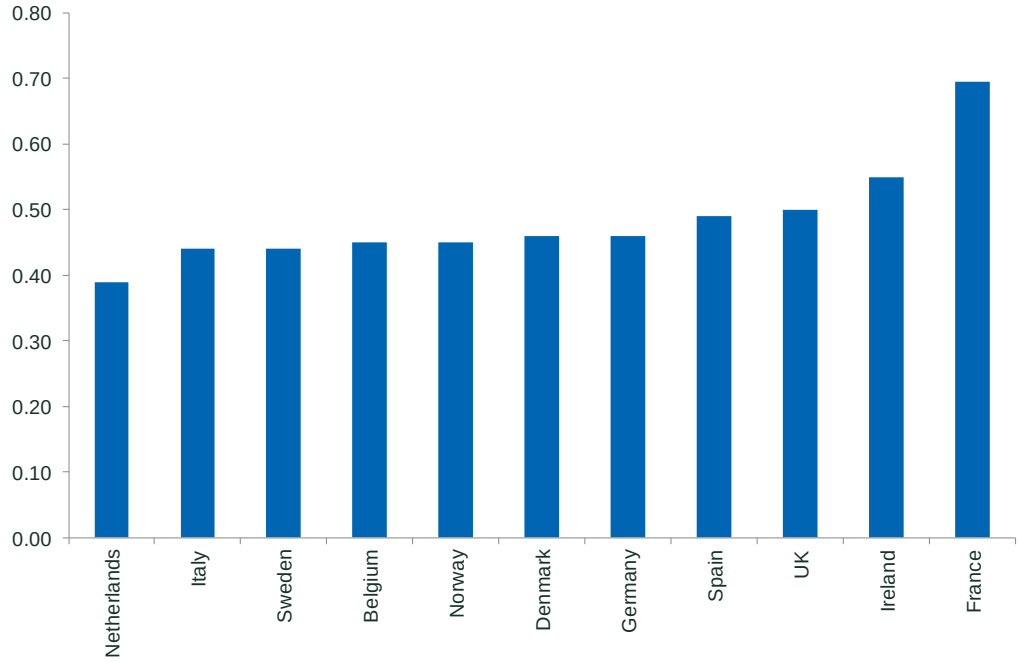
Again, there is no simple relationship, but in each geographical area the average of the range is consistent with our focal point of 0.3–0.45 from the Chorus data.

### 3.5 Evidence from regulatory precedent

Given that other regulators set asset betas specifically for wholesale fixed-line activities for telecommunications companies in their respective jurisdictions, regulatory precedents provide a valuable cross-check to the appropriate asset beta determination for Chorus.

Figure 3.4 presents evidence on regulatory determinations for the asset beta from Europe for fixed-line activities.

**Figure 3.4 European regulatory precedent on asset beta**




Note: The UK Decision relates to Ofcom's 2014 Decision for BT Openreach. See Ofcom (2014), 'Fixed access market reviews: wholesale local access, wholesale fixed analogue exchange lines, ISDN2 and ISDN30', 19 May.

Source: Oxera analysis based on various regulatory determinations.

As presented above, regulatory determinations have ranged from approximately 0.40 to 0.70, with the average determination being approximately 0.50.

Ofcom recently determined the asset beta for BT Openreach to be 0.50, obtained by disaggregating the BT Group asset beta.[27] To estimate this value, Ofcom considered evidence from comparator companies, and assessed the potential riskiness of BT's investments in sports television and superfast broadband and also the relative weight of Openreach within BT Group. The value of 0.50 includes a debt beta of 0.10. In section 5, we discuss the potential debt beta for Chorus, concluding that Chorus is likely to have a positive debt beta, with an estimate of 0.05–0.10. Given this range for the debt beta for Chorus, the BT Openreach beta is within our range for the beta for Chorus, but towards the top of the range.

[27] Ofcom (2014), 'Fixed access market reviews: wholesale local access, wholesale fixed analogue exchange lines, ISDN2 and ISDN30', 19 May.

The final estimate, however, was mainly driven by the perceived weight assigned to Openreach within BT Group. Starting with an asset beta of 0.72 for BT Group, the regulator assigned a weight of one-third to Openreach and two-thirds to the rest of BT, resulting in an asset beta of 0.50 for Openreach. This methodology is constrained by the requirement that the weighted sum of the asset betas of Openreach and the rest of BT must be equal to the BT Group asset beta derived from market data.

In this section, we observed that BT Group has a high asset beta relative to other international telecommunications comparators. The higher risks associated with BT Group's operations, including the impact of pension risk, and the lack of precise reasoning for the choice of weights, therefore appear to have influenced a high asset beta determination by the regulator.

### 3.6 Conclusions

This section has reviewed international comparators, including those analysed by Dr Hird in his analysis for Chorus. Such comparator analysis is a valuable contribution to understanding the beta for a business such as UCLL and UBA, in particular given the approach of the Commission which considers a hypothetical operator.

Equally, in the specific case of UCLL and UBA, there are limitations to the role of international comparator analysis. There are no pure-play comparators to Chorus, given that all other fixed access operators are part of a wider integrated business. Dr Hird's proposed closest comparator, BT, has no material mobile operations, but is an international fixed access, retail and broadcasting business, with less than 50% of revenues from fixed access. A similar pattern is observed for much of the comparator set, with international diversification, mobile operations, and/or retail businesses common factors to many of the comparators.

Therefore, in theory, there are likely to be biases between the betas for these operators and those for UCLL and UBA, which would be addressed by focussing on the Chorus beta. Should the two diverge materially, it would be important to understand whether this reflects issues specific to Chorus which may impact its reliability for use in UCLL and UBA, or whether it reflects these biases within the international dataset.

In practice, we do not consider this is a concern. We have produced a refined dataset, and analysed longer-term and shorter-term trends, and we consider the two analyses are useful in combination. We find:

- the longer-term average of five- and two-year daily, weekly and monthly asset beta analysis indicates a range of 0.46–0.49 across Oxera's (refined) comparator set;
- the more recent analysis indicates a significantly lower range of 0.33–0.41 for five- and two-year asset betas;
- asset beta values have been consistently declining across time, as technology and market conditions have changed. The analysis for the most recent timeframe (i.e. ending in April 2014) has the highest number of comparators, and this period is therefore likely to be more relevant for the Chorus beta;

The conclusion from this analysis is that the international comparator set would suggest a similar range for the asset beta. On the basis of the zero debt beta

assumption applied within these sections, this would be illustrative of a range of about 0.30–0.45.

This is at the bottom end of regulatory precedent, which indicates an average closer to 0.50, although this is likely, in part, to reflect our conclusion that betas appear to be falling over time. In practice, we also discuss in section 5 below that a small positive debt beta appears to be appropriate, which would result in a small increase in the asset beta range.

We therefore propose to use a range for the asset beta (with zero debt beta) of 0.30–0.45, which is consistent with both the Chorus beta analysis and supported by the international precedent.

# 4 Leverage and credit rating

Calculating a cost of equity for UCLL and UBA requires the asset beta estimated in previous sections to be converted into an equity beta, which in turn requires an assumption on leverage. In this section, we review available evidence to inform what this leverage level could be (section 4.1). In addition, as requested by the Commission, we consider what long-term credit rating would be consistent with our assessment of business risk and leverage for UCLL and UBA services (section 4.2).

## 4.1 Leverage

In the IM, the Commission's approach to estimating leverage is to use notional leverage based on a sample of comparator firms used to estimate the asset beta. This approach is preferred in the IM, as it aims to address a counterintuitive characteristic of the simplified version of the Brendan–Lally CAPM, whereby the WACC increases with increasing leverage.[28] This simplified version uses a deleveraging formula for the equity beta using a zero debt beta assumption. Therefore, if a zero debt assumption is used, it is concluded in the IMs that using actual leverage could create perverse incentives for companies to increase leverage.

An alternative and, as acknowledged in the IM, potentially superior approach to addressing this characteristic of the Brendan–Lally CAPM would be to use non-zero debt betas. In this case, actual leverage may be used for estimating the WACC.

However, regardless of the approach chosen, there are other reasons why using actual leverage might be inappropriate, even if the link between the WACC and leverage conforms to standard theory.

- The regulator's view of the optimal capital structure does not have to coincide with the management's view. The regulator is typically interested in estimating the WACC for a notional efficiently financed company.
- In cases where the regulated business forms only part of the business activities of the firm in question, the observed leverage might not be a good reflection of the appropriate leverage for the regulated segment. Chorus' investment into fibre is one example of why its actual leverage may be different from what might be optimal for a pure-play copper network.

Therefore, regardless of the approach adopted in relation to the debt beta, to form a view on the appropriate leverage for UCLL and UBA we consider a range of evidence, including Chorus' actual leverage, leverage of comparator firms, and regulatory precedent.

### 4.1.1 Chorus and comparator firms

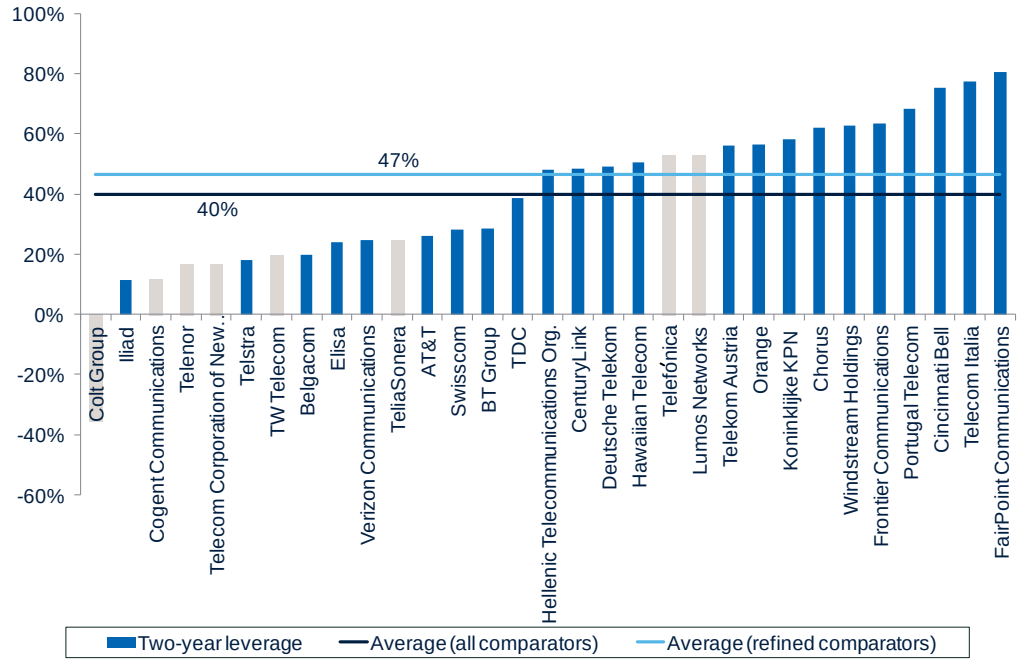
Chorus' current capital structure includes nearly 70% debt.[29] Since November 2011, Chorus' leverage has averaged 61%.[30] This is primarily due to the drop in Chorus' share price in late 2013, which reduced the market value of the assets relative to liabilities. At the same time, as discussed below, Chorus' credit rating has also fallen, such that there is a realistic probability of its rating falling below

[28] Commerce Commission (2010), 'Input Methodologies (Electricity Distribution and Gas Pipeline Services)', Reasons Paper, December, section 6 and Appendix H3.
[29] Based on data from Bloomberg and Datastream.
[30] Based on data from Bloomberg and Datastream.

investment-grade levels. It is therefore unlikely that the Commission would consider this to be a notionally efficient level of gearing.

In assessing a notional leverage assumption, we have started with a similar approach of comparing Chorus' leverage to that of international comparators. Using the same comparator set as for the beta estimation, Figure 4.1 summarises leverage levels for the full and refined comparator sets.

**Figure 4.1 Two-year leverage for comparator firms**




Note: Grey bars indicate firms excluded from the refined comparator set.

Source: Oxera analysis based on Bloomberg and Datastream.

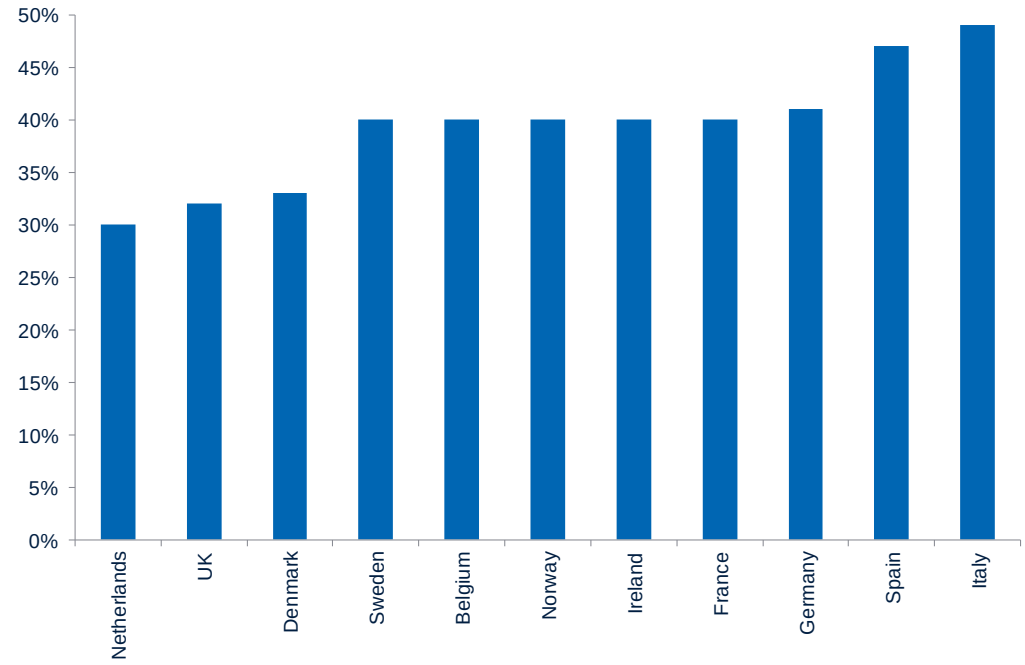
The average leverages of the full and refined comparator sets are 40% and 47% respectively—i.e. considerably lower than Chorus' actual leverage.

### 4.1.2 Regulatory precedent

In its IM for electricity and gas networks and for airports, the Commission previously determined notional gearing levels of 44% and 17% respectively. Considering that the UCLL and UBA services are likely to be exposed to higher business risk than electricity and gas, a notional gearing assumption that is higher than that adopted for electricity and gas is unlikely to be appropriate. In other words, notional leverage below 44% would be more appropriate.

International regulatory precedent is broadly consistent with this conclusion, with average notional leverage levels chosen by international regulators for fixed-line telecommunications services being around 40%.

**Table 4.1 Regulatory precedent on leverage for telecommunications companies**




Source: Oxera analysis based on various regulatory determinations.

### 4.1.3 Conclusion

A notional leverage level of 40% is deemed to be appropriate on the basis of the comparator evidence and regulatory precedent. This assumption is consistent with the relative risk of Chorus compared to other utilities. It also avoids a possible issue with creating perverse incentives for the regulated company to gear up, which might arise if actual leverage is used.

## 4.2 Long-term credit rating

As there is likely to be a long-term relationship between asset beta, leverage and credit rating, the Commission has also asked for our view of what long-term credit rating assumption would be consistent with our proposals on the asset beta and leverage.

In theory, if the assumptions of Modigliani–Miller hold, business risk, and subsequently the required rate of return on assets (the WACC), should be independent of the financial structure of the firm. In other words, asset beta should not have a direct link to leverage or the target credit rating. In practice, however, some of the assumptions underlying this theory do not always appear to hold.

Credit rating agencies assess a range of factors to determine a credit rating, with a significant proportion of their assessment being qualitative in nature. Therefore, it is difficult to determine mechanistically what target credit rating is appropriate for Chorus, especially without considering how the cost of debt will be assessed by the Commission. Nevertheless, there are some high-level relationships between business risk (measured by the asset beta), leverage and credit rating.

First, business risk itself is a factor in determining ratings. A business with higher risk is likely to have a lower credit rating. However, higher business risk could

also be consistent with taking on less debt (i.e. less leverage), which in turn, all else being equal, may help to support a higher credit rating.

As an example, the matrix below summarises the trade-offs between business and financial risk that are typically considered by Standard & Poor's (S&P) in assigning corporate ratings. It should be noted that this matrix is indicative only and cannot be used to deterministically predict what rating a company might receive from S&P.

**Table 4.2 Indicative impact of business and financial risk on ratings, S&P**

| | Financial risk profile | | | | |
|---|---|---|---|---|---|
| **Business risk profile** | **Minimal** | **Modest** | **Intermediate** | **Aggressive** | **Highly leveraged** |
| Excellent | AAA | AA | A | BBB | BB |
| Strong | AA | A | A- | BBB- | BB- |
| Satisfactory | A | BBB+ | BBB | BB+ | B+ |
| Weak | BBB | BBB- | BB+ | BB- | B |
| Vulnerable | BB | B+ | B+ | B | B- |
| **Financial risk indicative ratios** | **Minimal** | **Modest** | **Intermediate** | **Aggressive** | **Highly leveraged** |
| Funds from operations/debt (%) | Over 60 | 45–60 | 30–45 | 15–30 | Below 15 |
| Total debt/capital (%) | Below 25 | 25–35 | 25–45 | 45–55 | Over 55 |
| Debt/EBITDA (x) | <1.4 | 1.4–2.0 | 2.0–3.0 | 3.0–4.5 | >4.5 |

Note: Financial ratios as used by S&P will involve certain adjustments to reported figures. Leverage figures in this report may not be directly comparable to the thresholds shown in this table.

Source: Standard & Poor's (2008), 'Corporate Ratings Criteria', 15 April, p. 18, Table 2.

Chorus' business risk profile is judged to be 'strong' by S&P.[31] However, its current credit rating of BBB is on a negative credit watch.[32] As noted by S&P, some of Chorus' financial metrics are currently under pressure at the current rating.

A notional business with a strong business risk profile but with lower leverage than Chorus could reasonably be expected to be able to maintain a comfortable investment-grade credit rating. At 40% leverage, a target credit rating of around A- would seem to be broadly consistent with S&P's guidance.

Dr Hird considers a credit rating of BBB- to be appropriate. This appears to be unusually low for a network operator with a strong business risk profile such as Chorus. Chorus' current credit rating assigned by S&P is one notch higher, at BBB, although it is on credit watch.[33] Furthermore, evidence from regulatory precedent suggests that a target credit rating of A- is reasonable. For example, the Australian telecommunications regulator adopted a credit rating of A for Telstra.[34] In the UK, Ofcom does not explicitly target any particular credit rating as it does not set a notional gearing assumption. However, BT's 2012 annual report indicates a target credit rating of BBB+ for the medium term (it is currently rated BBB). Hence, on balance, a target credit rating of A- seems appropriate.

[31] Standard & Poor's (2014), 'Chorus Ltd. Remains On CreditWatch Negative Pending Confirmation Of Strategies To Mitigate UBA Pricing Decision', 4 February.
[32] Standard & Poor's (2014), 'Chorus Ltd. Remains On CreditWatch Negative Pending Confirmation Of Strategies To Mitigate UBA Pricing Decision', 4 February.
[33] Although Moody's assigns a Baa3 rating to Chorus, which is equivalent to BBB- on the S&P scale, Dr Hird bases his analysis largely on S&P ratings.
[34] Australian Competition & Consumer Commission (2011), 'Public inquiry to make final access determinations for the declared fixed line services', April.

In the IM, the Commission used a target credit rating of BBB+ for gas and electricity, whereas for the airports it was determined to be A-. Consistent with the relative risk hierarchy of the different sectors, this further supports a recommendation to target a slightly higher credit rating for telecommunications of A-. Equally, the differential between A- and BBB+ is small, and should not impact the choice of the equity beta, and therefore either of these precedents could potentially be appropriate.

### 4.2.1 Conclusion

A regulated fixed-line telecommunications provider would be required to maintain a solid investment-grade credit rating. Given that telecommunications is typically higher risk than traditional regulated utilities, and given the evidence available from precedent and comparators, a target credit rating of A-/BBB+ is considered appropriate. Consistent with airports, we propose the use of A- as a base case.

The next section considers the concept of the debt beta, its relevance to the assumed WACC for Chorus, and a practical approach to determining an estimate for the debt beta.

# 5 The debt beta for Chorus

Sections 2 and 3 above have provided evidence in respect of the equity beta for Chorus, based on the CAPM for deriving returns on capital. The equity beta, together with the market risk premium, determines the returns required by equity investors in Chorus and other comparable companies, assuming a particular capital structure.

In practice, the capital structure will vary over time, between companies, and between the actual and notional financial structures for regulated businesses such as Chorus. The calculation therefore requires an understanding of the asset beta, discussed in sections 2 and 3, and the debt beta. This section considers the role of the debt beta.[35]

Sections 2 and 3 assume a debt beta of zero. This section revisits this assumption, and considers its implication for the estimation of the equity beta for Chorus, and, therefore, for UCLL and UBA.

## 5.1 How is the debt beta assessed?

As part of the wider calculation of the WACC (beyond the scope of this report), the Commission needs to understand the returns required by debt investors in Chorus. The required return on debt can be assessed from the market prices of bonds, which illustrate (through the yield to maturity) the returns required by investors in return for debt finance of Chorus' business.[36]

The level of the yield to maturity demanded by investors is in part to compensate for the risk of non-payment. Debt investors can never earn more than the yield to maturity over the life of the bonds. Given that there is a risk of non-payment, the expected returns will therefore be below the yield to maturity.

Lenders to the business are exposed to this risk that Chorus is unable to meet its liabilities, and therefore require a premium above the risk-free rate to mitigate it. However, market evidence indicates that the returns required by bondholders in practice are higher than those required to offset the risk of default alone. Bondholders also require an additional premium to reflect the systemic nature of the risk taken in bond investments. This requirement for a debt premium to reflect wider market risks within the cost of debt is consistent with the CAPM used for the cost of equity.[37]

The returns required by debt investors may therefore cover some of the same systematic risks as those faced by equity investors, and therefore the size of required return on debt may be at least in part determined by a 'debt beta'—a concept directly analogous to the equity beta used in determining equity returns.

## 5.2 The role of the 'debt beta' in determining equity returns

As discussed above, the cost of debt can generally be directly observed. Therefore, if the equity beta can be directly assessed from market data, and the cost of debt can be observed, there may be no need to assess in further detail

[35] The formula for calculating the equity beta alone does not require estimation of the debt beta, but if the equity beta is to be recalculated for a different level of gearing, this does require an assumption on the debt beta. The Commission has previously assumed a debt beta of zero.
[36] The yield to maturity is the annualised level of return for a holder of a debt obligation, assuming that the counterparty meets all payments on the debt as they fall due. It is therefore above the expected return, to the extent that there is a probability of non-payment.
[37] Webber, L. and Churm, R. (2007), 'Decomposing corporate bond spreads', *Bank of England Quarterly Bulletin*, **47**:4, pp. 533–41.

the assumptions underlying the cost of debt, and in particular whether there is a 'debt beta'.

**When comparing firms with different levels of gearing, the debt beta matters**

Section 2 discussed the concept of the asset beta. The asset beta is not directly observable, but is a more relevant measure than the equity beta for comparing firms with different levels of gearing. The asset beta reflects the overall level of systematic risk that is associated with the assets of the firm. Assuming a combination of debt and equity financing, the asset beta can be shown to be a weighted average of the equity beta and the debt beta.

For a firm that is fully equity financed, the asset beta is therefore the same as the equity beta. However, where there is a high level of gearing, the asset beta and the equity beta may be very different. Section 2 discussed how the initial estimate of the asset beta for Chorus is 0.38, relative to an equity beta of around 1, if a debt beta of zero is assumed.

This is shown in the standard Modigliani–Miller approach to the cost of capital, in which both equity and debt returns increase with gearing. The asset beta can be described by the following equation:

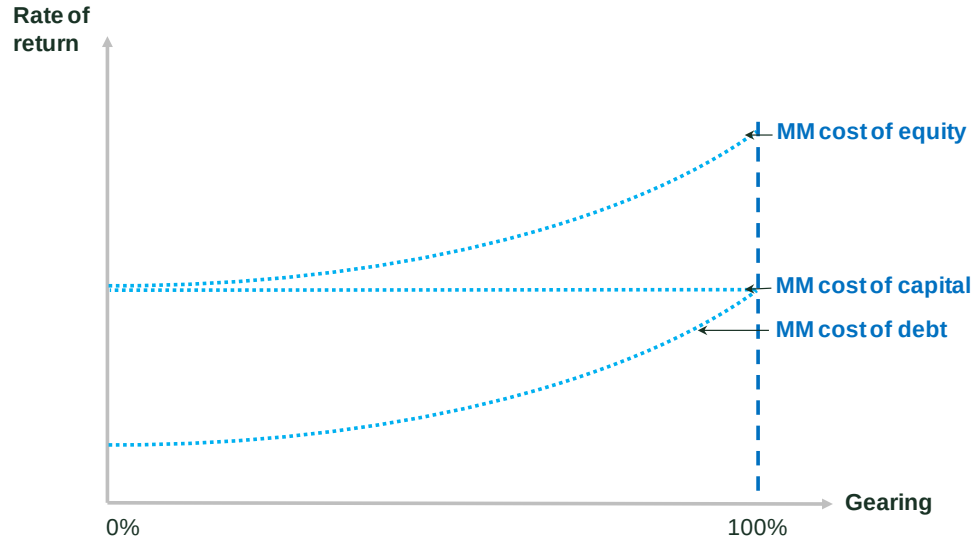
$$\beta_a = \beta_e * (E/(D+E)) + \beta_d * (D/(D+E))$$

where:

$E$ = market capitalisation of the firm;

$D$ = market value of the debt.[38]

**Figure 5.1 Illustration of asset returns as a function of gearing**




Note: MM, Modigliani–Miller.

Source: Oxera analysis.

Figure 5.1 illustrates that, as gearing rises, not only will the equity beta increase, but any debt beta is also likely to increase. As gearing tends towards 100%, debt

[38] The market value of debt is not always observable, and the book value is often considered as a proxy.

becomes gradually more 'equity-like' and therefore the debt beta will become more like the equity beta for a 100% equity financed firm—i.e. the asset beta. The debt beta should never go above the asset beta, as the fixed nature of debt obligations means that debt investors are protected from some of the market risks faced by equity-holders. Therefore, given that the asset beta is the weighted average of the equity beta and the debt beta, the debt beta should always remain below the asset beta.

There are therefore two reasons why the debt beta may be important.

- **First, the comparison of the asset betas of Chorus against those of comparator firms may not be like-for-like**. If Chorus has significantly higher gearing than the comparators, there is a reasonable probability of a different debt beta, which will affect the comparison of Chorus with the asset betas of the other firms outlined in section 2 and section 3.
- **Second, in deriving a 'notional' equity beta for Chorus, based on lower leverage, the debt beta matters**. In practice, as discussed in section 4, the actual gearing for Chorus, which is currently as high as 70%, is likely to be higher than the notional assumption. the Commission chose 44% gearing for energy networks, and a lower gearing for airports.

### 5.3 Estimating the debt beta in practice

In theory, the debt beta should be calculated identically to the equity beta. In practice, calculating the debt beta tends to be more difficult. Debt issues are often thinly traded, and therefore estimating the debt beta in the same way as the equity beta may give inconclusive results. As a result, the precedent illustrates that two alternative approaches have been taken to estimating the debt beta.

- **Option 1: a default zero debt beta assumption**. Regulators, including the Commission, have often used a zero debt beta. The debt beta assumption makes a relatively small difference in many regulatory decisions. Given the lack of practical evidence to support a different number, the level of zero has tended to be a focal point for most regulators.
- **Option 2: a non-zero, but rounded, point estimate**. Not all regulators have used a zero debt beta. However, where regulators have estimated a positive debt beta, the value for the debt beta tends to be estimated as a rounded figure, such as 0.10 or 0.15.

In theory, Option 1 is not well-founded. Debt investors share in the systematic asset risk with equity investors. As gearing rises, the debt becomes more 'equity-like', and if the company defaults on its debt, debt investors will often become equity-holders. At or close to this point, the systematic risk faced by debt investors will tend towards the asset beta (as illustrated by Figure 5.1), as equity becomes worthless and debt investors take over the assets.

However, for companies with limited default risk, the debt beta may be very close to zero. A positive 'debt beta' implies that, as wider economic conditions change, the value of the debtholders' claim on the assets changes to such a degree that the value of the debt will change. For companies with very low default risk, the value of this claim, and therefore the bond prices, are unlikely to be significantly affected by the value of the assets. This is discussed below, and the evidence indicates that the debt beta is indeed very close to zero for companies with stronger credit ratings. There is also limited practical experience

of identifying debt betas in a robust manner. As a result, regulatory precedent for Option 2 is limited.

The 'best' option, of a detailed assessment of the debt beta, comparable to that applied for the equity beta, is not an approach generally taken, due to the difficulty in identifying the debt beta from primary market analysis.

In the UK, Ofcom and the Civil Aviation Authority (CAA) are the only two regulators that have consistently adopted a non-zero debt beta. Ofcom determined a debt beta of 0.15 for all three business divisions of BT in its 2013 Decision.[39] In its recent Fixed Access Market Review draft statement for the UK equivalent of UCLL services, Ofcom has considered a point estimate of 0.10 or 0.15.[40]

The CAA determined a debt beta of 0.10 for Heathrow and Gatwick airports in 2014.[41] More recently, in the energy sector, the UK Competition Commission adopted a debt beta of 0.1 in its March 2014 determination for the cost of capital of Northern Ireland Electricity.[42]

### 5.4 Approach to estimating the debt beta

In practice, the debt beta is likely to be small for most companies, as the proportion of the value of the debt that is influenced by equity market conditions is small. Analysis by Schaefer and Strebulaev (2008) tested for observed debt beta statistics for companies with different credit ratings, through regressions of a range of bond prices against relevant measures for company credit risk and wider market risk.[43] Using this model, the paper found that, consistent with the theoretical Modigliani–Miller approach, companies with lower credit ratings (and therefore higher gearing) had positive debt betas, and the size of the positive debt betas increases as credit quality declines.

Oxera has assessed this analysis based on a review of the observed relationship between debt prices and equity prices based on data from the last five years. We have followed a three-step process:

- Step 1: identify a set of comparable debt market indices for companies with different credit ratings. Oxera used European corporate bond indices;
- Step 2: identify a comparable equity market index. Oxera used European equity market indices;
- Step 3: estimate the betas of the different corporate bond indices relative to the comparable equity markets.

The conclusions of this analysis are supportive of both the theoretical position illustrated in Figure 5.1, and the previous analysis by Schaefer and Strebulaev. However, the analysis is not strongly supportive of the scale of betas used in some of the precedent, other than where it is considered that there is increasing credit risk. We find:

[39] Ofcom (2013), 'Business Connectivity Market Review, Statement', March.
[40] Ofcom (2014), 'Fixed access market reviews: wholesale local access, wholesale fixed analogue exchange lines, ISDN2 and ISDN30 – Volume 2: LLU and WLR Charge Controls, Draft Statement', May.
[41] Civil Aviation Authority (2013), 'Estimating the cost of capital: a technical appendix to the CAA's Final Proposal for economic regulation of Heathrow and Gatwick after April 2014', October
[42] Competition Commission (2014), 'Northern Ireland Electricity Limited price determination', April.
[43] Schaefer, S. and Strebulaev, I. (2008), 'Structural models of credit risk are useful: Evidence from hedge ratios on corporate bonds', *Journal of Financial Economics*, **90**:1, pp. 1–19.

- at an A rating, although debt betas appear to be positive, they are very small, and may be as low as 0.01–0.02;
- at an average BBB ratings, debt betas are higher than for A rated firms, and this finding is statistically significant. The average debt beta is close to 0.05. For lower-rated (i.e. sub-investment grade) companies, the debt beta rises further;
- nevertheless, for Chorus, which is rated in the bottom end of the BBB range, this is consistent with a positive debt beta—the evidence suggests that a zero debt beta is unlikely;
- based on the evidence available, a plausible estimate at Chorus' actual credit rating for the debt beta would therefore be in the range of 0.05–0.10. At the notional gearing of 40%, the debt beta would be more likely to be zero, and zero would be a reasonable point estimate.

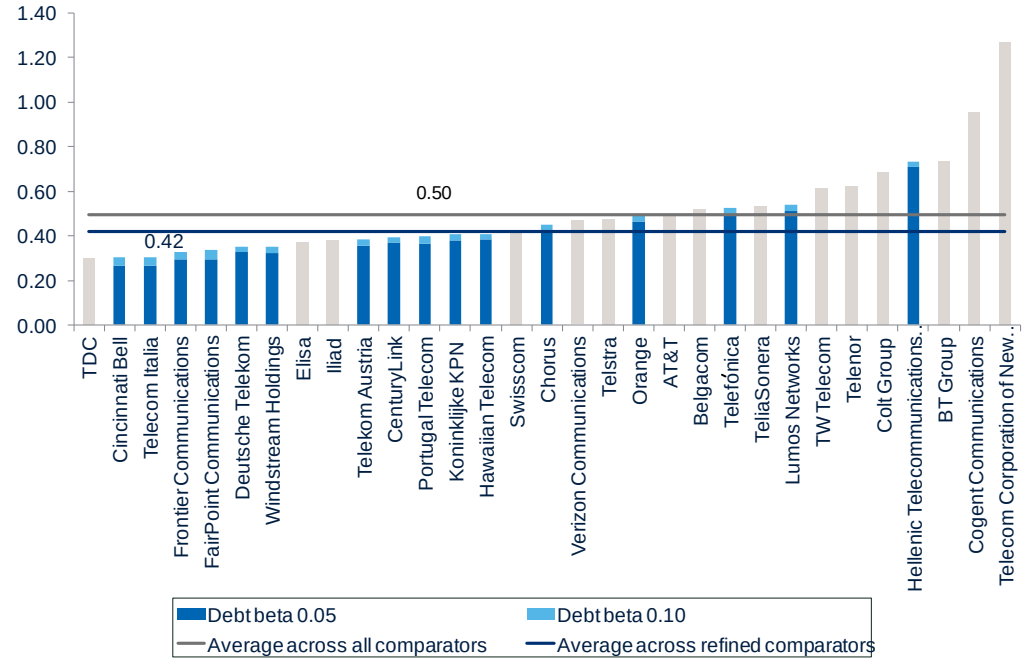
### 5.5 Consistency with Oxera's comparator analysis

In sections 2 and 3, Oxera provided a wide range of analysis of asset betas for Chorus, regional comparators and international telecommunications comparators. We presented the information on the assumption of a zero debt beta for all companies.

We have conducted sensitivity analysis around the assumption regarding the value of the debt beta. It may be argued that higher-geared companies may, in fact, have a positive debt beta. Figure 5.2 illustrates the estimated asset betas for the comparator set presented in section 3, assuming a non-zero debt beta for the more highly geared firms in the sample.

In particular, two-year daily asset beta estimates are calculated based on notional debt betas of 0.05 and 0.10 for those firms with average gearing exceeding 40%.

**Figure 5.2 Two-year daily asset betas with non-zero debt beta for companies with average gearing exceeding 40%**




Note: Averages represent average asset beta across the debt beta of 0.10. Bars in grey indicate asset betas for companies with gearing below 40% and zero debt beta.

Source: Oxera analysis based on Bloomberg and Datastream.

Table 5.1 below compares the results of average asset beta calculations across the debt beta assumptions.

**Table 5.1 Comparison of average two-year asset beta calculations across the comparator set, assuming varying debt betas**

| | Zero debt beta | 0.05 debt beta | 0.10 debt beta | Difference |
|---|---|---|---|---|
| Average across all comparators | 0.47 | 0.48 | 0.50 | 0.01–0.03 |
| Average across refined comparators | 0.39 | 0.40 | 0.42 | 0.01–0.03 |

Source: Oxera analysis based on Bloomberg and Datastream.

The analysis indicates that the assumption of a non-zero debt beta value for firms with relatively moderate to high levels of gearing leads only to a marginal increase of 0.01–0.03 for the average comparator asset beta. This would not affect our conclusion that the Chorus beta analysis remains an appropriate focal point for the selection of an equity beta for UCLL and UBA.

Whilst we have not repeated all of the same analysis as was applied for the equity beta in estimating the debt beta, this is proportionate to the relative size of the impact of the choice of debt beta on the Commission's decision, as well as the precedent which reflects the difficulties in identifying robust estimates for the debt beta.

## 5.6 Recommendation on the debt beta

Assuming a notional gearing of 40% for Chorus, relative to an actual gearing of over 60%, the impact on equity beta, and therefore on the WACC, will be sufficiently material that we recommend a non-zero debt beta assumption. Chorus' gearing has risen over the relevant period, but has been consistently well above the notional gearing assumption. Chorus' credit rating has been BBB or below throughout the period.

From the analysis above, we conclude that an appropriate case for the debt beta is:

- an actual debt beta, given Chorus' high gearing and low credit rating, of 0.05–0.10;
- a lower debt beta at the notional gearing of 40%, with a point estimate of zero, than at the actual gearing (the average gearing over the relevant period is around 62.5%).

Table 5.2 demonstrates the impact of the debt beta assumption on the choice of asset beta and equity beta. The table shows the impact of a positive debt beta assumption on the equity beta, relative to the level of equity beta which would be found under the approach taken by the Commission in the electricity and gas IMs—i.e. the assumption of a zero debt beta.

**Table 5.2 Sensitivity analysis of the impact of a non-zero debt beta on the equity beta**

| | Zero debt beta | Non-zero debt beta | Non-zero debt beta |
|---|---|---|---|
| | | 0.05 | 0.10 |
| Equity beta | 1.00 | 1.00 | 1.00 |
| Actual gearing | 62.5% | 62.5% | 62.5% |
| Debt beta (actual gearing) | 0.00 | 0.05 | 0.10 |
| Asset beta | 0.38 | 0.41 | 0.44 |
| Notional gearing | 40% | 40% | 40% |
| Debt beta at notional gearing | 0.00 | 0.00 | 0.00 |
| Equity beta at notional gearing | 0.63 | 0.67 | 0.72 |

Source: Oxera.

In conclusion, in coming to a range for the equity beta:

- we are giving significant weight to the Chorus beta, as it is the best comparator for UCLL and UBA, and it is—in any case—consistent with wider comparator sets;
- Chorus' asset beta is likely to include a positive debt beta;
- consistent with the approach from precedent, and also with evidence that is available on debt betas at different points in the risk spectrum, the best estimate for Chorus is for a small positive debt beta, in the range 0.05–0.10;
- at the notional gearing of 40%, a zero debt beta assumption is likely to be more appropriate;

- Oxera's proposed approach may result in an increase of 0.05–0.10 for the estimate of the equity beta, relative to the case where a zero debt beta is assumed at all levels of gearing.

# 6 Is there evidence for a different beta for UCLL and UBA, relative to Chorus?

This section considers two questions.

- Given the mix of Chorus' business, and in particular the fibre investment, is Chorus' overall beta likely to be different to the betas for the copper business?
- If so, is there a robust approach to defining a different beta for UCLL and UBA?

Oxera has focused on a qualitative assessment of the differential, as it is not necessarily practicable to identify a reliable quantitative assessment of the UCLL/UBA beta relative to the beta for Chorus as a whole, which would require an interpretation of the market'sview of the relative risk of these different services.

We consider the first question in two phases:

- what are the factors that could lead to the copper business having a different beta to the integrated copper/fibre business?
- is there evidence that these factors exist, and have a non-zero effect?

## 6.1 What are the differences between the asset risk of UCLL, UBA, baseband copper, and fibre?

This section briefly describes the different services, and therefore explains the relevant differences which might result in different systematic risks within a hypothetical TSLRIC model for UCLL and UBA, relative to the estimate from observed data derived for Chorus.

- UCLL is the local loop product offered by Chorus. It offers access to the metallic path facility that connects the end-user to the main distribution frame in the local exchange. This network can be used to offer voice and broadband services. It forms the 'passive' part of the telecommunications network;
- UBA is a bitstream access product, i.e. an 'active' product that allows retail service providers to access end-users from a central point of interconnect. It consists of electronic elements at the local exchange or cabinet such as the digital subscriber line access multiplexer (DSLAM) and transmission links back to the service provider. In principle, the components upstream of the UBA connection can be provided by either Chorus or an alternative provider using other wholesale inputs or self-supply. Entrants use UBA and subsequent investments on a path towards local-loop unbundling—i.e. applying the 'ladder of investment' principle. This replicability of the DSLAM and backhaul assets is the key difference between UCLL and UBA.
- In contrast, the ultra fast broadband (UFB) connectivity offered by Chorus is delivered over a separate overlay network. The service that can be offered to the end user replicates that which would be provided over UCLL/UBA, but with the ability to offer faster connectivity and therefore a superior range of applications. In other words, UFB is an alternative to UCLL/UBA, rather than an incremental service.

Table 6.1 below summarises the characteristics and some facts for UCLL, UBA and UFB.

**Table 6.1 Characteristics of UCLL, UBA and UFB**

| | UCLL | UBA | Fibre (consumer UFB) |
|---|---|---|---|
| **Description** | Metallic path facility which can be used by retail service providers to offer voice and broadband services | TDC | A simple but flexible service for introducing end-users to an entry-level fibre service, and includes the ability to deliver existing voice services over fibre |
| **Pricing** | $23.52 (from December 2014) | $44.98 per month | $37.50–$55.00 per month depending on plan |
| **Number of connections** | c. 0.1m | c.1.2m | c. 27,000 |

Source: Chorus 2013 annual report.

In summary, fibre and copper are similar in many ways. They are partial substitutes, and used for the same types of service. An end-user within Chorus' network footprint is likely to use either a fibre or a copper line. The differences between fibre and copper, and between UCLL and UBA, therefore largely relate to characteristics of the two networks and the stage of development of the two markets. For instance:

- **bandwidth capabilities**—where fibre is used in the network with suitable supporting active capabilities, it is not subject to the bandwidth constraints of copper, and the extent of degradation of signals over distances is almost negligible. The copper network was originally designed to carry voice signals and has a much lower bandwidth.
- **demand risk/platform risk**—fibre enables higher capacity, which could enable new services. However, there is uncertainty about the willingness to pay for additional bandwidth. Forecasts of the scale and nature of the future demand for different broadband services indicate that this demand is highly uncertain. There is limited understanding of the willingness to pay of end-users to switch from the existing copper network to the new fibre network. Therefore, if fibre is considered as a standalone project, the uncertainty over the timing and impact of consumers switching to fibre would be considerable. The switch In the 2013 annual report, fibre constituted less that 6% of Chorus' total revenues and less than 20% of Chorus' total assets;
- **regulatory risk**—the fibre network is under construction. Prices are fixed, but not by regulation. Instead, Chorus has committed to offer its fibre services at a contract price agreed by the government. The price is fixed under a long-term agreement, after which it may become regulated, and the form of any regulation is uncertain;
- **market risk**—passive products such as UCLL and fibre local loops involve large sunk costs to replicate and therefore pose higher barriers to entry to competitors. Active products (i.e. UBA) require less investment from entrants and therefore may face more competition from local loop unbundlers. Note that aggregation networks used to deliver UBA services have economies of scale (low cost to aggregate additional customer) and scope (ability to deliver services in adjacent markets).

## 6.2 Recommendations—a separate beta may not be practicable

Oxera's review of the structure of Chorus suggests that, in theory, when considering the de-averaging the beta of an integrated access operator, there are valid arguments that fibre faces different risks. Wider market conditions may

influence the level of investment in the applications that will drive the take-up of fibre, and drive the pace at which investors can switch from copper to fibre.

Equally, it could be argued that the majority of the differentials between risks around fibre and copper are not strongly linked to the wider economy. For example, the pace of take-up of fibre may be strongly linked to the technical risks around the pace of installation and reliability of the new fibre network. Similarly, the difference in risk between UCLL and UBA may largely relate to Chorus' ability to retain customers on its own UBA services relative to other operators using UCLL.

More fundamentally, it is not clear that, for an access operator such as Chorus, it is logical to apply different systematic risk assumptions to fibre and copper. The substitutability of the services, and the way in which they all help retailers deliver the services required by end-users, suggests that all services may be broadly comparable in the way they expose investors to the wider market risks around the use of telecommunications services. For Chorus, if wider market conditions encourage users to switch from fibre to copper more quickly than expected, this will have a relatively small effect, as the revenues will switch between its services.

This would therefore be different to a business offering only fibre or only copper. By operating both the copper and fibre networks in New Zealand, Chorus effectively has a natural hedge on the developments in technology and economic conditions which may occur and impact the profitability of a standalone fibre operator.

We have also considered whether there is any practical evidence that the commencement of the fibre investment programme has impacted the perceived risk around Chorus. It is inevitably speculative as to how the market would reflect the early stages of a long-term investment programme, and Chorus' fibre programme was originally announced before the demerger. However, there is no evidence from the market data or analyst commentary which supports a perception of a higher market risk for the business as a result of the fibre investment programme.

In practice, there are therefore a number of reasons for why no adjustment is appropriate when converting from the Chorus analysis and comparator analysis to a beta for UCLL/UBA, as follows.

- **The international comparator data suggests that Chorus' actual beta is consistent with international comparators which rely largely on fixed copper access networks, and therefore both are suitable for UCLL and UBA**. If the Commission were to make an adjustment to Chorus' actual beta to reflect the idea that copper is likely to be lower risk than fibre, this would bring the beta below the comparator data and, arguably, to a level that appears unrealistically low for a telecommunications business.
- **There is no evidence that the beta of Chorus has increased as a result of the fibre investment**. All the arguments that fibre may have a higher beta are theoretical in nature. In practice, there is no evidence that the market has required a higher return as a result of the commitment to the fibre project, with the Chorus beta appearing to be broadly constant over time, and to be consistent with the TNZ beta prior to demerger.
- **The notional betas for separated fibre and copper businesses are arguably irrelevant to Chorus, which has protection as the integrated access provider**. A separated fibre owner might have a theoretically higher

beta than Chorus, but Chorus itself is an integrated provider of access services, and therefore will be likely to retain access customers regardless of the pace of the shift to fibre, which will mitigate the risks it faces in both the fibre and the copper business.

- **The largest areas of clear difference in risk between fibre and copper, and UCLL and UBA, appear to be specific to Chorus** and therefore would not translate directly into a different beta, which reflects different levels of systematic risk, i.e. risk linked to developments in the wider economy.

As a result, not only does the analysis not suggest evidence for a particular value for the differential, but both the market data and the theoretical analysis suggest that the hypothesis that the beta for Chorus as a whole is consistent with that for the copper business cannot be rejected. There is no compelling approach to determining a beta for UCLL or UBA that is 'better' than assuming that these are the same as Chorus' beta, after assessment against relevant comparators.

In summary, it would appear reasonable to make no adjustment to the Chorus beta analysis when deciding on a beta for UCLL and UBA.

# 7 What is the correct level for the UCLL/UBA beta?

In coming to a view about the Chorus beta, Oxera has considered a wide range of evidence, as follows.

- Data on the Chorus equity and asset beta, which indicates that the equity beta is around 1.0, and that a range for the asset beta, assuming zero debt beta, would be about 0.30–0.45. We have used this as an anchor point for the assessment of the Chorus beta.
- A range of tests of the robustness of these beta estimates, which suggest that, while the standard errors may be marginally above average, the CAPM assumptions are broadly met.
- Consistently defined beta estimates for regional comparators, specifically utilities in New Zealand and Australia. These appear supportive of the range for Chorus.
- International comparators in the telecommunications industry. These are generally different in their business composition to Chorus; however, over the last two to five years, our proposed comparator set has a beta range that is consistent with the range identified for Chorus.
- The actual and notional leverage for Chorus. Over the last two years, Chorus; gearing has averaged over 60%. The regulatory precedent and actual comparator data both point to gearing of around 40%, and this would be more consistent with an A-/BBB+ investment-grade credit rating.
- An assessment of debt betas for companies with ratings more comparable to Chorus, which suggests that such betas are likely to be non-zero, with a plausible estimate in the range of 0.05 to 0.10, which will increase the notional equity beta.
- An assessment of the impact of separating UCLL and UBA from Chorus as a whole. We conclude that there is no compelling evidence to select a different equity beta for UCLL and UBA.

The evidence leads us to propose the following recommendations for the cost of capital calculation for Chorus:

- an equity beta range, based on actual gearing, of 0.8–1.2;
- a debt beta range, based on actual gearing, of 0.05–0.10;
- a notional gearing of 40%, and a debt beta of zero at the notional gearing level.

This would suggest a range for the equity beta for UCLL and UBA of 0.55–0.85, as indicated by Table 7.1 below.

**Table 7.1 Oxera's assessment of the equity beta for UCLL and UBA**

| | Low | Mid | High |
|---|---|---|---|
| Equity beta at actual gearing | 0.8 | 1 | 1.2 |
| Actual gearing (average) | 62.50% | 62.50% | 62.50% |
| Debt beta at actual gearing | 0.05 | 0.075 | 0.10 |
| Asset beta | 0.33 | 0.42 | 0.51 |
| Notional gearing | 40% | 40% | 40% |
| Debt beta at notional gearing | 0.00 | 0.00 | 0.00 |
| Equity beta at notional gearing | 0.55 | 0.70 | 0.85 |

Source: Oxera.

If the Commission were to give equal weight across this range, this would indicate an appropriate point estimate from around the middle of the range—i.e. an equity beta of 0.7.

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