FINAL REPORT

WACC issues in Commerce Commission's Final Report on the Gas Control Inquiry

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PREPARED FOR
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1. EXECUTIVE SUMMARY

This report has been prepared for Powerco as an analysis of the Commerce Commission's Gas Control Inquiry Final Report, dated 29 November 2004 (Final Report), with respect to cost of capital issues.

The estimation of WACC involves the choice of models to use and then, given the model choices made by the Commission, the estimation of seven parameters. In addition to the point estimates of parameters, it is important to estimate ranges for those parameters that have appreciable uncertainty.[1]

I have reviewed Dr Lally's advice to the Commission that lead to an estimate of 7.2%. Derivation of the WACC is a complex matter requiring judgement on many issues. For every parameter except tax rate, I believe Dr Lally's judgement has been an underestimate. In a number of areas, it is clear that he has biased the WACC downward by failing to reflect factors even after acknowledging them. The Commission has accepted his advice apparently without question and, as such, its derivation of WACC is inconsistent with accepted practice in regulatory regimes overseas.

The Commission used the same models in its decision for the Gas Control Inquiry as it has in all recent decisions. I believe the use of those models, and in particular the Brennan-Lally CAPM, should be reconsidered. However, I accept that this is unlikely to be the appropriate forum, and I do not debate the models in this report.

My comments on parameter values chosen by Dr Lally and hence the Commission and my preferred values are set out below.

Risk free rate of 5.54% The Commission used a maturity for the risk free rate of three years based upon the regulatory period (the price resetting period). The literature, commercial practice and regulatory precedent is to set the maturity consistent with the life of the assets being financed. For practical reasons, it is usual to estimate the risk free rate based on the market yields of 10 year government bonds. Recently the position of the ACCC on the maturity and the inconsistency with the CAPM was rejected by the Australian Competition Tribunal, and subsequently the ACCC has announced that it will no longer support setting maturities at the regulatory period. Furthermore, the gas pipeline companies are not subject to control and therefore have no price resetting period.

Tax rate of 30% The Commission has used 30% as the tax rate for investors and I agree with that rate, given that we are using its models.

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[1] By setting a range of one standard deviation, it is intended that the true value of the parameter being estimated would fall within the range approximately two out of three times. Having ranges set with transparent statistical properties is necessary to meaningfully talk about percentiles of the WACC distribution, as is discussed in this report.

Leverage of 60% The Commission has estimated leverage for the gas pipeline businesses as 40%. The major rationale in Dr Lally's report to the Commission was to retain consistency with its decision on electricity lines businesses. Consistent with actual leverage ratios of Powerco and NGC, I believe an appropriate leverage to assume for gas pipeline businesses is 60%.

Debt risk premium of 1.5% The cost of debt is typically estimated as the risk free rate plus the debt risk premium plus the costs incurred to issue the debt. The Commission estimates a debt risk premium of 1.2% based upon its assumed leverage ratio of 40%. I estimate the premium at 1.5% based upon 60% debt. The higher debt margin will follow from the higher leverage.

Debt issuance costs of 0.4% To issue debt, a company unavoidably incurs costs, and these costs can be substantial. Dr Lally agrees with the principle that the costs should be treated as an increment to the cost of debt and also agrees that the magnitude of the costs may be 0.3%. Yet he does not recommend that the cost is recognised. The ACCC now routinely recognises debt issuance costs. I estimate that debt issuance costs approximate 0.4%. Combining the risk free rate, debt risk premium and debt issuance costs gives a cost of debt capital of 7.44%.

Market risk premium of 8% The market risk premium is a particularly difficult and contentious parameter to estimate. It is an estimate of a forward-looking premium and hence cannot be observed. Until June 2003 the Commission used a rate of 8%. This rate is consistent with the regulatory estimate used by virtually all the many regulators in Australia.[2] The Commission changed its estimate of MRP to 7% in its decision on electricity lines businesses. I cite current estimates from the two best-known providers of historical data on the issue. I also use a benchmarking approach to estimating a forward-looking MRP for New Zealand. My estimate reflects the fact that New Zealand is a very small market with relatively very small companies. In my opinion, the best estimate is 8%.

Asset beta of 0.6 In the CAPM the only risk is called "beta". The Commission estimated the beta for gas pipeline businesses as 0.5, which is higher than the 0.4 it estimated for the electricity lines businesses. Dr Lally used US and UK companies in the gas and electricity industries. He properly identified that these companies were all subject to price controls, the difference being the length of time between price resets. He based his estimate of beta for the ELBs on the average of his beta estimates for the US and the UK. He then adjusted it upward to 0.5 for gas pipeline companies. Dr Lally's analysis suffers from being based upon a presumption of the gas pipeline companies being subject to control. However, they were subject to light-handed regulation and a disclosure regime. There was no control. In my opinion an appropriate estimate of asset beta for the gas pipeline businesses is 0.6, which converts to an equity beta (at 60% leverage) of 1.5.

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2 Australia uses the standard CAPM for estimating the cost of equity capital rather than the model used by the Commission and Dr Lally. The Australian regulators use 6% as MRP in their models. Also, Dr Lally provided a report to the ACCC supporting the use of 6% as its MRP. An MRP of 6% for the standard CAPM is consistent with 8% in the Brennan-Lally model used by the Commission.

WACC estimate of 9.3%.

There are a number of additional issues in relation to the estimation of WACC and the assessment of excess earnings.

In applying a WACC to the estimation of excess returns, it is necessary to estimate the WACC that would have been deemed appropriate at that point in time. The Commission estimated MRP at 8% until June 2003. Even if the Commission's estimate is used, it should be estimated at 8% until June 2003 and then 7% after that. There is no indication that it properly revised its MRP.

The Commission and Dr Lally repeatedly assert that they are overestimating WACC by one percent because of the models that they use, which assume New Zealand is a closed economy rather than an economy that is integrated with the world. I do not agree that the choice results in an overestimate of WACC. The best evidence indicates that using a model that reflects being a part of the world markets would decrease the MRP and increase the beta. The combined result is likely to be close to nil.

After the parameters are estimated as above, there is an issue of the appropriate ranges to use for each parameter. Although all seven parameters are estimated and subject to uncertainty, the Commission only considers ranges for two – MRP and beta. I also consider ranges for the debt risk premium and debt issuance costs. In my view, the Commission significantly underestimates the uncertainty with the parameter estimates. There is additional estimation error in the parameters where we do not formally estimate a range (e.g., tax rate) and related to the actual models that are used. I believe that the estimation error in WACC is very large, and the upper bound on the one standard deviation range should be about 12%.

The process of estimating WACC is full of estimation and uncertainty at every single step including the very foundational principles and precepts. In my view the Commission dramatically understates the uncertainty.

In its Final Report, the Commission evaluates each of the gas pipeline companies for excess returns and then for net acquirer benefit. This assessment uses the WACC and should also reflect the range. There are a number of issues that remain to be addressed concerning this process.

The Commission accepts the widely held understanding that the social consequences of underestimating WACC and discouraging investment far exceed the consequences of overestimating WACC. The Commission proposes to recognise this asymmetry in the consequences of an error by using the 75th percentile of the WACC distribution rather than the mid-point.[3] In my opinion, the percentile should reflect a 90 or 95% confidence interval.

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[3] The reason the range, as an estimate of one standard deviation, is so important in this process is that compensating for the asymmetric consequences or error is achieved by increasing the WACC to reflect some confidence that it is not too low. For that to be done with any substance and statistical context, the range must reflect an unbiased estimate of one standard deviation.

Although the Commission proposes to use the 75th percentile, it then asserts that the assessment of net acquirer benefit includes recognition of the costs of control, which confer an excess return margin on the gas pipeline companies. So it simply reverts back to using the mid-point of its WACC range. I conclude that there are additional issues that mitigate any margin from the costs of control. The Commission has not established a basis to justify its abandoning of a higher percentile than the mid-point for WACC.

The Commission acknowledges that there is measurement error in the accounting measures of returns. There are transitory events that will swing the measured returns up or down in ways that cannot be controlled by the gas pipeline companies. To protect against wrongly finding for excess returns, there should be an averaging over a number of years. Given the truly revolutionary events that have swept over New Zealand and impacted on infrastructure companies in the past decade, I do not agree.

Aside from all of the measurement issues that pertain to an assessment of a company's excess returns, there is the possibility that even properly measured excess returns are not an indication of the exercise of monopoly power. Even in workably competitive markets, some companies outperform the average. This can be the result of superior management and decision-making or fortuitous outcomes that were not expected. That these firms earn a higher rate of return is not a sign of market power, or at least of the kind of market power that should be of concern to the regulator.

In conclusion, the process of estimating the WACC is full of uncertainty and measurement error. As a result, a wide margin for error should be allowed. There are further imprecisions in the process that support giving the gas pipeline businesses leeway before pronouncing that there is a need to impose controls.

2. INTRODUCTION

I have been engaged by Powerco Ltd to provide an analysis of the Commerce Commission's Gas Control Inquiry Final Report, dated 29 November 2004 (Final Report), with respect to cost of capital issues. Dr Martin Lally prepared a report for the Commission concerning cost of capital,[4] and it is clear that the Commission relied considerably on that report. Therefore, I will address issues from both of these documents.

Before moving to the remainder of this report, I want to mention an issue that is highly relevant to the decision that the Commission made concerning regulatory control of the gas pipeline businesses.

The Weighted Average Cost of Capital ("WACC") model is applied to many circumstances. Its most common application in regulatory settings is as an input into the derivation of a benchmark revenue stream or price structure for a regulated firm using the building blocks approach.

The task facing the Commission in the Gas Control Inquiry was different to the above. The Commission was to evaluate the returns achieved by gas pipeline businesses, operating in a largely unregulated environment. The role of the WACC here is as an input in conducting a cost benefit analysis.

> In determining whether there are likely to be benefits from control, the Commission must form a view on whether the prices set by the gas businesses exceed prices that would prevail in a workably competitive market. (para 5.4)

It is clear that the basis on which the gas pipeline businesses are to be evaluated is as unregulated operators in a workably competitive market. That is approximately the circumstance under which they have been operating, although there has been the threat of regulation that would have mitigated the decisions of the businesses. It is not appropriate to evaluate the businesses as if they were controlled.

In my opinion, this role for the WACC is not adequately reflected in either Dr Lally's report or the Commission's Final Report. In places the Commission and Dr Lally have evaluated information and estimated parameters within the context of a regulated company subject to control. This is particularly stark in the determination of the appropriate maturity for the risk free rate, an issue that is discussed in more detail below.

As a final point, I acknowledge that my advice is not commenting on whether the Commission has carried out the appropriate analysis, given the legal framework in which it must operate.

My qualifications and relevant experience are set out in Appendix 1.

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4 Martin Lally, "The Weighted Average Cost of Capital for Gas Pipeline Businesses," 24 November 2004.

3. WACC ISSUES

The estimation of WACC involves use of a set of models and the separate estimation of seven parameters. In the sections below I comment on the Commission's choice of models and its position on parameters. Before discussing the specific parameters, I comment on the use of ranges and confidence intervals.

3.1. MODELS

The Commission used the same models in its decision for the Gas Control Inquiry as it has in all recent decisions. The standard WACC model is used to estimate the cost of capital for the firm. This model is widely used internationally. The other major model that is used is the Brennan-Lally CAPM, which is used to estimate the cost of equity capital. There are two levels of issues with the choice of a CAPM model. The first applies to the standard CAPM and the second applies specifically to the Brennan-Lally CAPM.

The assumptions of the standard CAPM lead to the conclusion that the only risk that will be priced out in securities markets is the risk that derives from movements in the returns of the stock that are systematic with movements of the returns to the whole market. As with all such models that are generally accepted, the conclusions follow from the assumptions. There are a number of key assumptions in the CAPM and the most important for this discussion are that investors hold fully diversified portfolios and that returns are normally distributed.

Whilst the theory of the CAPM is sound, empirical research has shown that it is an incomplete model of the risks that are rewarded in securities markets. If returns are estimated solely with the CAPM, it is likely that the result will be an underestimate of the true cost of equity capital. The major place that this arises in the regulatory context is with what are commonly referred to as asymmetric risks. Standard examples of this type of risk include the risk of asset stranding, regulatory errors and changes, and of uninsurable risks such as terrorism. I do not deal with these issues in this report.

The Brennan-Lally version of the CAPM is an after-investor-tax version. There are significant theoretical and application issues related to the model. Perhaps the most troublesome is that the average personal tax rate of investors must be estimated. As the model assumes that the New Zealand economy is closed to international investors, the taxes are assumed to be those that pertain to New Zealand investors, and on average across all investors. The Brennan-Lally CAPM is the only approach used by the Commission in New Zealand, although it is not used anywhere else in the world, either by regulators or commercial entities.

In addition, a model is used to convert a company's beta back and forth between equity betas and asset betas. The form of this model flows logically from the choice of the Brennan-Lally CAPM and its assumptions.

I believe the use of those models, and in particular the Brennan-Lally CAPM, should be reconsidered. However, I accept that this is unlikely to be the appropriate forum, and I do not debate the models in this report.

3.2. RANGES AND CONFIDENCE INTERVALS

I commend the Commission for adopting a policy of setting ranges that are based upon sound statistical properties and that reflect a one standard deviation measure of the precision of a parameter estimate.[5] [6]

The next step is for the Commission to establish ranges, which are realistic assessments of the uncertainty surrounding parameter estimates. I believe that all of the ranges that the Commission and Dr Lally have set for the gas pipeline businesses are substantial underestimations of one standard deviation ranges. Only if ranges reasonably reflect statistical precision can the Commission meaningfully talk about confidence intervals or setting WACC at some percentile. I will discuss ranges further as I consider appropriate parameter estimates.

There is another area of uncertainty that I do not believe has been adequately considered by the Commission. It uses an after-tax version of the CAPM and the WACC model in its determination. There are significant theoretical and application issues related to these models. The WACC model is widely used internationally. The Brennan-Lally CAPM is the only approach used by the Commission in New Zealand, although it is not used anywhere else in the world, either by regulators or commercial entities. Even if it was agreed that they are the best models available, there are limitations and problems with them.

Professor Boyle provides a useful discussion of these problems,[7] and I will not repeat them but do note that I agree with him. Because the models being used have limitations and require assumptions and approximations, it reinforces a point to be made below that the Commission should provide a very substantial range to the WACC estimates that it derives from using the models.[8]

3.3. RISK FREE RATE

I support the adoption of the 10-year bond for the risk free rate.

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5 Final Report, para 9.36, 9.37 and 9.119.

6 The Commission did not set a range on the cost of debt although there is clearly uncertainty in the estimate. We discuss this issue in section 3.6 below.

7 Glenn Boyle, "Some thoughts on the cost of capital proposed for the Regulation of Electricity Lines Businesses," 15 September 2003.

8 The issue being considered here has to do with shortcomings of the models, not with measurement issues that arise when estimating specific parameters of the models. Estimation errors on the parameters are dealt with later in this report.

Based on advice from Dr Lally, the Commission's approach is to derive the risk free rate from a bond with maturity equivalent to the "likely time horizon for price setting"[9] and adopted a three-year term for the risk free rate. As the Commission has interpreted the "time horizon for price setting" differently across sectors, it has applied a wide range of risk free rates in its determinations ranging from 1 year to 10 years.[10] In his paper on the WACC, Dr Lally stated that the appropriate regulatory price-setting period was unclear and suggested possible frequencies of 1 to 5 years, from which he adopted a 3 year bond maturity in his calculations.[11]

In my view this position is not consistent with deriving a revenue benchmark that allows the firm to operate in a manner consistent with a workably competitive benchmark.

In its Final Report the Commission justifies its position as follows:[12]

> The Commission's view is that the term of the risk-free rate should match the term for which prices are fixed, on the basis that charges should reflect expected costs and risks over the term for which prices are fixed but not be affected by the expectations of costs and risks beyond that point. The Commission has adopted a three-year term for the risk-free rate for gas pipeline businesses on the basis that this most closely approximates the likely time horizon of price setting in the gas pipeline industry.

This is an example of where the Commission and Dr Lally are setting parameter values based on having a price setting regulatory regime in place. That is not an appropriate perspective for estimating excess returns. The Commission's approach reflects Dr Lally's view of what is an appropriate regulatory proxy for the bond maturity, not what is acceptable or standard commercial practice of firms acting in predominately unregulated markets or markets that are only subject to light-handed regulation. I am not aware of any commercial business that matches its financing to correspond to the periods at which they assess prices. Many, and indeed the vast majority of commercial businesses review their pricing on a daily basis. However, this does not lead to the majority of firms financing their businesses based on the overnight rate.

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9 Para 71.

10 For example, the Commission applied a 1 year risk free rate in its annual Telecommunications Service Obligations decisions, a 3 year risk free rate in its gas inquiry, maturity of between 3 to 5 years in its airports inquiry and 10 years for Fonterra in its determination on milk regulation.

11 Lally, p 28.

12 Para 9.24.

If the purpose of the analysis is to provide a rate of return that will give the Commission comfort that Powerco has not operated with excess returns, what is relevant is the efficient practice of an unregulated business or a business subject to very light-handed regulation. In such an environment, the optimal strategy for a firm with long-lived assets will be to match financing to long dated instruments. In discussing the maturity issue, Brigham and Gapenski conclude:[13]

> *For all these reasons, the best all-around financing strategy is to match debt maturities with asset maturities.* In recognition of this fact, firms generally place great emphasis on maturity matching, and this factor often dominates the debt maturity decision. (emphasis is in the original text).

The Australian Competition Tribunal recently supported such practice, even for firms actually subject to price cap regulation. In its conclusions in relation to GasNet, the Tribunal argued that GasNet, in adopting a 10-year bond, had used the CAPM model correctly, stating that use of a ten year Commonwealth bond rate to determine a rate of return on equity "was a correct use of the CAPM and in accordance with the conventional use of a ten year bond by economists and regulators where the life of the asset approximated 30 years."[14]

3.3.1. Consistency of bond maturity in the risk free rate and MRP

The Commission makes a fundamental error in applying the CAPM by applying a market risk premium that is of different bond maturity to the risk free rate.

In his papers, Dr Lally frequently argues that it is not necessary to adopt a bond with equivalent maturity in the estimate of the market risk premium. In his paper for the gas inquiry he went further by stating that the "consistency argument is flawed".[15]

The Commission has a discussion about bond maturity, noting the GasNet case, and then concludes that some adaptation of the CAPM model is inevitable, with data limitations supporting adopting different terms. It states:[16]

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13 E. Brigham and P. Daves, *Intermediate Financial Management* (8th ed), 2004 (South-Western), p 615.

14 Australian Competition Tribunal, Application by GasNet Australia (Operations) Pty Ltd [2003] ACompT 6, para 48.

15 Lally, p 32.

16 Final Report, para 9.53.

> The Commission concludes that the application of the theoretically 'pure' version of the CAPM model is not possible in all circumstances and that some adaptation of the model is inevitable. Further, the Commission's view is that the NPV = 0 principle requires the first Rf to match the price setting period, assumed in the current circumstance to be three years. This leaves the issue of whether the second Rf should match the first. The Commission notes that the case for consistency rests on the assumption that there is a flat 'term' structure for the market return Em, but that this is unlikely. Further, the problem of data availability argues for use of a five- to ten-year risk free rate, consistent with the values used to calculate the market risk premium in empirical analysis. Thus, the Commission's view is that the second Rf should continue to match the assumed investment horizon of the Em, which is usually assumed to be five to ten years.

Two defences that the Commission claims in this passage can be dismissed directly. First it says in the first sentence that it is not possible to be theoretically pure with the CAPM in all circumstances. I agree and believe it is appropriate to consider alternatives when it is not possible to be theoretically pure. However, being theoretically pure by being consistent with the measurement of the risk free rate is possible. It is only convoluted thinking and rationalizing that moves away from the actual CAPM.

The second defence offered by the Commission is its NPV = 0 principle. However, the formulating and examples used by Dr Lally, and hence the Commission, depend upon the assumption that there is no re-contracting risk when debt matures. The failure of this assumption is even stated by Dr Lally in his WACC report on gas pipelines. He has assumed three years for the regulatory cycle and is discussing the estimation of a debt risk premium (p 58) – "However, triennial refinancing is likely to be inferior to longer-term debt coupled with a swap contract to ensure exposure to triennial interest rate movements." If the risks with renewing debt contracts are admitted in the analysis, setting debt maturity at the regulatory cycle will fail the Commission's NPV = 0 principle. Therefore, the Commission's adherence to the NPV = 0 principle requires that it change its position on the maturity of the risk free rate.

The Commission's position on the maturity to use in estimating the risk free rate raises the issue of whether maturity matching is essential within the CAPM. While the Commission chooses to legally distance itself from the findings of the Australian Competition Tribunal, what cannot be disputed is that the Tribunal could not have been more adamant that adoption of different bond maturities **is not the CAPM**. The Tribunal stated:

> The ACCC erred in concluding that it was open to it to apply the CAPM in other than the conventional way to produce an outcome which it believed better achieved the objectives of s 8.1. In truth and reality, the use of different values for a risk free rate in the working out of a Rate of Return by the CAPM formula is neither true to the formula nor a conventional use of the CAPM. It is the use of another model based on the CAPM with adjustments made on a pragmatic basis to achieve an outcome which reflects an attempt to modify the model to one which operates by reference to the regulatory period of five years. The CAPM is not a model, which is intended to operate in this way. The timescales are dictated by the relevant underlying facts in each case and for present purposes those include the life of the assets and the term of the investment.[17]

The Commission's only ally in adopting a different bond maturity in the risk free rate and the market risk premium – the ACCC – has accepted the Tribunal's findings and has publicly stated it will adopt the 10-year bond in the risk free rate in future decisions – even in the electricity sector where it has the authority to determine the optimal approach, not merely assess business applications against a Code (as per Gas). In its revised Statement of Principles for the Regulation of Electricity Transmission Revenues, the ACCC states:[18]

> Although the ACCC used a 5-year rate, the Tribunal accepted GasNet's approach to calculating the risk free rate on the basis of a 10-year government bond rate. The Tribunal cited the traditional application of the CAPM and estimation of the MRP which was based on a 10-year time horizon as the basis for its decision. It therefore considered that the service provider, under the terms of the Gas code, was entitled to use a CAPM calculation based on a 10-year horizon as a legitimate basis for estimating the cost of equity.

Given the Tribunal's decision, the ACCC has adopted a 10-year government bond rate as the risk free rate.

3.3.2. Appropriate rate and averaging period

In my view the theoretically appropriate rate to apply is the on-the-day rate corresponding to the start of the period that is being evaluated for excess returns. However, some averaging is acceptable provided it is done consistently from period to period. In this case, there are a number of years that the Commission evaluates. It its Final Report it states that it uses an average over July 2003, which is consistent with estimating WACC for a period beginning 1 August 2003. For illustrative purposes, I will use the same measurement period as the Commission. Averaging the 10-year bond rate over the month of July 2003, the risk free rate is 5.54%.

As the Commission will be assessing excess returns over a number of different periods, it will be necessary to recalibrate the risk free rate to coincide with the beginning of the period being assessed.

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17 Ibid, para 47.

18 ACCC, Decision, Statement of principles for the regulation of electricity transmission revenues —background paper, December 2004, p 97.

3.4. TAX RATE

The Commission uses an investor tax rate of 33%. The Commission, following Dr Lally, has adopted the Brennan-Lally CAPM, which assumes that the New Zealand securities markets are closed to all but domestic investors. From this assumption, it follows that all investors are subject to New Zealand tax and New Zealand investor tax rates will apply. Dr Lally then argues that across the range of investor tax circumstances in New Zealand, an average of 33% is reasonable.

Given the assumption of its model that the New Zealand securities markets are segmented from the rest of the world, the Commission's use of 33% as the investor tax rate is reasonable. However, a few points must be made.

If the segmented market assumption is dropped and the real world of international investors is allowed, the impact on the investor tax rate could be substantial. For example, it could be argued that price-setting international investors are able to avoid tax on their investments, in which case the tax rate should be nil.

It is obvious, even from Dr Lally's discussion, that the tax rate is an estimate, and there is uncertainty around the estimate. A range would be appropriate.

Although the chosen rate can be questioned and a range is surely appropriate, I will accept the Commission's estimate without a range. My reason is that its rate follows somewhat logically from its assumption of the Brennan-Lally CAPM. Unless that model is going to be challenged, there is little to be gained from arguing over the tax rate.

3.5. LEVERAGE

I support 60% as the leverage for Powerco.

The Commission considers the alternatives of a company's actual leverage and an optimal leverage for the company. It states that the decision hinges on the costs used in assessing excess earnings. Those costs are a mix of actual and efficient costs. The Commission, following Dr Lally, states that since the measurement of actual leverage is impossible when a firm is not listed, they will estimate the optimal leverage. This approach raises a number of issues.

Although there were unlisted gas pipeline companies, Powerco was a listed company during the times at issue. Thus there are no significant measurement issues involved in observing its actual leverage. Even if the decision was made to estimate an optimal leverage for Powerco, it is not clear why the actual leverage was not considered the optimal leverage. Powerco bears the financial consequences of its capital structure. If its leverage is sub-optimal, the value of the firm will be diminished. Thus its incentive to have its actual leverage approximate its optimal leverage is real. This contrasts with the financial consequences to the Commissioners (or Dr Lally or Professor Bowman) of getting it wrong.

In my opinion, the onus should be on the Commission to demonstrate that Powerco's actual gearing in past years was inefficient, rather than superimpose a value that is significantly different to actual practice.

The Commission adopts a value for efficient leverage of 40%, which is significantly different from that adopted by Powerco (Dr Lally cites leverage for Powerco of 62% (p 55) and 67% (p 56)).

In support of his position, Dr Lally cites leverage of NGC of 26% (p 55). However, NGC's cost of debt is the topic of a memorandum from NGC's Treasury to its Chief Financial Officer and Manager Regulatory Affairs, dated 22 June 2004.[19] The memorandum discloses that NGC's leverage has been around 60% since its refinancing in 2003.

In my opinion an appropriate leverage for Powerco is 60%. This is supported by the actual leverages of Powerco and NGC. It is also consistent with the economics of a gas pipeline business. Powerco is able to maintain a credit rating of BBB+ with Standard & Poor's with its current leverage,[20] which is consistent with 60% leverage being a prudent level.

Dr Lally rightly points out in his report that the effect of alternative measures of leverage is "modest" (p 55). Although I agree that differences in leverage do not lead to much difference in WACC, I still have my preference and my analysis will be based on that assumption. Also, it could well be argued that there should be a range on leverage, particularly if it is estimated as an optimum leverage ratio. However, this would be fruitless in respect to estimating WACC.

3.6. COST OF DEBT

The cost of debt (R_d) is estimated using the following equation:

$$R_d = R_f + DRP + DIC$$

where R_f is the risk free rate of interest, DRP is the debt risk premium, and DIC is the debt issuance cost.

The measurement of the risk free rate has been discussed above, and I note that I believe it should be measured using the yield on 10-year government bonds. Although I prefer using the closing rate on the day immediately preceeding the date at which the WACC is being measured,[21] I accept that averaging over a month, as preferred by the Commission, is acceptable.

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19 The memorandum is available on the Commission's website: http://www.comcom.govt.nz/RegulatoryControl/GasPipelines/submissionsandconferencetranscripts.aspx under Gas Control Inquiry Draft Report Submissions, item 8, Annex 2

20 Powerco Annual Report, 2004, p 71.

21 The closing date immediately preceding the measurement date is a proxy for the opening yield on the date of measurement, which is generally not available.

For a WACC measurement date of 1 August 2003, the monthly average yield on 10-year government bonds for July 2003 was 5.54%. In the sections that follow, I will support a debt risk premium of 1.50% and debt issuance costs of 0.4%. Therefore, my estimate of the cost of debt is 7.44%.

3.6.1. Debt risk premium

I suggest a debt risk premium for Powerco of 1.50% for a WACC estimate at 1 August 2003 (to coincide with the Commissions dating of its risk free rate estimate).

Dr Lally has proposed a debt risk premium of 1.20% for a firm with 40% gearing, based largely on his earlier estimate of that premium for ELBs. He cites market yields from traded bonds of Powerco, which had an average debt margin of 1.46%. The bonds that he investigated had maturities at the time of two and four years. As I believe the appropriate maturity to consider is at least 10-years, these market yields will under state the true debt margin that is appropriate.

I do not have market yield data for the longer term Powerco bonds. The spread of the debt margin between the two maturities will vary over time and should be matched to time period being evaluated. Under any normal conditions the debt margin spread will increase with maturity. The market yields that Dr Lally quotes are consistent with a debt risk premium for Powerco of at least 1.50% with leverage of 60%.

Dr Lally creates an example. He supposes that the leverage was 50% and the debt margin was 1.4%, which I would consider reasonable if the debt maturity was three years as he assumes. In his example, he estimates that this would raise the WACC by 0.15% over his estimates. He says (p 57), "The difference is only 0.15%." He gives no further consideration to the example, implicitly dismissing 0.15% as trivial.

If the impact is trivial, why does the Commission ignore it when it requires rejecting a clear position of Powerco, which is backed up with real financial decision making? There are places in Dr Lally's report where he performs adjustments that are truly trivial.[22] Yet here is a place where an adjustment that would move the parameters toward the actual position of Powerco is identified, but ignored by the Commission and Dr Lally.

There is another issue associated with the estimation of the debt risk premium that requires consistency.

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22 His corrections for different leverage across markets, such as on page 40, is an example.

Debt can be issued either directly by private placement or through a public issue. The issuance costs of a direct placement are considerably lower than a public issue.[23] However, the interest rates paid on private placements are usually higher than those on a public issue.[24] So there is a trade-off when issuing debt by private placement – issuance costs are lower but interest rates are higher. Brealey and Myers state:

> "a typical differential [between the interest rate on public and private issues] is on the order of 50 basis points".[25]

Hays, Joehnk and Melicher[26] conducted an empirical study of the difference in rates between public and private debt issues and found that the yield to maturity on private placements was 0.46% higher than on similar public issues.

Dr Lally notes an average debt margin of 146 basis points for Powerco on its public debt in the period sampled (August 18-21, 2003). Simply considering public debt will understate the average debt margin to a firm such as Powerco that has a mix of public and private debt. Since private debt typically has a higher interest rate (offset by lower issuance costs), the estimate based on public debt is an underestimate – probably by 25 to 50 basis points.

The Commission and Dr Lally have treated the cost of debt issue in a manner that particularly disadvantages companies such as Powerco that have a mix of public and private debt. They estimate the debt risk premium from publicly listed debt. This will give a lower yield than private debt, but if public debt really was used the company would have to incur substantial debt issuance costs. The Commission and Dr Lally have not allowed a provision for debt issuance costs. Powerco is being disadvantaged on both counts.

In my opinion, the Commission and Dr Lally have erred in their determination of cost of debt. To have consistency in the regulatory process across a range of companies and circumstances, I believe the best approach is to continue to base an estimate of the debt risk premium on available data on publicly listed debt. However, this makes it very important to allow a provision for debt issuance costs, and the provision should be estimated for publicly listed debt. The assumed form of debt (i.e., public or private) must be the same for both the debt risk premium and the debt issuance costs to be consistent. I consider debt issuance costs in the following section.

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23 An obvious cost advantage in a private debt issue is that a prospectus does not have to be issued.

24 For example, see R. Brealey, S. Myers, G. Partington and D. Robinson, 2000, Principles of Corporate Finance, McGraw-Hill Australia, p 741.

25 R. Brealey and S. Myers, 1996, Principles of Corporate Finance (5th ed), United States of America: McGraw-Hill, p 401.

26 P. Hays, M. Joehnk and R. Melicher, "Determinants of Risk Premiums in the Public and Private Bond Market," Journal of Financial Research, Fall 1979, 143-152.

In my opinion an appropriate estimate of the debt risk premium is 1.5%, with a range of 1.2% to 1.8% to reflect uncertainty in actual margins. This is based upon leverage of 60%. It is possible that an appropriate debt risk premium at other dates could be different from this rate. For other years, it is recommended that the debt risk premium be re-examined.

3.6.2. Debt issuance costs

I propose a range of 25 to 55 basis points around an estimate for Powerco of 40 basis points for the costs of debt issuance.

Dr Lally accepted that debt issuance costs were valid, but then dismissed the effect as trivial.[27] Similarly, the Commission ignored debt issuance costs on the grounds that "such costs when spread over the term of the debt have a relatively small impact on WACC, and that it is difficult to remove debt issue costs from the businesses' cash flows (to ensure consistency)."[28]

The ACCC has allowed debt issuance costs in its recent decisions. Furthermore, the Australian Competition Tribunal, in its determination on GasNet, agreed that the costs should be recognised in a company's WACC and increased the allowance.

Dr Lally presents information that he regards as supporting an estimate of about 30 basis points. He then calculates that the effect of this on WACC would be less than 0.10%.[29] At my preferred leverage of 60%, the effect on WACC is over 0.10%. Dr Lally says of the impact, "This is trivial." He then says that there would be difficulties in sorting out the incurred costs from the firm's reported costs, and so suggests that no allowance be made.

As I discussed above, it is necessary to be consistent in the type of debt assumed in the estimation of the debt risk premium and the debt issuance cost. I recommended that the Commission do its analysis based on publicly listed debt, so in estimating debt issuance costs for Powerco, I do so for publicly listed debt.

A number of studies have investigated the issuance costs of debt offerings to the public. The study that is most cited estimated the total direct issuance costs as a percentage of the total proceeds for US corporations during the period 1990 to 1994. The costs for issues by utilities and non-utilities of relevant sizes are shown below (proceeds in US$ millions).[30] Total direct costs ("TDC") are partitioned into expenses ("Exp") and gross spread ("GS").

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27 M. Lally, p 58.

28 Final Report, para 9.86.

29 M. Lally, p 58.

30 I. Lee, S. Lochhead, J. Ritter and Q. Zhao, "The Costs of Raising Capital," *Journal of Financial Research*, Spring 1996, pp 59-74.

	Total Costs (as a percent of proceeds)					
	Utilities			Non-utilities		
Proceeds	GS	Exp	TDC	GS	Exp	TDC
$60–80	0.87	0.26	1.13	1.84	0.60	2.44
$80–100	0.71	0.27	0.98	1.61	0.65	2.25
$100–200	1.06	0.36	1.42	1.83	0.55	2.38

The New Zealand debt market is not nearly as developed and competitive as the debt market in the US, which leads me to believe that the total cost of issuing debt would be higher here. Also, the differentiation between utilities and non-utilities is not strong here. The direct expenses (e.g., legal, auditing, printing) are only half as high for utilities in the US as for non-utilities. I do not believe such a differential exists in New Zealand and doubt that there would be such a difference in gross spread between the two.

Powerco's total debt would be roughly US$700 million. A prudent company raises its debt capital in a number of separate issues. For example, Powerco has debt outstanding from six major issues. So an average issue size for Powerco would be a little over US$100 million. Considering these factors, I estimate that if Powerco were to issue public debt the total debt issuance cost would be about 1.8% to 2.4% of the issue proceeds.

This quantum of issuance costs as a percent of the total proceeds of the issue can be converted into an equivalent cost of capital rate. The conversion will depend upon the maturity of the debt. The longer the maturity, the more years there are to spread the costs over. The appropriate maturity for Powerco is ten years. The conversion also depends upon the assumed principal repayment structure, where the options range from all payment at maturity or regularly scheduled repayments throughout the life of the debt. Converting the issuance costs into an annualised cost of capital rate for the ten-year maturity can then vary from about 0.3% to 0.6%.

In the previous section on debt risk premium, I cited empirical evidence that differences in rates of return between public and private debt issues are quite large, averaging about 50 basis points. Even if issuance costs of private placements were nil, which of course they are not, it would indicate issuance costs for public debt issues of about 0.50% if the total costs of public and private are equal.

In my view, the evidence that is available is consistent with total debt issuance cost of 0.4% for a company such as Powerco. Given the estimation error in this assessment, I believe a one standard deviation range ± 0.15% is appropriate. If the Commission persists with its short maturity for the risk free rate, then the annualised debt issuance costs will be significantly higher.

Dr Lally suggested ignoring debt issuance costs even though his evidence supports 30 basis points, if not more. He states that the effect is trivial. I disagree that the costs of debt issuance are in any sense trivial and can be ignored. An impact of 0.10% on WACC, which Dr Lally acknowledges, should not be brushed aside. If it is deemed trivial by Dr Lally and the Commission, it should not matter to them whether it is included or not. Since it is clear that there are debt issuance costs that are in the order of at least 25 to 40 basis points, I suggest that it be allowed.[31]

I note also that the Commission and Dr Lally have trivialised a 0.15% impact on WACC in the debt margin and now 0.10% in debt issuance costs. Even by their own estimates, they have understated the cost of debt so much that it has reduced the estimated WACC by 0.25%. This is not an amount that any commercial business would consider trivial.

I believe a proper estimate of WACC for Powerco will have a leverage of 60%, a debt risk premium of 1.5% and debt issuance costs of 0.4%.

3.7. MARKET RISK PREMIUM

I propose a range of 5% to 11% for the tax adjusted market risk premium ("TAMRP"), with a mid point of 8%.

Based on advice from Dr Lally, the Commission has adopted a range of 6-8% for the market risk premium in recent decisions, which was widened to 5.5-8.5% in its gas inquiry Final Report.

Dr Lally presents a range of estimates of the TAMRP, with the point estimates under these approaches ranging from 5.9% to 8.3% for New Zealand.[32] The various point estimates form the basis of Dr Lally's proposed range of 6.0% to 8.0% for the TAMRP, which was subsequently widened in the Commission's final decision to 5.5% to 8.5%, with a mid-point of 7.0%.[33] In my view the mid-point understates the likely mean TAMRP for New Zealand at this time, and the range fails to reflect the statistical variation and underlying uncertainty associated with all estimates of the MRP.

I agree with the Commission in paragraph 9.35 of its Final Report where it states a case for considering a wide range of estimates for the MRP:

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31 Dr Lally also cites potential difficulty in ensuring that debt issuance costs are not included in reported costs. I agree that there cannot be double counting by having the costs in reported costs and also in a WACC allowance. This is an administrative issue that should be pursued, but it is not an excuse for ignoring the legitimate debt issuance costs.

32 These estimates are reproduced in the Final Report, para 9.33.

33 In its Final Report on airfields, the Commission ("Final Report, Part IV Inquiry into Airfield Activities at Auckland, Wellington, and Christchurch International Airports," 1 August 2002) followed the advice of Dr Lally ("The Cost of Capital for the Airfield Activities of New Zealand's International Airports," November 2001) and used an MRP estimate of 8%.

> The Commission's view is that all of the different methodologies have advantages and disadvantages, but that all provide insights into the appropriate TAMRP. It therefore prefers to consider a wide range of estimation approaches.

Two points are worth mentioning. First, Dr Lally did not consider all the different estimations or methodologies that have been used to estimate MRP. Some approaches that he did not discuss yield substantially more divergent estimates. I will discuss some of these approaches below. Second, to consider a set of different methodologies does not require that they be treated as of equal value in making an estimate, which is what Dr Lally effectively does by taking a simple average across all the methods he used.

Two issues are relevant. First, whether the Commission and Dr Lally's best estimate of 7.0% is appropriate, and second, whether the MRP range is correctly set at 5.5-8.5%.

3.7.1. Considering the reasonableness of the mid-point value

The plausibility of a value of 7.0% can be seen by compared this value to estimates of the MRP in Australia and the US. Since both Australia and the US use the standard CAPM, the Commission's mid range estimate for the MRP in the Brennan-Lally CAPM can be converted to the standard CAPM. As noted by Dr Lally a MRP of 7% under the Brennan-Lally CAPM equates to a MRP of around 5% for the standard CAPM. For purposes of estimating a MRP I accept that converting an estimate based on the standard CAPM to an estimate based on the Brennan-Lally CAPM requires an addition of 2%.

Australia

The standard view of experts in Australia is that its long horizon MRP is in the range of 5% to 8%. Regulators in Australia are near unanimous in adopting an MRP estimate of 6%. This figure of 6% is consistent with the advice of Dr Lally himself, who recommended adoption of a value of 6% in a report to the Australian Competition & Consumer Commission.[34] This equates to a TAMRP of 8% under the Brennan-Lally model.

By stating that the appropriate mid range value of the TAMRP in New Zealand is 7%, Dr Lally is implicitly arguing that market risk in New Zealand is 1% lower than in Australia. This appears implausible. Even if market risk is identical in the two markets a TAMRP of 8% is justified by Dr Lally's analysis on the Australian market. Given that it is more likely that market risk is higher in New Zealand than Australia, Dr Lally's own advice to the ACCC is consistent with a mid range value above 8% for the New Zealand TAMRP.

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34 Lally, M, "The Cost of Capital under Dividend Imputation, a report for the ACCC," June 2002.

United States

The US is considered the economy with the most robust estimates of MRP, and is widely regarded as a good benchmark against which to compare risk premiums.[35]

The most common reference for MRP in the US is from Ibbotson Associates, and the most common period is from 1926. For the 78 years, 1926 through 2003, the risk premium for large stocks over the long-term (20-year) government bonds was 7.2%.[36] An alternative source is Dimson, Marsh and Staunton, which covers from 1900 through 2002. They report a premium over bonds of 6.4%, which increases to 6.6% if 2003 is added.[37] The estimates have a standard error of 3%.

There is a range of research into an appropriate measure of the MRP in the US. A review of all the literature is well beyond the scope of this report. Dr Lally reviews research that has built on work by Siegel and Merton as well as attempts to estimate a forward-looking MRP without dependence on a time series of historical returns. The output of research in these areas has resulted in a fairly wide range of MRP estimates. There is a clear consensus that the standard historical long-run MRP estimates are unlikely to be reproduced going forward. The MRP estimates tend to range from 3% to 7% with some estimates further out in both directions.

In a broad based online poll of financial economists, Welch found that the average MRP estimate was 7-8% depending on the horizon assumed for the risk free rate, with 7.1% relative to 10-year government bonds.[38] Welch has reported an update of his survey[39] that indicates respondents on average had become more pessimistic and reduced their estimates by an average of 1.6%. A caution needs to be made about these polls. First, they were from on open online poll and the respondents are likely to be educated with respect to the MRP, but there were none of the normal controls on participation. Second, the polls were taken during a period of considerable turmoil in the US markets. The first result was toward the end of the "bubble" when many people felt markets were over-valued. The second poll was taken around the time the bubble was being corrected, which would most likely have had a transitory impact on perceptions of the MRP.

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35 Contrary to the situation in New Zealand, the US has been an open economy for virtually all of its existence. The quantum of evidence and analysis of the US equities markets (and its MRP) would probably exceed that of all other countries in the world combined.

36 Ibbotson Associates, "Risk Premia over Time Report: 2004."

37 E. Dimson, P. Marsh and M. Staunton, "Global Evidence on the Equity Risk Premium."

38 I. Welch, "Views of Financial Economists on the Equity Premium and on Professional Controversies," Journal of Business, 2000, 501-537.

39 I. Welch, "The Equity Premium Consensus Forecast Revisited," Cowles Foundation Discussion Paper No. 1325, September 2001.

There have been numerous empirical estimations of the MRP in the US. A common result of a stream of research on the volatility of the US markets is that the historical returns seem high relative to that volatility. However, this is a contentious area of research. Much of the early research in this area challenged the reasonableness of the historical MRP as a forward-looking estimate. Predictions of a forward-looking MRP ranged from about the historical level down to as low as 2%. Recent research has been more successful in reconciling historical returns with rational behaviour of investors and the markets.

The use of historical information to estimate a forward-looking MRP is logical, but subject to measurement error and distortions. The approach requires an assumption that the conditions underlying the historical returns are expected to be present in the future. Clearly this is a strong assumption and is unlikely to be appropriate when comparing the US equity markets in the twentieth century with those markets going forward.

Dimson, Marsh and Staunton[40] have observed, "there are cogent arguments for going beyond raw historical estimates." There are four changes over the past few decades in the US that I believe are particularly important in assessing the MRP.

There has been an explosion in the breadth of investment alternatives available to investors, both domestic and international. As a result, investors are far better positioned to efficiently diversify their portfolios. This change includes the growth in mutual funds and pension plans. Economies, at least in the industrialised world, have apparently learned to control inflation.[41] This results in interest rate stability, which is a substantial reduction of risk for businesses. A wide range of new financial securities have been introduced that have advanced portfolio risk management tremendously. Finally, and perhaps the most important, transactions and monitoring costs have declined markedly. I include the improved liquidity of the markets as a reduction in transactions costs.

Reflecting these changes in an estimate of a long-horizon MRP is necessarily subjective and uncertain. Interesting perspectives on a forward-looking long-horizon MRP come from the authors of the two best-known sources of historical estimates, as cited above. Ibbotson[42] has estimated a MRP of 6.2%. Dimson, Marsh and Staunton[43] have proposed an estimate of 5% as a plausible forward-looking MRP.

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40 Op. cit., p 11.

41 Just how enduring or strong this is will be revealed in the future. For purposes here it is sufficient that market participants believe that there will be relative interest rate stability in the future.

42 R. Ibbotson, "Predictions of the Past and Forecasts for the Future," and "The Supply of Stock Market Returns" (with P. Chen), both available on the Ibbotson Associates website at http://www.ibbotson.com

43 Op.cit., p 13.

In assessing the available literature and evidence, my estimate of the forward-looking, long-horizon US MRP is 5.0% to 5.5%. I regard a one standard deviation range to be 3% to 8%. I now consider differences in taxation, in equity markets and indices, and country risk that might cause the New Zealand *ex ante* MRP to be different from the US MRP.[44]

Differences in taxation

There are many differences between the system of personal taxation in New Zealand and in the US. The differences that are important to the topic of this paper are the tax rates, the New Zealand dividend imputation system, the treatment of capital gains, and the opportunities to shelter tax. Unfortunately, there are a number of complications to this issue. One problem is that the tax systems have changed over time in both countries. The tax regime that is important is mainly the forward-looking tax system in New Zealand, although historical tax structures may be important to interpreting the US historical MRP data. A second problem is that we do not know the identity(ies) of the price setting investors. The tax systems do not treat all investors the same. Furthermore, since New Zealand has open markets, the price setting investors may not be New Zealand taxpayers.

Importantly, the investors we are concerned with are those that are price setters. This almost certainly does not include all investors, but rather includes a relatively small number of highly sophisticated investors. It is reasonable to assume these investors are skilled at managing their tax affairs to minimise taxation.

There are obvious differences in the taxation systems between the two countries. At first glance, the differences seem to favour a lower MRP in New Zealand. But a closer analysis shows that arguments can be made for adjustment in either direction. Unfortunately, this is a complex area. There are simple answers that almost certainly are wrong. To accurately assess the importance of tax differences to price setting requires that we know the tax circumstances of the marginal investors. We do not know this, but empirical evidence favours a view that there is little difference between the two countries. Although the magnitude of adjustments to MRP from taxation could be substantive, I do not see any clear basis for predicting the direction. The dividend imputation system would seem to confer an advantage on New Zealand, but if the marginal investors are international, then the advantage would not be reflected in security prices. If there is a difference, it is likely to favour New Zealand, but I do not recommend adjusting the US MRP before applying it as a benchmark for estimating the MRP in New Zealand.

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44 In his WACC report to the Commission on the airfields, Dr Lally says foreign estimates of MRP "are subject to the problem of inter-country differences relevant to market risk premiums, such as market volatilities and personal taxes." This is consistent with the approach I use here.

Differences in markets and indexes

There are many obvious differences between the equity markets in the two countries.[45]

First, the New Zealand market has a disproportionate representation of companies in telecommunications, health care, transport and primary industries. While infrastructure companies internationally tend to have low to moderate levels of systematic risk, the New Zealand environment, including the role of regulation and the government, is considerably less protective than is generally the case internationally. Healthcare and transport typically have betas above one. As a consequence, I believe the riskiness of New Zealand companies in these industries is the average relative to the US. In US markets there is a higher representation of leading-edge type companies. However, the empirical evidence used to estimate the US MRP is based upon the Standard & Poor's 500 Index. This index is on a highly diverse set of companies that is not over represented by high-risk companies.

Second, US companies are considerably larger on average. It is well documented that size is negatively related to risk, both total risk and systematic risk. This was established earlier in my report. Based on Ibbotson data, over the period 1926 through 1996, a portfolio of small stocks, defined as the smallest twenty percent of all firms listed on the New York Stock Exchange (NYSE), showed a return that was 6.52% higher than the return on the S&P500. Note that although the portfolio is labelled small stocks, they are not small stocks as would be thought of with respect to the NZ stockmarket. As a measure of total risk, the standard deviation of the small stocks was nearly double the standard deviation of the S&P500. An estimate of the systematic risk (beta) of the small stocks portfolio can be made by dividing the excess return (over the risk-free rate of return) of the small stocks by the excess returns of the market portfolio (i.e., the S&P500). This calculation gives a portfolio beta for small stocks of 1.75.

Based upon the analysis above, it is certainly reasonable to infer that the New Zealand market is higher risk than the US market and hence should have a higher MRP. The question is whether there is a reasonable way to estimate the magnitude of the higher risk in terms of return. An intuitive way to apply such analysis to the New Zealand market is to think of it in terms of systematic risk. If the firms in the NZ market were listed on a stock exchange with the Standard & Poor's 500 firms, what would be the average beta of the NZ firms?

In my opinion, the average beta would likely be in the range of 1.25 to 1.5. To convert this to a rate of return, I assume an MRP of 8% and apply the beta estimate in excess of one to get an addition to the benchmark MRP of 2 to 4%.

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45 There are also differences in the taxation systems in the two countries. However, as this is a complex area with no clear indications of likely adjustments, I have not attempted to quantify the impact. In addition, country risk will differ between the two countries. However, as country risk is priced domestically I have assumed that this will be factored into the respective risk free rates.

Country risk

The incremental risk of a country is often referred to as "country risk". This risk is related to the risk that a government will abruptly alter its policies with respect to investments in the country (including expropriations), shifts in monetary or fiscal policy, regulatory changes, defaults and tax changes.

The literature and empirical evidence support the conclusion that political risk is priced domestically. However, it is likely that the country risk premium for a developed country such as New Zealand is priced in the risk free return such that there is no additional premium necessary in the MRP. I do not believe it is appropriate to not add to the benchmark MRP for country risk.

Conclusion on MRP [46]

To estimate a long horizon MRP for New Zealand, the information above is summarised as follows:

Taxation –perhaps a small subtraction in favour of New Zealand

Market differences – addition to benchmark of 3%

Country risk – no adjustment to MRP

In my opinion, this analysis indicates that an adjustment to the US MRP could be an increase of about 3% or slightly less. I combine this with my estimated long-horizon MRP for the US of 5.0% to 5.5%. In my opinion, an appropriate estimate of a long-horizon MRP for New Zealand is 8% under the standard CAPM and between 8% and 13% under the Brennan-Lally model.

The analysis above can be put another way. Using my estimate of a 3% difference in MRP between the US and New Zealand, Dr Lally's mid range MRP of 5% (standard CAPM) implies a US MRP of 2%. Certainly there is little support for such a very low forward-looking MRP.

Dr Lally and the Commission estimate the tax adjusted MRP for New Zealand at 7%. However, Dr Lally's own estimate of MRP for Australia is 6%, which when transformed to a TAMRP is 8%. In my view it is not plausible for Australia to have a higher MRP than New Zealand. As one piece of evidence, recall from the discussion on the ICAPM in section 4.2 that there was a very strong relationship between the size of a market and its total risk and beta with the world market. These are all consistent with a higher MRP for New Zealand than Australia.

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46 There are two separable issues here; the appropriate MRP for the US and the premium over the US MRP that is appropriate for New Zealand.

3.7.2. Range for the MRP

In his advice to the Commission in the gas inquiry, Dr Lally errs in basing his (then) proposed range of 6-8% on the means of the different estimates that he cites. Each of these estimates has a distribution (and hence a standard deviation). A range should reflect some confidence interval. A common and acceptable approach is to set the range at ± one standard deviation for the distribution underlying the estimate.

In its Final Report the Commission accepts this approach. Without providing any supporting evidence, it notes that Dr Lally believes that a standard deviation is around 1.5%. In my opinion this is low.

If analytical (rather than strictly empirical) approaches to the MRP are pursued, in which the estimate is generated by deduction from economic theory in a manner consistent with the assumptions of the CAPM, then a very wide range of estimates results – with values for the MRP that can go as low as 2 per cent and as high as 25 to 30 per cent.[47]

In practice, the results associated with the empirical methods have high standard errors, so that relatively little confidence can be placed on the "point estimates" (i.e., single best value) they generate. Rather, any reasonable estimate must cover a fairly wide range of possible values. Ibbotson has stated that the standard error of the long-run historical estimates of MRP for the US is about 2.7%.[48] As noted earlier, Dimson, Marsh and Staunton report that their estimates of MRP have a standard error of 3%. In a New Zealand context it has been pointed out that the standard errors associated with a historical averaging approach, which is the most-widely used basis for determining the MRP, are such that its true value may lie between 0 and 15 per cent.[49]

For the purpose of estimating excess returns, the range set by the Commission is still too small. Even Dr Lally has written that estimates of MRP "have wide confidence intervals."[50] Given the very substantial uncertainty with respect to estimating MRP, a range of at least ± 3% is appropriate.

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47 Very low values are generated if one uses the method set out by E. Fama and J. Macbeth (1973, "Risk Return and Equilibrium: Empirical Tests," Journal of Political Economy 81(3), 607-636). Conversely, the approach originally set out by R. Lucas (1978, "Asset Prices in an Exchange Economy," Econometrica 46, 1429-1445), and subsequently developed by K. French, G. Schwert and R. Stambaugh (1987, "Expected Stock Returns and Volatility," Journal of Financial Economics 19, 3-29) will yield very high or very low values depending on whether reinvestment is not allowed (as in the CAPM) or allowed.

48 See Ibbotson's comments in I. Welch, "Research Roundtable Discussion: The Market Risk Premium," available on Welch's website at http://welch.econ.brown.edu/academics/

49 See Professor David Emanuel, "Statement to the Commerce Commission in respect of regulation of electricity lines' businesses," March 2003.

50 M. Lally, "The Cost of Equity Capital and Its Estimation," 2000, McGraw-Hill, Australia, p 26.

3.8. BETA

I support an asset beta for Powerco of 0.6, and from that I derive an equity beta of 1.5 with leverage of 60%.

In his advice for the Commission, Dr Lally recommended a range for the asset beta of 0.4 to 0.6[51] with a midpoint estimate of 0.5. In developing his estimate he cites a wide range of relevant factors and empirical estimates.

3.8.1. Estimating beta

In setting his range of 0.4 to 0.6, Dr Lally considered a range of empirical evidence. He first looked at direct measurement of the three publicly listed gas companies in New Zealand. I reproduce his betas for Powerco, NGC and United Networks in section 3.8.2. For a number of reasons, Dr Lally decided that no great reliance can be placed upon this evidence. He does not disclose any diagnostic information on the beta estimates. My presumption is that the explanatory power of the estimates was very low, with the likely exception of Powerco. I agree with Dr Lally's reluctance to place much credibility on the beta estimates for purposes of estimating a representative beta for all gas pipeline businesses.

Dr Lally next turned to estimated betas of comparable companies, starting with the US. He states (p 39):

> If the gas pipeline businesses operated in a largely cost-plus fashion (i.e., cost and volume shocks were rapidly transmitted to their customers) then they would closely resemble US firms in the gas distribution sector, which are subject to rate of return regulation with annual resetting of prices.

He then says that US gas distribution companies and US electric utilities are similar in their activities and regulatory environment. As the Commission seeks consistency across industries, he favours using both industries in his analysis.

Dr Lally assembles nine different beta estimates of companies in the gas and electric industries from five different sources. The median of all of these estimates is 0.26. He then notes that from about 1998 through 2001 the US experienced what is widely referred to as a "bubble" where companies in the telecommunications, media and technology industries climbed to unsustainable prices. A result of this bubble was to distort measurements of betas. In the case of infrastructure companies this meant that betas estimated during that period were underestimated.[52] Based on his compilation of data over different estimation periods, Dr Lally accepts that some distortion is evident and chooses to use an estimate of asset beta for the US gas and electricity companies of 0.30.

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51 In its Final Report, the Commission adopted the practice of setting ranges as estimates based on one standard deviation and broadened the range for the gas pipeline businesses to ± 0.14.

52 See A. Annema and M. Goedhart, "Better Betas," McKinsey on Finance, Winter 2003, 10-13.

Acknowledging that the New Zealand gas pipeline businesses and ELBs do not face explicit price controls, Dr Lally concludes (p 44) – "Thus the US estimate of .30 should be seen as a lower bound on that of the New Zealand firms."

Dr Lally then turns to companies in the UK, focusing on the period 1990-1994 when the electricity companies were subject to price cap regulation with 5-year resetting of prices. The data he reports, after making his adjustment for differences in market leverage, indicates that the movement from annual to five yearly resetting increases the asset beta by 0.2. This provides an estimate of 0.5 for UK electricity companies with five-year price resetting, which he treats as an upper bound on an estimate of ELBs in New Zealand.

He does not discuss estimates of beta for UK gas and/or electricity companies since 1994, which seems peculiar.

From these two bounds he selects the mid-point as his best estimate of the asset beta of New Zealand ELBs. From the ELB estimate he considers differences between the ELBs and the gas pipeline businesses. He concludes that the gas pipeline businesses have characteristics that support a higher asset beta by 0.10. Thus he settles on an estimate of 0.50.

It is tempting to engage in a debate about Dr Lally's interpretation of his factors underlying asset betas, to contest his empirical analysis, adjustments and inferences, and to offer additional evidence. I believe there is much good in what he has done, but also believe that he has tailored his discussion in such a way that his estimate is too low. However, I will resist the temptation and focus on two specific issues that are important to Dr Lally's own analysis. The first issue is the comparative regulatory regimes and the second is the impact of the bubble.

Dr Lally describes the regulatory environment for the gas pipeline businesses and then qualifies the implications of that environment.

> In respect of the gas pipeline businesses, there are no price controls in force. However, they have operated for some time in the knowledge that excess profits might induce price controls. Thus they face a quasi-regulatory regime. (p 36)

In considering the empirical evidence, being betas of gas and electricity companies in the US and UK, he focuses on the price resetting period in comparing the US and UK companies. In compiling his asset beta estimate for gas pipeline businesses (p 48), he explicitly assumes that the only relevant difference between regulatory regimes in the US and New Zealand is the price resetting period.

Dr Lally progresses from no price controls in force, to a quasi-regulatory regime, to being comparable to price controlled with three-year price resetting.

In my view, this is a distortion of the regulatory regime faced by gas pipeline businesses and significantly understates the systematic risk of gas pipeline businesses in general and Powerco in particular. The gas pipeline businesses are to be evaluated for excess returns while operating under no specific regulatory regime. It is certainly true that the companies were aware of the various changes that could occur under light-handed regulation, but to equate that with being controlled is patently false.

It is another example of where Dr Lally and the Commission are not using the appropriate structure in their estimation of WACC.

In my view, the competitive environment faced by the gas pipeline businesses, including Powerco, was considerably less protective than the regulatory regimes of either the US or the UK industries. This is a very important distinction.

Gas pipeline businesses have very high investments in their infrastructure. As a result they have high fixed costs and high operating leverage. Dr Lally states (p 38) that "their high operating leverage should magnify their asset betas." This is particularly important the less the regulatory control. Yet in his analysis, Dr Lally appears to give no recognition to the high operating leverage of the gas pipeline businesses.

The gas pipeline businesses have little regulatory control and high operating leverage, both of which are not recognised in the asset beta of Dr Lally and the Commission. An improper interpretation of the regulatory control and operating leverage of Powerco would lead to an understatement of the company's asset beta.

The second issue was mentioned by Dr Lally, but in my view was not given more than trivial recognition. The stock market in the US during from the late 1990s through 2001 has been described as being a "dot-com bubble." During this time, companies in the telecommunications, media and technology industries had betas that were inflated by the transitory bubble. As a consequence, companies in other industries had temporarily depressed betas.[53]

There is no precise way to quantify the effect of this on the beta estimates used by Dr Lally. He adjusts his US asset beta from 0.26 to 0.30, which then becomes his lower bound. In my view this is a substantial under recognition of the distortion in the data as a result of the bubble.

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53 See A. Annema and M. Goedhart, "Better Betas," McKinsey on Finance, Winter 2003, 10-13. Dr Lally acknowledges this distortion in his Gas Inquiry WACC Report of 24 November 2004.

This is very clearly demonstrated in the data that Dr Lally cites in his WACC report to the Commission on ELBs.[54] He cites an asset beta estimate from Damodaran (pp 25-26) for 2002 of 0.30 and then an estimate from 2003 of 0.37. As he discloses, Damodaran's estimates are based upon five years of data, so the estimates would both include more observations from the bubble period than post-bubble. The fact that the estimated asset beta increases from 2002 to 2003 is fully consistent with the downward bias. It would also be reasonable to assume that the estimates will increase further as they rely less on the distorted data.

Before leaving the data from Damodaran on asset betas, I draw attention to one feature of Dr Lally's analysis with the data. He chose to ignore the more current data from 2003 and rely upon the data from a year earlier, thus reducing his estimate to 0.3 rather than 0.4.[55] Under any normal circumstances it would seem preferable to rely upon the more recent data, but he chose not to do that. Given the distortion created by the bubble discussed above, it is clear that the more recent estimate would be less downward biased as it is based upon less data from the bubble period.

The conclusion I draw from the presence of the downward bias discussed above is that Dr Lally's estimated asset beta for the US is much too low. I do not have comparable data on the UK, but I suspect that there is a similar, but less pronounced, bias in the UK beta estimates. As a result, both his lower and upper bounds should be higher, and hence his mid-point estimate should be higher. An increase of 0.1 in his asset beta estimates would seem to be a minimum.

In my opinion, Dr Lally's point and range estimates for an asset beta of New Zealand ELBs are too low. I believe that the appropriate point estimate of an asset beta for Powerco is at least 0.6. Using the standard re-levering equation, and my leverage estimate of 60%, this converts to an equity beta of 1.5.

3.8.2. Range for beta

I support a range for the estimate of an asset beta of ± 0.3.

Dr Lally supported a range of ± 0.1. Subsequently, in its Final Report on the Gas Control Inquiry, the Commission adopted the concept of a one standard deviation range and gave a range to the asset beta estimate of ± 0.14 (para 9.73).

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54 Lally, M. "The Weighted Average Cost of Capital for Electricity Lines Businesses", 4 August 2003.

55 Dr Lally consistently states that he does not believe estimates of beta can be expressed to more than one decimal place as the estimates are have such high measurement error. Therefore, the result of 0.37 would be rounded to 0.4.

There is a high degree of measurement error in any estimate of beta. I have data from the June 2004 Risk Measurement Service of the Australian Graduate School of Management's Centre for Research in Finance ("CRIF"). This dataset has 1,500 companies listed on the Australian Stock Exchange, but only 1,271 have sufficient data that betas have been estimated. The average standard error of these equity beta estimates is 0.93. Even when beta is estimated at the level of industry portfolios, where on average there are over 50 companies in each industry, the average standard error is 0.22.

The measurement error problem can be easily seen in the table Dr Lally presents on the three listed companies in the gas pipeline business (p 39). The table is reproduced below.

		B/S				
Company	B_e	2000	2001	2002	Mean	B_a
Powerco	.96	.89	.96	1.13	.99	.48
NGC	.27	n/a	n/a	.52	.52	.18
United Networks	-.20	1.13	.69	.72	.85	-.10
Average						.19

Clearly the estimated negative beta for United Networks is not economically sensible. Dr Lally did not report the explanatory power of the estimates, but I suspect that they are quite low, except perhaps for Powerco. Following the suggestion of Dr Lally,[56] we should not give credibility to this data. So I agree with him when he places no discernible weight on these beta estimates.

My point here however is to address the issue of a reasonable range for the estimated betas for gas pipeline companies. For that purpose, the estimates above are instructive.

Here are three companies in the same industry in New Zealand. What is striking is how diverse are the beta estimates – from +.96 to -.20. There are two obvious explanations for this data – the beta estimates are reasonable but the companies have widely divergent systematic risks, or the beta estimates are subject to very high measurement error. As the companies are in the same business and operating in essentially the same environment, it is reasonable to choose the latter explanation. Beta estimates of approximately similar companies can be wildly different.

In my opinion, the Commission's estimate of one standard deviation as ± 0.14 is far too small.

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56 M. Lally, "The Cost of Equity Capital and Its Estimation," 2000, McGraw-Hill, Australia, p 37.

3.8.3. Predictive ability

A further perspective on estimates of beta is the predictive ability of an estimate. This is an important issue because what needs to be estimated is a forward-looking beta. The predictive ability should provide additional insight into an appropriate range. To address this issue in a current Australian context, I used data from CRIF for June 2003 and June 2004. This dataset has all companies listed on the Australian Stock Exchange. I took the estimated betas from June 2003 and matched them with CRIF estimates from June 2004. I then test whether the June 2003 betas are good predictors of the betas one year later.

There are 1,104 companies that have estimated betas in both datasets. The average absolute prediction error for this set of companies is 0.51, while the median absolute prediction error is 0.36. Using the quartiles of the distribution of beta changes, if the earlier estimated beta was one, the estimated beta one year later was as likely to be outside the range 0.74 to 1.43 as to be within that range.[57] In assessing this predictive ability of the estimated beta, it should be remembered that in making the estimates all but twelve of the monthly data points used in the June 2004 estimate were also used in the June 2003 estimate. The two estimates are not independent, yet the prediction error is substantial.

This gives one more perspective on an appropriate range for the estimates of beta. If beta estimates change by an average of 0.51 when only about one-quarter of the data changes, then clearly 0.14 is not an adequate estimate of the one standard deviation range.

3.8.4. Conclusion

Aside from a statistical analysis, at a very intuitive level the range chosen by the Commission is too low. In his report, Dr Lally repeatedly makes assumptions reconciling different sources, and the sources cover a range of estimates. To consider this hand picked set of references and then state that there is a two in three probability that the true estimate will be within 0.14 of the point estimate is not credible.

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57 This range is developed from the beta change data so that a quarter of the changes would be below the range and a quarter of the changes would be above the range.

Consider the process Dr Lally went through to get his estimates. In the WACC report on gas pipeline businesses, he first considers nine factors underlying asset betas. In each case there is a subjective assessment of how the factor might impact the asset beta of a gas pipeline business, with no quantification at any of the steps. I do not agree with all of his assessments, but that only illustrates the subjectivity of this process. What he is then left with is his view on the influence that the nine factors will have on a gas pipeline business's asset beta. The factors have divergent influences and there is no obvious way of determining the relative importance of them. He does not venture any estimate of an asset beta at this point, but uses the analysis to assess alternative candidates for comparable companies. While this is a very reasonable approach to take, and I support it, the point is that it is highly subjective, even for purposes of choosing comparable companies.

After a short consideration of New Zealand evidence as above, Dr Lally then chooses to use beta estimates on US firms in the gas and electricity generation and distribution sector and UK firms in the electricity sector. He does not provide discussion of why these countries and industries are chosen (while others are not), but they are reasonable sources of data to consider.

He chooses five sources and nine estimates of beta for the US, and one for the UK. For each data set that he reports he has to go through a series of adjustments and transformations to arrive at an estimate that he regards as comparable to a New Zealand asset beta estimate.

The process of estimating an asset beta requires the use of a de-levering equation. This introduces the uncertainty of the model itself as well as the parameter values used in the estimation. Are the leverage ratios used in the equation the proper leverage ratios? Is there really no tax impact in the de-levering process?

He also makes a correction for differences in market leverage between the US or UK and New Zealand. This requires a conversion formula that Dr Lally has designed and estimates of market leverage and tax parameters in the US/UK and New Zealand. A particularly contentious assumption that he makes here is that the relevant tax rate in New Zealand is zero.

He then uses the US and the UK as lower and upper bounds respectively, chooses the mid-point based on his (erroneous) assessment of a price resetting period, and finishes with a very subjective assessment of the relative systematic risks of the gas pipeline businesses and ELBs. He determines that the gas pipeline businesses should have an asset beta higher than the ELBs by 0.10.

Dr Lally uses the beta estimates from the US or UK as appropriate for estimating betas in New Zealand. Although he has applied an adjustment for market leverage differences, he does not make any further adjustments or comments. This requires assuming that volatilities of the companies in the US and UK and the market indexes used for those two countries and the covariances between the market indexes and the companies are representative of the volatilities and covariances for New Zealand. There are adjustments that have been proposed for converting a beta estimated in one country to estimate a beta for another country, however there is no consensus in the literature on what approach if any is appropriate.

As before, the issue here is not the estimate of beta, although there are certainly concerns about applying a beta estimated in the US or UK to a company in New Zealand. The issue is the uncertainty of any estimate of beta. Clearly there are a number of sources of estimation error that result from applying a beta from another country to New Zealand.

At every step of the way there are choices being made of alternative data sources, models and parameter estimation. Every data source, model, parameter value and data point has measurement error.

The process that is employed by Dr Lally is clearly very subjective and riddled with measurement error.

In my view, the process of estimating an asset beta is fraught with uncertainty at every step. I do not regard it as plausible that the standard deviation of this process is only 0.14. Even Dr Lally accepts that no beta estimate can have more precision than one decimal place, yet the Commission has suggested that one standard deviation is only fractionally higher than the margin of error.

I regard a one standard deviation range of ± 0.3 as reasonable. Thus, I support an asset beta estimate of 0.6 with a range of 0.3 to 0.9. Converting this for leverage of 60% gives an estimated equity beta of 1.5. In my opinion an appropriate range on the equity beta is 1.0 to 2.0.

3.9. RANGE FOR WACC

My estimate of the appropriate WACC for Powerco and appropriate ranges are set out in the table below. To improve the comparability of my estimates with the estimates of the Commission, I have used the same date for the risk free rate as the Commission in its Final Report (i.e., averaged over July 2003). The difference in the risk free rate is a result of our different opinions on the maturity to use for this estimation. As explained earlier, the risk free rate should be reset for each period when excess returns are being assessed.

Proposed WACC range

		My Estimate		Commerce Commission	
Variable	Section	Point	Range (±)	Point	Range (±)
Risk free rate (July 2003)	3.3	5.54%		5.0%	
Tax rate	3.4	33%		33%	
Gearing	3.5	60%		40%	
Debt premium	3.6.1	1.50%	0.30%	1.20%	
Debt issuance	3.6.2	0.40%	0.15%	0.00%	

Cost of debt		7.44%		6.2%	
TAMRP	3.7	8.00%	3%	7%	1.5%
Asset beta	3.8	0.6	0.3	0.5	0.14
Equity beta		1.5	0.5	0.83	
Cost of equity capital		15.3%		9.2%	
WACC		9.3%		7.2%	1.2%

Determining the range for my WACC estimate has some complexities. The first is that any range on WACC with the procedures adopted by the Commission is likely to be asymmetric, with the range extending further on the high side than the low side. Ideally the parameters and the ranges would be modeled, generally using Monte Carlo simulations. I have not yet conducted those simulations.

Clearly it is the high side of the WACC range that is of interest in this application as it was the task of the Commission to assess excess returns. My ranges, when all applied simultaneously, yield an upper bound on a one standard deviation range of 14.6%. Generally a simulation would yield tighter bounds than this. In my opinion, a reasonable estimate of the upper bound that would result from a modeling of the parameters and ranges would be about 12%.

Using my best estimate of the one standard deviation upper bound on WACC of 12%, this provides the 83rd percentile in the confidence interval. In my view, the Commission should use at least a 90% confidence interval, which is at the 95th percentile, for purposes of assessing excess returns. That indicates the upper bound on the WACC estimate should be about 13.7%.

The Commission agrees (para 4.27) that "The estimation of WACC involves substantial uncertainty and the adoption of a WACC that is too low may result in false finding for control." Yet it estimates a range on its WACC estimate of only ± 1.2%. In my opinion, this is far too small and does not reflect the substantial uncertainty in the estimation of WACC that the Commission has acknowledged.

4. IMPACT OF ADOPTING A DOMESTIC MODEL TO ESTIMATE EQUITY RETURNS

A reoccurring point in Dr Lally's paper and the Commission's Draft Report is that the use of a domestic model of equity returns, namely the Brennan-Lally CAPM, overstates returns relative to an international model such as the international CAPM (ICAPM). Dr Lally claims:[58]

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58 Lally, p 10 and p 66.

> Having said this, it should be noted that use of a domestic rather than an international model for New Zealand assets is likely to produce a higher estimate of the cost [of] equity …
>
> due to both a larger market risk premium and equity beta.

This claim is repeated in the Commission's Final Report:[59]

> The Commission notes, however, that use of an international CAPM, where investors diversify risk across world markets, would likely provide a lower cost of capital compared to a domestic CAPM. Thus, the assumption of a domestic CAPM is favourable for the companies.

The implication of these claims is that use of a domestic model to estimate equity returns systematically overstates the returns an equity investor requires to invest in a New Zealand business. Dr Lally estimates that there is an upward bias in WACC of about one percent.[60]

Although I am not contesting the use of the WACC model and simplified Brennan-Lally CAPM here,[61] I believe it is important to challenge the Commission's assertion that "the assumption of a domestic CAPM is favourable for the companies." If the Commission persists in this belief, it may perceive that it is effectively providing companies a level of tolerance in its excess returns that it is in fact not providing.

New Zealand operates an open economy, and its securities markets have very few impediments to international investors. On a continuum between securities markets that are completely closed or completely integrated, we are certainly much closer to being completely integrated.[62] Therefore, whether we operate in a domestic or an international market is not the substantive question. The substantive question is - how should the cost of equity capital be estimated given that we effectively operate in an international market? Since this is an empirical question, we need to refer to empirical evidence.

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59 Final Report, para 9.13.

60 Lally, p 66.

61 I must say however, that I do not believe the Brennan-Lally CAPM is the best model to use for the real world task of estimating the cost of equity capital in New Zealand (or anywhere else for that matter). However, the Commission and Dr Lally are so committed to the model that it seems futile to do more than make this recording of my dissent.

62 The Commission raises the issue of "home bias" in defence of its choice of the Brennan-Lally CAPM (para 9.12). Research on the issue indicates that there is a home bias in equities markets. In all countries, domestic investors hold a higher portion of their equity portfolios in domestic equities than its domestic equity market's proportion of the total international equity market. Recent evidence shows that home bias is less than originally estimated and is diminishing (Amir Amadi, "Equity Home Bias: A Disappearing Phenomenon?," University of California, Davis Working Paper, April 2004). The importance of home bias to equity markets and prices is not well understood but may not be significant. To illustrate this in New Zealand, many domestic companies operate internationally, local superannuation companies allocate substantial portions of their equity investments overseas and many domestic prices are set in international markets (oil products being an obvious example).

4.1. IS THE DOMESTIC CAPM A GOOD PROXY FOR THE ICAPM?

In fully integrated capital markets, an international version of the CAPM is preferred to either the standard or Brennan-Lally CAPM. The available empirical evidence shows that the standard CAPM is only marginally different from the multi-factor ICAPM in explaining historical returns. The evidence also indicates that the single-factor ICAPM is an inferior model for this purpose.

The issue at hand is how best to estimate a forward-looking cost of equity, not how to best estimate historical returns. To estimate forward-looking cost of equity requires reliable estimates of the variables in the model. In the single-factor ICAPM that means we must be able to reliably estimate the world MRP. At the most we have 20 to 25 years of data for this purpose. To go back further than that, the assumption that world security returns were generated in an international market is tenuous at best. It is well accepted that such a short period is not sufficient for an estimate of MRP. Estimating MRP is always problematic. However, with respect to the ICAPM, the conclusion must be that we have no method of reliably estimating a world MRP.

Even if we could overcome the problem of estimating a world MRP, the fact remains that the single-factor model does not provide an improvement over the standard CAPM. To achieve a significant improvement it is necessary to apply an ICAPM that incorporates exchange rate risk. To achieve this we must estimate a firm's sensitivity to exchange rate risk across all countries in the world economy. We are far from having a reasonable basis for this estimation in practice. Due to the problems associated with applying the ICAPM, we can conclude that the predictive properties of the standard CAPM should be at least as good as the ICAPM.

Models such as the Brennan-Lally CAPM assume that all investors impact on security prices in proportion to their investment. However, prices in open markets are set by marginal investors. When prices are set by marginal investors, home bias is not a problem for equilibrium prices.

Recent empirical tests by Koedijk, Kool, Schotman and van Dijk[63] investigate to what extent international and domestic asset pricing models lead to different estimates of the cost of capital for an individual firm. They find that "even though the ICAPM is theoretically preferable to the domestic CAPM, a firm's beta calculated using the domestic CAPM does not necessarily provide a worse estimate of the cost of capital."[64] They test firms in nine industrialised countries, including Australia (but not New Zealand), over the period 1980 through 1999 – a total of 3,293 firms. The central test was whether the standard CAPM gave a significantly different estimate of cost of equity capital for the firm compared to the ICAPM. The difference was significant (p = 5%) for only 3.1% of the firms (3.7% in Australia). They also tested the difference between measures of systematic risk and found significance in only 2.95% of the cases (1.85% for Australia). They conclude: "the marginal contribution of all global factors is very limited, which indicates strong country factors."

In another study focusing on US firms,[65] the authors conclude, "We summarize this analysis with the estimate that, on average, it makes a difference of about 41 basis points whether a larger US company uses the local US CAPM or the single-factor global CAPM to estimate its cost of equity." They point out that since "the average standard error in the cost of equity estimates for the US stocks is about 190 basis points," there is no significant difference between cost of equity estimates using the CAPM and the ICAPM.

In responding to evidence along the lines of the above from my earlier submission to the Commission's Draft Decision, Dr Lally states (p 66) that the results in these two studies depend upon an assumption about the relationship between the MRP for a domestic market and the world MRP. He then uses his estimates of the necessary variables to show that the result would be lower than his proposed MRP. However, I dispute the values that he uses in his example. I discussed this more fully in section 3.7 on the MRP above and showed that if realistic values are used, my view on MRP and the credibility of the two articles above are confirmed.

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63 K. Koedijk, C. Kool, P. Schotman and M. van Dijk, 2001, "The Cost of Capital in International Financial Markets: Local or Global," Working Paper No. 3062, Centre for Economic Policy Research. See also K. Koedijk and M. van Dijk, "Do Global Risk Factors Matter for International Cost of Capital Computations?," ERIM Report Series Reference No. ERS-2002-100-F&A October 2002.

64 These tests are of the standard CAPM against the Solnik-Sercu ICAPM with exchange rate risk. In an earlier version of the paper (1999) they also included tests of the single-factor ICAPM, and found that it perform significantly worse than the CAPM against the multi-factor ICAPM.

65 D. Mishra and T. O'Brien, "A comparison of cost of equity estimates of local and global CAPMs," The Financial Review, November 2001, 27-48.

Dahlquist and Sällström[66] focus on the comparative power of the single-factor ICAPM, the multi-factor ICAPM with exchange rate risk and an international multi-factor model based on the research of Fama and French. They find that the single-factor ICAPM has poor explanatory power, while the other two models explain a large part of the variation in average returns. The main contribution of this research is to show that the single-factor ICAPM is not an effective model in explaining security returns.

The empirical evidence supports the conclusion that a domestic version of the CAPM has good predictive powers. Put another way, the evidence certainly does not support the proposition that the domestic CAPM systematically overstates the required return on equity as implied by Dr Lally and the Commission.[67]

4.2. IMPACT OF THE ICAPM ON PARAMETER VALUES

Dr Lally performs an estimate of the effect of using a domestic CAPM rather than an international version and finds that the effect is to raise the WACC by up to 1% (p 63). He goes on to claim that such a bias is likely to neutralise other errors in estimating WACC.

In my opinion, the world MRP in an ICAPM is almost certainly lower than the MRP in any individual market. However, the quantum of the world MRP and its relativity to specific markets around the world is open to question.

To support his claim on MRP, Dr Lally first chooses an ICAPM. The version he uses is the simplest of models and does not reflect the role of exchange rates in an ICAPM. He then uses values for variables that are of his choosing. The result is his estimate of the world MRP of about 4%.

In my view his estimate is too low but is not completely unreasonable as it is certainly within a one standard deviation range of the world MRP. In my view the world MRP is likely to be only marginally lower than the MRP for the US, as the US is the dominant market in the world. This is also consistent with available empirical evidence, which shows that characteristics of the major US market index and the most common world index are very similar.[68] In my view, a reasonable estimate of the world MRP would be 0.5% to 1.0% lower than the estimated US MRP. Using my estimate of the US long-horizon MRP, that supports a world MRP of 4.5% to 5.0%.

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66 M. Dahlquist and T. Sällström, 2002, "An Evaluation of International Asset Pricing Models," Working Paper, Duke University.

67 The research that I have summarised above involved tests of the standard CAPM, not the Brennan-Lally CAPM. The Brennan-Lally CAPM may be inferior as the Commission and Dr Lally claim, in which case the standard CAPM should be preferred to the Brennan-Lally CAPM.

68 For example, see C. Harvey, "The World Price of Covariance Risk," Journal of Finance 46, 1991, 111-157.

So I agree that the MRP will be lower for New Zealand with the ICAPM than with the CAPM. However, that does not mean that an appropriate MRP with the ICAPM would be lower than the Commission's MRP estimate for New Zealand (which I argue later understates the New Zealand MRP).

The Commission and Dr Lally also claim that the beta of New Zealand companies will be lower in an ICAPM. In support of this claim, Dr Lally cites a study and then creates an example (pp 65-66) to show that "very small markets have betas against a world market portfolio that are much less than 1." He goes on to assume that the average New Zealand company will have an equity beta of 0.7.

As with all such demonstrations, the credibility depends upon the assumptions imposed and the values placed on the parameters of the model. In this case, Dr Lally's example gives an incorrect result because his parameter values are significantly at odds with the values found in the real world. In particular, his result depends upon his assumption that all market pairs have the same correlation and the countries have the same variance.

Rather than dwell on the specifics of Dr Lally's example, I believe it can be refuted simply by reference to real empirical evidence of markets and betas. Professor Campbell Harvey[69] has published a study that includes data that is directly relevant to the issue. Portions of his Exhibit 1B are reproduced in the table below for the 19 developed countries in his study.[70]

	Correlation	Beta	Total risk	MCap
Australia	0.54	0.75	5.48	$131.24
Austria	0.39	0.69	7.16	19.72
Belgium	0.60	0.70	4.68	62.37
Canada	0.68	0.80	4.66	211.34
Denmark	0.54	0.71	5.27	40.52
Finland	0.56	1.24	8.74	40.39
France	0.66	0.93	5.58	356.85
Germany	0.62	0.91	5.85	396.55
Ireland	0.67	0.96	5.73	16.78
Italy	0.51	0.92	7.19	154.80
Japan	0.77	1.41	7.24	1810.75
Netherlands	0.74	0.79	4.24	213.95
Norway	0.56	0.98	6.94	22.45
Singapore	0.64	1.19	7.38	53.13
Spain	0.70	1.12	6.36	113.32
Sweden	0.71	1.19	6.62	105.27

69 C. Harvey, "Drivers of Expected Returns in International Markets," Emerging Markets Quarterly, Fall 2000, 1-17.

70 Correlation is the correlation of the returns on the countries market with returns on the world index. Beta is the systematic risk of the country to the world index. Total risk is the standard deviation of the country returns. MCap is the market capitalisation. The period is 1988 through 1999.

Switzerland	0.65	0.84	5.12	277.93
UK	0.76	0.89	4.68	923.20
US	0.76	0.72	3.77	3979.84

The correlation between country betas and country market capitalization is negative (-0.03) but influenced considerably by Japan, which is clearly an outlier. Given the difficult times in Japan over the period, it is reasonable to at least consider omitting it. The correlation of beta and size without Japan is – 0.278. This is precisely the relationship which I have maintained.

In his example, Dr Lally assumed that the variances of returns were equal for all four of his countries. The total risk in the table above shows that this is not a realistic assumption. The correlation of total risk and size is-0.49. Also, total risk is highly correlated with beta (+0.69).

Dr Lally applied his example to a world with four markets. But the scenario he sets is equally applicable to a market with four stocks. This provides another test of the reasonableness of his example.

Dr Lally's example implies that the smaller the company in a market, the lower will be its beta. The size of a company and its beta are positively correlated. However, it is well known that size and beta are negatively correlated. In general, smaller companies have higher betas.

To illustrate the fact that small firms have higher betas, I obtained the June 2004 database from the Risk Measurement Service of the Australian Graduate School of Management's Centre for Research in Finance (CRIF). This dataset has 1,500 companies listed on the Australian Stock Exchange, but only 1,271 have sufficient data that betas have been estimated and only 403 of those have sufficient explanatory power to be reliable.[71] Because the average beta of the companies is higher than the market average of one due to the omission of low beta companies, I have standardised the betas by dividing by the average of the sample. This has no implication for interpreting the data insofar as the relationship between beta and size. Std Error is one standard error of the beta estimates.

	MCap (mil)	Std Error	Beta	R^2
Largest	$4,902.9	0.43	0.62	0.23
Next largest	$199.1	0.64	0.85	0.19
Next smallest	$38.4	0.94	1.08	0.17
Smallest	$7.1	1.27	1.44	0.17

71 I used an $R^2 \geq 0.1$. Including companies with lower explanatory power actually makes the results reported stronger. This is not surprising as generally smaller companies have lower R^2 and hence lower betas (it is an econometric property that as R^2 goes to zero, beta also must go to zero).

The correlation between size and beta over the whole sample is -0.184. It is very clear that size and beta are negatively correlated. It is also interesting to note that smaller firms also have higher standard errors and lower explanatory power in the estimation of beta. These are all consistent.

Setting aside the pages of example building, assumptions, and parameter value speculating, this relationship between size and beta is very intuitive, whether at the country level or company level. Smaller companies are riskier (on average of course). It is similarly intuitive that smaller countries are riskier. Smaller countries such as New Zealand will have larger betas than large countries such as the US, the UK and Australia. And that beta will be greater than 1.

Beta will also change for specific firms and specific countries. That effect could very well be offsetting to the difference in MRP. Under the ICAPM the volatility of a company such as Powerco is likely to be compared with a world market with appreciably lower volatility than the NZSE. Essentially, that is the premise for assuming the MRP would be lower in an international model. As such, we expect beta to be higher. This is contrary to Dr Lally's assertions. As beta is based on covariance, not variance, this is suggestive rather than definitive.

We do know that across all firms, it must still be mechanically true in a world market that the average beta is one. So in general it is wrong to say that beta will be lower for all firms. Neither the Commission nor Dr Lally offer substantive evidence to support their assertion that beta would be lower if an ICAPM was implemented. The evidence above provides strong support for the position that New Zealand will have a higher country beta that is substantially greater than one.

Therefore, we are far from being able to conclude that any domestic version of the CAPM systematically biases up all parameter values compared with an international version. In my opinion, and consistent with the international empirical evidence cited in section 4.1 above, use of the domestic CAPM in New Zealand is unbiased relative to what would be estimated using an ICAPM.

4.3. CONCLUSION ON INTERNATIONAL MODELS

Given the difficulty associated with applying the ICAPM, I agree that it is not practical to use the model for the purposes at hand. However, from the empirical evidence, we can conclude that the predictive properties of the domestic CAPM should be as good as the ICAPM. In addition, there is consistent and persistent use of a domestic CAPM by market practitioners and no observable drive to operationalise the ICAPM. It seems unlikely that a model that systematically overstates equity returns would remain in such common usage. Therefore, in my opinion, there is no case made that adoption of a domestic model of equity returns systematically overstates required returns to investors – even if the appropriate market for investors is international.

The Commission has erred in asserting that its use of a domestic CAPM created an advantage to companies. Both the Commission and Dr Lally have made very strong assertions that this gave companies a benefit of about one percent in WACC. As this certainly influenced the Commission in its determination of WACC and its treatment of issues such as the asymmetric consequences of estimation errors, it is clear that a correction is needs. Precisely how best to correct for the error is difficult to say as it seems that the erroneous thinking on this issue has coloured the Commission's judgement throughout the process of estimating WACC.

An objective eye should be cast over each step in the process of estimating WACC and new parameter (and range) estimates determined. Then the issue of setting a confidence interval, such as the Commission's 75th percentile, would be reconsidered. However the correction is accomplished, the result should be an increase in the Commission's WACC of about one percent; that is from 7.2% to 8.2%. It also should be noted that this is not a blanket correction of all the Commission's parameter estimates. In my view, the best estimate of WACC for Powerco is even greater than 8.2%.

5. USE OF THE WACC TO CONSIDER EXCESS RETURNS

In the Final Report excess returns are measured as the difference between what the gas pipeline business is currently earning and what the Commission considers is a normal return for such a business (para 48). The calculation adopted is:

Excess returns ($) = Net Earnings ($) – (Asset base * WACC).

The presumption of this calculation is that where the value of excess returns is positive, there is a prima face case for control. In this section I consider reasons why caution should be exercised in calculating excess returns and why calculations that indicate excess returns may not be valid.

This is very important because it is widely agreed that the social consequences of underestimating the appropriate WACC (overestimating excess returns) are considerably more onerous than the social consequences of overestimating the appropriate WACC. Lally has accepted this in his Gas Control Inquiry Report,[72] and the Commission has accepted it in its Final Report.[73]

There are many reasons why a firm may be making "excess returns" without this involving exercise of monopoly power. These are explored in the next section.

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72 For example, see p 92.

73 For example, see para 6.138.

The WACC is estimated in an uncertain environment and hence with error. As a result, when the WACC is used to assess excess returns, there is a chance that the Commission's calculation will indicate positive excess returns, when in fact there are no excess returns. This is referred to in statistics as a type I error. Similarly, the calculation may indicate no excess returns when in fact there are positive excess returns. This is referred to as a type II error. Section 5.2 discusses statistical issues that surround the estimation of WACC and hence excess returns.

I provide concluding comments in section 5.3.

5.1. WHY FIRMS MAY EARN MORE THAN THEIR COST OF CAPITAL

Even if the cost of capital to the firm can be accurately measured, there are many reasons why a firm may earn more than a notional cost of capital that do not reflect market power. For example, some firms may be more efficient than others, say in managing their production operations. That these firms earn a higher rate of return is not a sign of market power, or at least of the kind of market power that should be of concern.[74]

Equally, a firm may earn what appears to be a high rate of return because its investments prove to be good fortune. It may, for example, find that it has made 'right' investment decisions, with demand for the services it supplies being especially high. The high apparent rate of return, however, is not linked to market power. Rather, in a context where the average excess return across all firms may well be zero (in the sense that the activity as a whole is merely earning its cost of capital), the high return to that firm offsets the losses made by its less fortunate or astute rivals.

Finally, firms may earn rents because costs at the margin are higher than costs on average. For example, the capacity to supply output in the short run[75] may be constrained by the fact that unit costs increase as additional inputs are secured. This could be because the asset needs to be operated more intensively (imposing greater wear and tear) than its usual level of operation or because more costly units need to be brought into production. In this case, as demand pushes output to the point where capacity is constrained, suppliers will generally earn economic profits, as the high price required to secure the last units of output translates into greater contribution margins on all the prior units of output. These profits provide the signal and incentive for capacity to be augmented in the long run.

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74 Economists refer to the rents that arise from superior efficiency as "Bertrand rents." This is because they are economic profits that would accrue to a supplier even in a market characterised by the most intense form of price competition – that is, a winner-takes-all single shot auction with perfectly undifferentiated goods and fully informed and footloose buyers.

75 In economics, the 'short run' and the 'long run' do not correspond to particular lapses of time. Rather, they refer respectively to the period in which the quantity of some productive inputs is fixed and the period in which the quantities of all productive inputs can be varied.

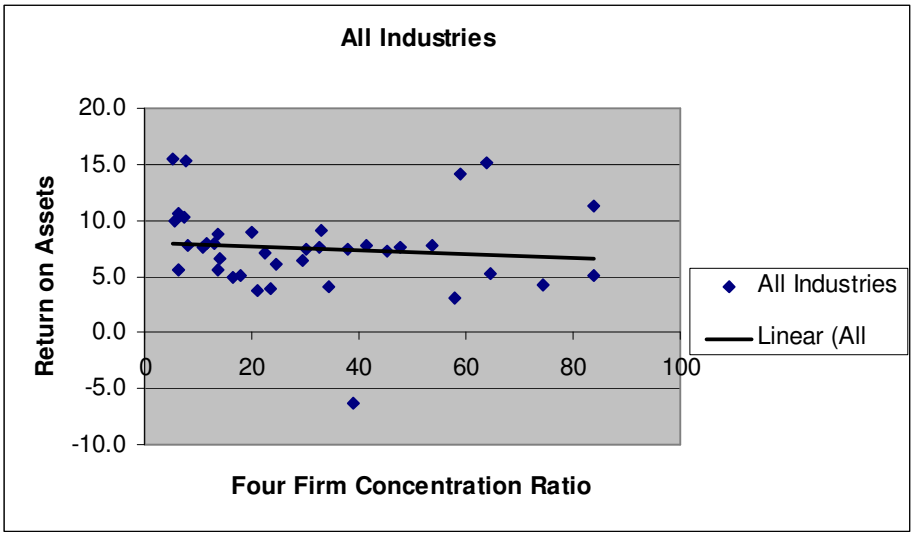
Supra-normal earnings such as these are therefore not indicators of monopolistic output restriction. Rather, absent the prospect of such higher earnings, firms would have little incentive to bear the risks involved in investing in uncertain activities, developing new ways of doing things or incurring sunk costs to expand productive capacity. In other words, such earnings do not restrict output, but rather they increase output in the long run.

It follows that even the fact that a profit-maximising firm secures earnings in excess of the cost of capital, does not necessarily imply either the exercise of significant market power or monopoly pricing.

The need for great caution in inferring monopolistic pricing from inherently uncertain calculations of rates of return is highlighted by considering the pattern of actual returns in the Australian economy.

I obtained data from the Australian Bureau of Statistics[76] on firm profitability which is summarised here in Chart 1. This shows a very wide spread of return on assets across industry groups, with little apparent relation to concentration levels (measured in the figures by the total share of the four largest firms in the industry's total sales), which is the most commonly used indicator of market power.

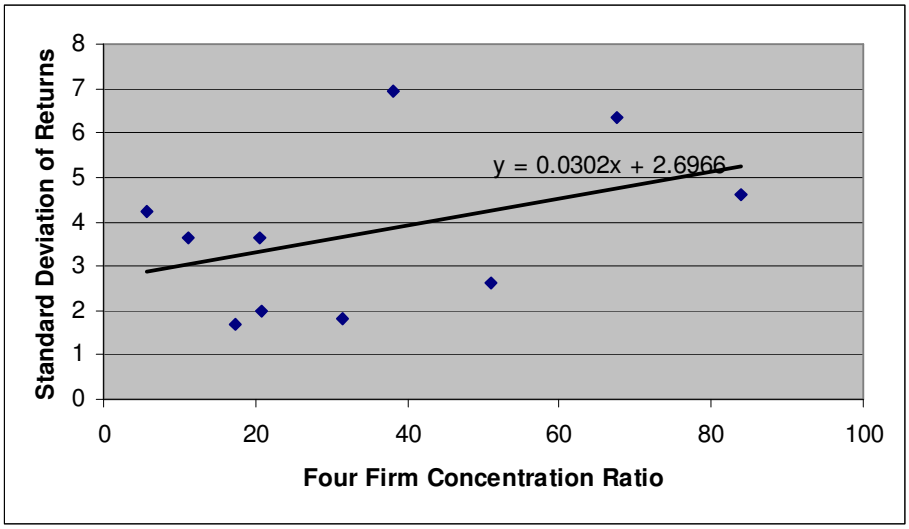
Chart 1 **Rates of Return on Assets for Australian Industries, 1995-2001**



76 The sources used were as follows: Rate of return data was obtained from Australian Bureau of Statistics, Summary of Industry Performance, Cat. No. 8140.0.55.002; Industry Concentration data was obtained from Australian Bureau of Statistics, Industry Concentration Statistics, Cat. No. 8140.0.55.001.

Moreover, the same data also shows a wide spread of rates of return within industries, as can be seen from Chart 2.

Chart 2 The Spread of Rates of Return on Assets within Australian Industries, 1995-2001



While there are obvious limitations to this analysis, the point remains that actual rates of return vary greatly, even in industries that seem highly competitive (i.e., they have low concentration ratios). Therefore, the inference that an observed high return involves monopoly pricing can often be completely incorrect.

5.2. THE COMMISSION'S RECOGNITION OF ESTIMATION ERROR

The Commission has recognised the asymmetry of the consequences of making an error insetting WACC.

> The Commission notes concerns about the asymmetric nature of errors in assessing WACC, i.e., underestimation is the more serious error because it may lead to underinvestment by the regulated companies. These considerations are taken into account in the Commission's judgment as to whether there are likely to be net benefits to acquirers from control. The Commission has used the 75th percentile of the WACC distribution as the basis for judging whether there are likely to be net benefits to acquirers, but in so doing also takes into account the implicit margins that the cost of control provide. This leads the Commission to using the mid-point WACC, because the implicit margins provided by the costs of control provide protection against the Commission wrongly finding for control. (para 9.92)

The Commission giveth and the Commission taketh away.

There are a number of issues to be dealt with in regards to adequately balancing the asymmetric consequences of making an error in setting WACC. First the Commission states that it has used the WACC at the 75th percentile rather than the mid-point. Then it asserts that the cost of control in estimating net acquirers benefit ("NAB") provides the gas pipeline businesses with a margin of protection, so it uses the mid-point WACC. Although the Commission does not explain its reasoning, I presume that it has made four assessments in making its decision to use the mid-point of the WACC estimates.

- The 75th percentile adequately balances the asymmetric consequences of error.
- Considering the cost of control in assessing NAB provides a benefit to the gas pipeline businesses.
- The benefits of considering the cost of control are equal to the benefits of setting WACC at the 75th percentile.
- Therefore, the cost of control is sufficient to balance the asymmetric consequences or error, and no adjustment to WACC is necessary.

I will address each of these four points in the following sections.

5.2.1. Using the 75th percentile

Whether the 75th percentile represents an effective threshold depends on whether it provides an appropriate trade off between allowing the firm to earn profit that may be considered excessive (type II error) and preventing the firm from earning returns consistent with a workably competitive market (type I error). Through the comments that it is better to err on the side of setting the WACC too high than too low, the Commission and Dr Lally recognise that the social costs of type I errors are higher than for type II errors.

The 75th percentile is applied to an estimate of the statistical distribution of the WACC estimate. Therefore, the margin provided by a chosen percentile depends upon the percentile and the estimated one standard deviation range.

In my opinion, the Commission's adoption of a 75th percentile value and its estimated ranges fail to adequately balance the asymmetric consequences of error.

First, when statistical inference is being made and confidence intervals are chosen, the acceptable level of confidence adopted is usually 90% or 95% before a result is considered significant. Therefore, in terms of statistical significance, choosing a 75% confidence interval provides an unusually low level of confidence. As the social consequences of under estimating the appropriate WACC are considerably more onerous than the social consequences of over estimating the appropriate WACC, I believe the confidence level should be set at no less than 90%.

Second, the ranges chosen for the various parameters used in estimating WACC, the uncertainty induced by the use of the chosen models, and the aggregation into an estimate of the range for WACC are all underestimated. I will deal with these issues throughout this report.

In addition, the choice of the 75th percentile is meant in part to provide some headroom for variables associated with the cost of capital that the Commission and Dr Lally consider are either difficult to calculate or relatively trivial by themselves, and which are thereby excluded in the Commission's WACC. Among those issues which the Commission and/or Dr Lally considered trivial are the debt margin, debt issuance costs, and amending estimates of the MRP to be consistent with bond maturity in the risk free rate.

If the Commission continues to dismiss issues that it deems too small to warrant inclusion or adjustment, and as those issues predominately favour a higher WACC, one approach to reflect their aggregate impact would be to increase the confidence level.

The Commission's choice of the 75th percentile WACC value rather than the mid-point was to reflect uncertainty in the parameter estimates and to provide some protection against the relatively dire social consequences of underestimating WACC. However, the Commission provides no substantive basis for its choice of the 75th percentile. As such its choice says little about falsely condemning efficient behaviour, the potential for statistical error or an appropriate margin for adverse social consequences of its decision.

In my opinion, even if the mid-points chosen by the Commission were appropriate, and I do not agree that they are, the Commission's choices of ranges are far too tight, its choice of a confidence level is far too low, and its choice of an appropriate threshold for testing excessive returns is far too low.

5.2.2. Relevance to asymmetry of consequences of the cost of control

The Commission assumes that the cost of control in assessing NAB provides a benefit to the gas pipeline businesses. Costs of control are discussed in Chapters 4 and 6. The Commission says (para 4.26):

> The costs of control allow businesses to earn an implicit margin on WACC before the Commission would find net acquirers benefit. … the implicit margin provided by the costs of control protects against the Commission wrongly recommending control.

There is substance to the Commission's point here. If the Commission allows a business to earn an amount above its WACC return before it judges it as having excess returns, there is a margin being granted.

An analogy is with speeding on the highway and the police use of radar detectors of speed. Car speedometers measure speed with error, and police radars measure speed with error. Police generally allow a margin over the speed limit before they issue speeding citations, presumably to both avoid citing an innocent person and to reflect the costs of processing a citation. The rational margin to provide would depend upon the measurement error in both the driver's car and the police's radar.

As to the gas pipeline businesses, the police (Commission) radar (measurement of WACC, asset valuation, etc) has significant measurement error issues, which I will address in the sections to follow. The driver's (Powerco) speedometer (accounting measurements) has measurement error and the response time to an observation of speed (returns) is very slow. The margin over the speed limit that is allowed (cost of control) has not been disclosed in the past and the calculation of it has not been agreed to be equitable.

In another place the Commission relates the cost of control and a margin on WACC to a company's pricing (para 4.39).

> The Commission notes that to the extent the costs of control imply that businesses can earn an implicit margin on WACC before a control finding will be made, businesses may form the view that they can increase their prices in the absence of control.

This statement raises a perception held by the Commission that warrants comment.[77] In my view, the Commission is not demonstrating a realistic understanding of a workably competitive market.

In unregulated, workably competitive markets, incumbents have an inherent advantage. Entrants must incur costs to establish themselves in the market, just as the incumbent will have incurred entry costs in establishing itself. As a result, it would not be unusual for incumbents to earn marginally higher returns (charge higher prices).

In my opinion, there is merit to considering the cost of control in evaluating whether Powerco has been given a margin in evaluating NAB that reflects the plethora of estimation errors in WACC, the asymmetry of consequences of an error in setting WACC and the transient errors in measuring returns.

5.2.3. Benefits of the cost of control

The Commission provides estimates of the cost of control to Powerco in its Chapter 14. I am not able to evaluate the amounts shown in Table 14.4, but I note that Excess return unrecoverable is over half of the total amount.

If the amounts shown, particularly the Excess return unrecoverable, are likely to be decisive in the decision to impose control, then I believe an independent review of these amounts would be in order.

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77 There is a second issue that is expressed in this quote that I will return to in section 6.4.

5.2.4. Benefit equivalence of 75th percentile and cost of control

The Commission implicitly assumes that the cost of control is at least sufficient to balance the asymmetric consequences or error, and no adjustment to WACC is necessary. Put another way, the Commission grants a WACC based on the 75th percentile, but then reverts to the mid-point due to the role of the cost of control. Therefore, it seems that the Commission has judged that the difference in earnings that would accrue to Powerco if its WACC was increased from the mid-point to the 75th percentile is approximately equal to the cost of control that it sets out in Chapter 14.

I do not have the data to verify the Commission's calibration. However, I do discuss some approximations in the following section.

5.2.5. Conclusion

The Commission has agreed that WACC should be set at the 75th percentile, but then asserts that because of the margin that is provided by including the costs of control in the estimation of NAB, it has already provided an equivalent margin. Therefore, it applies the mid-point WACC.

I agree there is merit to the Commission's basic argument. However, there is not sufficient information and data to allow me to evaluate its calculations. I particularly have reservations about the calculation of Excess return unrecoverable, which is over half of the amount.

Even if the Commission's calculations are correctly executed, there are at least five reasons why the analysis may be deficient. The bases for these points will be developed in the rest of this report.

1. The Commission significantly underestimates Powerco's WACC

2. The Commission significantly underestimates the appropriate range for the estimate of WACC.

3. The Commission's use of the 75th percentile is an inadequate reflection of the adverse consequences of underestimating WACC.

4. The Commission ignores the implications of Powerco having returns above the (appropriate) WACC for reasons unrelated to the exercise of monopoly power.

5. The Commission improperly assumes that any singular events in earnings average out in the short period of its analysis.

Given that Powerco has an ODV in its gas pipeline businesses of about $200m, a one percent increment to its WACC is a quantum of $2 million annually. From the information in Chapters 14 and 20, it seems that a relatively small adjustment to the WACC would be sufficient to eliminate all of the NAB reported by the Commission in its Table 20.1.

5.3. THE COMMISSION'S RECOGNITION OF THESE FACTORS

In my view, the Commission's recognition of the issues that I have discussed in this section is inadequate or ignored entirely. The magnitude of uncertainty in the quantification of the process of estimating NAB is enormous relative to the nominal allowance provided by the Commission.

The findings of a UK Office of Fair Trading (OFT) study are relevant in this regard. In a 1997 working paper quoting its earlier 1994 research,[78] the OFT considered how the Monopolies and Mergers Commission (MMC) had considered the issue of companies earning excessive profits in a series of 19 reports from 1973 to 1993. The OFT concluded that for a company, profit (as defined by standard accounting practice) had to be on average 4.6 times that of all manufacturing companies for the MMC to consider profit as 'high', 'very high' or 'excessive'.

In contrast to the findings and conclusions of the OFT, the Commission's decision to use the 75th percentile as its WACC for evaluating excess returns constitutes a margin of about ten percent on its mid-point estimate of WACC. Furthermore, although the Commission states that it uses the 75th percentile, it immediately rescinds that offset due to the "implicit margins provided by the cost of control" and reverts back to using the mid-point WACC to evaluate excess returns.[79]

6. IMPLEMENTATION ISSUES

In addition to the issues addressed above of estimating the WACC and its associated one standard deviation range, there are a set of implementation issues to discuss. The first of these is the estimation of WACC across time. Then I discuss the impossible position that the gas pipeline businesses would be put in unless the WACC that is used in assessing excess returns is based upon what was knowable to the businesses at the time of the period being assessed. In my view the WACC should be based upon what would reasonably have been expected by the businesses at that time. Another problem in implementing the excess returns and NAB measurement approaches is that the earnings (and returns) of the gas pipeline businesses are measured with error. In particular, they would be influenced by transitory events. Unless a long enough time period is evaluated, there is a likelihood that the observed earnings and returns are distorted by singular events. Finally, I discuss how the gas pipeline businesses might be expected to react going forward if control is not imposed.

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78 M. Graham and A. Steele, *The Assessment of Profitability by Competition Authorities*, Office of Fair Trading Research Paper 10, February 1997.

79 Final Report, para 9.92.

6.1. MEASUREMENT OF WACC THROUGH TIME

The Commission requires an estimate of WACC to apply in a series of years beginning in 1996 and carrying forward to forecasts out to 2008. As I have noted above, any estimate of a company's WACC is related to a specific point in time. Because the Commission had provided an estimate of the risk free rate that was appropriate for a period beginning on 1 August 2003, I also adopted this reference point.

The most time sensitive parameter is the risk free rate. This rate changes virtually continually. As the period to be evaluated changes, it is necessary to change the estimation of the risk free rate. This is a relatively effortless adjustment and could be done without controversy and with objectivity once the appropriate procedure is agreed. In the current application, I disagree with the procedure used by the Commission to determine the maturity. Other wise, we seem to be in agreement.

The other parameters that are time sensitive, although less so than the risk free rate, are the debt risk premium and beta. The asset beta would not generally change abruptly for the gas pipeline businesses, although the equity beta would change with changes in leverage. The major concern with an estimate of beta is changes in the regulatory structure. If this changes, the asset beta would change. Assuming the initial asset beta is estimated for a company subject to light-handed regulation (as I have done), then if control is imposed the asset beta would be expected to decrease. However, if the initial asset beta has been estimated based upon control being in place (as the Commission has done), then a decision not to impose control should result in an increase in the asset beta.

There is literature that supports a time-varying MRP, however, the tools to accurately predict the variation are not sufficiently refined to be applied in a regulatory setting. In general the approaches we use to estimate MRP are such that it is not a parameter that would change often. However, the Commission changed its estimate of TAMRP between its decision on airfields in August 2002 and its decision on ELBs in June 2003. It decreased its estimate from 8% to 7%. Therefore, to be consistent with its own positions through time, any estimate of WACC by the Commission to be applied to a period that began before June 2003, should be based upon a MRP of 8%.

The Commission discloses in paragraph 20.7 that it used a mid-point WACC of 8% averaged over "the same period." It does not say what the same period is, and it cannot be discerned from anything in Chapter 20 as no time period is mentioned there. I presume that the time period is the period used in the Chapters addressing individual companies. For Powerco that would be some number of years forward from 1996. Thus, it seems that the Commission has adjusted the WACC that it uses through time.

I believe the estimation procedures it used should be disclosed. In particular, I would like to know if it has used 8% as its WACC for all periods beginning prior to June 2003.

Because the major time variation in WACC arises from the risk free rate, I would expect that the spread between my benchmark estimate of WACC as 9.3%, and the Commission's estimate of 7.2%, would roughly hold through time.

When a reasonable range is set and an appropriate percentile is chosen to reflect the range of motivations to avoid underestimating WACC, the spread between our WACC estimates will widen.

6.2. EXPECTING THE UNKNOWABLE

The approach used to measuring excess returns, and hence NAB, seems to be asking a gas pipeline business such as Powerco to have known the Commission's WACC at the start of each of its years being evaluated. Clearly that was unknowable to Powerco.

In my opinion, an equitable approach would be to evaluate the company's returns against the returns that it should reasonably have expected the Commission to set as WACC at that time. This presents a practical problem. What would the Commission's WACC have been for gas pipeline businesses in years from April 1995? If that seems a difficult question, which it is, then how difficult would it have been for Powerco to pursue a pricing policy that would allow it to achieve that unknown WACC? Yet the task that Powerco is now being held responsible for having achieved was to have known in 1996 that in 2004 the Commission was going to mandate its WACC of 7.2%. Further, it was to have known as early as 1995 that its returns were going to be assessed based upon an evaluation system that it could not possibly have anticipated.

This perspective reinforces the need to use a MRP of 8% for all years that began before June 2003. In fact, it could reasonably be argued that an MRP even higher should be used, at least in the early years.

6.3. TRANSITORY IMPACTS ON RETURNS

The Commission states (para 5.25) that "businesses in competitive markets will earn normal returns on average over time." This indicates that the Commission is aware that normal (or excess) returns cannot be reliably evaluated on a single year. There are far too many transitory impacts that will only average out over an extended period. "Normal returns need to be assessed over a period of time, so that singular events do not bias the results and thereby unduly influence the Commission's recommendations." (para 5.28) An important issue then becomes - how may periods are reasonably required before it is prudent to assume the singular events have in fact averaged out?

In its evaluation of the results of Powerco (Chapter 14), the Commission reports on the years 1996 through 2004. The issue of whether singular events average out over the nine years is not mentioned in Chapter 14, so presumably the Commission is confident that the averaging has been effective.

The entire New Zealand economy has been radically transformed in the past twenty years. New Zealand infrastructure companies have undergone truly revolutionary changes over the past decade or so. Powerco's transformation is partially recounted by the Commission in paragraph 14.1 and its recent ownership changes in paragraph 14.2. In addition, the regulatory environment has gone through continual development, which is continuing to this day. It seems heroic to me to assume that transitory effects over the past nine years have been eliminated.

In my opinion, there is almost certainly an accounting impact from transitory events in each of the years that is measured for excess returns. Also, I do not share the Commission's confidence that the transitory measurement issue will have averaged out over the period it is examining.

6.4. THE REACTION OF BUSINESSES IF CONTROL IS NOT IMPOSED

The Commission relates the cost of control and a margin on WACC to a company's pricing (para 4.39).

> The Commission notes that to the extent the costs of control imply that businesses can earn an implicit margin on WACC before a control finding will be made, businesses may form the view that they can increase their prices in the absence of control.

The Commission makes a similar statement in paragraph 14.113 where it is specifically evaluating Powerco. In my opinion the Commission has not given adequate thought to the point it raises. Alternatively, it does not have a realistic understanding of a workably competitive market.

An important issue comes through in the Commission's statement that has significant implications for its approach to calculating excess returns and hence NAB. In unregulated, workably competitive markets, incumbents will determine their pricing strategies[80] based on expectations. The incumbent will be concerned about potential entrants to the market and set pricing strategy and other market behaviours with that in mind. In most cases, the incumbent would want to keep prices just low enough to discourage additional entrants. Similarly, in the light-handed regulation environment faced by gas pipeline businesses, rational behaviour would be to set prices so that heavy-handed regulation[81] would not be precipitated.

The key point, which the Commission seems to miss, is that it is not the absence of control that matters. That is the current situation. What matters to gas pipeline businesses is the expectation of how their actions and pricing decisions will affect the possibility of future control.

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80 Pricing here is only a representative mechanism that a business can use to earn returns.

81 The Commission describes the regulation that it assumes would be imposed under Part V of the Commerce Act as a "relatively heavy-handed approach" (para 4.41).

An analogy could be drawn to almost any context where there is a threat, a decision, and subsequent consequences and ongoing threat. With the Commission's logic, criminals who receive probation or suspended sentences would be predicted to go out and increase their criminal activities. Children who are given a warning would be predicted to immediately increase their misbehaving. Now clearly some criminals and some children will behave perversely, but in general that is not the predicted behaviour.

In my view, business executives are more insightful and perceptive than the typical criminal or child. They will frame their decisions on expectations of costs and benefits and that would apply to the threat of control.

This point is particularly important to the Commission's calculation of NAB. The Commission expresses concern that if it does not impose control businesses will believe they can further increase their prices without control being declared.[82] I do not believe this is a sensible conclusion to draw. The businesses are going to respond to the threat of control, not simply whether or not control is imposed as a result of this exercise. What will determine the reaction of the businesses to a decision of no control will be the signal that is conveyed about the monitoring and decision making that will flow from future operations and pricing decisions. Hence, I agree with the Commission that it should maintain the threat of control if control is not now imposed.

When the Commission calculates NAB, it appears to use excess returns based on an assumption that any response of the gas pipeline businesses to the current process will be to increase excess earnings in the future. Even if there was clear evidence of excess returns from Powerco, and I do not agree that there is such evidence, it seems appropriate to assume that the gas pipeline businesses will respond by making adjustments they deem necessary to avoid the imposition of heavy-handed regulation.

As a result of this point alone, I regard the logic that underlies the Commission's estimation of excess returns and NAB to be fundamentally flawed.

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82 For example, see para 4.39 and 14.113.

Appendix 1

Qualifications

I am Professor of Finance in the Department of Accounting and Finance at The University of Auckland. I was appointed to this position in 1987 after holding positions in academia, industry and consulting in the USA. In this position, I am involved in issues related to cost of capital on a regular basis. I have been awarded BA in economics from Pomona College, MS in accounting from San Diego State University and PhD in accounting from Stanford University.

In the past six years at The University of Auckland, the University of Queensland, and Hong Kong Polytechnic University I have taught courses in Introductory Investments, Introductory Financial Management, Advanced Financial Management, Case Studies in Finance, Financial Statement Analysis, and Seminar in Modern Corporate Finance. All of these courses include components on the cost of capital. While at the University of Auckland, I have supervised research on topics relevant to cost of capital at the undergraduate, diploma, MBA, masters and doctorate levels.

I have published numerous articles in international journals and books, presented research papers at international conferences and presented invited guest research seminars at numerous universities. Nearly half of my research publications are on topics related to cost of capital.

I am currently on the editorial board of an academic journal (*International Review of Finance)* and am an active reviewer for other journals. In these capacities I am involved in evaluating the research work of other scholars on topics including the cost of capital.

Experience

I have been involved in the estimation of cost of capital at both a practical and theoretical level through most of my commercial and academic career. In my academic positions I have regularly taught courses on cost of capital at undergraduate and graduate levels. I have lectured to executive audiences in Australia, New Zealand, Hong Kong, Singapore and the United States. I have consulted and provided expert evidence on topics in financial economics, including cost of capital.

I was involved in a project in 2000 to advise the National Competition Council (Australia) on aspects of an application from the Northern Territories Government to certify a regime for access to the Northern Territories electricity networks. This involved advising on the proposed approach to Weighted Average Cost of Capital ("WACC"), including issues similar to those involved in this case.

In 2002 I was responsible for the preparation of the cost of capital component of a report to the Ministry of Economic Development in New Zealand on Telecom New Zealand. The objective of the report was to develop an appropriate structure for the estimation of WACC for Telecom New Zealand.

I was involved in a project in 2003 to advise the Office of the Rail Access Regulator (Australia) on the determination of WACC for rail infrastructure.