

FINAL REPORT

**Response to WACC issues in Commerce  
Commission's Draft Report on the Gas  
Control Inquiry**

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PREPARED FOR  
POWERCO

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## 1 Introduction

I have been engaged by Powerco Ltd to provide an analysis of the Commerce Commission's Gas Control Inquiry Draft Report (dated 21 May 2004) with respect to cost of capital issues. Associate Professor Martin Lally prepared a report for the Commission concerning cost of capital,<sup>1</sup> and it is clear that the Commission relied considerably on that report. Therefore, I will address issues from both of these documents.

All of the basic issues that are necessarily addressed in estimating the cost of capital have been addressed repeatedly in the Gas Control Inquiry process and in previous regulatory considerations of the Commission. I do not discuss all issues here. It is my intention to focus on issues and information that are either new to the deliberation or that I feel have been seriously under-appreciated by the Commission and/or Associate Professor Lally.

Before moving to the remainder of this report, I want to mention three issues that are highly relevant to the decision that the Commission is to make concerning regulatory control of the gas pipeline businesses. The first seems not to be contentious. The second reflects an inappropriate focus by the Commission and Associate Professor Lally. The third has thus far been ignored by the Commission in its Draft Report.

The Commission must make estimates of cost of capital in an uncertain environment. Virtually all of its estimates are made with error, and as we will mention later, generally considerable error. The Commission needs to give consideration to the consequences of either over or under estimating an appropriate cost of capital. It is widely agreed that in a regulatory environment, the social costs of under-estimating the cost of capital are higher than are the social costs of over-estimation. The Commission accepts this asymmetry,<sup>2</sup> as does Associate Professor Lally.<sup>3</sup> I concur with this assessment, and do not believe that the Commission has adequately given consideration to the social cost of under-estimating cost of capital.

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 for a regulated firm using the building blocks approach.

The task facing the Commission is different to the above, as it needs to evaluate the returns achieved by gas pipeline businesses, operating in a largely unregulated

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<sup>1</sup> Martin Lally, "The Weighted Average Cost of Capital for Gas Pipeline Businesses," 14 May 2004.

<sup>2</sup> Commerce Commission, Gas Control Inquiry Draft Report, 21 May, 2004, para 7.103.

<sup>3</sup> Lally, p 43.

environment. The role of the WACC here is as an input in conducting a cost benefit analysis.

In my opinion, this role for the WACC is not adequately reflected in either Associate Professor Lally's analysis, or the Commission's Draft Report. In numerous places the Commission and Associate Professor Lally have evaluated information and estimated parameters within the context of a regulated company subject to price 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.

I note that Geoffrey Horton<sup>4</sup> makes the point that the Commission's Draft Decision is inconsistent in its consideration of two alternative questions – whether prices are excessive, and what price level would exist if Powerco were under price control.

The Commission uses the Capital Asset Pricing Model (CAPM) and the WACC model in its inquiry. Rather than deal with specific issues related to these models and the approach used by the Commission, I only wish to note that 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 to my knowledge it is not used anywhere else in the world, either by regulators or commercial entities. However, there are limitations and problems with these models, even if it is agreed that they are the best models available. Professor Boyle provides a useful discussion of these problems,<sup>5</sup> 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.<sup>6</sup>

There are a number of aspects of Associate Professor Lally's paper and the Commission's Draft Report that I do not consider in detail in this report. These are:

- Leverage – Associate Professor Lally adopts a value for efficient leverage (40%) that is significantly different from that adopted by Powerco (67% based on Lally's estimate). In my opinion, the onus should be on the Commission to demonstrate that Powerco's actual or target gearing in past years is inefficient, rather than superimpose a value that is significantly different to actual practice;

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<sup>4</sup> Geoffrey Horton, "The New Zealand Commerce Commission's natural gas control inquiry."

<sup>5</sup> Glenn Boyle, "Some thoughts on the cost of capital proposed for the Regulation of Electricity Lines Businesses," 15 September 2003.

<sup>6</sup> 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.

- Debt margin – the Commission’s proposed margin (120 basis points) is low, especially against the actual value of public debt issued by Powerco (noted by Associate Professor Lally as 138 basis points during August 2003). Given significant volatility in actual debt margins over time, a range should be applied; and
- Debt issuance costs – there is increasing regulatory acceptance that these are valid business costs, and as noted by Associate Professor Lally these can be significant (up to 50 basis points on the cost of debt). My understanding is that these are already reflected in the financial modeling for Powerco through amortization costs. To the extent this is not the case, allowance should be provided either in the cost of debt or cashflows.

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.

## 2 Use of the WACC to consider excess returns

In the Draft 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 63). The calculation adopted is:

$$\text{Excess returns (\$)} = \text{Net Earnings (\$)} - (\text{Asset base} \times \text{WACC}).$$

The presumption of this calculation is that where the value of excess returns is positive, there is a prima face case for price control. However, there are many reasons why a firm may be making “excess returns” without this involving exercise of monopoly power.

### 2.1 Why may firms 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 might be of concern.<sup>7</sup>

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<sup>7</sup> 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

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 in no way 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 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<sup>8</sup> may be constrained by the fact that unit costs increase as additional inputs are secured, say because the asset needs to be operated more intensively (and hence 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.

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, but rather they increase output in the long run.

It follows that even the fact that a profit-maximising firm persistently 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 the actual pattern of returns in the Australian economy.

Specifically, data obtained from the Australian Bureau of Statistics<sup>9</sup> on firm profitability and summarised here in Chart 1, shows a very wide spread of return on assets across

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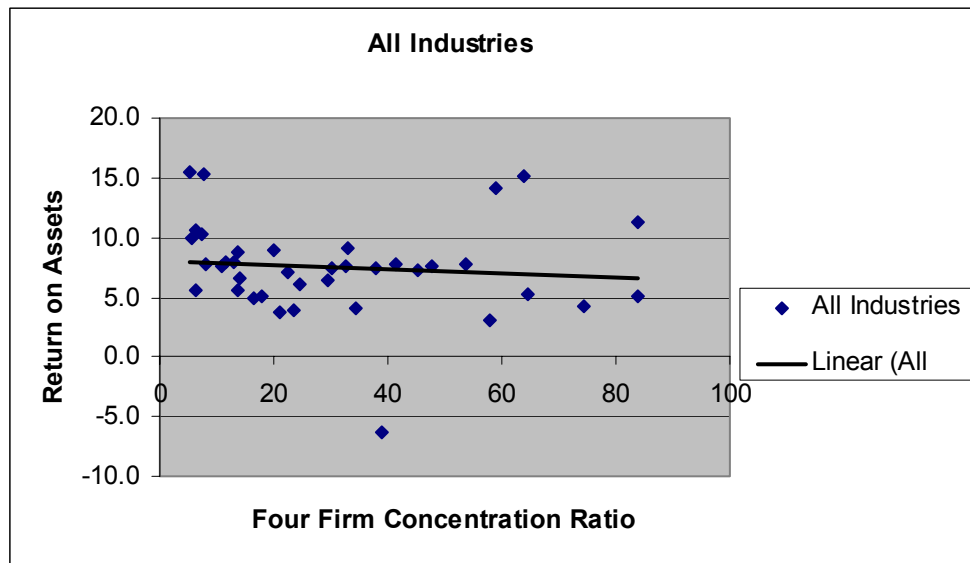
by the most intense form of price competition – that is, a winner-takes-all single shot auction with perfectly undifferentiated goods and fully informed and footloose buyers.

<sup>8</sup> 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.

<sup>9</sup> 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.

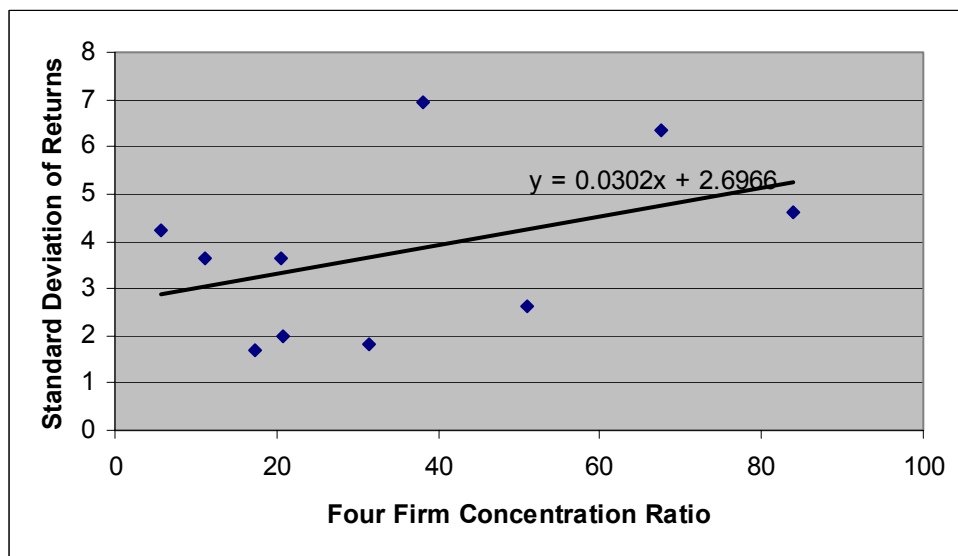
industry groups, with little apparent relation to concentration levels (measured in the figures by the total share of the four largest firms in the industry's total sales) and hence to the most commonly used indicator of market power.

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



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, even in industries that seem highly competitive, vary greatly, implying that the inference that an observed high return involves monopoly pricing can often be completely incorrect.

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,<sup>10</sup> 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 75<sup>th</sup> percentile as its WACC for evaluating excess returns constitutes a margin of less than ten percent on the mid-point estimate of WACC.

## 2.2 Does setting the WACC at the 75<sup>th</sup> percentile reflect these factors?

The Commission has allowed some scope for the benchmark against which company returns are assessed to deviate from Associate Professor Lally’s best point estimate of the WACC.

Given that there is some uncertainty as to the correct parameter estimates, and that the consequences of judging excess profits to exist when they do not are more severe than the contrary error, the Commission (sic) is minded to choose a WACC value from the 75<sup>th</sup> percentile of the WACC range (i.e., half way point between the upper limit and the mid point estimate of WACC in the final report, in order to judge whether there are net benefits to acquirers.<sup>11, 12</sup>

Whether this 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 I error) and preventing the firm from earning returns consistent with a

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<sup>10</sup> Graham, Martin, Steele, and Anthony (1997), *The Assessment of Profitability by Competition Authorities*, Office of Fair Trading Research Paper 10, February 1997.

<sup>11</sup> Draft Report, para 7.103.

<sup>12</sup> The Commission’s description of the half way point between the upper limit and the mid point estimate of WACC as the 75<sup>th</sup> percentile, implies a number of assumptions which are unlikely to be true. Specifically, it would be true if the entire distribution of possible WACC values is uniform and bounded by Lally’s lower and upper limits. The distribution of returns is almost certainly peaked and not bounded by Lally’s estimates. As these points will be discussed further below, we will continue to use the Commission’s description of its chosen value as the 75<sup>th</sup> percentile.

workably competitive market (type II 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 Associate Professor Lally imply that the social costs of type II errors are higher than type I errors. Generally the social cost of type II errors is considerable relative to type I errors. However, the Commission's adoption of a "75<sup>th</sup> percentile" value fails to reflect the importance of this trade off for a number of reasons.

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 75<sup>th</sup> percentile value chosen by the Commission does not reflect a true statistical point in the distribution of possible values of WACC. The Commission's WACC has been derived from a series of point estimates or small ranges of particular variables, where the ranges given on each parameter do not reflect statistical distributions. For example, the range of 6.0 to 8.0% for the MRP represents Associate Professor Lally's view of a distribution of plausible point estimates for the MRP, not a feasible distribution of the parameter. He accepts this point where he states:<sup>13</sup>

Having said all this, there is no doubt that estimation of the market risk premium is difficult. *My judgement that the bounds on the value should be .06-.08 was not intended to indicate that there is no chance of the true value lying beyond these bounds, or even that the chance is slight.* Instead my intention was to offer a range of numbers that are readily reconcilable with the majority of empirical evidence, subject to my belief that precision beyond the second decimal point is unattainable. [emphasis added]

As a result, the Commission's 75<sup>th</sup> percentile value does not represent a 75% confidence level in the statistical sense.

Third, the choice of the 75<sup>th</sup> percentile is meant in part to provide some headroom for variables associated with the cost of capital that the Commission and Associate Professor 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 Associate Professor Lally considered trivial are an allowance for the cost of self-insurance, debt issuance costs, and amending estimates of the MRP to be consistent with bond maturity in the risk free rate.

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<sup>13</sup> Lally, p 20.

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 75<sup>th</sup> 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 under estimating WACC. However, the Commission provides no basis for its choice of the 75<sup>th</sup> 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.

I believe it is appropriate and reasonable to expect that a moderate level of sophistication be used in setting ranges for purposes of this inquiry. A defensible approach would be for the Commission to determine ranges for the parameters of WACC that reflected statistically valid estimates of the distributions. For example, the Commission might adopt ranges that were intended to reflect one standard deviation on either side of its best estimates. Although it would generally be necessary to make informed judgements as to the one standard deviation ranges, rather than precise measurements, the objective of the ranges should be clear. Then the Commission could simulate likely WACC values based on these parameters and consider the confidence interval that is appropriate for its purpose. In my opinion, a 75% confidence is not nearly sufficient in the circumstances of this gas control inquiry. I will return to this issue in section 7 below.

### **3 Impact of adopting a domestic model to estimate equity returns**

A reoccurring point in Associate Professor 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). Associate Professor Lally claims:<sup>14</sup>

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, both because of higher betas and a higher market risk premium.

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<sup>14</sup> Lally, p 9.

This claim is repeated in the Commission’s Draft Report:<sup>15</sup>

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.

Although I am not contesting the use of the WACC model and simplified Brennan-Lally CAPM here, 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.<sup>16</sup> 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.

### **3.1 Is the domestic CAPM a good proxy for the ICAPM?**

In fully integrated capital markets, an international version of the CAPM is preferred to 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

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<sup>15</sup> Draft Report, para 7.13

<sup>16</sup> The Commission raises the issue of “home bias” in defence of its choice of the Brennan-Lally CAPM (para 7.12). 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).

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 acceptable 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. 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.

Recent empirical tests by Koedijk, Kool, Schotman and van Dijk<sup>17</sup> 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.”<sup>18</sup> They test firms in nine industrialised countries, including Australia, over the period 1980 through 1999 – a total of 3,293 firms. The central test was whether the 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.”

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<sup>17</sup> 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.

<sup>18</sup> 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.

Dahlquist and Sällström<sup>19</sup> 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 Associate Professor Lally and the Commission.

### **3.2 Impact of the ICAPM on parameter values**

The Commission and Associate Professor Lally are also at odds with empirical evidence in claiming that both the market risk premium and beta would be lower under the ICAPM.

Although it has not been determined, it is probably true 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).

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 market with lower volatility than the NZSE. Essentially, that is the premise for assuming the MRP would be lower in an international model. As such, we may expect beta to be higher. This is contrary to Associate Professor Lally's assertions. As beta is based on covariance, not variance, this is suggestive rather than definitive. However, we do know that across all firms, it must still be mechanically true 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 Associate Professor Lally offer any evidence to support their assertion that beta would be lower if an ICAPM was implemented.

In his paper, Associate Professor Lally has also failed to consider how differences in taxation and exchange rate risk would be treated in applying his model to an international context.

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<sup>19</sup> M. Dahlquist and T. Sällström, 2002, "An Evaluation of International Asset Pricing Models," Working Paper, Duke University.

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.

### 3.3 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. To the extent that the Commission has deemed the use of a domestic CAPM as creating an advantage to companies, there should be adjustment now made to reflect the advantage in another way. I suggest that an increase in the confidence level would be appropriate.

## 4 Market risk premium

In my opinion Associate Professor Lally and the Commission's proposed range of 6-8% for the market risk premium understates the likely mean tax adjusted MRP (TAMRP) for New Zealand at this time, and fails to reflect the statistical variation and underlying uncertainty associated with all estimates of the MRP.

Associate Professor 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. The various point estimates form the basis of Associate Professor Lally's proposed range of 6.0% to 8.0% for the TAMRP, with a mid-point of 7.0%.

I agree with Associate Professor Lally where he states that "all approaches to estimation [of the MRP] are imperfect", which argues for "considering all of them" (p 17).<sup>20</sup> However, this is not to say that all approaches are of equal value in making an estimate, which is what Associate Professor Lally implicitly does by taking a simple average across all the methods he used.

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<sup>20</sup> Although he suggests using all of the estimates, in fact he does not include estimates he discusses in his section 3.3 responding to contrary views. These estimates emphasize the wide range that exists in estimates of MRP.

Two issues are raised by his approach. First, whether Associate Professor Lally's best estimate of 7.0% is appropriate, and second, whether he has correctly considered the range of the MRP in adopting a lower bound of 6.0% and an upper bound of 8.0%.

#### **4.1 Considering reasonableness of 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, I start by converting Associate Professor Lally's mid range estimate for the MRP in the Brennan-Lally CAPM to the standard CAPM. As noted by Associate Professor Lally a MRP of 7% under the Brennan-Lally CAPM equates to a MRP of around 5% for the standard CAPM. For purposes of this report, 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%.

##### **4.1.1 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 Associate Professor Lally himself, who recommended adoption of a value of 6% in advice for the Australian Competition & Consumer Commission.<sup>21</sup> 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%, Associate Professor Lally is implicitly arguing that market risk in New Zealand is 1% lower than in Australia. In my opinion, this is implausible. Even if market risk is identical in the two markets a TAMRP of 8% is justified by Associate Professor Lally's analysis on the Australian market. Given it is more likely that market risk is higher in New Zealand than Australia, Associate Professor Lally's own analysis is consistent with a mid range value above 8% for the New Zealand TAMRP.

##### **4.1.2 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.<sup>22</sup>

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<sup>21</sup> Lally, M, The Cost of Capital under Dividend Imputation, a report for the ACCC, June 2002.

<sup>22</sup> 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.

The most common reference for the MRP in the US is from Ibbotson Associates, and the most common period is from 1926. For the 76 years, 1926 through 2001, the MRP was 8.8%. This estimate is based upon the standard CAPM. Associate Professor Lally cites evidence on MRPs for twelve countries from a different study by Dimson, Marsh and Staunton covering the period 1900 to 2000. In that study, the US MRP is 6.7%. Associate Professor Lally also cites a survey by Welch that estimates the forward-looking US MRP as 5%. Although I have serious reservations about the value of surveys, I believe this survey does reflect a fairly common view that the MRP may have declined from its long-run historical average over the past five to ten years.

Over the period used by Ibbotson, there was an average annual return premium of about 1.5% for intermediate-term government bonds over Treasury bills. Therefore, the MRP estimate derived using short-term bonds should be reduced for this premium to obtain a long term MRP. This will provide consistency with Associate Professor Lally's estimate, which is based upon ten-year bonds. Adjusting all of these estimates by this amount implies a range of roughly 3.5% to 7.0%. Associate Professor Lally also provides a number of estimates that are around the bottom end of this range.

When comparing estimates of MRP for the US to estimates of MRP for New Zealand, an increment needs to be added to reflect the substantial differences between the two markets. In my opinion, this requires a premium for the New Zealand MRP over the US MRP of around 3%.

There are many obvious differences between the equity markets in the two countries.<sup>23</sup>

First, the New Zealand market has a disproportionate representation of companies in telecommunications and in primary industries. While such 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. As a consequence, I believe the riskiness of New Zealand companies in these industries is not below 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.

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<sup>23</sup> 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.

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. 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 (ie, 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%. Adding this to the range of estimates for the US MRP (cited above as 3.5% to 7%) implies an estimate of the MRP in New Zealand of between 6.5% and 10% under the standard CAPM and between 8.5% and 12% under the Brennan-Lally model.

Put another way, with a mid range estimate of a 3% difference in MRP between the US and New Zealand, Associate Professor 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.

I note that when Associate Professor Lally cites evidence of MRP for other countries, he does not make any adjustment for possible differences between the country and New Zealand. He summarises his choice of evidence on the MRP in the US as 5.5%, 6.3%, 7.3% and 8.7%, which gives an average of 6.95%. Since Associate Professor Lally arrives at a MRP of 7% for New Zealand, he is implicitly concluding that there is virtually no difference between the MRPs of New Zealand and the US. As stated above, I do not regard this as a tenable conclusion.

In my opinion, the MRP of the comparator countries would be less than in New Zealand. In the US, I estimate the difference at 3%. In other countries, it is likely to be less, but not likely to be zero.

#### **4.1.3 Conclusion on MRP**

Associate Professor Lally estimated the tax adjusted MRP for New Zealand at 7%. However, his own estimate of MRP for Australia was 6%, which when transformed to a TAMRP is 8%. In my opinion it is not plausible that Australia has a higher MRP than New Zealand.

My own analysis, using a benchmarking approach against the MRP in the US, is the New Zealand MRP is even higher. Depending upon the MRP for the US, the TAMRP for New Zealand is in the range of 8.5% to 12%.

Given the substantial uncertainty in estimating MRP or TAMRP, I am content to accept Associate Professor Lally's MRP estimate for Australia, transformed into a TAMRP; that is, 8%. In my opinion this should be regarded as a lower bound on a reasonable estimate of the TAMRP in New Zealand.

## **4.2 Range for the MRP**

In my opinion, Associate Professor Lally errs in basing his range on the means of the different estimates that he cites (p 14). Each of these estimates has a distribution (and hence a standard deviation). As was discussed earlier, a range should reflect some confidence interval, and I suggested earlier that a common and acceptable approach is to set the range at  $\pm$  one standard deviation for the distribution underlying the estimate.

Associate Professor Lally does not say what confidence interval he is using when he sets the range at  $\pm$  1% of his best point estimate. However, even if the range was one standard deviation and the distribution was normal, then that means he can only be about 83% confident that the true value is less than the top of his range. If the distribution is skewed or the range is less than one standard deviation, then the level of confidence will drop off sharply.

Given the circumstances under which the estimate of MRP is used – to consider whether the gas businesses have been achieving excess returns – this is not sufficient confidence.

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.<sup>24</sup> Again this supports my view that the range of  $\pm 1\%$  set by Associate Professor Lally is substantially too low to be useful to the Commission in deciding whether the companies are earning excess returns.

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. 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.<sup>25</sup>

If the five point estimates that Associate Professor Lally cites as evidence on page 14 of his report are used, the standard deviation is slightly above 1%. However, he acknowledges in his report that there are a number of other estimates, and that these approaches may yield estimates substantially higher or lower than the evidence that he prefers and cites. Therefore, it is clear from his own evidence that his range of  $\pm 1\%$  is less than one standard deviation.

There is another problem with Associate Professor Lally’s setting of a range. The evidence that he appears to use in arriving at his recommended range is summarised as the means of the various estimates. However, each of these estimates has an underlying distribution and standard deviation. There is nothing in his report to indicate that he has considered the imprecision of the evidence he cites in arriving at his range.

It is important for the Commission and Associate Professor Lally to consider the standard deviation of all the estimates he cites. A simple example can illustrate the issue - if all of his estimates chosen were with significant estimation error, but all had the same mean, it could not be concluded that there was no range. It is clearly inappropriate to only use the distribution of a few mean estimates to determine the range.

In my opinion, the range set by Associate Professor Lally is less than one standard deviation of the underlying distribution, and hence is too small to be useful to the Commission in its determination. In my opinion, given the very substantial uncertainty

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<sup>24</sup> Very low values are generated if one uses the method set out by Fama, E.F., and J. Macbeth 1973, ‘Risk Return and Equilibrium: Empirical Tests’, *Journal of Political Economy*, vol. 81, no. 3, pp. 607-636. Conversely, the approach originally set out by Lucas, R. 1978 “Asset prices in an exchange economy” 46 *Econometrica* 1429-1445, and subsequently developed by French, K., G. Schwert and R. Stambaugh 1987 “Expected stock returns and volatility” 19 *The Journal of Financial Economics* 3-29 will yield very high or very low values depending on whether reinvestment is not allowed (as in the CAPM) or allowed.

<sup>25</sup> See Emanuel, Professor David 2003 “Statement to the Commerce Commission in respect of regulation of electricity lines’ businesses”, March 2003.

with respect to estimating MRP, a range of  $\pm 2\%$  is acceptable, although likely to be an under-estimate.

## 5 Risk free rate

I wish to comment on two features of the Commission's approach to the risk free rate: the bond maturity in the CAPM (and cost of debt) and the question of matching bond maturity in the risk free rate and the market risk premium.

### 5.1 Bond maturity in the risk free rate

The Commission's approach to the risk free rate, in which it adopts a bond maturity of 3 years based on its view of the "price setting period", is not consistent with the question the Commission is required to consider, namely whether the returns earned by gas businesses are excessive against a workably competitive benchmark.

The Commission justifies its position as follows:<sup>26</sup>

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.

In reaching this position, the Commission has relied on the following statement of Associate Professor Lally:<sup>27</sup>

The feasible candidates for the frequency with which prices are reviewed are in the 1-5 year range, and I therefore suggest the midpoint of 3 years. So, this points to using the three year risk free rate.

However, the approach adopted in these papers reflects Associate Professor 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. The latter is the key counterfactual against which rates of return should be assessed. 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

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<sup>26</sup> Draft Report, para 7.23.

<sup>27</sup> Lally, page 21.

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.

If the purpose of the analysis is to assess 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:<sup>28</sup>

*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 do place great emphasis on maturity matching, and this factor often dominates the debt portion of the financing 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.”<sup>29</sup>

## 5.2 Consistency of bond maturity in the risk free rate and MRP

Based on his preference for a bond of 3-year maturity, Associate Professor Lally then proceeds to argue that it is not necessary to adopt a bond with equivalent maturity in the estimate of the market risk premium. He goes further than this by stating that the “argument for consistency is flawed” (p 23).

The Commission has a discussion about bond maturity, noting the GasNet case, and then concludes the practical impact of maturity matching is minimal. It states:<sup>30</sup>

In any event, the Commission considers that, in the current situation, changing the term of the risk-free rate in the TAMRP to match the three-year maturity of the first Rf would have little practical effect, within the uncertainties involved in calculating the TAMRP. The Commission, therefore does not propose to adjust its estimate of TAMRP on the basis of the consistency argument.

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<sup>28</sup> E. Brigham and L. Gapenski, *Intermediate Financial Management* (5<sup>th</sup> ed), 1996 (The Dryden Press, Fort Worth), p 544.

<sup>29</sup> Australian Competition Tribunal, Application by GasNet Australia (Operations) Pty Ltd [2003] ACompT 6, paragraph 48.

<sup>30</sup> Draft Report, paragraph 7.48.

These considerations raise two issues. First whether maturity matching is essential, and second whether the impact of not matching maturities is material.

On the first issue, 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.<sup>31</sup>

On the second point, notwithstanding the fact that the Commission is not applying the CAPM, in practice bond yields of different maturity can deviate significantly – particularly if the difference is between 3 years and 10 years. In July 2003, the period sampled by Associate Professor Lally, the average yield on 10-year Government bonds was 5.54% - a full 44 basis points higher than the value of 5.10% adopted in the Draft Report based on the 3 year bond.

## 6 Beta

Associate Professor Lally and the Commission consider much relevant material in estimating an asset beta for the gas businesses. Given the lack of listed gas pipeline businesses in New Zealand, and poor statistical properties of these estimates Associate Professor Lally is forced to consider a wider set of material, including data from overseas businesses and first principle analysis. Given the data limitations, I agree with this approach.

However, in considering comparable companies, Associate Professor Lally compares the New Zealand businesses to overseas comparators on the basis that they would be expected to behave as a regulated entity. For example, he states that the US gas betas are comparable assuming that the New Zealand gas pipeline businesses “operated in a largely cost-plus fashion” (page 29).

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<sup>31</sup> Ibid, paragraph 47.

Associate Professor Lally notes listed beta values from New Zealand, US and UK. However, the statistical properties of these estimates are not shown. It is my expectations that many of these estimates will have poor R-squared statistics and low t-ratios. It is a statistical property that as R-squared approaches zero, the estimated beta will also approach zero. This implies that little confidence can be given to these numbers for regulatory purposes.

In any case, there is compelling evidence, particularly in the US, that current beta values of listed utility stocks significantly understates the “true” forward looking systematic risk of such stocks due to the lasting impact of the telecommunications, media and technology (TMT) bubble. The impact of the TMT bubble is important as it represents a one-off or significant and abnormal distortion to equity markets, markets against which the covariance of utility stocks is measured. The impact of the high beta values of such stocks was counter-balanced by reduced betas for non-TMT stocks. Given betas are estimated over periods up to five years the impact of such an abnormal event can significantly bias beta values for several years, even though the TMT bubble has burst.

Estimates from the US suggest that the beta values of US electricity businesses are understated by almost 0.50 due to the lasting impact of TMT bubble. Annema and Goedhart<sup>32</sup> estimate beta values for various firms including and excluding the period of the TMT bubble. They find that if the period of the TMT boom is excluded, the beta value of electricity firms increases from 0.13 to 0.62 – an increase of 0.49. In similar research in the UK, Hern and Zalewska<sup>33</sup> find a statistically significant impact of the order of 0.29 (standard error 0.11) in times of excess market volatility for listed electricity businesses.

In my opinion the mid-point beta of 0.5 for gas pipeline companies is low. However, as Associate Professor Lally correctly notes, the estimation of beta for a company involves enormous estimation error.

## 6.1 Range for Beta

The range of beta recommended by Associate Professor Lally and accepted by the Commission is 0.4 to 0.6 - that is,  $\pm 0.1$  from his best estimate of 0.5. In explaining his choice of a range, he states (p 34) “The range here will reflect the extent to which the gas pipeline businesses operate in a cost-plus fashion.” In other words, the range is to reflect differences between companies. Some companies will operate in more of a cost-plus fashion, consistent with a beta of 0.4. Others will be in less of a cost-plus environment

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<sup>32</sup> Andre Annema and Mark H Goedhart, Better Betas, McKinsey on Finance, Winter 2003, pp10-14.

<sup>33</sup> Hern, R. and Zalewska, A. Recent Evidence on Beta and the Cost of Capital for UK Electricity Companies, NERA Topics, October 2001.

and warrant a beta of 0.6. He then acknowledges that “quantifying any such effect upon beta would seem to be impossible to attain.”<sup>34</sup> As his range is intended to encompass the betas of different companies, it therefore does not reflect the uncertainty or estimation error in the estimates. In my opinion, this is a serious oversight in setting an appropriate range.

Associate Professor Lally states that the estimation of beta for a firm using returns data “exposes one to enormous estimation errors.”<sup>35</sup> Later he says, “beta estimates based on the returns data of only one firm are statistically very unreliable.”<sup>36</sup> I agree with him that estimates of beta for individual firms have very high standard errors. I also agree that this provides justification for considering a range of sources of information before reaching a conclusion on a best estimate of beta. I further agree with him that “there will be judgement questions in this area.”<sup>37</sup>

Throughout his section on beta he discusses a very wide range of beta estimates that vary with the company, the industry, the country and the time period. He repeatedly mentions the “enormous” uncertainty in estimating beta. Yet he sets a range for beta that does not reflect any recognition of the uncertainty.

I believe this is a significant oversight. The Commission accepts his analysis and is guilty of the same oversight of ignoring uncertainty in setting a range.

In my opinion, the substantial uncertainty in estimating beta for gas pipeline companies should be reflected in a broad range. Using the guideline of the range reflecting one standard deviation, I believe the range for the asset beta should be  $\pm 0.3$ . Using the Commission’s best estimate of 0.5, the range should be 0.2 to 0.8.

## 7 Asymmetric risks

Associate Professor Lally and the Commission accept that it is appropriate for a gas business to receive compensation for the cost of asymmetric risk borne. However, Associate Professor Lally chooses not to provide any value for costs that he considers legitimate, claiming that upward biases in other parts of the WACC provide adequate compensation. He does not specify the upward biases to which he refers. It seems likely that he is referring to the use of a domestic CAPM rather than an international CAPM. As noted earlier, in my opinion this choice does not create a bias. In any case, there is

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<sup>34</sup> Lally, p 34.

<sup>35</sup> Lally, p 36.

<sup>36</sup> Lally, p 36-37.

<sup>37</sup> Lally, p 37.

growing regulatory precedent for providing allowance for such risk, including the self-insurance considered by Associate Professor Lally.

As noted by Associate Professor Lally, gas pipeline businesses face a range of risks that are asymmetric. These include assets becoming stranded as customers change consumption patterns and competitors change strategies, and the occurrence of extreme events, such as an explosion, with the firm in all likelihood bearing the costs when they are negative but not commensurately benefiting when the gains are positive.

There is ample discussion, if not satisfactory resolution, of a range of asymmetric risks in other submissions as well as the Draft Decision and Associate Professor Lally's report. I see little chance of contributing with a repeat of that discussion. However, it may be useful to set out at a general level what these asymmetric risks are and why compensation is required. This flows on to consideration of alternative mechanisms for recognising the risks that are borne by gas pipeline companies.

Asymmetric risks can have a number of characteristics that differentiate them from other risks faced by the company and from most asymmetric risks that are confronted by other types of businesses. First, the risks are unavoidable and asymmetrical (i.e., the possible negative outcomes are significantly larger than the possible positive outcomes). Therefore they are risks that cannot be diversified away by the company. Secondly, insurance against these risks is not commercially available. Thirdly, these are risks that cannot be diversified away by investors in the company. This is a critical point. The reason that they cannot be effectively diversified away is that the counter-parties to the risks are not primarily public companies in which investors can invest. The principal economic counter-parties in each of the cases are consumers. That is, consumers will benefit from lower charges for the service. Finally, these risks are not accommodated in the CAPM.

Because these risks are assumed not to exist in the CAPM, estimations of the cost of equity capital using the CAPM will not include any reward for facing these risks. Yet it is clear that investors will require such recognition if they are to invest in infrastructure companies. The question becomes how recognition of the risks should be achieved in the regulatory process. Clearly when such risks do exist, the CAPM is inadequate and some form of modification or supplementation is required.

Since a gas pipeline company has no alternative but to bear the risk of losses, the benchmark return for the firm should reflect the cost of this risk. If insurance was available, the owners of the firm could take out insurance coverage. Of course, if it did so, the expense of the insurance could be recognised in the cost base. On this basis the company could cover the risk with no adverse impact on its profit.

Since insurance coverage is generally not available, other options need to be considered. In a price setting environment, these include the imputing of an actuarially fair self-insurance premium to allowable costs, supplementing the WACC with a positive increment, or seeking de-facto insurance from customers or Government in the form of an effective indemnity against major losses (such as system paralysis from terrorism).

In Australia the ACCC has provided allowances for costs associated with self-insurance against asymmetric risks in the cashflows in its determinations for GasNet and SPI Powernet. The ACCC agreed to raise total allowance for asymmetric risk to \$182,000 per annum during GasNet's appeal on the ACCC's decision to the Australian Competition Tribunal. In the case of SPI Powernet the ACCC allowed an allowance of \$710,000 per annum for non-insured risks such as liability insurance, easement disputes and handling public liability. Also, in both these decisions, the ACCC made considerable concessions in dealing with the costs of events such as terrorism, which it agreed to treat as pass-through items on an ex post basis.

In his paper Associate Professor Lally discusses the issue of treating asymmetric events ex ante or ex post, but assumes that the company dealt with such events ex ante. Because the companies have not been regulated, it would have behooved them to set prices so that they reflected the implications of the asymmetric risks that they could not avoid. So I agree with him that in the context of this inquiry, asymmetric risks should be regarded as requiring treatment on an ex ante basis. Under price control it may be decided to treat some or all of the risks on an ex post basis, as has been done by the ACCC, but that is not relevant here.

Rather than seek to estimate these costs, some of which he acknowledges, Associate Professor Lally argues that an adjustment is not necessary. With respect to the costs of financial distress, he maintains that compensatory effects are provided by using the domestic version of the CAPM (which he asserts overstates returns) and the choice of a 75<sup>th</sup> percentile value for the WACC.<sup>38</sup>

I have previously demonstrated why the use of a domestic CAPM does not imply an overstatement of returns. Also, when the Commission states its reason for choosing a 75<sup>th</sup> percentile WACC value, it does not make any mention of these asymmetric risks. Therefore, it is an error to ignore these issues in evaluating excess returns.

In my opinion, the Commission's position on asymmetric risks is particularly muddled. It seems to confuse ex post and ex ante and to treat some issues as if the gas pipeline companies were price regulated.

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<sup>38</sup> Lally, p 62.

In paragraph 7.83, the Commission discusses the situation if companies raised prices ex post. “The Commission’s view is that assuming businesses act in this way provides the most straightforward way of handling the risks of asset stranding and optimisation in the assessment of excess profits.”

In the next paragraph, the Commission goes on to say “If businesses raise their prices ex ante, assessing excess earnings is difficult.”

I certainly agree that an ex post treatment would be the easiest for the Commission as they could then ignore the issue. However, it would also be wrong. Associate Professor Lally recognised that the asymmetric risk issue needed to be considered ex ante. The Commission did not explain why, on this point, it chose not to accept the opinion of its advisor.

The Commission states (para 7.87):

Overall, as noted above, the Commission believes that the most straightforward way of handling the risks of adverse events such as stranding is to make adjustments to cash flows when these events occur.

As a statement of how the Commission proposes to handle these issues if price control is imposed, it is informative. However, it is irrelevant to the issue of how the companies actually treated the issues in their pricing. It seems clear that the companies had no reasonable choice but to consider them in their pricing, that is, to treat asymmetric risks ex ante.

To the extent that a firm such as Powerco has built asymmetric events into its pricing on an ex ante basis, then a conceptually sound approach is to estimate the actuarially-fair insurance premium that would have been required to insure against the risk.

In my opinion, it is important for the Commission to consider the ex ante operating cost implication of Powerco being forced to self insure for the full range of asymmetric risks. Although that task is admittedly imposing, to ignore the issue is to substantially bias the analysis towards a finding of excess returns.

## **8 Estimating an appropriate WACC range**

The Commission, following the position of Associate Professor Lally, adopted ranges for only two variables; the TAMRP and the beta. For these two variables, the ranges were set very tightly. In fact, for the estimated beta, the range is not intended to reflect uncertainty about the estimates, but rather to span possible levels of cost-plus pricing by different companies.

As discussed in section 2 of this statement, in my opinion a defensible approach for the Commission would be to first determine statistically valid ranges for the parameters considered, and I recommend that the range interval approximate one standard deviation of the distribution. The Commission could then simulate likely WACC values based on these parameters. The simulation results can then be used to consider an appropriate confidence interval.

In sections above, I explained why I believe the two ranges set are far too narrow, and I recommended ranges that I believe approximate one standard deviation. I also note that there are other variables where the values are estimates; in fact in principle all the variables are estimates. As estimates they have estimation error. However, the two major issues are where the Commission has acknowledged a range, so to prevent getting enmeshed in relatively minor issues, I focus only on TAMRP and beta.

In Table 1 below I have set out Associate Professor Lally's WACC estimates and ranges except for the two parameters for which I have estimated a range (TAMRP and beta).

**Table 1: WACC ranges**

	<b>Low</b>	<b>Mid</b>	<b>High</b>
Risk free rate	0.051	0.051	0.051
Debt margin	0.012	0.012	0.012
Tax rate	0.33	0.33	0.33
Debt ratio	0.40	0.40	0.40
Equity ratio	0.60	0.60	0.60
Cost of debt	0.063	0.063	0.063
Cost of debt (after tax)	4.22%	4.22%	4.22%
TAMRP	0.05	0.07	0.09
Asset beta	0.20	0.50	0.80
Equity beta	0.33	0.83	1.33
Cost of equity	5.08%	9.25%	15.42%
WACC	4.74%	7.24%	10.94%

As I have only expanded two of the ranges, the mid-point estimate is the same as that estimated by the Commission and Associate Professor Lally. However, the range on beta is now greater. In my opinion, the range on WACC represented here as 4.74% to 10.94% is a lower bound on the appropriate range. The reasons why I believe it is a lower bound are three-fold. First, there are ranges in other variables that I have not estimated. Second, I believe my estimate range for TAMRP is likely to be too narrow. Third, as mentioned in my introduction section, there are issues of uncertainty and estimation with respect to the CAPM and WACC themselves that are inducing estimation error.

## 9 Conclusion on an appropriate WACC

In the section above on MRP, I explain why I believe the appropriate TAMRP should be not less than 8%. In addition, I explained why I believe the asymmetric risks faced by the gas pipelines companies justify an increment to WACC. I do not have an estimate of an appropriate increment to WACC, but believe it will be more than minor. Finally, there are a number of relatively minor issues addressed by Associate Professor Lally, and to some extent by the Commission, that were judged to be trivial and hence ignored. These issues cumulatively result in some measure of understatement of WACC. I doubt that in the aggregate these are trivial, but have not estimated them for this report.

Table 2 below shows the WACC and its range using the estimate of TAMRP of 8% and the ranges as used in Table 1 above.

**Table 2: Revised WACC**

	<b>Low</b>	<b>Mid</b>	<b>High</b>
Risk free rate	0.0510	0.0510	0.0510
Debt margin	0.012	0.012	0.012
Tax rate	0.33	0.33	0.33
Debt ratio	0.40	0.40	0.40
Equity ratio	0.60	0.60	0.60
Cost of debt	0.0630	0.0630	0.0630
Cost of debt (after tax)	4.22%	4.22%	4.22%
PTMRP	0.06	0.08	0.10
Asset beta	0.20	0.50	0.80
Equity beta	0.33	0.83	1.33
Cost of equity	5.42%	10.08%	16.75%
<b>WACC</b>	<b>4.94%</b>	<b>7.74%</b>	<b>11.74%</b>

In my opinion, the WACC above of 7.74% and the range on that mid-point estimate of 4.94% to 11.74% are the best estimates available for the gas pipeline companies in the context of the gas control inquiry conducted by the Commission.

## 10 An appropriate WACC for evaluating excess returns

There is an important additional issue that needs to be revisited in determining an appropriate WACC to use in evaluating excess returns. In section 2 I discussed a number of reasons why the observed returns to a gas pipelines company might not reflect an exercise of monopoly power even if they were estimated to be excess returns using the

Commission's methodology. There are issues of superior management, good fortune in the outcomes of its investments, marginal costs greater than average costs, and the normal volatility of returns in any short or even medium term period of measurement. In other sections I discussed the uncertainty in using the CAPM and WACC models and the substantial estimation error in the inputs to those models.

As discussed in the introduction, there is a consensus that the social costs of under-estimating WACC are substantially greater than the social costs of over-estimating WACC. The Commission has accepted this asymmetry and has used it as its motivation for choosing the 75<sup>th</sup> percentile.

In my opinion, the appropriate place to reflect this asymmetry is in choosing a confidence interval that reflects the relative costs. If the Commission chose the mid-point WACC for evaluating excess returns, there would be a 50% chance that it would reach a conclusion that was socially damaging. Clearly this would be an unacceptable risk. The difficult issue is to determine what is the appropriate confidence level for the Commission to set that reflects the relative costs to society of over and under estimating WACC.

In scientific inquiries, the confidence levels chosen to reflect significance are rarely less than 90% and are often 95%. In my view the importance of the relative social costs is such that a confidence level of this magnitude would be appropriate. However, that is ultimately a judgement that the Commission must make.

My appeal to the Commission is that they make that judgement in the context of confidence levels, not in an ad hoc fashion.

## 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.

I am also a Network Associate with Network Economics Consulting Group (“NECG”). The bulk of my activities as an expert in financial economics over the past few years have been working with NECG.

In the past six years at The University of Auckland 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 I 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 recent project in 2003 to advise the Office of the Rail Access Regulator (Australia) on the determination of WACC for rail infrastructure.