

# Comments on the Commerce Commission's Approach to estimate the Cost of Capital



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**Report prepared for:**

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## Executive Summary

### 1. Introduction

This report comments on the Commerce Commission’s approach to estimating the cost of capital set out in the Commission’s Cost of Capital Guidelines dated 19 June 2009, the Straw Person Example and the related Commission’s publications.<sup>1</sup>

Our report is written for the NZ Airports Association on behalf of Auckland International Airport Limited, Christchurch International Airport Limited and Wellington International Airport Limited (“Airport” or “Airports”). The three Airports are subject to an Information Disclosure Regime following the 2008 amendments to the Commerce Act.

A summary of our key points on the Commission’s Guidelines and approach to the determination of the cost of capital are provided below.

### 2. Cost of Equity Capital

We consider the simplified Brennan-Lally version of the capital asset pricing model (“CAPM”) is an acceptable model to determine the cost of equity capital for NZ firms. At present we do not consider alternative asset pricing models to the CAPM are practical to apply for the Airports.

The Commission needs to recognise, however, the limitations of the CAPM and that the potential for model and parameter error is high. Estimation errors in the determination of a firm-specific cost of equity capital will be even higher than industry estimates of the cost of capital.

### 3. Industry wide versus firm specific factors

We agree with the Commission that industry cost of capital estimates provide a useful benchmark.

In an Information Disclosure Regime, the Commission for monitoring purposes should compare ex-post returns relative to a plausible range for the WACC, which in the first instance is based on industry benchmarks. In our view further specificity is not required as would be the case where the Commission has a price setting role. We note that developing firm-specific cost of capital estimates will be more costly than developing an industry benchmark range for the cost of capital.

However, the three Airports may have different pricing arrangements, passenger and freight mix and different exposures to asymmetric risks, asset optimisation and asset stranding. The Commission would need to take these factors into account if it concludes that firm-specific costs of capital are required for Airports.

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<sup>1</sup> References in this report to “we” or “our” refer to the opinions of Dr Alastair Marsden.

#### **4. The NPV = 0 Criterion**

The NPV = 0 zero concept applies over the expected life of an asset and is applied by the Airports on a forward looking basis for pricing periods. Forecasting demand for Airport services, costs and the timing of capital expenditure is subject to uncertainty and actual ex-post returns may vary by a wide margin to expected ex-ante returns. For the Airports, it is not uncommon that some revenues and prices may be set to under and/or over-recover for specified periods during the expected life of an asset.

Thus ex-post measures on an annual basis will be a very imprecise estimate that a firm may have earned more than its ex-ante required rate of return. Under an Information Disclosure Regime a multi-year analysis of returns should be considered and will be more meaningful than a single year analysis.

#### **5. Financeability Test and Credit Ratings**

The Commission should not be able to arbitrarily reduce “notional” gearing below a reasonable lower bound of a long-run leverage ratio to ensure financeability.

The three Airports may have different financeability risk exposures due to different future business mixes or capital expenditure requirements that are often lumpy and vary in timing.

#### **6. Regulatory Risk**

There is no certainty that consistent regulatory practice will apply over the expected life of an asset and there may be rule changes by the regulator that will influence future price reviews. The presence of regulatory risk and regulatory uncertainty will increase hurdle rates and act to constrain new investment.

This is of particular concern to Airports where new investment in infrastructure assets have long expected asset lives and investment decisions are likely to be irreversible.

There is also the potential for asymmetry of outcomes if the regulator imposes penalties where ex-post returns are above expectations but with no compensation if large losses are incurred.

#### **7. Parameter Inputs into the CAPM**

##### **7.1 Risk Free Rate**

We consider there are strong commercial arguments to justify the use of a long-term risk free rate in the first-term of the CAPM. This will ensure overall consistency in the cost of capital estimate, as prudent firms, exhibiting rational competitive market behaviour, will borrow and source debt finance with maturities that do not match the regulatory review period. That is Airports will borrow according to their forward looking investment and operating requirements and not for the term of a price review period.

In our view it would also be helpful if the Commission were to clarify its position as to the exact procedure it will use to calculate the risk free rate (see section 3.1.4 of this report).

## **7.2 Beta**

Industry benchmarks and comparable company analysis will assist in the determination of a firm's systematic risk. Industry benchmarks and comparable company analysis will also inform the asset beta range for airports. A range will exist because the three Airports may face different systematic risk exposures and because of estimation error.

The Commission's Cost of Capital Guidelines and Straw Person Example do not provide any view on the Commission's estimate of an asset beta for Airports. Accordingly we would wish to comment in more detail on the systematic risk for Airports in the event the Commission were to determine a beta for Airports.

However, at a fundamental level Airports have significantly different risk characteristics to electricity distribution businesses. We expect that returns to investors in Airports will be more sensitive to changes in macro-economic conditions, demand shifts and other general economic shocks compared to the sensitivity of returns for investors in electricity distribution businesses. We also consider that Airports will have a higher systematic risk exposure to asset optimisation and the risk of asset stranding from demand shifts compared to electricity distribution businesses.

The Commerce Commission (2002) in the Airports Inquiry derived an asset beta by starting with the asset betas for observed US electricity distribution businesses and then adding an increment for greater systematic risk facing Airports. In the Airport 2002 Inquiry the Commission's estimate of the asset beta for Airports was 0.4 to 0.6.

The simple average unadjusted asset beta for the ten listed airport entities in the Straw Person Example (Appendix 1) is 0.74. This is substantially above the estimate of the asset beta for electricity distribution businesses in the Straw Person Example (0.30 to 0.40). In our view the Commission should use comparable company evidence when estimating an Airport beta, and no longer adopt the approach used in the Airports 2002 Inquiry whereby adjustments were made to the betas of electricity distribution businesses.

The Straw Person Example assumes zero debt betas. In our view estimation of debt betas is problematic at the present time and an assumption of a debt beta equal to zero is reasonable.

## **7.3 Market Risk Premium**

The Commission should increase its mid-point estimate of the tax-adjusted market risk premium from 7.0% to 7.5% (measured relative to long-term bonds) within an appropriate range that reflects estimation error.

The Commission should also ensure consistency in the term of the risk free rate throughout the CAPM. If the Commission uses a short-term risk free rate in the first-term of the CAPM, the market

risk premium should be measured relative to short-term bonds. Based on the evidence of Dimson et al. (2009) that historical worldwide bond term premiums are in the order of approximately 1.0%, we believe an increment of 1.0% to the point estimate of the MRP / TAMRP should apply if the market risk premium is measured relative to short-term risk free rates.

#### **7.4 Debt Risk Premium and Debt Costs**

The Commission should recognise that Airports source debt from a variety of debt markets and for terms that differ from a regulatory review period.

Prudent firms in a competitive market will not seek to have all their debt maturities matching a defined price or regulatory review period. Rather debt will be structured to mature in a staggered manner over periods other than a price or regulatory re-set date. This is rational to reduce refinancing risk. In the present financial environment where access to debt markets is more constrained than it has been for many years, re-contracting and re-financing risk is a paramount issue for many firms.

Standby and underwriting costs to provide liquidity buffers are required to maintain credit ratings and are a feature of sound treasury policy. Standby and underwriting costs should be included in allowed debt costs.

We consider it more practical to include debt raising costs in the cost of debt and not as an allowance in the expected cash flows under a building blocks model. We understand this is consistent with how Airports analyse commercial market funding options.

If the Commission still takes the view that the term of the risk free rate should match the price review period and set the benchmark for the debt premium, the costs of hedging debt and interest rate risk to match the regulatory review period should be allowed in the debt premium. In our view, however, the implication that Airports should hedge their debt and interest rate risk in the manner proposed by the Commission will lead to the potential for volatility in reported accounting income. This is due to the requirement to mark-to-market derivative gains or losses, with changes in value reported as income or expenditure.

#### **7.5 Leverage**

The Airports should have flexibility to set their borrowing policies and long-run target ratios within reasonable bounds.

Under an Information Disclosure Regime, if the Commission is to consider adopting minimum benchmark ratings for Airports, it should be at an investment grade level of BBB (i.e. one notch above the minimum investment grade credit rating).

An unnecessary high ratings benchmark will potentially constrain future investment as the Airports may not invest if they have other more productive uses of capital and are not willing to increase debt funding if compensation cannot be gained for the cost of the debt.

Any benchmark credit rating that the Commission assumes when deriving the cost of debt should be consistent with the relevant firm's financeability requirements and constraints (e.g., capex requirements etc) and consistent with the benchmark gearing level that is assumed.

## **8. Impact of the Global Credit Crisis**

The global credit crisis has increased debt premiums and the market risk premium at least over a short-to-medium term time horizon.

At the Commission's Cost of Capital Workshop there was general agreement that risk premiums should be increased as a result of the global credit crisis. We note that the Commission's adviser, Dr Lally, also agreed with this view:<sup>2</sup>

*“But in principle it seems to me very clear that the MRP must have gone up. The market risk premium is a reward for bearing market risk and market risk has clearly gone up.”*

While over time risk premiums may fall back to its current level it is uncertain as to if, or when, this may occur.

## **9. Adjustments to WACC for Type I and II Asymmetric Risk**

Airports are exposed to Type I asymmetric risks that include extreme events such as “SARS”, Bird Flu, terrorist attacks, (e.g. 9/11 type events) and natural disasters. Such events are difficult to predict in terms of both impact and timing, which makes cashflow forecasting very difficult. Nevertheless there is evidence that these events do occur.

The long-life and often irreversible nature of Airports' new infrastructure investment also exposes Airports to Type II asymmetric risks.

The Commission needs to recognise that Airports are exposed to these risks and not assume they are zero. The burden of proof of the level or quantum of asymmetric risks should not be impossibly high and should rest largely with the Commission.

The Commission needs to provide an allowance for these risks either by way of an increment to the WACC, an adjustment to the asset base or the expected cash flows under a building blocks model.

We consider the Commission has some responsibility to conduct or sponsor research on both Type I and Type II asymmetric risks.

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<sup>2</sup> Cost of Capital Workshop Transcripts, page 95, lines 23-25.

## **10. Market Frictions, Costs of Financial Distress and Equity Issuance Costs**

Market frictions and financial distress costs exist in the real world. These costs may impact on the overall cost of capital and can lead to lost investment opportunities. The Commission should be aware of these costs in setting a WACC and in undertaking any financeability test.

Firms will typically incur substantial costs to raise new equity and the Commission should also be cognisant of these costs.

## **11. Asymmetry of Social Consequences**

The Cost of Capital Guidelines (para. 239) notes that the Commission accepts the general proposition that the social costs of setting allowed rates of return too low probably outweigh the costs of setting allowed rates too high.

Airports are an integral part of New Zealand's tourism, business travel and air transport freight and infrastructure in New Zealand. Tourism is a significant earner of foreign exchange income for New Zealand and directly or indirectly responsible for a large number of jobs in the New Zealand economy.

Prima-facie, in our view, under-investment in Airport aeronautical assets risks adverse long-term consequences for the wider New Zealand economy.

## **12. WACC Range: Allowance for model error, parameter error, asymmetric risks and the asymmetry of social consequences**

The WACC range and any point estimate within the range should take into account asymmetric risks (to the extent these are not provided for in the cashflow expectations or as an increment to the asset base), parameter error, asymmetry of social consequences and model error.

Errors in the estimation of the individual parameters used in the calculation of WACC leads to a range estimate for the WACC. Asymmetry of social consequences suggests the Commission should adopt a point estimate towards the upper end of this range.

The presence of model error means there should be a further allowance, in addition to an allowance for parameter error and asymmetry of social consequences, in the determination of a plausible WACC range and the choice of a point estimate for the WACC within this range.

We suggest a study be undertaken to determine if material differences may arise in the WACC range under Monte-Carlo simulation compared to the analytical approach proposed in the Guidelines (para. 235). A simple absolute minimum and maximum range for WACC based on the intervals for the individual parameters into the WACC calculation should also be calculated.

### **13. Airport WACC and application of WACC for Information Disclosure**

In its Cost of Capital Guidelines and related reports the Commission has not made it clear how it will use or apply an Airport WACC under an Information Disclosure Regime.

We cannot make a final submission until we are informed of the Commission's specific views on the use of a cost of capital in relation to the Information Disclosure Regime for Airports.

As already noted, ex-post measures on an annual basis will be a very imprecise estimate that a firm may have earned more than its ex-ante required rate of return or more than a WACC determined by the Commission. Under an Information Disclosure Regime a multi-year analysis of returns will be more meaningful than a single year analysis

### **14. WACC and Leverage under the simplified Brennan-Lally Version of the CAPM**

Appendices 2 and 3 examine the Commission's concern that WACC increases with leverage using the simplified Brennan-Lally version of the CAPM.

We conclude that any error and overstatement of WACC is likely to be small and should not be of a material concern to the Commission. Any small over-statement of WACC is likely to be a less serious error than any under estimation of WACC, when there is asymmetry of social consequences and the risk of under-investment.

### **15. Overall Conclusion**

The Guidelines and Straw Person Example do not:

- Provide any specific determination of a cost of capital for Airports; and
- Clearly state how a WACC estimate and range for the WACC will be determined and used by the Commission under an Information Disclosure Regime.

There are a number of areas where the Guidelines or Straw Person Example are also unclear in the approach to determine the parameter inputs in the WACC calculation.

In summary we cannot form final conclusions until we are fully informed of the Commission's specific views on the cost of capital and its use in relation to the Information Disclosure Regime for Airports. Thus, we would wish to comment in more detail on the Commission's approach to the determination of cost of capital if, or when, the Commission determines an Airport WACC and/or clarifies its intention on the use of a WACC under an Information Disclosure Regime.

# Comments on the Commerce Commission's Approach to Estimate the Cost of Capital

## 1 Introduction

Auckland UniServices Ltd has been engaged by the NZ Airports Association to comment on the Commerce Commission's ("Commission") proposed approach to estimating the cost of capital and issues raised in the following Commission reports.

- *Revised Draft Guidelines: The Commerce Commission's Approach to Estimating the Cost of Capital*, 19 June 2009 (hereafter, "Guidelines");
- *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology*, 18 December 2008, by Julian Franks, Martin Lally, and Stewart Myers (hereafter "Recommendations");
- *Input Methodologies Discussion Paper*, 19 June 2009, Chapter 8 which is titled 'The regulatory cost of capital';
- *Cost of Capital Straw Person Example, Electricity distribution industry*, (hereafter, "Straw Person Example");
- *Draft Guidelines: The Commerce Commission's Approach to estimating the Cost of capital, October 2005* (hereafter, "Draft Guidelines");
- *Commerce Commission: Cost of Capital: Post-workshop Submissions*;
- *Commerce Commission Transcript of the Cost of Capital workshop held 12<sup>th</sup> and 13<sup>th</sup> of November 2009*;
- *Effects of leverage on WACC under two Difference CAPMs*; and
- *WACC and Leverage* by Dr Lally dated 17 November 2009.

Our comments reflect our review of these reports; however, we note that the Commission's reports do not specifically address the Commission's views in respect of cost of capital issues for Airports. While we express our views on the relevant issues for the cost of capital for Airports in this report these should not be considered as final. We cannot form final conclusions until we are fully informed of the Commission's specific views on the cost of capital and its use in relation to the Information Disclosure Regime for Airports.

### 1.1 Intent of Legislation

The NZ Airports Association comments on the Part 4 Purpose Statement and the section 53A purpose statement for information disclosure in this submission, and provided earlier comment in its various submissions to the Commission on the 2008 changes to the Commerce Act ("Act"). We understand that the NZ Airports Association and the Airports consider the interpretation of the legislative requirements for the airports, which will be subject to information disclosure only, particularly critical for a WACC input methodology that will be used for an ex-post monitoring purpose only.

This is because the NZ Airports Association and the Airports consider an overly determinative approach may influence airport price setting and consequently will establish a default price control regime for Airports which is not the intent of the legislation

## 1.2 Structure of this Report

The remainder of our report is structured as follows:

- Section 2 discusses the regulatory cost of capital;
- Section 3 discusses the parameter inputs in the capital asset pricing model (“CAPM”);
- Section 4 discusses the debt premium;
- Section 5 considers the appropriate leverage ratio;
- Section 6 considers the impact of the global credit crisis on the cost of capital;
- Section 7 discusses adjustments to the weighted average cost of capital (“WACC”) for Type I and Type II asymmetric risks; and
- Section 8 discusses asymmetry in social consequences, selecting an appropriate WACC within a range and use of Monte-Carlo simulation.

Appendix 1 provides references to the sections in our report that address the questions put to all parties in the Commission’s document on *Cost of Capital: Post-workshop Submissions*.

Appendices 2 and 3 examine the Commission’s concern that WACC increases with leverage using the simplified Brennan-Lally version of the CAPM (Cost of Capital Workshop Transcripts p 101, Lines 16-28).

## 2 Regulatory Cost of Capital

### 2.1 Cost of Equity Capital

#### 2.1.1 Capital Asset Pricing Model

The Commission proposes to use in all cases the simplified version of the Brennan-Lally CAPM when estimating the cost of equity capital (Guidelines, para. 101).

We accept the CAPM and this simplified Brennan-Lally version of the CAPM is an acceptable model for New Zealand under the assumptions of the dividend imputation tax regime.<sup>3</sup>

We do not favour the international version of the CAPM for regulatory purposes. This model is not extensively used in practice, and the simple version of the international CAPM ignores exchange rate risk. Koedijk, Kool, Schotman and van Dijk (2002) report evidence that an international CAPM will often not provide an estimate of the cost of capital materially different to a simple classical version of the CAPM. In the Recommendations paper (para. 32) we note that Professor Myers also does not agree that the international version of the CAPM will necessarily yield lower estimates of the cost of capital than the simplified Brennan-Lally version of the CAPM.<sup>4</sup>

#### 2.1.2 Alternative models

In our view alternative asset pricing models such as the arbitrage pricing model or the Fama-French (1996) three factor model are difficult to apply in New Zealand at present given the lack of reliable data and risk premiums on size and book-to-market data for some New Zealand firms. This may change in the future as more research on the New Zealand market is conducted or New Zealand's capital markets deepen.

Estimates of the cost of equity capital under forward looking dividend growth models can also be unreliable and are highly sensitive to forecast earnings and long-run growth assumptions.

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<sup>3</sup> We note, however, the recommendation of the review panel on the form of the CAPM is mixed. In particular Professor Myers recommends the Commission use the classical CAPM instead (Recommendations, para.22). In our view use of the classical CAPM as a cross-check to the simplified version of the Brennan-Lally CAPM has merit to examine the impact of the tax and leverage assumptions under the Brennan-Lally version of the CAPM. This model recognises that some investors (and in particular international investors) that adopt the CAPM would typically use the classical version of the CAPM as opposed to the simplified Brennan-Lally version of the CAPM.

<sup>4</sup> In the event the Commission were to apply an international version of the CAPM, we consider the cost of capital should first be determined from the perspective of an international investor who would likely price assets in United States dollar (“USD”) and not NZ dollars (“NZD”). This would require empirical estimates of beta to be measured using firm specific returns and a world market index of returns denominated in USD.

An examination of the use or application of alternative asset pricing models in jurisdictions other than New Zealand may, however, assist in determining the possible extent of any model error from the use of the CAPM.

### 2.1.3 Model error and parameter estimation error

Estimates of cost of capital are imprecise and under any theoretical asset pricing both model and parameter error will exist.

#### *Model error*

There is a large amount of empirical evidence that the CAPM explains only a small proportion of the cross-sectional variation in stock returns. For instance, Fama and French (2004) argue the CAPM has never been a model that is able to empirically explain asset pricing. They further conclude that the empirical failure of the CAPM invalidates the way the model is used in many applications. For the New Zealand market, Bryant and Eleswarapu (1997) fail to detect any significant relationship between beta and market returns in the New Zealand market. This suggests that potential model error is high.<sup>5</sup>

#### *Parameter error*

In addition to model error there is parameter error. Fama and French (1997) conclude cost of equity estimates for industries are very imprecise with standard errors of 3.0% per year typical for both the CAPM and the Fama- French three factor model. These large standard errors reflect uncertainty about the true risk premiums and risk factors. For specific firms and projects the cost of equity capital estimate would be even more imprecise.

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<sup>5</sup> Empirical tests of the CAPM have no validity. The fundamental issue is that the inability to identify the market portfolio means that the CAPM is not empirically testable. The potential for model error is therefore more convincingly demonstrated by consideration of the realism of the assumptions underlying the CAPM. For example, Malkiel and Xu (2000) argue wealth constraints and other market restrictions on the type of assets able to be held by investors means many investors are unable to form a diversified portfolio. On the other hand Fama and French (2004, page 41) note that the relationship between the expected return and market beta of the CAPM is a minimum variance condition that should hold in any efficient portfolio, including the market portfolio. A 2003 report for UK regulators by Wright, Mason and Miles (2003) also argues that for practical purposes there is no clear alternative *theoretical* model to the CAPM to estimate the cost of equity capital for an entity.

### *Implication of model and parameter error*

The Commission needs to be aware of the shortcomings of the CAPM in its regulatory decisions given the Commission's decisions can have a large impact on investment incentives for firms subject to a regulatory regime.

In particular inadequate recognition of the risk of model and parameter error may result in firms facing diminished incentives to undertake replacement and new investment.

This suggests the Commission should take a conservative position on WACC. There should be allowance for the uncertainties associated with estimation of the parameters (parameter error) and, separately, allowance made for inadequacies of the model (model error).

## **2.2 Vanilla vs Post-tax WACC**

The Commission's preliminary view is that a 'Vanilla' WACC should be used to estimate the cost of capital for the purposes of price quality regulation. The Commission also proposes to calculate post-tax WACCs for the purposes of the Information Disclosure Regime, given that post-tax WACCs values may be more readily understood by the interested parties (Input Methodologies Discussion Paper, para. 8.29).

For reporting purposes under an Information Disclosure Regime we support the Commission's view to use a post-tax WACC. The post-tax WACC is more readily understood by investors. We note that the Airports have provided comment to the Commission on their recommended approach to determining tax costs in earlier submissions to the Commission.

## **2.3 Industry Wide versus Firm Specific Factors**

### **2.3.1 Commission's view**

The Commission's view (Guidelines, para. 37) is that an industry cost of capital estimate is a useful benchmark starting point as it provides:

- A sanity check for firm specific cost of capital estimates; and
- There are large estimation errors in a firm specific cost of capital.

The Commission will consider firm specific adjustments to industry benchmarks during consultation on particular determinations if there are real, non-idiosyncratic differences between firms within the same industry (Guidelines, paras. 39 and 40).

### 2.3.2 Our view

We agree with the Commission that industry cost of capital estimates are a useful benchmark, with the caveat that we are yet to understand how this benchmark would be used in Information Disclosure Regime.

In determining an industry WACC for airports the Commission should look at the range of differences within the industry. In this respect the three Airports may have different:

- Pricing arrangements with customers (including unit risk and price term);
- Passenger and freight mix;
- Airline customer concentration; and
- Different risk exposures to levels of asymmetric risks, asset optimisation and asset stranding.

In particular these factors may result in a range of firm specific differences in beta estimates and debt risk premiums.<sup>6</sup>

However, for the Airports that are subject to an Information Disclosure Regime only, there may be no need for the Commission to initially determine any firm specific cost of capital estimate. Developing firm specific cost of capital estimates will be more costly than developing an industry benchmark range for the cost of capital. Thus, in an information disclosure environment we consider the Commission for monitoring purposes should compare ex-post returns relative to a plausible range for the WACC, which in the first instance is based on industry benchmarks.

At each price reset period we understand there is also detailed consultation between the Airports and the airlines on the WACC.

## 2.4 WACC and NPV = 0

### 2.4.1 Commission's view

The Commission's view (Guidelines, para. 32) is that NPV = 0 means firms expect to earn a reasonable rate of return and recover efficient capital investment and efficient costs.

The Commission also recognises (Guidelines, para. 34) that a firm's profits fluctuate over time, even in regulated industries, and ex-post NPV may not equal zero.

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<sup>6</sup> We have already noted errors in determining a firm specific cost of capital estimate can be wider than an industry benchmark cost of capital estimate.

## 2.4.2 Our view

In our view the NPV = 0 criterion is a means whereby the Commission is seeking to achieve the objectives of the Act. Strictly speaking it is a concept that only applies where expected ex-ante returns are forecast over the expected life of a particular asset. In practice this is achieved by applying the building block model for future periods each time prices are reset. That is expected revenues set each year by use of the model is equivalent to expected NPV=0; however, the revenues set could vary from the levels set by the model provided that the present value of the excess earning over the lifetime of the relevant assets = 0.

Thus, it would not be appropriate for the Commission to form conclusions on historical compliance with NPV=0 without analysing all variances from past ex ante forecasts and distinguishing those variations arising from unexpected market outcomes and those that may have arisen from inappropriate forecasting by the airport. To take such an approach mid way through asset lives is retrospective and contrary to appropriate ex ante application of NPV=0.

This is particularly relevant for Airports subject to an Information Disclosure Regime. The reasons are:

- The Airports may in consultation with Airlines establish a price schedule or depreciation profile that may be NPV negative over an initial price review period and then NPV positive over subsequent price review periods;<sup>7</sup> and
- In any year ex-post cash flows may exceed ex-ante expectations of cash flows. Thus, ex-post profits measured on an annual basis are a very noisy estimate that a firm may have earned more than its ex-ante required rate of return.

The implications of measuring ex-post profits relative to the Commission's estimate of WACC are therefore:

- The Commission's estimate of WACC for information disclosure may differ from the ex ante WACC estimated for price setting due to differing market conditions or time of estimation;
- Ex-post profits would need to exceed target returns or profits by a substantial margin to reach a conclusion with any degree of confidence that excessive profits have been earned;

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<sup>7</sup> The firm will earn (ex ante) NPV=0 in all periods provided that the regulatory depreciation method reflects the recovery of capital that is assumed in prices. However, this will only apply or is feasible, where under the pricing structure; the firm has absolute certainty that the depreciation method implied by its pricing will be used to update the regulatory asset base at each price re-set date in the future.

- It needs to be ensured that any perceived over recovery is not due to expected under recovery in earlier periods;
- Risk sharing allocations in the airport price setting process, under the Airport Authorities Act, must be considered when analysing changes from expectation; and
- A multi-year analysis will be more meaningful than a single year analysis.

In this respect any forecast error for Airports is likely be to high where passenger demand and aircraft volume movements are difficult to predict with any degree of certainty. For instance, in the case of Airports:

- If traffic volumes are above or below forecast, annual returns from airport cash flows could result in a return on investment outside the WACC bounds;
- A concentration on expansion of facilities within a period could lead to short term compromises in quality or service with an impact on airline and passenger demand pending completion of the new facility;
- New regulatory requirements could lead to unanticipated increases in costs, outside the control of the Airports, thereby lowering returns and also implying poor cost containment.
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Ex post NPV returns may also be greater than zero where an ex ante allowance is made in cash flows for asymmetric risks but the asymmetric risks or extreme events did not actually eventuate.

We agree with the Commission that the NPV = 0 concept should be measured relative to efficient capital investment and costs. Higher returns than WACC may accrue to firms that are highly efficient. A firm that is more efficient than the average firm should be allowed to retain expected “efficiency” gains. Efficiencies that Airports are able to achieve also enable benefits to be shared and passed onto passengers, each time a price reset is undertaken.<sup>8</sup>

Overall we are doubtful that annual monitoring will enable the Commission to consider the effectiveness of the Information Disclosure Regime concerning any short term measure of excessive profits. Monitoring will, however, enable a knowledge base to be built up over a period for time.

In summary it is unclear how the Commission will apply the NPV = 0 rule and use a WACC for the Airports under an Information Disclosure Regime. In this regard we believe it would be helpful if the Commission were to state and clarify its intentions on the use of an Airport WACC in relation to information disclosure and monitoring.

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<sup>8</sup> Airports should be able to retain efficiencies at least for the price rest period or else it will diminish the incentive to achieve these efficiencies.

## 2.5 Financeability Tests and Credit Ratings

### 2.5.1 Commission’s view

The Commission (Guidelines, para. 49) proposes a sanity check on its overall cost of capital estimate. If the Commission considers a financeability issue may arise (Guidelines para. 57) then the steps are:

1. The Commission will check regulatory inputs;
2. The Commission will consider reducing the notional gearing assumption within its cost of capital estimate;
3. The Commission will consider if the profile of the business revenues should be accelerated to allow early cost recovery (noting this raises inter-generational issues); and
4. Lastly the Commission will adjust the cost of capital.

### 2.5.2 Our view

We agree that the Commission should exercise a sanity check in its overall cost of capital estimate. As a first step in relation to the check of regulatory inputs, we suggest this could include discussions with industry practitioners, investment bankers, ratings agencies and corporate advisors as to current acceptable parameter inputs that will encourage firms subject to a regulatory regime or regulatory oversight to innovate and invest.

In respect of the Commission’s proposal to reduce the notional gearing assumption, we do not believe the Commission should have discretion to “notionally” reduce gearing below a long-run range for an acceptable benchmark industry leverage. For instance, at an extreme the Commission might ensure financeability by setting a notional leverage equal to zero. However, in practice it is rare to observe firms subject to regulation adopting no debt in their capital structure. If the Commission were able to arbitrarily reduce notional gearing below any reasonable range to satisfy the financeability test, in our view this would be inconsistent with a “workably competitive market”.

If the Commission were to still take the view that notional gearing could arbitrarily be reduced below an appropriate range of a long-run target leverage ratio to meet any financeability test, then we consider the Commission should allow for “notional” costs of raising “additional” equity in its cost of equity capital estimate.<sup>9</sup>

In respect of the Commission’s proposal to consider the profile of the business revenues, we have already noted that Airports in consultation with Airlines may establish an expected revenue and depreciation profile to under or over-recover in an initial price review period, with the expectation

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<sup>9</sup> The alternative would be to provide an allowance for equity raising costs in the cash flows. However, from a practical perspective (similar to our view for debt raising costs) we believe it is more appropriate to recognise these costs in the cost of equity capital estimate.

that a compensating over or under-recovery may be expected in subsequent price review periods. The flexibility for the parties to alter the profile of revenues or depreciation recovery is consistent with workably competitive markets, may encourage new investment and enable economies of scale to be achieved.<sup>10</sup>

Lastly we are not clear how on this test would apply for Airports in any event. The three Airports may have different financeability risk exposures due to issues such as different future capital expenditure requirements that are often lumpy. Airports financeability risk is managed through:

- Airport price resetting under the Airport Authorities Act following consultation with the airlines;
- Prudent treasury management;
- Annual credit reviews undertaken by external rating agencies; and
- Compliance with covenants required in funding arrangements.

We cannot comment further without understanding in more detail on how the Commission might apply a financeability test in its ex-post monitoring of information disclosures.

## 2.6 Regulatory Risk

In our view the Commission should recognise the potential for regulatory risk and how this may impact on cost of capital and investment decisions by Airports. We have already noted that it is not clear how the Commission intends to use or apply a WACC estimate for Airports under an Information Disclosure Regime.

The presence of regulatory uncertainty has the potential to constrain new investment by increasing the hurdle rate that firms apply in their investment decisions to account for “regulatory risk”. This can arise because the regulator may be subject to “political” pressures and investors face the risk of changes in legislation. This is particularly relevant for Airports due to the requirement in the Act for the Commission to undertake a review of the effectiveness of the airport Information Disclosure Regime in 2012.

That is, there is no certainty that consistent regulatory practice will apply over the expected life of an asset and there may be rule changes by the regulator that will influence future price reviews. This is of particular concern to Airports where new investment in infrastructure assets have long expected asset lives and investment decisions are likely to be irreversible.

There is also the potential for asymmetry of outcomes if the regulator imposes penalties where ex-post returns are above expectations but with no compensation if large losses are incurred.

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<sup>10</sup> Any acceleration or delay of the profile of revenue receipts or depreciation recovery may also alter the risk profile of an investment.

In addition regulatory risk can arise due to both model and parameter error, with the potential that errors result in a non-commercial cost of capital. Errors in estimating the cost of capital means the regulator may fail to correctly adjust prices at the re-set date or fail to correctly measure returns under an Information Disclosure Regime and this can increase risk.

To illustrate, in the Guidelines and Straw Person Example the Commission adopts a point estimate for the tax-adjusted market risk premium of 7.0%. In our view this fails to recognise that an increase in the market risk premium is likely warranted to reflect the impact of the global credit crisis (see section 6 of our report). If risk premiums have increased, but the regulator persists with the view that the market risk premium has not changed, then in the presence of a general market downturn and fall in equity values, returns for firms subject to regulatory control, under Part 4 of the Commerce Act, will be more negative than otherwise expected. This is because the regulator has failed to correctly allow for an increase in investor risk aversion under a building block model used to set prices. Under a regulatory building blocks approach, however, an increase in investor risk premiums should increase the WACC and hence raise ex-ante prices. Thus, the actions of the regulator can *increase* the firm's beta or level of systematic risk.

### 3 Parameter inputs in the CAPM

#### 3.1 Risk Free Rate used to determine the Equity Side of the Cost of Capital

Determination of the risk free rate is relevant to estimation of the cost of capital under the CAPM and also relevant to the cost of debt capital.

##### 3.1.1 Term of the risk free rate

The Commission in its Guidelines (para. 146) and its Straw Person Example (para. 14) considers that the term of the risk free rate should match the length of the regulatory review period. In this regard, Lally (2004a, 2007a) provides a theoretical model to show that if the term structure of interest rates is upward (downward) sloping then allowed regulated revenues will be too high (low) if using a rate of return longer than the regulated period.

In our view the Commission's position that the term of the risk free rate should match the regulatory review period does not accord with:

- Normal commercial practice. We understand Airports do not seek debt finance that matches a regulatory review period. The regulatory review period is irrelevant in the term of the debt funding decision and Airports will consider:
  - Forecast capital commitments;
  - Funding availability and cost;
  - Refinancing risk;
  - The appropriate mix and terms of debt taking into account capital commitments and other risks to the business;
  - Rating requirements including liquidity margins required;
  - The impact of financial reporting standards with respect of debt maturities and hedging decisions; and
  - Cost of hedging to achieve long term debt profiles.
- The Matching Principle: Firms that are required to finance assets with expected lives greater than a regulatory review period will seek to borrow term debt with a maturity greater than a typical regulatory review period. This is to match the maturity of funds sourced to the expected life of the firm's assets. Much of the Airport's infrastructure assets have expected lives much greater than a regulatory review period;
- Mitigation of re-financing risk. Prudent firms will have debt maturing at different profiles or times than a regulatory review re-set date. This is to reduce re-financing risk and ensure the firm is able to service debt costs on interest and meet any principal repayments in a staggered manner.

- Competitive market behaviour. In a competitive market, many firms undertaking investment decisions based on use of the CAPM to derive a cost of capital are likely to use a risk free rate that as close as possible matches the expected duration of the cashflows from the firm’s assets. For example Brigham and Davies (2007, page 324) raise the question that since in practice a true risk free rate cannot be determined, what “riskless” rate should be used in the CAPM? The authors refer to the study by Bruner et al. (1988)<sup>11</sup> that finds most US firms use a long-term Treasury bond rate to proxy for the risk free rate and agree with this choice. Brigham and Daves’ (2007) reasons are:
  1. *“Common stocks are long-term securities, and although a particular stockholder may not have a long investment horizon, most stockholders do invest on a long-term basis. Therefore, it is reasonable to think that stock returns embody long-term inflation expectations similar to those reflected in bonds rather than the short-term expectations in bills.*
  2. *Treasury bill rates are more volatile than are Treasury bond rates and, most experts agree, more volatile than  $r_s$  (cost of equity capital)*
  3. *In theory, the CAPM is supposed to measure the expected return over a particular holding period. When it is used to estimate the cost of equity for a project, the theoretically correct holding period is the life of the project. Since many projects have long lives, the holding period for the CAPM also should be long. Therefore, the rate on a long-term T-bond is a logical choice for the risk-free rate.”*
- Mitigation of regulatory risk. For firms subject to regulation there is potential for changes in the regulatory framework over time. In the presence of regulatory risk firms will source debt finance that matches the asset life and not the regulatory review period. This is to ensure the firm maintains a prudent commercial treasury policy at all times;
- Internal consistency. The Guidelines (para. 147) state that the Commission considers the:
 

*“... same risk-free rate used to estimate the cost of equity should also be used to estimate the cost of debt. This approach is desirable for two reasons. First, it ensures an internally consistent approach to measuring the overall cost of capital. Second, it is consistent with the Commission’s objective of estimating firm’s financing costs over the regulatory period”* (emphasis added).

The Straw Person Example makes no allowance for any hedge contracts to match the debt maturity to the length of the regulatory review period. Thus, in the absence of any allowance for hedge costs the Commission’s implied position that firms should match the maturity profile of their debt to ensure “*internal consistency*” with the term of the risk free rate and regulatory review period will either (i)

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<sup>11</sup> Bruner, Eades and Harris (1998) note that about two thirds of US firms use long-term treasury bond yields to determine the risk free rate in the CAPM model. In practice firms in a competitive market will often add an increment to any CAPM derived discount rate.

expose the firm to unacceptable re-financing risk, or (ii) provide an outcome that will tend to be NPV negative.<sup>12</sup>

### 3.1.2 Australian regulatory practice

The Australian Energy Regulator (“AER”) (2009) considered the appropriate term for the risk free rate in the CAPM in its recent regulatory decision on the cost of capital for electricity transmission and distribution network service providers. The AER concluded (p173) that:

*“...despite the strong conceptual arguments for a term matching the length of the regulatory period on the equity side, the AER considers it is reasonable and appropriate to take a cautious approach on this matter and retain a 10-year term assumption. This reflects the AER’s concern that refinancing risk not be increased for the sector. ...”*

In reaching its decision the AER noted it was not possible for firms to hedge the credit spread component of the firm’s debt. Maintaining consistency between the term of the risk free rate and the estimate of the market risk premium was also an important consideration as part of the AER’s decision.

We understand, however, the AER assumed that execution and credit margin costs were zero for swapping the floating rate underlying component for the five year regulatory period.<sup>13</sup> Hence, the AER’s conclusions that the effective all up cost of debt for the electricity businesses were equivalent to between a 7 and 8 year fixed rate bond omitted this cost.

### 3.1.3 Recommendation on the term of the risk free rate

We acknowledge there are plausible theoretical arguments with respect to the equity side of the cost of capital that the term of the risk free rate should match the regulatory review period (Lally 2004a, 2007a).

On the other hand there are strong commercial arguments that the appropriate duration of the risk free rate should match as close as practical the expected asset life. In our view this is more consistent with:

- Normal commercial practice. As already noted, we understand Airports do not take account of the regulatory price review period in their debt financing decisions (prior to any hedging decisions);
- Capital budgeting assumptions adopted by firms in workably competitive markets when making investment decisions;

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<sup>12</sup> See Lally (2007a). Internal consistency in the overall measurement of cost of capital would require the first term of the CAPM to be consistent with the term of the risk free rate used to determine the market risk premium. We discuss these points in more detail later in this report.

<sup>13</sup> In discussions with PricewaterhouseCoopers Australia we understand that this cost is currently circa 20-35 basis points per annum in the Australian market.

- The principle that firms will match the duration of assets and liabilities and will seek to mitigate re-financing risk by borrowing debt funds with different (longer) maturity profiles and repayment dates that do not match regulatory re-set dates; and
- Internal consistency in the overall cost of capital measurement.

The observed behaviour by firms (as detailed above) indicates that the assumptions underlying Lally's (2004a and 2007a) analysis fail to fully capture key elements of the real world in which firms operate.

On balance we consider the Commission may wish to take a conservative position on this matter, and consistent with the current regulatory practice in Australia, use a long-term risk free rate commensurate with the long-term asset life of most infrastructure assets. At a practical matter this would suggest either 10-year Government stock yields are the most appropriate benchmark or an average of 5 and 10 year Government bond yields.<sup>14</sup>

In our view the use of a long-term Government bond to proxy for the risk free rate would reduce regulatory risk for firms and provide greater incentives for new investment, where firms are cognisant there is a risk of a change in regulatory practice.

If the Commission still takes the view that the term of the risk free rate in the determination of the equity side of the cost of capital should match the term of the regulatory review period, the same term to maturity of the risk free rate should be used in the determination of the market risk premium. We comment further on this point later in our report.

### 3.1.4 Determination of the risk free rate in the Straw Person Example

The Straw Person Example (para. 14) states the risk free rate is calculated using the current wholesale interpolated mid-yield to maturity for a residual period to maturity equal to the regulatory period for New Zealand Government denominated bonds as reported by Bloomberg. This seems to suggest a process of interpolation to arrive at a yield for maturity equal to five years that matches the assumed regulatory period for electricity distribution businesses.

We note, however, that:

- In the second and third bullet points of The Straw Person Example (para. 14) reference is made to the bid-rate (and not the mid-rate as referred to in the first bullet point of this paragraph); and
- The Guidelines are unclear in respect of the procedure to determine the risk free rate. The Guidelines (para. 142) suggest the Commission will use “*a N-period interest rate as the intercept in the CAPM*” as opposed to a N-period forecast of average future one-period

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<sup>14</sup> This recognises that in New Zealand debt markets Government bonds with a longer term to maturity than 10 years are often not available or are not actively traded in a debt market.

interest rates. However, the Guidelines (para. 224) subsequently state that the five-year Government bond risk free rate will be forecasted using data on the one year Government bond rate.

In our view it would be helpful if the Commission were to clarify its position as to the exact procedure it will use to calculate the risk free rate. We may wish to comment further once the Commission has clarified its position.

## **3.2 Beta**

### **3.2.1 Introduction**

An estimate of beta or systematic risk is an important component in the determination of the cost of equity capital.

The Guidelines and Straw Person Example do not provide any view on the Commission's estimate of an asset beta for Airports. In particular the Straw Person example only provides an asset beta estimate for electricity distribution businesses. Accordingly we would wish to comment in more detail on the systematic risk for Airports in the event the Commission were to determine a beta for Airports.

However, at a fundamental level Airports have significantly different risk characteristics to electricity distribution businesses. We expect that returns to investors in Airports will be more sensitive to changes in macro-economic conditions, demand shifts and other general economic shocks compared to the sensitivity of returns for investors in electricity distribution businesses. We also consider that Airports will have a higher systematic risk exposure to asset optimisation and the risk of asset stranding from demand shifts compared to electricity distribution businesses.

The Commerce Commission (2002) in the Airports Inquiry derived an asset beta by starting with the asset betas for observed US electricity distribution businesses and then adding an increment for greater systematic risk facing airports. While at the time of the Airports Inquiry there may have been insufficient listed airports companies to gain any meaningful measure of an empirical beta estimate, the Straw Person Example (Appendix 1) now provides equity and asset betas estimates for ten listed airport entities.

The simple average unadjusted asset beta for the ten listed airport entities in the Straw Person Example (Appendix 1) is 0.74. This is substantially above the estimate of the asset beta for electricity distribution businesses in the Straw Person Example (0.30 to 0.40) and above the Commission's estimate of the asset beta (0.4 to 0.6) in the Airport 2002 Inquiry.

In our view the Commission should now use comparable company evidence when estimating an Airport beta, and no longer adopt the approach in the Airports 2002 Inquiry whereby adjustments were made to the betas of electricity distribution businesses.

### 3.2.2 Overview of approaches to estimating equity beta

The basic approaches to estimating systematic risk are:

- First principles;
- Direct estimation; and
- Comparable companies.

### 3.2.3 First principles

Factors that impact on the sensitivity of returns to real economic and GNP shocks and hence a firm's beta includes the nature of the service, pricing structure, duration of contracts, market power, regulation, operating leverage and sensitivity of returns to shocks to the discount rate.<sup>15</sup>

#### *Customer Demand*

Passenger income elasticity of demand will provide some information on a first principles estimate of beta for an airport company and in particular the range of the relative risks faced by the three different Airports. In the context of the domestic CAPM, New Zealand residents travelling internationally or offshore on leisure are likely to have the highest income elasticity of demand. The income elasticity of demand is also likely to be high for New Zealand residents travelling internationally on business and for New Zealand residents travelling domestically on leisure. In contrast foreign travellers arriving into New Zealand for leisure may have a lower income elasticity of demand.

#### *Pricing Structure*

The pricing policy of airports and the length that customer prices are fixed will impact on systematic risk to Airports. We understand these are issues that are addressed as part of consultation with airlines when prices are reset under the Airport Authorities Act regime.

In this regard we also understand many of the Australasian Airports have moved to set prices based more on passenger numbers and less on aircraft movements and this practice is becoming more commonplace.

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<sup>15</sup> See Lally (2000).

### *Other*

Airports are potentially exposed to risks from potential asset stranding and asset optimisation of their aeronautical assets. This may have systematic and non-systematic risk components. For instance, a systematic component will arise when a fall in demand due to a general negative economic shock means some aeronautical assets become redundant or surplus to requirements.

Airports also face regulatory risk which can be systematic in nature and increase a firm's beta.<sup>16</sup>

In summary the three Airports may have different pricing arrangements with customers, different passenger and freight mix and different risk exposures to the level of asymmetric risks, asset optimisation and asset stranding. Thus, first principles analysis suggests Airports may face a range of different levels of systematic risk.

### **3.2.4 Direct estimation**

#### *Issues in the empirical Measurement of Beta*

There are a number of issues involved in the empirical determination of beta. These include:<sup>17</sup>

- (i) The return measure. Returns may be measured using either discrete or continuously compounded returns and raw versus excess market returns.
- (ii) The market index. The typical market index is proxied by a value weighted index of listed stocks. The composition of the market index can change over time and a stock's weighting in the index may be subject to rules that restrict the weighting to a stock's "free float" and estimates will vary according to choice of index.
- (iii) The length of the estimation period. In using empirical estimates based on a time series approach there is a trade-off between the length of the estimation period (to ensure a sufficiently large number of observations to obtain statistically reliable estimates) and use of historical data over prior periods that are not relevant to the beta estimation.
- (iv) The sampling interval. There is a choice between the use of daily, weekly or monthly return data. There is evidence that suggests that as the return interval increases, the empirical estimates of betas of large (small) stocks decrease (increase).<sup>18</sup>
- (v) Distributional assumptions. The standard ordinary least squares ("OLS") regression models assume that residuals are normally distributed and uncorrelated with each other.
- (vi) The impact of outliers in the sample can also exert considerable influence over beta estimates.
- (vii) Measurement errors and impact of thin trading. The presence of thin-trading or where stocks do not trade each day tends to bias OLS estimates of beta downwards.

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<sup>16</sup> We refer to our discussion under the heading regulatory risk in respect of this point.

<sup>17</sup> See Brailsford, Faff, and Oliver (1997).

<sup>18</sup> For example see Brailsford and Josev (1997) for Australian evidence.

These measurement issues mean that standard OLS empirical estimates of beta can be very imprecise.

The Commission in its Guidelines (para. 173) recognises that estimated betas can be volatile over time and may vary due to large economic shocks and bubble and/or bust events. Thus, we agree with the Commission's proposal to check beta estimates with monthly data over long periods using a plot of rolling five-year betas.<sup>19</sup>

However, we recommend that the Commission consider more rigorous analysis of the empirical estimates, particularly where the standard errors of the estimate are high and/or where outliers or influential data points may have a material impact on the OLS beta estimates. The Commission may also need to adjust its beta estimates if there is evidence of thin trading.

### ***Bayesian Adjustments to Beta Estimates***

The Recommendations to the Commission by the panel comprising Dr Lally and Professors Franks and Myers on the need for a Bayesian adjustment to empirical estimates are divided.

Dr Lally recommends the Commission avoid making any Blume adjustments to equity betas and that Vasicek adjustments are undesirable if beta estimates are sought for more than one firm in an industry (Recommendations paper, recommendation No 32, page 27). In contrast Professors Franks and Myers consider some form of Bayesian adjustment to the beta estimate may be sensible (Recommendations paper, recommendation No 33, page 27).

### ***Empirical evidence of mean reversion in betas***

Fama and MacBeth (1973) document order bias in OLS beta estimates whereby the further an observed beta estimate is from one, the greater the probability that a sampling error may have occurred. The Vasicek (1973) approach seeks to correct this order bias by shifting beta estimates towards one.

For a sample of Australian firms Gray et al. (2006) conclude the use of a Vasicek beta with a prior estimate of one and derived from four years of monthly returns provide significantly less biased estimates than standard OLS beta estimates.

We recommend the Commission retain an open mind with respect to some form of Bayesian adjustment towards beta estimates. This is particularly given empirical OLS beta estimates are likely to be imprecise, with a wide confidence interval around any expected point estimate value.

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<sup>19</sup> Rolling beta estimates are not provided in the Straw Person Example.

Many academics and practitioners also report adjusted betas (e.g., website of Damodaran, 2009).<sup>20</sup>

### 3.2.5 Commission beta estimates for Electricity Distribution Industries

In the Straw Person Example the Commission provides no comment on its industry beta estimate range for Airports. However, for the electricity distribution industry the Commission's (Straw Person Example, para. 42) industry wide unadjusted beta estimate is in the range of 0.30 and 0.40. The mid-point estimate of 0.35 appears based on the average of the reported asset betas.

It is uncertain how the Commission has calculated its range of the asset beta for electricity distribution businesses of between 0.30 and 0.40. Boyle et al. (2006) show that the standard error of the estimate of the asset beta for a single firm, as opposed to the average asset beta for all firms in the industry, will likely be much higher than 0.1. Boyle et al. (2006) consider a more plausible estimate will be 0.3. For the gas industry, Lally (2008) derives an estimate for the standard error of the asset beta of 0.175.

It should be noted that in earlier decisions, the Commission relied on Dr Lally's approach of including in the estimate of the asset betas for electricity distribution and gas pipeline businesses specific allowances for differences in regulatory regimes and demand characteristics (e.g. Lally, 2008).

### 3.2.6 Multi-divisional betas

The Guidelines (para. 181) note that a firm's overall beta can be viewed as a weighted average of the betas of its component units. Appendix A of the Guidelines provides a discussion of the techniques and challenges in estimating multi-divisional betas.

We agree with the Commission that a firm's overall beta reflects the betas of a firm's component parts, but there are often considerable challenges in estimating pure play betas for firms with multiple business units and where the risk characteristics across business units differ.

Airports derive revenues and profits from both aeronautical and non-aeronautical sources. Non-aeronautical sources include income from retail, car parks, utilities and rental income on property. Some of these activities may have lower asset betas than the Airports' aeronautical activities and others may be higher.

Thus, a priori, it cannot be assumed that the beta of the aeronautical component of airport activities will be lower than the beta of the combined airport (i.e. aeronautical and non-aeronautical activities). It may be both reasonable and practicable to use the beta that is estimated for Airports as the beta for the aeronautical activities.

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<sup>20</sup> Website: [http://pages.stern.nyu.edu/~adamodar/New\\_Home\\_Page/](http://pages.stern.nyu.edu/~adamodar/New_Home_Page/)

The Straw Person Example makes no attempt to adjust the beta for electricity distribution businesses to reflect any difference in risks across different business units.

### 3.2.7 Debt betas and impact on cost of capital

We discuss this specific issue in Appendices 2 and 3 of our report

### 3.2.8 Conclusion on beta

At this stage we are unable to form final conclusions on the Commission’s approach to an estimation of beta. The Straw Person Example provides insufficient details on how the Commission will apply first principles analysis and the results of its empirical analysis (Straw Person Example, Appendix 1) to determine a beta estimate for Airports.

However, we recommend the Commission should use comparable company evidence when estimating an Airport beta, and no longer adopt the approach in the Airports 2002 Inquiry whereby adjustments were made to the betas of an electricity distribution business.

We would wish to make further comments on the Commission’s approach to the estimate of beta for Airports in the event the Commission were to determine a cost of capital for Airports.

## 3.3 Market Risk Premium

### 3.3.1 Introduction

The tax-adjusted market risk premium (“TAMRP”) under the Brennan-Lally CAPM is:

$$\text{TAMRP} = E[R_m] - R_f (1 - T_1)$$

Where:  $E[R_m]$  = expected market return  
 $R_f$  = risk free rate  
 $T_1$  = weighted average investor tax rate on ordinary income

The Commission notes that the market risk premium can be estimated using backward looking (ex-post) methods, forward looking (ex-ante) methods and survey evidence.

The standard market risk premium (“MRP”) is  $E[R_m] - R_f$ .

### 3.3.2 Definition of the MRP and TAMRP in the Guidelines

The Commission preliminary view is that the point estimate of the TAMRP is 7.0% (Guidelines, para. 164).<sup>21</sup>

In our view, however, it is not clear in the Guidelines if:

- This estimate of the TAMRP is measured relative to short or long-term bonds yields or returns;
- Whether or not the Commission considers the risk free rate in the intercept term of the CAPM should match the term of the risk free rate in the determination of the market risk premium. While the Guidelines (para. 147) note the need for internal consistency in measuring the overall cost of capital, the panel in the Recommendations paper (recommendations 11 and 12, page 13) was divided over the need to employ one risk-free rate in the CAPM; and
- The time period that the estimate of the market risk premium relates to (the Guidelines para. 156 and 159 refer to Dimson et al. (2008) type adjustments, whereas Dimson et al (2009) data is now available).

It would be helpful if the Commission clarified its position on these points above.

### 3.3.3 Ex-post methods

The most common ex-post method is to rely on an historical estimate of the annual market risk premium over a long period of time. An alternative method is to apply the Merton (1980) methodology and calculate the market risk premium as a function of the estimated volatility of market returns.

For New Zealand, historical estimates for the New Zealand market are:

<b>Study</b>	<b>Period</b>	<b>Market Risk Premium = <math>R_m - r_f</math></b>	<b>TAMRP</b>
PricewaterhouseCoopers (PWC)	1925 - 2002	5.1%	7.5%
Lally and Marsden (2004)	1931 – 2002	5.5%	7.2%
Marsden (2004)	1931 – 2004	5.9%	7.7%

<sup>21</sup> The Guidelines state the 7 per cent is for the market risk premium. We assume this represents the TAMRP under the simplified Brennan-Lally model.

Historical estimates of the market risk premium based solely on New Zealand data must be interpreted with some care given that over the relevant time period the New Zealand market was subject to price controls and other significant shifts in monetary and fiscal policy.<sup>22</sup> The New Zealand market has also been subject to industry concentration and is less well diversified across different industries compared to many other markets. There is also a high standard error in the estimate.

Other studies on the historical market risk premium include Ibbotson (2008), who measured the historical arithmetic MRP for US stocks for the period 1926 - 2007 at between 7.1% (referenced to the S&P and long-term bonds) and 8.50% (referenced to the S&P and short-term bonds). Similarly, Damodaran (2009) provides a historical arithmetic estimate of the MRP for the US market over the period 1928 -2008 of 5.32% (stocks minus Treasury bonds) and 7.30% (stocks minus Treasury bills).

For Australia a study by Brailsford et al. (2008) reports an historical equity risk premium of 6.6% (arithmetic mean relative to bills) and 6.2% (arithmetic mean relative to bonds) over the period 1883 – 2005. This is after consideration of the data quality prior to the 1958 year.

### 3.3.4 Ex-ante or forward looking methods

The ex-ante or forward looking method to estimate the MRP is mostly based on approaches adopting discounted cash flow or dividend discount rate models.

Most forward-looking estimates of the MRP are lower than the historical estimates of the MRP. For the New Zealand market, Lally (2001) estimates a forward looking market risk premium under the standard version of the CAPM of 3.8% to 5.9% and for the tax-adjusted version of the CAPM a range of 5.8% to 7.9%. For the US market Fama and French (2002) generate forward-looking estimates for the US standard market risk premium of 2.6% - 4.3% over the period 1951 -2000. Similarly Claus and Thomas (2001) generate estimates of the MRP for a number of countries with a maximum of 3.0%.

Ibbotson and Chen (2003) argue, however, based on a decomposition of historical equity returns into supply factors of inflation, earnings, dividends, the price to earnings ratio, dividend payout ratio, book value, return on equity and GDP, that the forecast arithmetic MRP (relative to long-term bonds) is around 6.0% for the United States.<sup>23</sup> Similarly Mehra (2003) on the equity risk premium puzzle concludes that the MRP is likely to be similar to what it has been in the past.

The recent credit crisis will have increased forward looking estimates of the market risk premium if the fall in equity prices reflects, at least in part, an increase in investor risk aversion.<sup>24</sup>

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<sup>22</sup>The limitations of historical evidence based solely on the New Zealand market are recognised by the Commission in its Guidelines (para. 161).

<sup>23</sup>The equity risk premium puzzle refers to the inability of standard economic models to explain why the MRP has been so high in many developed countries such as the United States.

<sup>24</sup> The impact of the credit crisis may also reduce expectations of forward looking profit and growth rates.

### 3.3.5 Survey evidence

Survey evidence generally report estimates of the market risk premium below long-term historical estimates. A summary of some studies are provided below:

<b>Author</b>	<b>Market</b>	<b>Average MRP</b>
Lally, Roush and van Zijl (2004)	NZ	5.5% -7.0% (standard CAPM) 7.4% - 8.9% (TAMRP)
Welch (2008)	US	5.74% (arithmetic premium)
Graham and Harvey (2009)	US	4.74%
Fernández (2009)	US UK Australia	Finance Professors 6.3% 5.5% 5.9%
AER (2009)	Australia	5.94% (Average of independent expert valuation reports) 5.09% (Average MRP of broker ‘dailies’)

### 3.3.6 Are Historical estimates of the MRP / TAMRP a good ex-ante estimate of the MRP / TAMRP for New Zealand

As noted, the Commission’s current preliminary view is that the TAMRP is 7.0 per cent, although it will consider submissions that provide robust analysis as to the sustained (rather than transitory) effects of the recent financial turmoil (Guidelines, para. 164).

We partly agree with the Commission’s view (Guidelines, para. 159) that the most helpful starting point for the MRP and TAMRP estimation is ex-post techniques, with ex-ante estimates as a cross-check to ex-post estimates. In our view the Dimson et al. (2009) estimates adjusted for long-term trends in price earnings ratios is a forward looking or ex-ante measure.

It is important to recognise any estimate of the market risk premium is imprecise and subject to measurement errors.

Factors that differentiate the New Zealand market from other major world markets include New Zealand’s small market size, exposure to country risk, taxation and differences in market composition (Bowman, 2005; Synergies Economic Consulting, 2009).

In our view the most relevant factors that distinguish the New Zealand market from other markets are market size and market composition. In particular the New Zealand market is small and less diversified compared to other large more developed markets. Historically the New Zealand market has also exhibited a higher average standard deviation of returns compared to many other markets.

### 3.3.7 Size of the New Zealand market

The New Zealand market is very small in international terms. The total New Zealand market capitalisation of New Zealand resident listed stocks is below 1% of the total world capitalisation of stocks.

A small firm risk premium has been documented in many markets. For the US market, Ibbotson (2008, Table 7.2) provides size-decile portfolios of the NYSE / AMEX/ NASDAQ, Largest company and its market capitalisation by decile as at 30 September 2007. This shows:

<b>Decile</b>	<b>Market capitalisation of largest company (in millions USD)</b>	<b>NZD equivalent market capitalisation (using 1 NZD = 0.7598 USD)</b>
3	9,207	\$12,117,285
4	5,013	\$6,597,232
5	3,423	\$4,504,795

Source: Ibbotson (2008), Tables 7.2 and own analysis

As at 1 October 2007 we calculate New Zealand's five largest listed resident stocks by market capitalisation were:

<b>Company</b>	<b>Market Capitalisation as at 1 Oct 2007 (in thousands)</b>	<b>Rank in US Size Decile</b>
Telecom	\$8,026,955	3
Fletcher Building	\$6,380,860	4
Contact Energy	\$5,305,033	4
Auckland Airport	\$3,848,325	5
Trustpower	\$2,658,164	5

New Zealand’s largest market capitalisation stock (Telecom) would have ranked in the third size decile of US stocks. US stocks in this size decile earned on average 2.40% p.a. excess return over the largest decile return stocks over the period 1926-2007 (Ibbotson, 2008).

The next largest firms (Fletcher Building and Contact Energy) fall within the 4th size decile. The remaining NZ listed stocks would rank in the 5<sup>th</sup> size decile or below. US stocks in the 4<sup>th</sup> and 5<sup>th</sup> decile earned excess returns of 2.80% and 3.50% over the largest decile stocks for the period 1926 – 2007 (see Ibbotson, 2008, Table 7.4).

The evidence of Ibbotson (2008) also shows a negative relationship between the ordinary least squares beta estimate and portfolio size of US firms. From an international investor’s perspective this suggests the New Zealand market in aggregate may have a high beta.

### 3.3.8 Market composition and historical differences in variance of returns between markets

Dimson et al. (2009) provide an estimate of the historical risk premium for a number of developed countries over the period 1900 to 2008. These historical estimates for certain countries are summarised in the table below.

**Table 5. Worldwide equity risk premiums: 1900 - 2008**

Country	Arithmetic mean % (relative to bills)	Arithmetic mean % (relative to bonds)
<b>Average (17 Countries)</b>	<b>6.7</b>	<b>5.7</b>

**Based on data sourced from: Dimson et al. 2009, Tables 9 and 10.**

For the New Zealand market Lally and Marsden (2004, Table 2) provide an estimate of the standard deviation of the standard MRP (relative to bond yields) of 22.2% for the period 1931- 2002. This exceeds both the average standard of returns for the 17 countries (21.9%) reported by Dimson et al. (2009) and the standard deviation of world returns (15.6%).

The historical standard deviation of returns for the New Zealand market has also exceeded the historical standard deviation of returns for the Australian market (19.5%) and the UK market (16.90%) reported by Dimson et al. (2009). For the Australian market Brailsford et al. (2008) also report an historical standard of 16.0% over the period 1883 to 2005. Lally (2007b)<sup>25</sup> notes such evidence is consistent with the Australian market and the UK market being more diversified than the New Zealand market.<sup>26</sup>

<sup>25</sup> See Lally (2007) footnotes 10 and 18.

<sup>26</sup> Also see Merton (1980) that models the MRP as a function of market variance.

In our view the New Zealand market, being a small undiversified market, is exposed to greater catastrophic risk that may cause a dramatic drop in wealth. For instance, in addition to world catastrophic risk the New Zealand market faces “unique risks” that by their nature would likely have a large scale systemic impact on our economy. These are relevant risk factors to investors under the domestic simplified version of the Brennan-Lally CAPM and include:

- Risk of an earthquake, volcanic or other natural disaster;
- The reliance of the New Zealand economy on agriculture exposes the economy to risks such as outbreak of “foot and mouth” disease; and
- Pandemic risk that may lead to border closure.

The undiversified nature of the New Zealand market and greater exposure to catastrophic risk means the risk premium in New Zealand will be expected to be greater than the market risk premium in larger more diversified economies.

### 3.3.9 TAMRP for NZ using historical estimates

The table below calculates an estimate of the TAMRP based on the historical average of the MRP reported for the 17 counties examined by Dimson et al. (2009). We then add an increment of 1.7% to convert the standard MRP to the TAMRP. Lally and Marsden (2004) report a difference for New Zealand of 1.7% over the period 1930 – 2002 between the standard and tax-adjusted market risk premiums.

<b>Table 6</b>		
<b>Risk premium</b>	<b>Average historical MRP for the world capital markets 1900-2008. Source Dimson et al. (2009)</b>	
	<b>Estimate relative to bills</b>	<b>Estimate relative to bills</b>
Standard MRP	6.7%	5.7%
<i>Add: Increment for the difference between the MRP and TAMRP</i>	1.7%	1.7%
<b>TAMRP</b>	<b>8.4%</b>	<b>7.4%</b>

Based on the historical evidence of Dimson et al. (2009) the TAMRP measured relative to bills is 8.4% and measured relative to bonds is 7.4%. This is prior to any increment for a size effect or lack of market diversification.

### 3.3.10 Consistency with the intercept term of the risk free rate in the CAPM and term of the risk free rate in the MRP / TAMRP

In the Recommendations paper (para. 36-37) we note that some disagreement exists between Dr Lally, Professor Myers and Professor Franks on whether or not the first term of  $r_f$  (intercept term) in the CAPM should equal the term to maturity of  $r_f$  in the MRP or TAMRP of the CAPM.

Dr Lally acknowledges that under his recommended approach, two different risk-free rates may arise in the CAPM formula. Dr Lally argues that this is a pragmatic modification of the CAPM to preserve the NPV = 0 principle.

The assumption of consistency between the maturity of the first term of  $r_f$  in the CAPM and the term of  $r_f$  in the MRP /TAMRP (second term of the CAPM) is important, given historical estimates of the MRP / TAMRP generally show the estimate is higher measured relative to bills than long-term bonds.

The Brennan-Lally CAPM may be restated as follows:

$$E(R_j) = R_{f \text{ intercept}} \times (1-T_i) + \beta[E(R_m) - R_{f \text{ MRP}} \times (1-T_i)]; \text{ or}$$

$$E(R_j) = E(R_m) + (R_{f \text{ intercept}} - R_{f \text{ MRP}}) \times (1 - T_i) \text{ if } \beta = 1$$

If the firm has a beta of one and exactly matches the risk of the market portfolio, its expected rate of return should also equal the market rate of return. However this result will not be achieved if  $R_{f \text{ intercept}}$  does not equal  $R_{f \text{ MRP}}$ .

The AER (2009) in its recent regulatory decision also acknowledges the importance of maintaining consistency in the term of the risk free rate throughout the CAPM.

In our view the same measure of the risk free rate should be used consistently within the CAPM.<sup>27</sup>

### 3.3.11 Conclusion on MRP and TAMRP

In determining the risk premium for the New Zealand market the Commission should take into account the small size of the New Zealand market and the less diversified nature of the New Zealand economy compared to other larger offshore markets.

The Commission should ensure consistency in the term of the risk free rate throughout the CAPM.

Our recommendation is that the Commission should raise its mid-point estimate of the TAMRP (measured relative to long-term bonds) to at least 7.5%, with recognition there is a wide range around this point estimate. The impact of the financial credit crisis on the market risk premium and debt premium is also discussed in section 6 of our report.

If the Commission takes the view that the first term of the risk free rate should match the regulatory review period, then the same term for the risk free rate should be used in the determination of the market risk premium.

In our view the MRP / TAMRP measured relative to short-term bonds will be higher than 7.5% (to maintain consistency with the firm term of the risk free rate in the intercept). Based on the evidence of Dimson et al. (2009) that historical worldwide bond term premiums are in the order of approximately 1.0%, we believe an *increment* of 1.0% to the point estimate of the MRP / TAMRP would be justified if returns are measured relative to short-term risk free rates.

In the Recommendation paper (para. 38) we note that Professor Franks also disagrees with the Commission's statement in the Draft Guidelines (para. 94) that the MRP is invariant across different time horizons.

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<sup>27</sup> See Boyle, Evans and Guthrie (2006) for a more detailed explanation as to why consistency in the measurement of the risk free rate term in the CAPM is a necessary condition.

## 4 Debt Premium

### 4.1 Requirement to Hedge and Match the Term of Debt Finance to the Regulatory Review Period to ensure NPV = 0?

The Commission in its Guidelines (para. 147) notes that the same risk free rate used to estimate the cost of equity should be used to estimate the cost of debt.

On the debt side of the cost of capital we strongly disagree with the Commission's implied position that the term of the risk free rate should match the regulatory review period and hence the term of the risk free rate and the regulatory period should form the basis to determine the debt risk premium. That is, we understand that if Commission adopts a five year price review period, the Commission proposes the debt margin should be set as the margin over the five year Government stock rate.

Lally (2007a) considers the appropriate term of the risk free rate in a regulatory price control environment with the presence of corporate debt. He concludes that to ensure the NPV = 0 criterion for equity holders is satisfied, the term of the risk free rate should match the time period of the regulatory cycle. However this also requires that the firm match the duration of debt to the time period of the regulatory cycle.

Lally (2007a, p80) notes that failure of the firm to match its duration of debt to the regulatory cycle:

*"... lead to cash flows to equity holders whose net present value will tend to be negative, and will also inflict interest rate upon equity holders"* (emphasis added).<sup>28</sup>

Prudent firms in a competitive market will not seek to have all their debt maturities matching a defined price or regulatory review period. Rather debt will be structured to mature in a staggered manner over periods other than a price or regulatory re-set date. This is rational to reduce refinancing risk. In the present financial environment where access to debt markets is more constrained than it has been for many years, re-contracting and re-financing risk is a paramount issue for many firms.

To match the duration or term of debt to the regulatory cycle<sup>29</sup>, firms will therefore need to offset any interest rate risk in the swap or derivatives markets. In this respect the Guidelines (para. 148) note that if regulated firms borrow for periods longer or shorter than the regulatory cycle, any interest rate risk associated with different debt maturities could be offset in the interest rate swap market.

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<sup>28</sup> Lally (2007, p80) also states, however, that the "firm's choice of the longer duration of debt cannot justify the regulator lengthening the term of the risk free rate used in setting prices because the only effect from doing so will be to exchange a net present value on the cash flows to equity holders that tends to be negative for one that tends to be positive."

<sup>29</sup> We assume any difference between the duration and term of debt will be relatively small. In the Recommendations paper (para. 59) Dr Lally argues that the matching of terms rather than durations provides a close approximation. We agree with Dr Lally's arguments in the case of assets with an expected asset life much greater than the price review period.

In this regard, however, the Commission's Straw Person Example provides no increment to the debt premium for "hedging costs" to recognise that:

- Firms will have strong incentives to borrow for a duration and term other than the regulatory review period; but
- Under the Commission's approach, and in the spirit of Lally's (2007a), the firm will have "incentives" to match the firm's debt duration to the regulatory cycle.

Lally (2009a) recognises that in the case of the TSO provider a prudent firm would seek to borrow for a term longer than the regulatory review period (in this case a period of one year). For the TSO provider Lally considered the option where the firm borrows for a term longer than the regulatory period to be clearly superior both in cost terms and to minimise re-financing risks. To calculate the appropriate debt risk premium Lally included estimated hedging costs to convert a five year loan to an effective one year loan with annual resetting of the cost of debt.

We note, however:

- The AER considered it was not possible for firms to hedge the credit spread component of the firm's debt. We agree with the AER's conclusion;
- In our view, Lally's (2004a) and (2007a) analytical models rely on the key assumption that any regulator will correctly re-set prices at any price review date. In the presence of regulatory risk or regulatory uncertainty, the expected NPV = 0 outcome may not be in fact be achieved; and
- It may not be feasible to fully hedge all debt for the regulatory period when the level of debt changes throughout the regulatory period and there is uncertainty as to the timing of debt requirements due to capital expenditure programmes and changes in fixed and floating rate debt sources.

In summary we consider the length of the regulatory period is irrelevant in respect of the term of debt financing decisions (prior to any hedging decision). The key fundamentals are certainty of debt funding, when required, and long term cost. We also note some funding agreements for Airports may be for shorter than the regulatory period but this is due to availability and cost issues rather than the duration the debt is required.

#### 4.1.1 Impact of hedging on accounting reported earnings

Mr Robertson of Auckland Airport commented at the Cost of Capital workshop that implementing such an approach to interest rate hedges in the manner proposed by the Commission / Lally (207a, 2009a) actually exposes firms to increased volatility in reported earnings due to current accounting standards. That is changes in the value of “hedged on hedges” must be reported in current earnings.<sup>30</sup>

To illustrate assume a regulatory price review period of five years. A prudent firm that seeks to match the term of debt finance to the life of its assets and to mitigate refinancing risk may borrow for a longer term period of 10 years. In the New Zealand market this could be at a fixed interest rate.

To swap 10 year fixed rate debt into five year fixed rate debt (to match the regulatory review period), the firm may have to effectively enter into two interest rate swaps. That is:

- An interest rate swap to pay 10 year floating rates and receive 10 year fixed; and
- An interest rate swap to pay 5 year fixed and receive 5 year floating rate.

We understand this type of swap transaction would not fall within the definition of a “hedge contract” under the New Zealand equivalent to International Financial Reporting Standards to enable hedge accounting, and consequently there would be a requirement to mark-to-market the swap contracts at each balance date, with any gain or loss reported through the profit and loss statement.

This potential for volatility in reported accounting income due the mark-to-market derivative gains or losses will likely make returns more difficult to analyse and interpret under an Information Disclosure Regime.

Commission Mazzoleni commented at the Commission’s Cost of Capital Workshop that:<sup>31</sup>

*“But that would be for regulatory accounts only because it will only be a notional swap back for the five year period for regulatory purposes.”*

If such hedges were “notional” and not “real” we question how this approach can be consistent with Commission’s concept of NPV=0 for a defined price review period or how such hedges would be consistent with competitive market outcomes.

#### 4.2 Determination of the Debt Risk Premium and Debt Standby Costs

The Airports source debt from a variety of markets, in differing amounts and at different time periods between the three Airports. This includes debt that may be sourced from the bank domestic market, public and private debt markets, and offshore markets.

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<sup>30</sup> Cost of Capital Workshop Transcript, page 132, lines 7-12.

<sup>31</sup> Cost of Capital Workshop Transcript, page 132, lines 13-14

The Commission should recognise there is a range of debt cost and issuance costs for the Airports.

We understand that the three Airports have received a request to provide information on the historic costs of current debt. In our view it is important that the Commission considers:

- That Airports have debt underwriting agreements and standbys with banks to provide funding certainty. For example, we understand that Airports have historically accessed considerable funding from the commercial paper market which has largely dried up. We further understand bank standbys were in place in case there was no market demand for the commercial paper. This situation occurred early in the credit crisis. The cost of such arrangements, where they are not part of existing drawn debt, but essential to maintain an investment grade credit rating need to be included in funding cost assumptions established by the Commission;
- The Commission in its analysis of balance sheet debt and costs must recognise that Airports have to maintain finance facilities above actual debt levels. This is to maintain liquidity that is sufficient, among other reasons, to provide access to cash for working capital, future capital expenditure, adverse events or shocks. If adverse events occur it would be difficult to obtain new funding at that time and could result in default and / or bankruptcy; and
- The cost of debt should be based on forward looking costs. The historical cost and debt premiums that Airports may have raised debt in the past may have no relevance to the cost and debt risk premiums faced by Airports when seeking to refinance debt in the current economic environment.

#### **4.2.1 Bank Debt Market**

We understand that corporate debt sourced from the bank market is typically priced at a premium to the swap rate plus a borrowing margin that reflects the firm's credit risk.

#### **4.2.2 Use of traded bond yields**

The Straw Person Example (para. 44) proposes to use comparable company analysis as its primary approach to estimating the industry wide debt premium ("Debt Premium Method 1").

In our view caution should be used in taking traded bond yields as representative of the cost of debt for firms.

Data on the behaviour of credit spreads in New Zealand during the financial crisis is limited. The small size of the bond market, the lack of analyst coverage and the relatively unsophisticated investor base mean that corporate bond yields are heavily influenced by short-term liquidity considerations rather than by economic fundamentals, in contrast to the market for bank funding.

For example, the yields reported by ASB Securities in mid-August 2009 for eight bonds issued by five utility companies (AIAL, WIAL, Contact Energy, Vector and Telecom) with terms to maturity between three and seven years show according to our calculations an average spread to interpolated New Zealand Government stock rates of 1.79% (ASB Securities, 2009c). This spread is low by international standards.

Table 7 below provides summary data on mean credit spreads on 1 – 5 year corporate bonds in Australia for various rating categories at four points in time: June 2007 – over a month before the global finance crisis struck in August 2007, June 2008 – several month before the failure of Lehman Brothers, March 2009 – the height of stress in global bonds markets, and finally August 2009. All spreads are measured relative to yields on Australian Commonwealth Government bonds.

**Table 7: Bond spreads in Australia**

	Ratings category		
	AA	A	BBB
June 2007	58	66	88
June 2008	216	265	267
March 2009	301	485	574
August 2009	128	294	400

Source: Reserve Bank of Australia

The data in Table 8 show that corporate bonds issued by credits in the range A/BBB carried spreads between approximately 300 and 400 basis points in August 2009. These spreads are approximately 1.5 to 2 times the level of the debt risk premiums reported in the Straw Person Example.

Furthermore, credit spreads on bonds in the New Zealand market do not appear to have shown the responsiveness to changes in underlying credit market conditions. For example, on 12 September 2008, a week prior to the collapse of Lehman Brothers, the yield on A rated TCNZ Finance (Telecom) March 2013 bond was 7.75%, a premium of 2.03% points to the yield of 5.72% on the benchmark five-year bond, NZGS April 2013 (ASB Securities, 2008). On 20 March 2009, the mid-quote on the TCNZ Finance March 2013 bond was 6.22% versus 3.83% on the benchmark five-year bond, giving a premium of 2.39%, an increase of 0.36% since mid-September 2008 (ASB Securities, 2009a). In contrast, the average spread in the Australian market for A rated corporate bonds had risen by 1.59% (from 3.26% to 4.85%) over the same period in response to increased risk aversion on the part of bond market investors (Reserve Bank of Australia, 2009).

The influence of short-term liquidity considerations on implied debt risk premiums in the New Zealand market is clearly illustrated by the behaviour of the credit spread on the Vector October 2014 bonds issued in May 2009. On 27 May 2009 Vector issued \$150 million of senior bonds that were unsecured, unsubordinated debt. The Vector bonds were indicatively priced at 275 basis points over the five-year swap rate or a minimum of 7.5%. The bonds were issued with a coupon of 7.80% p.a., paid semi-annually (ASB Securities, 2009b).

The five-year swap rate at the time was 4.81% and the yield on the five year benchmark maturity at the time (i.e. issues maturing 15 April 2013) was 4.66%. The implied debt risk premium on issue was

therefore 3.14% but by the end of September 2009 the spread in the secondary market was down to 2.00% (see Table 8 below).<sup>32</sup>

**Table 8: Pricing of Vector 15/10/2014 bonds in the secondary market**

Date	Yield: Vector 15/10/2014	Yield: NZGS 15/04/2013	Spread
27 May 2009	7.80%	4.66%	3.14%
26 June 2009	7.85%	4.87%	2.98%
31 July 2009	7.30%	4.80%	2.50%
28 August 2009	7.00%	4.91%	2.09%
25 September 2009	6.90%	4.90%	2.00%

Sources: Vector bond yields, National Business Review; NZGS yields, Reserve Bank of New Zealand

### ***Reasons for the compression of the spread***

The compression of the Vector October 2014 bond spread can be largely attributed to the problem the domestic bond market faced in absorbing the proceeds from the redemption of \$3.5 billion of maturing Government stock in mid-July 2009. ASB Securities noted in its NZ Fixed Interest Summary of 21 August 2009 (ASB Securities, 2009c):

*“After the 2009 government bonds maturity, the market has been heavily supported by excess liquidity. No big new issue has come to the market since Vector and Rabobank. This has caused a significant surge in bond prices across the board, most investment grade rated bonds have seen large falls in their yields, and several issues are almost impossible to source.*

*We expect this liquidity problem will continue until at least September ....*

*Investors considering liquidating their portfolio in the short term can consider selling now, as demand is very high on most decent quality securities and there is not much selling competition”.*

However, any excess liquidity in the bond market may be temporary only. We note that the New Zealand government is expecting to run substantial fiscal deficits in the near term and this will increase the government’s borrowing requirement. The government intends to issue up to \$8.5 billion of Government bonds in 2009/2010, increasing this to \$11.5 billion in 2010 and to \$15 billion in the 2011/12 and 2012/13 fiscal years (New Zealand Debt Management Office, 2009).

In addition, firms may be expected to turn to the corporate bond market to obtain medium-term to long-term funding that will not be available from the banking system. In our view the projected

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<sup>32</sup> A more accurate reference yield would be the interpolated yield for a term to maturity of five years or a term to maturity matching the maturity date of the Vector bonds. Unfortunately this data is not readily available.

increase in bond issues by both the Debt Management Office and corporate firms may raise the level of market yields and increase the corporate bond spread.

#### 4.2.3 Bloomberg's A long term credit rated fair value curve

The Straw Person Example (para. 45) proposes to use information from Bloomberg's A long term credit rated fair value curve as its "Debt Premium 2" method.

In our view there are potential significant limitations to the use of Bloomberg fair value curves. Recent submissions to the AER have drawn attention to the limitations of the Bloomberg fair value yield curve (Hird, 2009; VEDB, 2009; VDNSP, 2009).<sup>33</sup> The issues these submissions have raised are as follows:

- Bloomberg fair value yield curves were originally designed as a tool to indicate where relative value lay i.e. which bonds were trading at an expensive or cheap price in the market. They were never designed to operate as a regulatory measure of the cost of debt;
- The manner in which the curves are calculated is not transparent and involves considerable discretion;
- The approach taken by Bloomberg and the regulator to remove outliers cannot be justified; and
- The movement in the Bloomberg curves over time is not consistent with consensus opinion on the effects of the global financial crisis. In particular, Bloomberg-based measures of the spread on corporate bonds did not reflect the widening of market spreads that occurred in late 2008 when investor risk aversion and the flight to quality drove government bond yields down and the yields on corporate bonds in the other direction.

Hird (2009) details other methods for calculating the debt risk premium, including data on corporate bond spreads collected by the Reserve Bank of Australia and data on bonds recently issued by Australian non-financial corporations in both Australia and the US. The author argued that adopting any one, or combination of these methods, would result in a benchmark rate at least 1.5% higher than the rate derived from the AER/Bloomberg fair value curve. Hird (2009) concluded that the Bloomberg fair value curve delivered downwardly biased estimates of the debt risk premium.

Hird (2009) also compared the AER/Bloomberg methodology with that used by CBASpectrum. Both organisations produce estimated fair value curves. Although the details of the precise methodology each organisation employs is proprietary knowledge, Hird (2009) inferred that CBASpectrum used more market information in fitting its fair value curves and that the fair value curves for the different ratings categories were determined jointly.<sup>34</sup>

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<sup>33</sup> Victorian Distribution Network Service Providers, 2009, AER draft determination on 2009-2011 AMI budget and charges applications. Joint submission by the Victorian DNSPs on the debt risk premium, 11 September 2009; and Victorian Electricity Distribution Businesses, 2009, Response to IPART Discussion Paper. Estimating the debt margin for the weighted average cost of capital. Joint submission by the Victorian Electricity Distribution Businesses, 19 June 2009.

<sup>34</sup> More specifically, Hird (2009) suggested that the Bloomberg fair value curve was anchored at the seven-year maturity by the yield on a seven-year Santos bond and was relatively flat beyond that point, which seemed

Lastly, Hird (2009) noted that the Bloomberg methodology produced estimates of the BBB fair value curve that were consistently 0.0% to 0.50% higher than the estimates of the CBASpectrum BBB+ fair value curve during period between mid-2003 and mid-2007. However this divergence reversed with the onset of the global financial crisis and by late 2008 the Bloomberg methodology was yielding estimates between 2.00 and 2.50% below those of CBASpectrum. This suggested that while the two methodologies yielded similar results during normal times, the Bloomberg methodology proved to be less reliable during times of turmoil in financial markets.

#### **4.3 Comment on the Straw Person Example’s Approach to Computing Debt Premiums and Use of Comparative Firm Analysis**

The Straw Person Example (paras 46 - 52) uses comparable company analysis to estimate the industry wide debt risk premium.

In our view there are a number of potential problems with the application of the comparable company analysis in the Straw Person Example:

- The apparent exclusion of the data from Powerco seems arbitrary and appears to be based on the assumption that the difference in spreads over benchmark government stock yields vis-à-vis bonds issued by other electricity or infrastructure businesses may reflect issues associated with its shareholders. While the Straw Person Example (para. 48) notes that Powerco’s circumstances are different to the other entities, it is arguable that Transpower’s and Genesis’ debt risk margin should also be ignored given these are NZ Government owned entities that may enjoy an implicit Government guarantee<sup>35</sup>; and
- The computation of spread over government stock seems unduly reliant on quotes supplied by ANZ National (Straw Person Example, para.46). We suggest an alternative reference point may be the spreads to swap prices available from the New Zealand Financial Market Association (NZFMA).<sup>36</sup> The NZFMA’s daily *NZ Credit Market Pricing Service* commenced operation on 1 October 2009 provides daily average midrate spread to swap prices on a range of New Zealand dollar-denominated instruments including corporate bonds.<sup>37</sup> Contributing banks include ANZ National, ASB Bank, BNZ and Westpac (NZFMA, 2009).<sup>38</sup> It should be relatively

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typical of Bloomberg practice. This meant that the debt risk premium on a 10 year BBB+ rated issued was affectively tied to the debt risk premium on the seven-year Santos bond. Hird (2009) then noted that the Santos bond was an unreliable proxy for the benchmark BBB+ rate as its average yield over the regulatory fixing period was below that of most bonds with a rating of A- to AA-. The author argued that the low yield on the Santos bond was likely due to the firm’s very strong balance sheet, with the December 2008 financial statements showing cash and cash equivalents approaching A\$2.0 billion and interest-bearing debt of only \$2.5 billion.

<sup>35</sup> For instance, in Table 4 of the Straw Person Example the debt margin on Genesis bonds is 1.87% and the debt margin on Vector’s bonds is 2.13%. The credit rating for Genesis and Vector is, however, the same.

<sup>36</sup> See New Zealand Financial Market Association <http://www.nzfma.org/>

<sup>37</sup> Corporate bonds must have a minimum issue volume of \$50 million to qualify for pricing.

<sup>38</sup> Ibid.

straightforward to adjust these spreads for the spread between swap rates and the yield on NZ government stock.

#### **4.4 Allowance for Debt Issuance Costs**

The Guidelines (para. 78) proposes that debt issuance costs be included as an allowable cash outflow and the expense to be amortised over any regulatory review period.

We agree that debt issuance costs associated with prudent re-financing are a legitimate expense. However, as a practical matter we recommend debt issuance costs are added to the cost of debt and included in the cost of capital, rather than allow for debt issuance costs in the cash flows. In our view the Commission's approach:

- Is inconsistent with our understanding of the way financing decisions are made by Airports which compare the total costs associated with all funding options;
- Would result in unnecessary complexity though taking a different approach than is required for annual financial reporting;
- Would create an anomaly in regulatory reporting as this may be the only financing item that would be included in cash flows; and
- Would lead to an inconsistency with the pricing consultation process undertaken with airlines, where we understand the total costs of debt are included in the WACC.

#### **4.5 Allowance for Hedging Costs**

As already noted if the Commission persists with its view that the term of the risk free rate in the should match the term of the regulatory review period, then an allowance for expected additional debt hedging costs should be provided (also see Lally, 2009a). In this case we recommend that the Commission seeks advice from an independent Treasury market expert on the feasibility of hedging and likely costs.

We note, however, the implication that Airports should hedge their debt and interest rate risk in the manner proposed by the Commission will lead to the potential for volatility in reported accounting income. This is due to the requirement to mark-to-market derivative gains or losses, with changes in value reported as income or expenditure (see section 4.1.1 of our report).

#### **4.6 Conclusion on debt premiums and debt costs**

The Commission should recognise that Airports source debt from a variety of debt markets and for terms that differ from a regulatory review period.

We believe caution should be used in taking traded bond yields as representative of the cost of debt for firms. The small size of the bond market, the lack of analyst coverage and the relatively

unsophisticated investor base mean that corporate bond yields are heavily influenced by short-term liquidity considerations rather than by economic fundamentals.

The cost of debt should be based on forward looking costs and include underwriting costs and debt standby costs that provide a liquidity buffer and protect debt ratings.

We consider it more practical to include debt raising costs in the cost of debt and not as an allowance in the expected cash flows under a building blocks model.

If the Commission still takes the view that the term of the risk free rate should match the price review period, the costs of hedging debt and interest rate risk to match the regulatory review period should be allowed in the debt premium.

Overall we recommend that the Commission seeks advice from an independent Treasury market expert on the expected costs of raising or refinancing debt in the current climate for suppliers with different leverage, debt make up and rating profiles.

## 5 Leverage

### 5.1 Leverage ratio

#### 5.1.1 Commission's view

In the Commission's view:

- A business should be allowed appropriate flexibility over their borrowing policies if it is within reasonable bounds (Guidelines, para. 202).
- To provide incentives for firms to adopt prudent leverage ratios the Commission will set the debt premium at a level consistent with an investment grade credit rating, (Guidelines, para. 208);
- In the case of a regulatory review period equal to five years, the allowed debt risk premium will be measured as the average yield spread paid by firms issuing plain-vanilla corporate debt with a maturity of five years and a rating of A- or BBB+ (Guidelines, para. 224); and
- Financial ring-fencing is not feasible at present time (Guidelines, para. 216).

#### 5.1.2 Our view

We agree that businesses should be allowed flexibility over their borrowing policies within reasonable bounds (which may be quite large).

In this respect the three Airports face different capital expenditure requirements and may have different treasury policy criteria set by the individual Airport's board. Thus, the three Airports may at times have different leverage positions and target different investment grade credit ratings. The Commission should not penalise firms that adopt different leverage positions within reasonable bounds.

We understand that from a practical and commercial perspective the Airports also wish to retain the flexibility to finance their business on a consolidated basis, consistent with workably competitive markets.

#### *Leverage and Debt Ratings*

Under an Information Disclosure Regime if the Commission is to consider adopting minimum benchmark ratings for Airports it should be at an investment grade level of BBB (i.e. one notch above the minimum investment grade credit rating).

An unnecessary high ratings benchmark may constrain future investment as the three Airports and their shareholders may not invest if they have other more productive uses of capital and are not willing to increase debt funding if compensation is not allowed in the WACC for the cost of the debt.

For example, if an Airport is rated A- or BBB+ now and a significant investment was to result in a downgrade to BBB the Airport may defer the investment if it were not compensated for the cost at this rating level.

Any benchmark credit rating that the Commission assumes when deriving the cost of debt should be consistent with the relevant firm's financeability requirements and constraints (e.g., capex requirements etc) and consistent with the benchmark gearing level that is assumed.

We note that size differs between the three Airports. Size can impact on a firm's credit rating and ability to access debt finance.

The credit rating agencies themselves are also being subject to considerable scrutiny at present due to the number of rated firm failures during the global credit crisis and as a consequence are taking a more conservative view of credit risk. It is possible that this scrutiny will result in the rating agencies adjusting their risk criteria and lowering current ratings as a result. In this circumstance a number of regulated supplier's ratings could fall below BBB+ regardless of their own circumstance. Some tolerance should be provided for this situation

## **5.2 Allowance for Underwriting and Debt Standby Costs**

As already stated the Commission should allow for debt underwriting costs and costs of standby debt facilities to enable the firm to maintain a liquidity buffer and an investment grade credit ratings. This is to also be consistent with costs faced by firms that operate in a competitively workable market.

## **5.3 Leverage and Debt Betas**

We refer to our discussion on leverage, debt betas and its impact on WACC in Appendices 2 and 3.

## 6 Impact of the Global Credit Crisis

The Commission in its Guidelines (para. 164) stated it will fully consider any submissions that provide robust analysis as to the sustained (rather than transitory) effects of the recent financial market turmoil.

### 6.1 Overview

The global credit crisis began with the collapse of the sub-prime mortgage market in the US, starting August 2007. This led to significant write-downs in the value of securitised mortgages and collateralised debt obligations held by major US and international financial institutions.

During 2008 the crisis deepened in the US with the demise of household names such as Bear Stearns, Lehman Brothers, Freddie Mac, Fannie Mae and American Insurance Group. Led by a rapidly slowing US economy, many economies moved into a steep recession in 2008 and recorded large output losses during late 2008 and early 2009. The turmoil in financial and real markets sparked a strong response from governments across the globe to allay concerns over systemic financial collapse and to support demand to ease serious fears of a global depression.

The systemic nature of the economic shock has led to a collapse in investor confidence which is only tentatively recovering. The recent announcement of the inability of the Dubai development company to meet its short term financing commitments is a clear illustration of the fragility of any current perceived recovery. Because the shock has been systemic in nature and risks are positively correlated with market returns, investors have been unable to diversify away from these risks.

### 6.2 Consequences of the Global Credit Crisis

The consequences of the global financial crisis have included:

- A significant disruption to economic growth. The latest World Economic Outlook (International Monetary Fund, 2009a) reports that world output growth slowed sharply from 5.2% in 2007 to 3.0% in 2008 before declining further to -1.1% in 2009. Although world output growth is expected to recover in 2010 the losses in output that have been experienced are expected to be permanent (see Table 9 below).

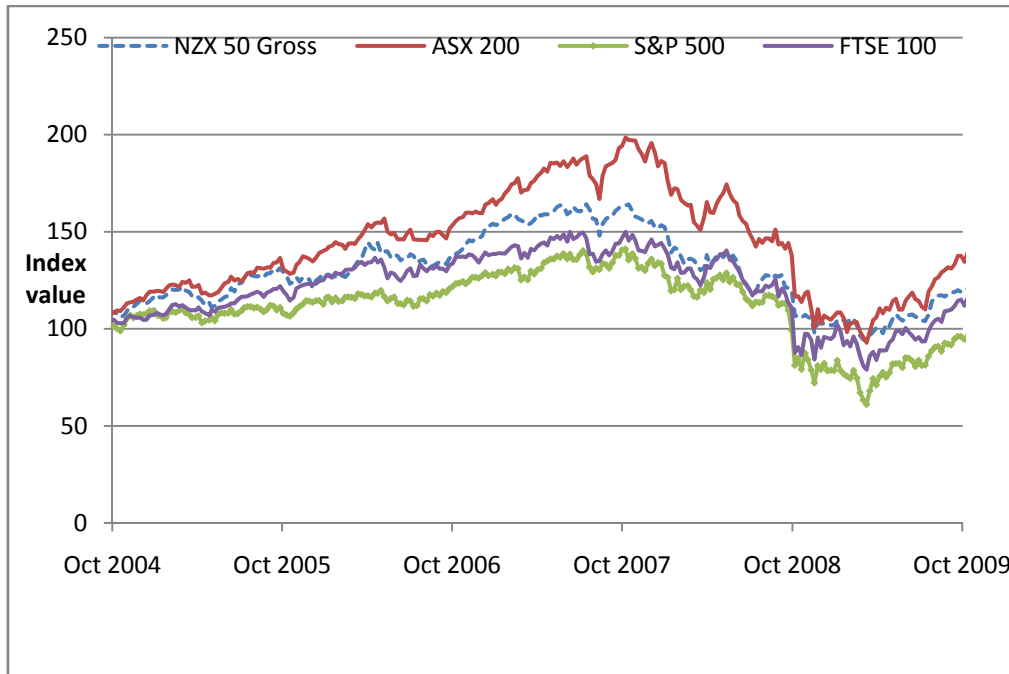
**Table 9: World Economic Outlook Projections**

	Annual % change			
	Actual		Projections	
	2007	2008	2009	2010
World output	5.2	3.0	-1.1	3.0
United States	2.1	0.4	-3.4	1.3
Euro area	2.7	0.7	-4.2	0.3
United Kingdom	2.6	0.7	-4.4	0.9
Japan	2.3	-0.7	-5.4	1.7
China	13.0	9.0	8.5	9.0
India	9.4	7.3	5.4	6.4
Advanced economies	2.7	0.6	-3.4	1.3
Emerging & developing countries	8.3	6.0	1.7	5.1

Source: International Monetary Fund (2009a)

- A worldwide collapse in equity prices which has been followed by a partial rebound. Figure 1 below shows the movement in equity prices in New Zealand, Australia, US and UK since April 2004. Between the end of June 2007 and early March 2009 these markets lost between 41.5% (NZX50) and 55.8% (S&P500) of their value. Although markets began to recover in the second quarter of 2009 the four markets were still between 23.7% (FTSE100) and 31.9% (S&P500) below their end of June 2007 levels by the end of October 2009.

**Figure 1: Equity Markets (April 2004 = 100)**



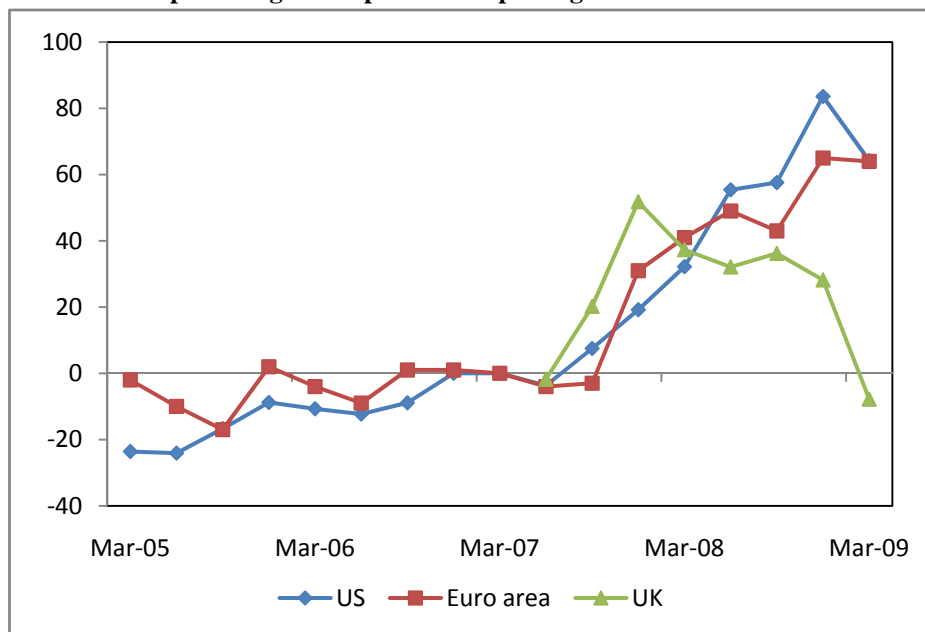
Source: Yahoo Finance

This fall in equity prices may be attributable to a variety of factors. These include:

- Investors' expectation of a long-run decline in corporate profitability or cash flow as a result of the decline in private sector demand;

- An increase in the market risk premium or the long-term cost of equity capital;<sup>39</sup> or
  - Irrational pricing behaviour and over-reaction (on the downside) by investors in response to the negative economic shock of the global credit crisis.
- An increased focus on balance sheet risk. Both the corporate and household sectors are focused on de-leveraging their balance sheets. Firms that are weak credits and have significant debt maturing in the near-term are finding it difficult to re-finance the debt.
  - A new operating environment for banks where they are under continual pressure from investors, counterparties and supervisors to hold more than the minimum level of capital. The need to rebuild their capital base and shrink their balance sheets has led to a reduction in lending volumes. The decision to tighten lending standards which had loosened over time was given impetus by the prospect of rising loan losses as many developed economies slipped into recession (see Figure 2 below).

**Figure 2: Survey measures of lending standards in US, Europe and UK**  
**Percentage of respondents reporting tighter standards minus**  
**percentage of respondents reporting easier standards**



Source: Reserve Bank of New Zealand (2009)

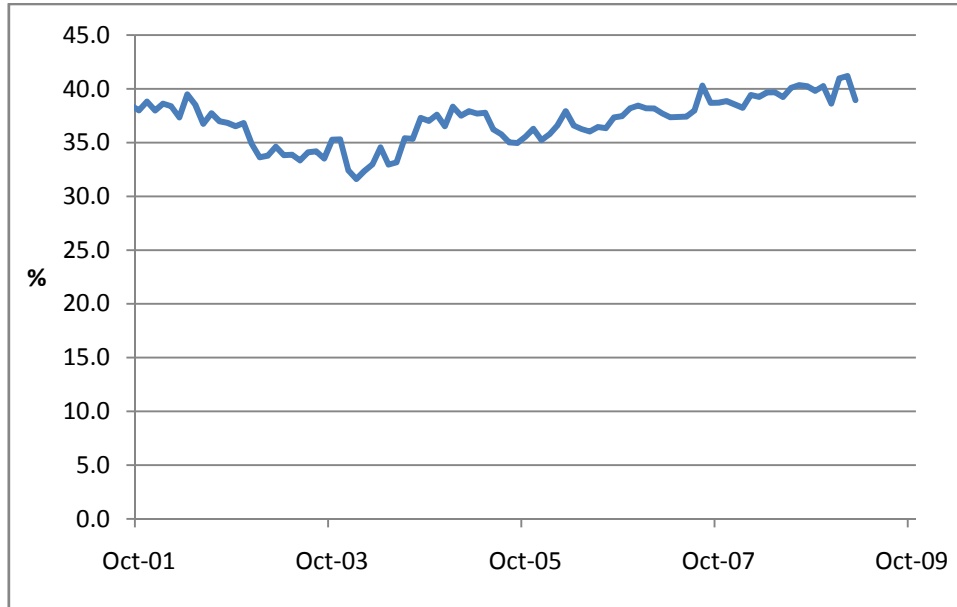
The cost of borrowing relative to the New Zealand dollar swap rate has increased. As a result, loan criteria have tightened and many corporate borrowers are now facing higher interest margins over wholesale rates and increased fees for bank credit (Reserve Bank of New Zealand, 2009).

Figure 3 shows that 39.0% of registered bank funding in New Zealand at 31 March 2009 was derived from offshore.

<sup>39</sup> The implied market risk premium will move in the opposite direction to market returns.

While there appears no immediate threat of a sudden negative shift in investor sentiment towards New Zealand assets, banks remain vulnerable to a capital account shock since a large portion of this funding is short-term. To reduce the vulnerability of banks to this threat, the Reserve Bank of New Zealand introduced prudential liquidity guidelines in June 2009 to encourage banks to shift to medium term debt. This is likely to put upward pressure on medium-term interest rates in the domestic retail market.

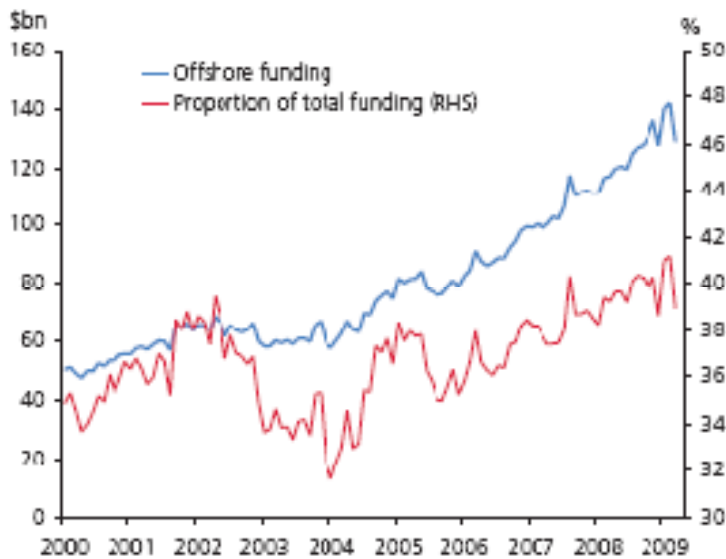
**Figure 3: Registered bank offshore funding**



**Source: Reserve Bank of New Zealand (2009)**

The dependence of New Zealand banks on parent bank funding and funding from offshore markets has also impacted on the availability and cost of credit (see Figure 4 below).

**Figure 4: Registered bank offshore funding**



**Source: Reserve Bank of New Zealand (2009)**

### 6.3 Is the Impact of the Credit Crisis Sustained or Transitory?

While the efforts of Governments and central banks have protected the global financial system and real economy from the worst of the crisis, the recent World Economic Outlook (International Monetary Fund, 2009a) suggests a number of reasons for expecting that the pace of recovery from the sharpest contraction in economic activity since the end of World War II will be gradual. The reasons are:

- The forces driving the recovery in many advanced economies are temporary in nature. These ‘temporary’ factors include the temporary nature of both central bank support for credit markets and fiscal stimulus in support of economic activity and the restocking of inventories brought about by the large cutbacks in production. The impact of these factors is expected to diminish in 2010;
- Bank lending will continue to be constrained in the future, for several reasons. First, credit losses have yet to be fully recognised by banks. Secondly, the regulatory environment for banks is developing to require financial institutions to hold more equity for their loans. It is expected that this will result in a combination of equity raising by banks and tighter lending conditions; and
- Private consumption and investment spending are likely to recover only slowly as both households and the corporate sector keep their focus on repairing over-stretched balance sheets. This will be a more important factor in economies that enjoyed debt-financed asset price booms in the pre-crisis period.

### 6.4 Impact of the Credit Crisis on the Components of the WACC

#### 6.4.1 Risk free rate

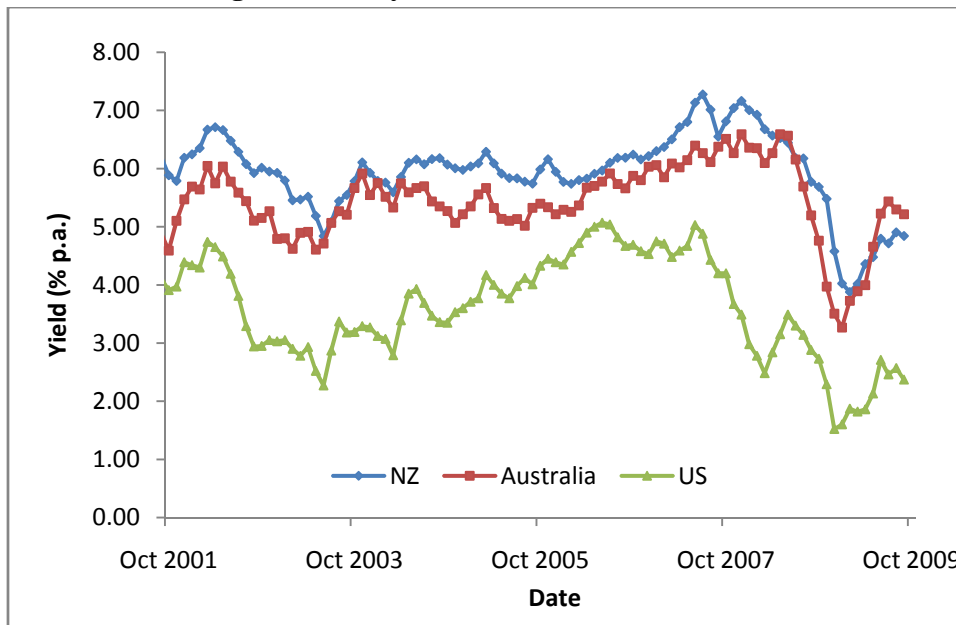
Figure 5 plots yields on 5-year treasury bonds in the United States, Australia and New Zealand. The figure shows that treasury yields fell from late 2007 as governments took steps to ease monetary conditions. However yields rose steadily in the US during 2009 due to concerns about the potentially inflationary consequences of the monetisation of fiscal deficits.<sup>40</sup> Despite this yields on treasury bonds and Government stock are still below pre-crisis levels.

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<sup>40</sup> The recent Global Financial Stability Report (International Monetary Fund, 2009b) notes that large increases in budget deficits and government debt levels could raise bond yields through several channels:

- Higher risk premiums, reflecting investor concerns about fiscal sustainability and government solvency, resulting in high real yields;
- Increased supply of government securities and rollover risk. The impact of supply pressures is likely to be significant in an environment where globally supply of government bonds is increasing; and
- Potentially higher inflation expectations, reflecting concerns about the Government’s ability to service their debt.

**Figure 5: Five-year Government Bond Yields**



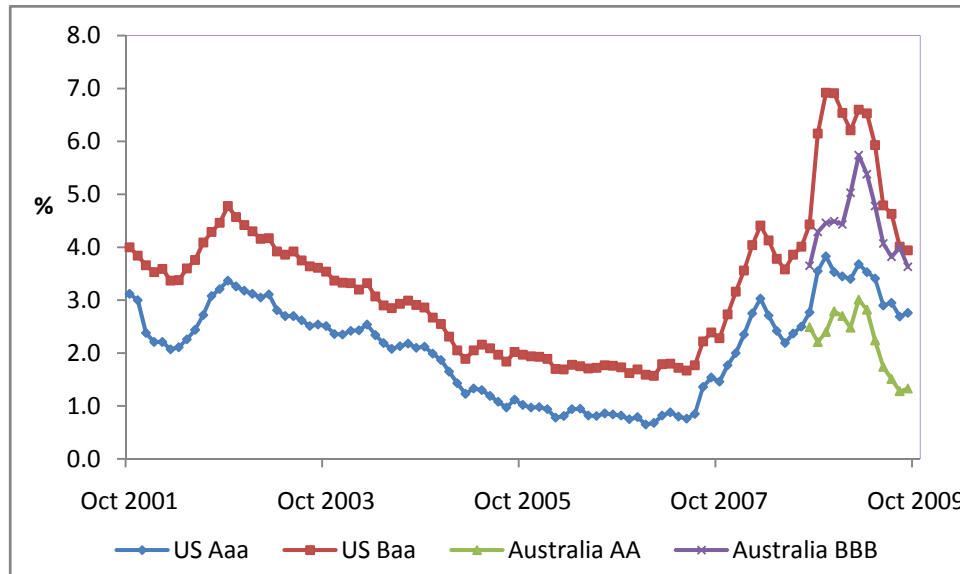
Sources: Websites of Reserve Bank of New Zealand, Reserve Bank of Australia and Federal Reserve Bank.

#### 6.4.2 Cost of debt

The global credit crisis has led to a significant increase in the cost of debt particularly for firms that are a weak credit risk, have high gearing and/or have high operating leverage.

Figure 6 plots the yield spread on (i) Aaa and Baa rated corporate bonds relative to the yield on five-year US Treasury bonds, and (ii) AA and BBB-rated corporate bonds relative to yields on Australian Commonwealth Government bonds. The figure shows that yield spreads began increasing in 2007, subsided in early 2008 and then increased dramatically in late 2008 and early 2009.

**Figure 6: Corporate Bond Spreads in Australia and US**



Source: Websites of Federal Reserve and Reserve Bank of Australia

Although yield spreads have abated since March 2009, they are still well above levels that prevailed in 2006 and early 2007. In September 2009, the spread on US Baa-rated bonds was 3.94% versus 1.67% in June 2007. The change in credit spread has been equally, if not more dramatic, in Australia. For example, the spread on BBB-rated bonds rose from 0.88% in June 2007 to 3.63% in September 2009, peaking at 5.74% in March 2009.<sup>41</sup>

*Evidence on debt premiums from CDX markets*

The North American Investment Grade CDX index peaked in December 2008 at the height of the credit crisis. However, the CDX index level as at October 2009 is still elevated compared to historical levels prior to the 2008 calendar year.

Fung et al. (2008) provide evidence of information flows between the credit and stock markets. Evidence that investment grade CDX spreads are still higher than pre-credit crisis levels suggests greater investor risk aversion in both the debt and equity markets.

**6.4.3 Impact of the global credit crisis on the market risk premium**

*Implications of the decline in the risk free rate*

There is some evidence to suggest that the MRP is negatively related to short-term interest rates, e.g. Scruggs (1998), Harris and Marston (1992). That is when short-term interest rates are low (as present now for Government bond and Treasury yields); the MRP is high and vice versa.

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<sup>41</sup> A rating of Baa under the Moodys classification scheme is equivalent to a rating of BBB under the Standard and Poors classification scheme.

### *Implications for market leverage and volatility*

As noted, the impact of the global credit crisis has resulted in:

- A substantial reduction in equity values. Prima-facie this will increase both company and market leverage where leverage (being the ratio of debt to equity) is measured using the market value of equity as opposed to the book value of equity;

Lally (2002) argues the MRP is positively related to market leverage. Using US data over the period 1952 – 1997, Lally shows the resulting estimate of the MRP may vary by as much as 3.4% based on the highest (0.43) and lowest (0.12) market leverage observed over this period.

- An increase in market volatility.

A number of academic studies argue that the MRP is positively related to market volatility. For example Merton (1980) derives an expression for the market risk premium as proportional to market volatility. Using NZ data Boyle (2005) applies the Merton methodology and finds estimates of the MRP vary between 0.9% and 33.6%.

### *Survey evidence on the MRP*

Results from a quarterly survey of US chief financial officers suggest that the global financial crisis has increased the equity risk premium (Graham and Harvey, 2009). The authors use a forward-looking measure of the equity risk premium which is defined as the expected annual return on the S&P500 over the next ten years of the survey respondents minus the ten-year yield on a treasury bond. The average equity risk premium has risen from 3.13% in 2007 Q2 to 3.97% in 2008 Q2 and further to 4.74% in 2009 Q2.

Graham and Harvey (2009) also examine the correlation between the equity risk premium and two measures of risk, the implied volatility on the S&P500 index option and the spread on Baa-rated corporate bonds over the yield on ten-year treasury bonds.

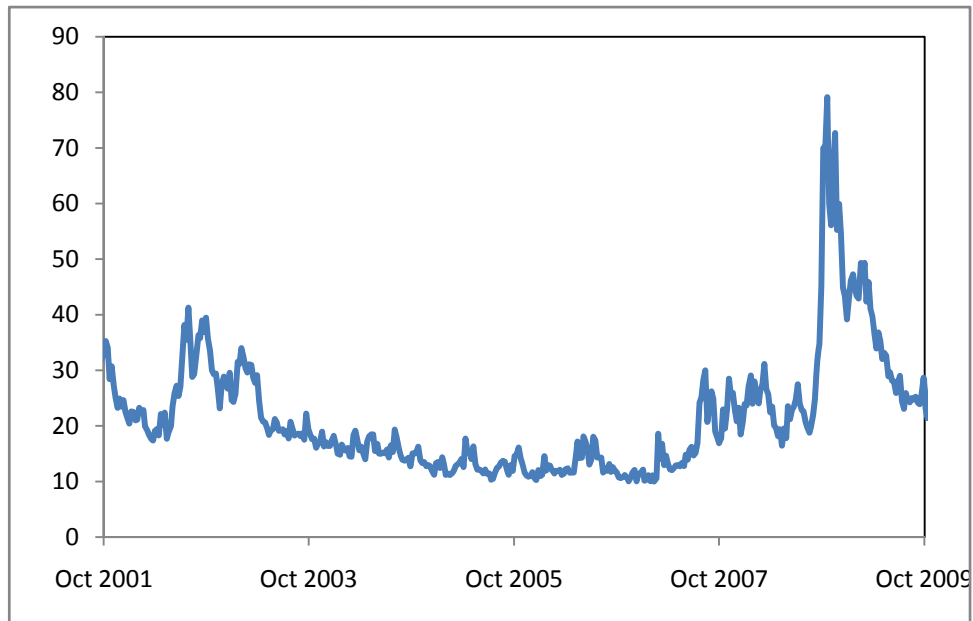
The correlation between implied volatility and the equity risk premium was +0.68 while the correlation between the corporate bond spread and the equity risk premium was +0.61. These results are consistent with asset pricing theory which suggests that there is a positive relation between risk and expected return.

In Figure 7 below we plot of the VIX index for the period between 3 January 2000 and 31 October 2009. While the VIX index has retracted from its recent highs the index is still above levels observed in mid-2003 to mid-2007.<sup>42</sup>

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<sup>42</sup> Damodaran (2008) argues there are two ways this increase in volatility may be viewed. The current heightened volatility is of relatively short duration only and once the credit crisis passes market volatility will return to long-run levels. On the other hand the sheer size and economic disruption caused by the current global

**Figure 7: VIX index**



Source: Yahoo Finance

***Commission’s Prior Estimates of the TAMRP***

The previous parameter estimates of the TAMRP by the Commission are (Input Methodologies Discussion Paper, para. 8.85, Table 8.2 and the Draft Guidelines of October 2005) are:

- 8.0% - Airports Inquiry (Commerce Commission, 2002);
- 7.0% - Gas control Inquiry (Commerce Commission 2004);
- 7.0% - Commission Draft Guidelines on Cost of Capital; and
- 7.0% - Gas Authorisation (Lally, 2008).

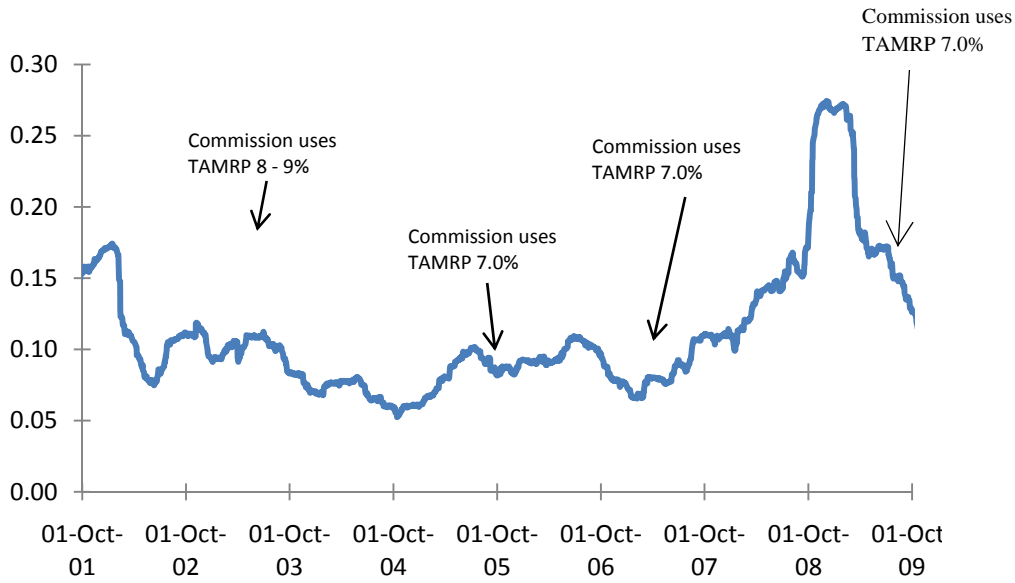
Figure 8 below show 100-day rolling averages of volatility of market returns for New Zealand listed stocks.

In our view the evidence below suggests market volatility was higher in both the 2001-2002 and 2008-2009 periods compared to the periods between late 2003 and mid-2007 surrounding 2004.

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credit crisis may cause a structural change (increase) in the market volatility until such time as investors perceive the global credit crisis has passed.

**Figure 8**



We consider the evidence on current market volatility does not support the Commission’s view of retaining a 7.0% estimate for the TAMRP in the current uncertain economic environment.

Moreover, in our view this assumes the Commission ascribes a 100% probability that the impact of the credit crisis is transitory and short-term only (i.e., the impact is much shorter than a term of 5 years, being the regulatory review period assumed in the Straw Person Example).

**6.5 Conclusion on the Impact of the Global Credit Crisis**

In conclusion we consider there is evidence that over a short-to-medium term time horizon (<5 years) there is evidence of:

- A substantial increase in debt premiums; and
- An increase in the market risk premium.

Over a long-term time horizon (5 years and greater) debt premiums and the market risk premium are more likely return to their long-term historical averages.

At the Commission’s Cost of Capital Workshop there was general agreement that risk premiums should be increased as a result of the global credit crisis. We note that the Commission’s adviser, Dr Lally, also agreed with this view:<sup>43</sup>

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<sup>43</sup> Cost of Capital Workshop Transcript, page 95, lines 23-25.

*“But in principle it seems to me very clear that the MRP must have gone up. The market risk premium is a reward for bearing market risk and market risk has clearly gone up.”*

Until there is stronger evidence that the impact of the credit crisis has dissipated, the Commission should take a cautious view and increase its estimate of the TAMRP.

The size of any increment to the market risk premium to take account of the global credit crisis is a matter of some judgement. The AER (2009) in its recent regulatory decision increased its estimate of the market risk premium by 0.5%.

In section 3 of this report we recommended the Commission adopt a mid-point estimate for the TAMRP of at least 7.5% (measured relative to long-term bonds) with recognition there is a wide range around this point estimate.<sup>44</sup> This is also to ensure adequate incentives are provided to firms to continue to invest and innovate in the present economic environment for the long-term benefit of consumers.

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<sup>44</sup> In the Cost of Capital Workshop Transcript (Page 94, Lines 10-16), Dr Marsden noted that in his view over a zero to five year time horizon there had been an increase in the market risk premium, but on a long-term basis the TAMRP measured relative to long-term bonds would converge to around 7.5%. Professor van Zijl concurred with this statement and also pointed out that a simple extrapolation of recent data that reflects negative realized returns might suggest a decrease in the forward looking rate. This would be inappropriate particularly for short estimates of the market risk premium: Cost of Capital Workshop Transcript (Page 94, Lines 18-23).

## 7 Adjustments to WACC

### 7.1 Introduction

The Commission (Guidelines, Section 5) recognises the need to provide for asymmetric risks split between:

- Type I risks i.e. infrequent events that can produce large losses e.g. natural disasters, earthquakes; and
- Type II risks i.e. risks such as the threat of competitive entry or asset stranding from technical innovations, etc.

### 7.2 Type I Risks

The risk of extreme events is predominantly negative and costs are borne by Airports with little or no benefits when the gains are positive. These types of asymmetric risks are typically unable to be diversified away by the investors in a firm.

Examples of Type I actual risks faced by Airports due to extreme events in recent years include SARs, Bird Flu and terrorist attacks e.g. 9/11 type events. Reductions in international travel were evident following each of these events. More serious consequences were close to reality due to the Bird Flu Pandemic when a national planning exercise was undertaken to enable closure of NZ's international borders which would have caused considerable reductions to aircraft movements and passenger flows. Natural disasters such as earthquake or volcano remain an ever present risk.

#### 7.2.1 Mechanisms to deal with Type I asymmetric risks

The approaches to deal with or recognise Type I asymmetric risks could take the form of a combination of:

- Determination of an actuarially-fair insurance premium and modelling this cost into the cash flows under any building blocks approach; or
- Adding an increment to the WACC; or
- Ex-post protection. That is when, or if, the adverse event occurs the cost is reimbursed by the customer.

#### *Actuarially-fair insurance premium*

Assessment of the level or quantum of adjustment for asymmetric risks is difficult. Commercial third party insurance to cover asymmetric risks is often not available and even where available is typically much more expensive than an “actuarially-fair” premium charge.

In this regard Boyle (2002) (quoting Froot, 1999) notes that reinsurers often require substantial risk premiums to ensure against catastrophe risks. Boyle (2002) also notes in 1996 Berkshire Hathaway sold \$1.05 billion of reinsurance to the California Earthquake Authority. The probability of Berkshire Hathaway having to pay anything under the reinsurance policy was estimated at 1.7%, but the premium was \$113 million – 6.3 times the expected loss. That is, according to the theory of the CAPM that provides a return for systematic or non-diversifiable risk only the premium should have been less than \$17.85 million.

### ***Increment to cost of capital***

In our view more common commercial practice is to add an increment to the discount rate as opposed to providing for asymmetric risks in the “cashflow” expectations. This recognises modelling any asymmetric risks in the expected cashflows is often not well understood or accepted in practice.

### ***Ex-post protection***

In respect of ex-post protection, assets owned by regulated firms typically have long expected asset lives and any contract for ex-post protection would need to be binding on the parties (including the regulator) and of long-term duration.

For Airports ex-post protection does not appear a realistic option given the potential for changes in the airlines that operate at each Airport. Future passengers would also be required to meet the cost of a past event.

### ***Burden of Proof***

The burden of proof on the existence and quantum of any asymmetric Type I risks should not fall solely on the provider of the regulated services. We accept that Airports would need to make a case and provide information to support the inclusion of an adjustment for asymmetric Type I risk. For instance the Airports may be able to provide historical evidence of these events and an estimate of the total impact on demand / price to inform a view on how big an adjustment might be.

However, the Commission should recognise that this will involve some degree of judgement and in our view it would not be appropriate for the Commission to assume asymmetric Type I risk is zero on the basis that the size of any adjustment could not be precisely quantified.

We also consider the Commission has some responsibility to conduct or sponsor research in this area and in the meantime make an allowance greater than a clearly incorrect estimate of zero.

### **7.3 Type II Asymmetric Risks**

#### **7.3.1 Real options and investment timing**

The Commission notes (Guidelines, paragraph 256) that real options theory predicts that firms facing investment decisions that are largely irreversible and subject to considerable uncertainty will not invest when the conventionally calculated NPV is zero.

Much of Airports' new investment in aeronautical assets represents sunk costs or irreversible investment. The irreversible nature of new investment provides incentives for a firm to delay investment unless returns for investing now are appropriate.

New capital investment in aeronautical assets takes considerable forward planning and time to construct. For large airport infrastructure investment some economics of scale may exist where it can be optimal to undertake new investment over and above current requirements in anticipation of increasing demand.

#### **7.3.2 Asset optimisation and stranding**

The irreversible nature of much of an Airport's new investment in aeronautical assets exposes Airports to asymmetric risks of asset optimisation and asset stranding. In the absence of appropriate compensation, there is a risk that upside returns may be capped where actual ex-post demand exceeds the capacity provided by its infrastructure assets. Airports may still be exposed to downside risk and loss where actual ex-post demand falls below the infrastructure capacity and assets are removed (either through asset optimisation or stranding) from the asset base.

#### **7.3.3 Mechanisms to deal with Type II asymmetric risks**

##### *Cash flows adjustments*

For assets subject to optimisation or stranding, the "expected" costs may be modelled into the cashflows by way of an accelerated depreciation charge. However, as noted by Boyle et al (2006) provided some demand shocks are systematic, stranding and optimisation risk will have a systematic component.

##### *Increment to the WACC*

The Commerce Commission has recognised that asset optimisation induced by cost or demand changes warrants some form of ex-ante protection. This could take the form of an "ex-ante allowance in the cash flows" or a "margin on the WACC". Lally (2005) also noted in the case of asset stranding and asset optimisation (other than in the case of gold-plating assets), some form of ex-ante compensation such as a margin on WACC would be appropriate.

### ***Adjustment to the Regulatory Asset Base***

Guthrie (2009) proposes that a regulator could incorporate real options into allowed prices by scaling up the regulated asset base by a real options multiplier.

In our view this approach has merit that the Commission should consider. In particular it provides greater transparency in the recognition of the value of real options as opposed to adding any increment to the WACC.

### ***Burden of Proof***

Again in our view, the burden of proof on the existence and quantum of Type II asymmetric risks should not fall solely on the provider of the regulated services. It would not be appropriate for the Commission to assume asymmetric Type II risks are zero on the basis that the size of any adjustment could not be easily quantified.

#### **7.3.4 Conclusion on asymmetric risks**

We consider that the Commission should keep an open mind with respect to both Type I and II asymmetric risks. We accept Airports will need to provide information and some evidence to support claims in respect of Type I and Type II asymmetric risks. The precise quantification of the impact of Type I and II asymmetric risks requires more detailed analysis and will likely vary between Airports

However, there may be cases where the costs or losses to firms associated with extreme events, real options, asset stranding and optimisation are significant and represent a material cost to Airports.

We consider the Commission has some responsibility to conduct or sponsor research on both Type I and Type II asymmetric risk.

#### **7.4 Market frictions and Costs of Financial Distress**

Market frictions exist in the real world. These include funding constraints, managerial constraints (with the result that the actual level of investment will be significantly less than the level at which expected return equals WACC and thus firms may be constrained from proceeding with investments for which expected returns equal WACC) and financial distress costs. In real world competitive markets these frictions can all lead to lost investment opportunities and their costs may impact on the overall cost of capital.

## 7.5 Equity Issuance Costs

Firms will typically incur substantial costs to raise new equity. These include the costs of raising of equity through an initial public offering (IPO) and ongoing costs of raising further equity via a secondary offering such as a rights issue or equity placement.

Information asymmetries between managers and shareholders of a company imply that investor's should only allow the company to raise new equity capital when the NPV of a project is positive. In part this is to compensate investors for the costs of raising new equity capital (Boyle et al, 2006).<sup>45</sup>

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<sup>45</sup> The costs of raising new equity have historically been ignored in regulatory decisions, either as an allowable cost or included as an increment to the cost of equity capital under the CAPM. Bowman (2005, p 83) notes, however, that in its final decision on Gas Net, the ACCC (2002, page 151) concluded the cost of capital should include:

*“an allowance for equity raising costs of 0.224 per cent of regulated equity, to be recovered as an annual non-capital cost cash flow”.*

## 8 Asymmetric Impact of Setting the WACC Too Low

### 8.1 Introduction

The Commission (Guidelines, paragraph 239) notes that the Commission accepts the general proposition that the social costs of setting allowed rates of return too low probably outweigh the costs of setting allowed rates too high. That is the adverse effects of under-estimation of WACC are likely to be greater than the adverse effects of the over-estimation of WACC. Reflecting this view the Commission often selects a WACC estimate above the midpoint of the estimated range when selecting allowed rates of return.<sup>46</sup>

However, the Straw person Example provides no estimate of the WACC range that the Commission may determine for an electricity distribution business.

### 8.2 Selecting the WACC range

Prior to selecting a range for the WACC the Commission should first clearly identify any adjustments to WACC (to the extent these are not fully provided in the regulatory asset base or expectations of cash flows) for:

- Asymmetric Type I and II risks;
- Asset stranding and optimisation; and
- Other market frictions.

The Guidelines (para. 46) then recognises that the tools the Commission uses to estimate a firm's cost of capital are imperfect.<sup>47</sup> The purpose of a range and choice of any point estimate within the range for the WACC is therefore to recognise:

- Parameter error;
- Asymmetry of social consequences; and
- Model error.

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<sup>46</sup> This is consistent with the New Zealand Government's announced economic policy for regulated businesses and the need to provide incentives to invest in replacement and new infrastructure. This can be achieved by ensuring commercially realistic rates of return and taking full account of the long-term risks to consumers of underinvestment in basic infrastructure

<sup>47</sup> The NZ Airports Association (2009) also notes that in respect of Airports' Information Disclosure the purpose statement in section 53A of the Commerce Act 1986 provides that:

*"The purpose of information disclosure regulation is to ensure that sufficient information is readily available to interested persons to assess whether the purpose of this part is being met".*

Errors in the estimation of the individual parameters into the WACC leads to a range estimate for the WACC. Asymmetry of social consequences suggests the Commission should adopt a point estimate towards the upper end of this range.

The presence of model error means there should be a further allowance, in addition to an allowance for parameter error and asymmetry of social consequences, in the determination of a plausible WACC range and the choice of a point estimate for the WACC within this range.

### **8.3 The Concept of Asymmetry of Social Consequences**

If a WACC is too low firms will under-invest. If a WACC is too high, firms may reap excess profits and over invest or gold-plate investments. From the perspective of consumers of the firm's services, a WACC that is too high leads to prices that may be excessive. In this case consumers of the service potentially pay too much.

Conversely if the WACC is too low, consumers may benefit at the expense of the service provider subject to the service providers continuing with the proposed investment. However if a consequence of setting the WACC too low is under-investment consumers may be disadvantaged. That is providers will allow assets to run-down with the potential for loss of services and substantial flow-on impacts on the wider economy.

### **8.4 Asymmetry of Social Consequences**

Airports are an integral part of New Zealand's tourism, business travel and air transport freight and infrastructure in New Zealand. Tourism is a significant earner of foreign exchange income for New Zealand and directly or indirectly responsible for a large number of jobs in the New Zealand economy.

In the year to June 2008 almost 2.5 million international visitors travelled to New Zealand and spent \$6.2 billion dollars including airfares.<sup>48</sup> Tourism also contributes directly or indirectly \$14.1 billion (9.2%) to New Zealand's GDP and employs nearly 10% of the total workforce in New Zealand (Tourism Resource Consultants, 2009).

Airports make a value-added contribution to New Zealand's economy through both the quality and quantity of services they provide. This includes the economic impact from:

- Domestic and international travellers who spend money at Airports and in the wider domestic economy;
- Contribution to employment and infrastructure of businesses that hub around an airport;

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<sup>48</sup> Source: Tourism New Zealand Annual Report 2007-2008.  
[http://www.tourismnewzealand.com/tourism\\_info/](http://www.tourismnewzealand.com/tourism_info/)

- Airport's contribution to the domestic region from employment opportunities and the multiplier effect of ongoing maintenance expenditure and major capital expenditure on new infrastructure assets.

## **8.5 Asymmetry of Social Consequences if Lack of Investment by Airports**

Major investments by Airports often involve significant consultation with stakeholders. Investments are made on the basis that an appropriate return will be earned for aeronautical investments.

Airports undertake capital expenditure programme to accommodate expected visitor passenger growth. A WACC that is set too low raises the risk that Airports may halt their investment programme if returns are expected to be inadequate and not consistent with enhancing shareholder value. This may result in congestion, delays in passenger throughput and airfreight and delays in lead times to bringing products to markets.

The NZ Airports Association (2009, Foreword statement) in its submission on the Commission's Input Methodologies note the cost per passenger of using New Zealand's major airports is as low as \$3 - \$5 for regional domestic services and \$15 - \$21 for international services. These rates compare favourably with comparable airports in Australia and around the world. Wellington International Airport (2009, para. 123) also notes that the airport costs are not a major determinant of the cost of travel, with competition amongst airlines a demonstrably more important factor in ticket prices. Lastly Auckland Airport (2009, para. 32) note a report prepared by Jacobs, an independent international consultant, show that in respect of charges of the top twenty airports flown to by Air New Zealand internationally (based on turnaround charges for an A320-200) Auckland Airport's charges rank in the middle of the pack.

The NZ Airports Association (2009, para. 51- 70) provides further discussion of the performance of the NZ aviation market and state (para 60) that an increase in passenger numbers has required a substantial investment by Airports in additional and improved facilities. Under-investment in aeronautical assets has potential downside implications for the airlines who may be restricted in their services they can offer passengers and air-freight users. New capital expenditure in aeronautical assets also benefits the airlines by allowing the airlines greater flexibility to accommodate growth in passenger numbers and freight volumes.

The NZ Airports Association (2009, para. 58-60) consider how the impact of airfare reductions and how airport investment may facilitate competition in the market between airlines. When new entry is threatened or occurs, air fares have historically fallen. Consumers therefore receive long term benefits while competition is sustained.

In our view there is a potential wider risk to tourism if sub-standard infrastructure investments are made. For example, underinvestment may result in a significant risk that New Zealand's connectivity for point to point services would be diminished (i.e., superseded by a hub model via the East Coast of Australia).

Lastly, we understand Airports take their safety and security responsibilities very seriously. To the extent that underinvestment could lead to a safety or security breach or even reduced passenger satisfaction from congestion and perceptions of New Zealand as a first rate destination there is the risk of knock on ramifications for New Zealand's tourism industry.

Prima-facie, in our view, under-investment in Airport aeronautical assets risks adverse long-term consequences for the wider New Zealand economy.

## **8.6 Other Issues Relating to Selecting an Estimate of the Cost of Capital along the Range**

### **8.6.1 Commission's view**

The Commission proposes to follow the methodology of Lally (2008) to estimate a WACC range (Guidelines, para. 235). The Commission also sees no gains from Monte-Carlo simulation (Guidelines, para. 238).

### **8.6.2 Our view**

A range for the WACC rather than point estimate of WACC is important under an Information Disclosure Regime. We have commented on the need for a range in the WACC and its relevance under an Information Disclosure Regime earlier in section 2.4 report.

For reporting purposes under an Information Disclosure Regime this means the Commission should in the first instance focus on a plausible range for the WACC and not a point-estimate of WACC. In any measurement of excess profits we also consider the Commission should adopt a WACC from the upper end of any range to recognise asymmetry of social consequences as well as making an adjustment if applicable to reflect asymmetric risks.

## **8.7 Monte-Carlo Simulation**

As noted, the Commission sees no gains from Monte-Carlo simulation.

We nevertheless suggest a study be undertaken to determine if material differences may arise in the WACC range under Monte-Carlo simulation compared to the analytical approach proposed in the Guidelines (para. 235). This recognises that:

- Standard deviation of errors for each parameter input into the WACC calculation are likely to be high;
- Distribution of a number of the parameter inputs into the WACC calculation may not be normal; and
- Correlations between the variables may be significant (for example between the debt risk premium and the market risk premium).



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**Appendix 1: References the sections in our report to the questions addressed to parties in the Commission’s document on *Cost of Capital: Post-workshop Submissions*.**

<b>Issue No.</b>	<b>Party raising Issue</b>	<b>Matter Discussed and Transcript Reference to Discussion</b>	<b>Party to Respond</b>	<b>Transcript Reference to Relevant Comment</b>	<b>Reference to This Paper</b>
<b>Expectation of Normal Return</b>					
5	Commission (Commissioner Duignan)	Real Options (p. 87, lines 23-33 – p. 88, lines 1-7)	All parties	p. 87, lines 23-33 – p. 88, lines 1-7	Section 7.3
<b>Leverage</b>					
6	Commission (Commissioner Duignan)	De-leveraging and increasing WACC with SBL (p. 100, line 23 – p 101, line 29)	Dr Marsden (for NZAA and AIAL)	p. 101, line 30	Appendices 2 and 3
10	Commission (Commissioner Duignan)	WACC increasing with leverage in SBL model (p. 96, line 32- p. 115, line 23)	All parties	p. 110, lines 22-26 and p. 115, lines 22-23	Appendices 2 and 3
<b>Debt Premium</b>					
13	Commission (Commissioner Mazzoleni)	Estimation term of the debt premium (p. 149, line 25 – p. 150, line 8)	All parties	p. 149, lines 25-33, p. 150, lines 1-8	Section 4.1 and 4.2
17	Commission (Commissioner Mazzoleni)	Debt premium and hedging costs (p. 156, lines 7-25)	Dr Marsden (for NZAA and AIAL)	p. 156, lines 11-12 and p 156, lines 22-23	Section 4.1, 4.2 and 4.5.
<b>Financeability</b>					
19	Commission (Commissioner Duignan)	Actual vs. Industry (p. 171, lines 3-17)	All parties	p. 171, lines 8-17	Section 2.3
<b>Estimating the WACC Range</b>					
25	Commission (Commissioner Duignan)	Estimating the WACC range using Monte Carlo	All parties	p. 212, lines 3-7	Section 8.6
<b>Selecting a Point on the Range</b>					
26	Commission (Commissioner Duignan)	Selecting the point on the range (p. 219, lines 30-33)	All parties	p. 219, lines 30-33	Section 8

## Appendix 2: WACC increasing with leverage under the simplified Brennan-Lally CAPM.

### A.1 Introduction

The Commission has expressed concern that WACC increases with leverage using the simplified Brennan-Lally version of the CAPM (Cost of Capital Workshop, Transcripts page 101, Lines 16-28).

Subsequent to the Cost of Capital Workshop of 12<sup>th</sup>-13<sup>th</sup> November 2009, the Commission has released two papers. These are:

- Commission paper on “Effect of Leverage on WACC under Two Difference CAPMs” (hereafter “Leverage and WACC” paper); and
- A paper by Dr Lally titled “WACC and Leverage” dated 17 November 2009.

### A.2 Comments on Commission’s Paper “Effects of Leverage on WACC under Two Difference CAPMs” - “Leverage and WACC” paper.

The Commission’s Leverage and WACC paper assumes that:

- The asset beta under the simplified Brennan-Lally CAPM using the Harris and Pringle (1985) de-leveraging formula is the same or identical to the asset beta under the classical CAPM using the Hamada (1972) de-leveraging formula; and
- Debt betas are zero.

#### A.2.1 Deleveraging Formulas and Asset Betas

The Harris and Pringle (1985) formula is:

$$\beta_e = \beta_A \times \left[ 1 + \frac{L}{1 - L} \right]$$

The Hamada (1972) de-gearing formula is:

$$\beta_e = \beta_A \times \left[ 1 + (1 - T_c) \times \frac{L}{1 - L} \right]$$

In our view the Commission’s assumption in its Leverage and WACC paper that the appropriate asset beta is the same<sup>49</sup> under both the Harris and Pringle and the Hamada de-leveraging formulas is not valid.<sup>50</sup>

In calibrating an asset beta it is important to take into account the beta de-gearing formula used (Marsden, Cost of Capital Workshop, Transcripts page 101, Lines 5-7.)

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<sup>49</sup> See Appendix 2, Commission’s WACC and Leverage Paper.

<sup>50</sup> Also see Appendix 3 of this report.

Lally (2009b, p4) also implicitly acknowledges this point when he states:

*“...  $K_u$  is now determined using  $\beta_u$  extracted from an estimate of  $\beta_e$  in accordance with equation (6) rather than equation (4).”*

To illustrate why the calibration of an asset beta must take into account the de-leveraging formula assume a hypothetical market with one stock only. We wish to calculate the asset beta of the market (stock). By definition the empirical equity beta of the market is one. Also assume the weighted aggregate “market” gearing (in this case one stock) or  $L = 60\%$ <sup>51</sup> and the corporate tax rate is 30%.

Then applying the Harris and Pringle formula the market asset beta is 0.4. That is:

$$\beta_e = \beta_A \times \left[ 1 + \frac{L}{1 - L} \right]$$

$$1.00 = 0.4 \times \left[ 1 + \frac{60\%}{40\%} \right]$$

If we now take this asset beta for the market of 0.4 and re-lever using the Hamada formula, we have an implied equity beta for the market of 0.82. This is below the true or expected equity beta for the market of 1.0. That is:

$$\beta_e = \beta_A \times \left[ 1 + (1 - T_c) \times \frac{L}{1 - L} \right]$$

$$\beta_e = 0.4 \times \left[ 1 + 0.7 \times \frac{60\%}{40\%} \right]$$

$$= 0.82$$

The correct asset beta of the market under the Hamada de-leveraging formula is 0.4878, i.e.,

$$\beta_e = \beta_A \times \left[ 1 + (1 - T_c) \times \frac{L}{1 - L} \right]$$

$$1.00 = 0.4878 \times \left[ 1 + 0.7 \times \frac{60\%}{40\%} \right]$$

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<sup>51</sup> This will likely be substantially higher than the actual market leverage for the New Zealand market. However, we assume this leverage to derive a market asset beta of 0.4 under the Harris and Pringle formula, consistent with the asset beta assumed in the Commission’s Leverage and WACC paper.

In summary the asset beta under the Harris and Pringle formula differs to the asset beta under the Hamada formula.

Thus, the Commission’s assumption in the WACC and Leverage Paper that the asset beta is the same under the Harris and Pringle (1985) formula (applied in the case of the simplified Brennan-Lally CAPM) and the Hamada (1972) formula (applied in the case of the classical CAPM) fails to take into account that the asset beta must be determined or calibrated in accordance with the specific de-leveraging formula that is adopted.

**A.3 Assumptions implicit in the Hamada de-leveraging formula used in the Commission’s WACC and Leverage Paper.**

*Hamada’s Assumptions*

The Hamada de-leveraging formula used in the case of the classical CAPM in the Commission’s WACC and Leverage Paper assumes corporate but no personal taxes. In addition the Hamada de-leveraging formula assumes (see Taggart, Jr, 2001):

- The operating cash flow stream of the firm or the project is a perpetual annuity; and
- Future debt levels are known with certainty.

*More realistic assumptions about the riskiness of the debt tax shield*

A more realistic assumption would be to assume either finite or perpetual cash flows and uncertainty about the debt-tax shield. For instance, a number of Australian regulators have assumed a beta de-leveraging formula consistent with the first period debt tax shield being certain and thereafter future debt tax shields are uncertain.<sup>52</sup>

Taggart Jr (2009) shows that where cash flows are either finite or perpetual life and all debt tax shields are uncertain, the beta de-leveraging formula in the presence of corporate taxes is the same as the Harris and Pringle formula used in the Commission’s Leverage and WACC Paper for the simplified Brennan-Lally version of the CAPM.

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<sup>52</sup>This is similar to the Miles and Ezzel (1985) de-leveraging formula that assumes firms adjust their level of debt to maintain a consistent debt to equity ratio or leverage, as opposed to a certain dollar amount of debt. The beta de-leveraging formula where the debt beta is assumed to be zero takes the form of:

$$\beta_e = \beta_A \left[ 1 + \frac{L}{1-L} \left( 1 - \frac{T_c K_d}{1+K_d} \right) \right]$$

Where  $K_d$  = cost of debt.

### A.3.1 WACC under the classical CAPM and Harris and Pringle de-leveraging formula.

Table A2.1 below replicates the analysis in Appendix 2 of the Commission’s Leverage and WACC paper, except we now use the Harris and Pringle de-leveraging formula together with the classical CAPM.

**Table A2.1 Classical CAPM - Harris and Pringle de-leveraging formula**

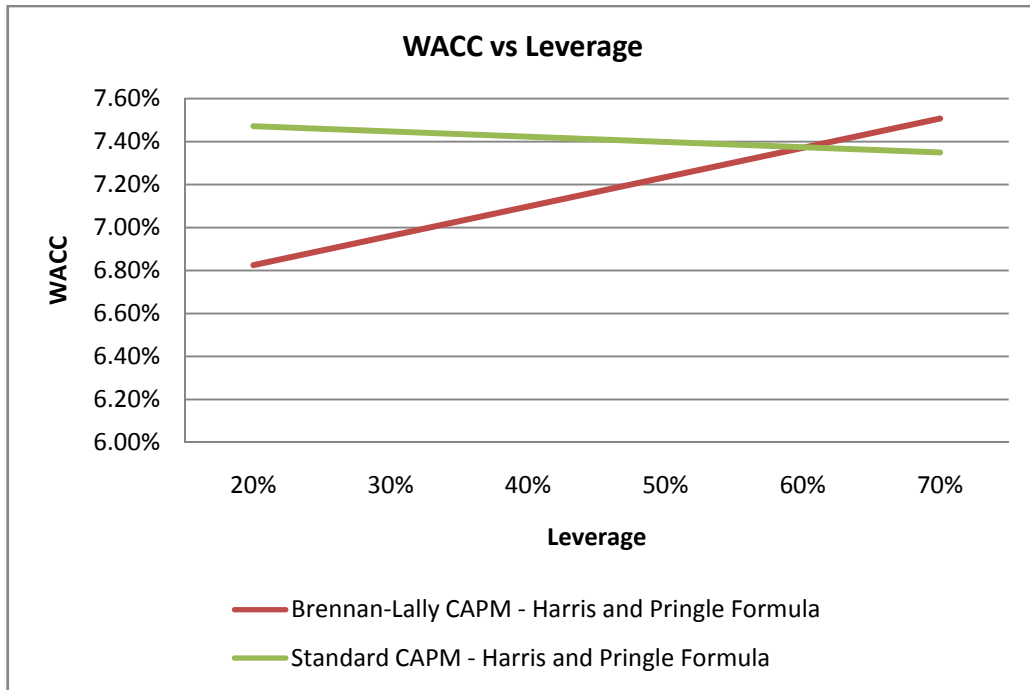
	1	2	3	4	5	6
Risk free rate	5.36%	5.36%	5.36%	5.36%	5.36%	5.36%
Debt premium	1.95%	1.95%	1.95%	1.95%	1.95%	1.95%
Leverage	20%	30.0%	40.0%	50.0%	60.0%	70.0%
Asset beta	0.40	0.40	0.40	0.40	0.40	0.40
Debt beta	0	0	0	0	0	0
MRP	5.40%	5.40%	5.40%	5.40%	5.40%	5.40%
Tc	30%	30%	30%	30%	30%	30%
Equity beta	0.50	0.57	0.67	0.80	1.00	1.33
Cost of Equity	8.06%	8.45%	8.96%	9.68%	10.76%	12.56%
<b>Post-tax WACC</b>	<b>7.47%</b>	<b>7.45%</b>	<b>7.42%</b>	<b>7.40%</b>	<b>7.37%</b>	<b>7.35%</b>

Table A2.1 shows that the post-tax WACC in the Commission’s WACC and Leverage Paper (Appendix 2) using the classical CAPM is under-stated where the asset beta is 0.4 and the Harris and Pringle formula is applied.

In Figure A2.1 below we plot the post-tax WACC against leverage for both the simplified Brennan-Lally version of the CAPM (Table A1 of the Commission Leverage and WACC paper) and the classical CAPM (calculated using the Harris and Pringle formula).

Figure A2.1 illustrates that under more realistic assumptions about the riskiness of the debt-tax shield, the tax advantage to debt is less than that assumed in the Commission’s WACC and Leverage paper in the absence of dividend imputation. This result is consistent with arguments by Miller (1977) that even under a classical tax system the tax advantages of debt are often overstated.

Figure A2.1



**A.3.2 Measurement of debt betas**

The Guidelines (para. 195) states that:

*“when setting allowed rates of return, the Commission intends to estimate debt betas wherever feasible using the CAPM. If, so for the reasons outlined above, reliable estimation proves infeasible, the Commission intends to draw on recent published evidence (which usually relate to overseas markets such as the US) to inform its view on the magnitude of (New Zealand) debt betas.”*

The Guidelines note (para. 191) that paucity of data could be a major hindrance to estimate precise debt betas in small, thinly traded markets such as New Zealand. It is also unlikely that debt betas remain stable over time (Guidelines, para. 194).

The Straw Person Example makes no attempt to estimate a debt beta. Lally (2009b, p 6) also notes measurement difficulties would seem to rule out the estimation of debt betas.

We agree with Lally (2009b) and the approach in the Straw Person Example that estimation of debt betas for New Zealand firms is problematic and probably not feasible at present.

#### **A.4 Size of error in WACC under the Harris and Pringle formula using the simplified Brennan-Lally CAPM**

Lally (2009b, p 3) notes that under the assumptions of zero debt beta and use of the Harris and Pringle formula, the WACC calculated using the simplified version of the Brennan-Lally CAPM is upward sloping as follows:

$$WACC = K_u + p(1 - T_c) L$$

where:

- $K_u$  = unlevered cost of capital
- $p$  = debt risk premium

This would suggest to minimise a firm’s cost of capital or WACC the “optimal” leverage ratio for the firm would be no debt in a firm’s capital structure.

##### **A.4.1 Is the assumption of zero leverage or no debt realistic?**

In our view it would not be appropriate to set WACC equal to  $K_u$  under the assumption that leverage is zero, implying that the firm’s WACC equals its unlevered cost of equity capital.

First, the comparative set of firms used to empirically estimate beta will most likely include predominantly levered firms.<sup>53</sup>

Second, it is not realistic to assume a long-run zero leverage assumption for infrastructure firms subject to regulatory oversight. Agency theory predicts debt has benefits other than any tax advantage. For instance, Jensen and Meckling (1976) suggest an optimal capital structure is a combination of debt and equity that minimises agency costs. Debt disciplines management by restricting consumption of perquisites and forcing managers to be subject to the scrutiny of capital markets when seeking additional finance for new projects. On the other hand too much debt reduces financial flexibility and increases the risk of financial distress and bankruptcy costs.

Third, the discipline that debt imposes on a firm’s management provides strong incentives for firms to efficiently manage operating costs (i.e., the costs run the business other than interest costs on debt). Thus, it would not be appropriate or realistic for the Commission to assume that an unlevered firm will achieve the same level of efficient operating costs compared to a firm that has leverage in its capital structure.<sup>54</sup> As already noted, efficiencies that Airports are able to achieve enable benefits to be shared and passed onto passengers, each time a price reset is undertaken.

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<sup>53</sup> Lally (2009, p 7) also notes “*use of debt by companies is typical*”.

<sup>54</sup> This means that if the Commission were to also benchmark operating costs for a firm of interest against comparative firms, the Commission should consider agency costs incentives that each firm has to efficiently manage costs.

#### A.4.2 Errors in determining WACC assuming debt betas are zero in the simplified Brennan-Lally CAPM

To ensure the WACC calculation is invariant to leverage a necessary assumption is to assume a non-zero debt beta.

However, in our view, errors in the determination of WACC assuming a zero debt beta are likely to be small provided:

- A consistent approach is used in the de-leveraging formula for comparative firms and the re-leveraging formula for the firm of interest; and
- The comparator set of firms on average have similar leverage to the specific industry or firm that the Commission seeks to determine the cost of capital.

To illustrate assume:

- The true equity beta of the comparator firms is 0.80;
- The comparator firms' leverage is 50% (mid-point of the industry leverage range in the Straw Person Example, para. 42, for electricity distribution businesses);
- The debt beta is 0.05<sup>55</sup> assumed constant across different leverage ratios. This is consistent with the Commission's assumption in its Leverage and WACC paper that the debt premiums are also invariant across different leverage assumptions;<sup>56</sup> and
- The other parameter inputs for the risk free rate, debt premium, TAMRP,  $T_c$  and  $T_1$  are identical to those assumed in Appendix 2 of the Commission's Leverage and WACC paper.

Under the assumption that the debt beta is 0.05 and using the following de-leveraging formula to account for debt betas (see Lally, 2009, equation 6, page 4), the asset beta of the comparative firms and the "true" asset beta for the firm of interest is 0.425.<sup>57</sup> That is:

$$\beta_e = \beta_A \times \left[ 1 + \frac{L}{1-L} \right] - \frac{L}{1-L} \beta_d$$

$$0.800 = 0.425 \times \left[ 1 + \frac{50}{50} \right] - \frac{50}{50} \times 0.05$$

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<sup>55</sup> Cornell and Green (1991) report betas for long-term government bonds of 0.20 and betas for high-grade debt of 0.22. Under the assumption that the risk free rate, with a zero debt, is proxied by yields on government bonds, the "implied" debt beta for high-grade bonds will be circa 0.02 (also see Lally, 2004b, footnote 61).

<sup>56</sup> The Commission in its Leverage and WACC paper (Footnote 2, p 1) notes that as leverage increases, the debt premium should also increase. However, such increase is difficult to monitor as the function will be non-linear.

<sup>57</sup> For simplicity we are assuming the unlevered firm of interest has exactly the same systematic risk as the comparative firms.

We replicate below the Commission’s Table A.1 in its Leverage and WACC paper assuming a debt beta of 0.05 and the beta de-leveraging formula immediately above.

**Table A2.2 Simplified Brennan-Lally CAPM with non-zero debt beta**

	1	2	3	4	5	6
Risk free rate	5.36%	5.36%	5.36%	5.36%	5.36%	5.36%
Debt premium	1.95%	1.95%	1.95%	1.95%	1.95%	1.95%
Leverage	20%	30.0%	40.0%	50.0%	60.0%	70.0%
Asset beta	0.425	0.425	0.425	0.425	0.425	0.425
Debt beta	0.05	0.05	0.05	0.05	0.05	0.05
TAMRP	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Tc	30%	30%	30%	30%	30%	30%
Ti	30%	30%	30%	30%	30%	30%
Equity beta	0.519	0.586	0.675	0.800	0.988	1.300
Cost of Equity	7.38%	7.85%	8.48%	9.35%	10.66%	12.85%
<b>Post-tax WACC</b>	<b>6.93%</b>	<b>7.03%</b>	<b>7.13%</b>	<b>7.23%</b>	<b>7.34%</b>	<b>7.44%</b>

However, if we incorrectly assume that the debt beta is zero and use the Harris and Pringle formula in the Commission’s WACC paper, then the calibrated asset beta is 0.4 for both the firm of interest and the comparative firms. That is:

$$\beta_e = \beta_A \times \left[ 1 + \frac{L}{1-L} \right]$$

$$0.800 = 0.40 \times \left[ 1 + \frac{50}{50} \right]$$

The WACC calculations now exactly replicate the Commission’s Table A.1 in its Leverage and WACC paper.

**Table A2.3 Simplified Brennan-Lally CAPM with zero debt beta**

	1	2	3	4	5	6
Risk free rate	5.36%	5.36%	5.36%	5.36%	5.36%	5.36%
Debt premium	1.95%	1.95%	1.95%	1.95%	1.95%	1.95%
Leverage	20%	30.0%	40.0%	50.0%	60.0%	70.0%
Asset beta	0.400	0.400	0.400	0.400	0.400	0.400
Debt beta	0.00	0.00	0.00	0.00	0.00	0.00
TAMRP	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Tc	30%	30%	30%	30%	30%	30%
Ti	30%	30%	30%	30%	30%	30%
Equity beta	0.500	0.571	0.667	0.800	1.000	1.333
Cost of Equity	7.25%	7.75%	8.42%	9.35%	10.75%	13.09%
<b>Post-tax WACC</b>	<b>6.83%</b>	<b>6.96%</b>	<b>7.10%</b>	<b>7.23%</b>	<b>7.37%</b>	<b>7.51%</b>

The error by incorrectly assuming the Harris and Pringle formula and a zero debt beta is summarised in Table A2.4 below. The direction of any error depends on the leverage of the firm under consideration compared to the leverage of the comparator set of firms.

<b>Table A2.4: Errors in the Post-tax WACC estimation</b>						
<b>Leverage</b>	20%	30%	40%	50%	60%	70%
Table A2.2: Simplified Brennan-Lally CAPM with non-zero debt beta	6.93%	7.03%	7.13%	7.23%	7.34%	7.44%
Table A2.3: Simplified Brennan-Lally CAPM with zero debt beta	6.83%	6.96%	7.10%	7.23%	7.37%	7.51%
<b>Difference</b>	<b>0.11%</b>	<b>0.07%</b>	<b>0.04%</b>	<b>0.00%</b>	<b>0.04%</b>	<b>0.07%</b>

If the firm in question has a lower (higher) leverage than the comparator firms the simplified Brennan-Lally model with a zero debt beta will understate (overstate) the firm’s cost of capital. However, Table A2.4 above suggests that over a leverage range between 40% and 60% (equal to the industry leverage range in the Straw Person Example, para. 42, for electricity distribution businesses) the size of the error is small (between plus and minus 0.04%).

### **A.4.3 A Caveat**

Our analysis above assumes in the calculation of WACC that the promised yield is the appropriate cost of debt, rather than the expected yield on debt plus an allowance for a liquidity premium and bankruptcy costs. The use of a promised yield rather than the expected yield plus an allowance for a liquidity premium and bankruptcy costs will result in the WACC estimate being slightly over-estimated.<sup>58</sup>

On the other hand, we consider there is a potential compensatory error as the CAPM abstracts from liquidity.<sup>59</sup> As noted by Lally (2009b, p 4):

*“... in respect of the liquidity premium, a properly specified cost of equity ought to include allowance for this in so far as a firm’s equity is less liquid than government bonds.”*

Amihud and Mendelson (1988) show that even with bid-ask spreads of 1%-2% there is a substantial discount in value for liquidity costs. Amihud and Mendelson also argue investors

<sup>58</sup> The default rate for investment grade bonds is likely to be small. A Standard and Poor’s (2009) study reports median one-year global default rates for BBB bonds of 0.21% over the period 1981 to 2008.

<sup>59</sup> At a theoretical level, however, this would suggest an alternative asset pricing model to the CAPM should be used.

require a higher expected rate of return from an asset with lower liquidity to compensate for higher trading costs.

Lally (2009b, p 5) states liquidity premiums are likely to be much smaller on equity than corporate debt but provides no evidence in this paper to support this claim. For stocks in firms that are thinly traded or firms that are unlisted it is not apparent that a smaller illiquidity premium will apply to equity compared to corporate debt.

Overall we consider the likely size of any error in relation to the Commission's concern that under the simplified Brennan-Lally version of the CAPM, WACC increases with leverage will be small.

In this respect the Commission also needs to balance the risk of over-estimation of WACC against the more serious error of under-estimation of WACC (see Guidelines, para. 239).

## **A.5 Summary**

We conclude:

- The Commission's use of the same asset beta in its WACC and Leverage Paper under the Harris and Pringle and the Hamada formula is not appropriate;
- At present the assumption of a zero-debt beta is an appropriate and reasonable assumption in the WACC model and application of the simplified version of the Brennan-Lally CAPM. This is provided the Harris and Pringle formula used by the Commission is applied consistently to the comparative set of firms and the industry or firm in question;
- The assumption of zero leverage such that the WACC should be set equal to the unlevered cost of capital is not plausible when firms are typically observed to use debt in practice. Debt reduces agency costs of the firm and has benefits other than taxation advantages (e.g., incentives for firms to efficiently manage costs); and
- While the use of the Harris and Pringle formula in conjunction with the simplified Brennan-Lally version of the CAPM does mean the cost of capital increases as leverage also increases, the error and any overstatement of WACC is likely to be small. Any small over-statement of WACC is likely to be a less serious error than any under estimation of WACC, when there is asymmetry of social consequences and the risk of under-investment.

In summary we consider the outcome that WACC increases with leverage under the simplified version of the Brennan-Lally CAPM should not be of a material concern to the Commission.

## Appendix 3: WACC and Leverage

### 1. Introduction

The purpose of this Appendix is to show that the assumptions underlying the Sharpe-Lintner or classical CAPM and the corresponding WACC calculations do not match those under the simplified Brennan-Lally version of the CAPM.<sup>60</sup>

### 2. Notation

$\beta_e$	=	equity beta
$\beta_A$	=	asset beta
$\beta_d$	=	beta of debt
$T_c$	=	corporate tax rate
$T_e$	=	investor tax rate on equity income
$T_i$	=	investor tax rate on interest income
$K_e$	=	expected return on equity: pre-personal tax
$K_d$	=	expected cost of debt: pre-personal tax
$R_f$	=	risk free rate: pre-personal tax
$R_m$	=	expected return on the market
$r$	=	expected return on equity: post-personal tax
$r_m$	=	expected return on the market: post-personal tax
$r_f$	=	risk free rate: post-personal tax
$m$	=	market risk premium = $[R_m - R_f (1 - T_i) / (1 - T_e)]$
$p$	=	debt risk premium
$WACC$	=	weighted average cost of capital
$K_u$	=	unlevered cost of capital
$B$	=	market value of debt
$E$	=	market value of equity
$V$	=	value of the firm (i.e. $B + E$ )

### 3. Beta and CAPM

A general formula for beta conversion (which is independent of the CAPM) is:

$$\beta_e = \beta_d \left(1 + T \frac{B}{E}\right) - \beta_d (1 - T_c) \frac{B}{E}$$

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<sup>60</sup> We thank Professor van Zijl for assistance in the preparation of this Appendix.

where

$$T = \frac{(1 - T_c)(1 - T_e)}{(1 - T_i)}$$

and the CAPM, in terms of after personal tax rates of return, is:

$$r = r_f + (r_m - r_f)\beta$$

and thus, in terms of market observed equity returns (i.e. post-corporate but pre-personal tax), is:

$$K_e = R_f(1 - T_i)/(1 - T_e) + [R_m - R_f(1 - T_i)/(1 - T_e)]\beta_e$$

and for debt assets is:

$$K_d = R_f + [R_m - R_f(1 - T_i)/(1 - T_e)]\beta_d$$

#### 4. The Sharpe-Lintner CAPM and tax system.

Under the Sharpe-Lintner CAPM and its tax system:  $T_e = T_i$ .

The weighted average cost of capital WACC is:

$$\begin{aligned} WACC &= (R_f + m\beta_e)\frac{E}{V} + (R_f + m\beta_d)(1 - T_c)\frac{B}{V} \\ &= \left\{ R_f + m\beta_d \left[ \left( 1 + (1 - T_c) \frac{B}{E} \right) - \beta_d (1 - T_c) \frac{B}{E} \right] \right\} \frac{E}{V} + (R_f + m\beta_d)(1 - T_c)\frac{B}{V} \\ &= R_f + m\beta_d - m\beta_d T_c \frac{B}{V} - R_f T_c \frac{B}{V} \\ &= K_u - K_u T_c \frac{B}{V} \end{aligned}$$

Thus WACC decreases with increasing leverage.<sup>61</sup>

If it were assumed that debt beta equals zero but the cost of debt exceeds the risk free rate by a fixed amount  $p$ , then:

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<sup>61</sup> This is equivalent to Taggart Jr's (2001) formula 2A.3 in Exhibit 2, page 11.

$$\begin{aligned}
 WACC &= (R_f + m\beta_e) \frac{E}{V} + (R_f + p)(1 - T_c) \frac{B}{V} \\
 &= \{R_f + m\beta_a[1 + (1 - T_c) \frac{B}{E}]\} \frac{E}{V} + (R_f + p)(1 - T_c) \frac{B}{V} \\
 &= K_u - [K_u T_c - p(1 - T_c)] \frac{B}{V}
 \end{aligned}$$

Thus WACC still decreases with increasing leverage but at a slower rate compared to the assumption of non-zero debt betas.

## 5. The Brennan-Lally CAPM and tax system.

Under the Brennan-Lally CAPM and its tax system  $T_e = 0$ , and  $T_c = T_i$ .

$$\begin{aligned}
 WACC &= [R_f(1 - T_i) + m\beta_e] \frac{E}{V} + (R_f + m\beta_d)(1 - T_c) \frac{B}{V} \\
 &= \{R_f(1 - T_i) + m[\beta_a(1 + \frac{B}{E}) - \beta_d(1 - T_c) \frac{B}{E}]\} \frac{E}{V} + (R_f + m\beta_d)(1 - T_c) \frac{B}{V} \\
 &= K_u
 \end{aligned}$$

Thus WACC is invariant to leverage.

If it were assumed that debt beta equals zero but the cost of debt exceeds the risk free rate by a fixed amount  $p$ , then:

$$\begin{aligned}
 WACC &= [R_f(1 - T_i) + m\beta_e] \frac{E}{V} + (R_f + p)(1 - T_c) \frac{B}{V} \\
 &= [R_f(1 - T_i) + m\beta_a(1 + \frac{B}{E})] \frac{E}{V} + (R_f + p)(1 - T_c) \frac{B}{V} \\
 &= K_u + p(1 - T_c) \frac{B}{V}
 \end{aligned}$$

Thus WACC increases with increasing leverage.

## 6. Comparison between the Sharpe-Lintner and Brennan-Lally CAPMs

Although the same symbols appear under the Sharpe-Lintner tax system as under the Brennan-Lally tax system, the systems will have different equilibria and the values for corresponding rates are therefore likely to be different. The only comparisons that can be made are those within each system.