The Pilbara Infrastructure Pty Ltd

Review of the Weighted Average Cost of Capital

October 2008

Synergies Economic Consulting Pty Ltd
www.synergies.com.au

Disclaimer

Synergies Economic Consulting (Synergies) has prepared this advice exclusively for the use of the party or parties specified in the report (the client) and for the purposes specified in the report. The report is supplied in good faith and reflects the knowledge, expertise and experience of the consultants involved. Synergies accepts no responsibility whatsoever for any loss suffered by any person taking action or refraining from taking action as a result of reliance on the report, other than the client.

In conducting the analysis in the report Synergies has used information available at the date of publication, noting that the intention of this work is to provide material relevant to the development of policy rather than definitive guidance as to the appropriate level of pricing to be specified for particular circumstance.

Executive Summary

Synergies Economic Consulting (Synergies) has been engaged by The Pilbara Infrastructure Pty Ltd (TPI) to undertake a review of its Weighted Average Cost of Capital. The WACC is to apply to TPI's railway from the Cloud Break iron ore mine to Port Headland (the railway).

The 260 kilometre railway was commissioned in April 2008. The railway will have an initial capacity of 70 million tonnes per annum (mtpa), with provision for expansion. The railway currently has a single customer Fortescue Metals Group (FMG). Future access may also be sought from a number of junior miners, although it is understood that these volumes will be relatively small compared to the volumes that will be railed by FMG.

Key issues for estimating TPI's WACC

TPI's situation is unique, particularly relative to other regulated below-rail infrastructure providers in Australia. TPI's network is currently dedicated to a single new development, with any third party users only likely to haul relatively small incremental tonnages.

It is true that there will be a greater diversity of mines and mine owners that TPI services over time and over time it can be expected TPI's beta will change accordingly. However, at least at the current time, the risk profile of the rail network is inextricably linked with the risk profile of the Cloud Break and Christmas Creek developments, which have an estimated mine life of 20 years.

This unique situation poses a challenge for the WACC assessment. Given the extent of TPI's dependence on the risk profile of the mining ventures it has been built to service, we are of the view that it is not appropriate to assess its beta by comparing it to other rail transport businesses. Changes in the demand for FMG's iron ore will be directly translated into changes in demand for rail haulage.

We cannot identify any ways in which (or reasons why), TPI's systematic risk would materially differ from the systematic risk of FMG's iron ore business whilst it remains an emerging producer. Even if the new junior miners come on stream, their contribution to revenues, and hence TPI's risk profile, is expected to be relatively limited. The only way this could change is if a significant third party user obtained access to the railway, and only then if such entry has an impact on systematic risk.

This assessment is not dependent on the relationship between TPI and FMG but is reflective of FMG as an emerging mining company.

If a hypothetical new entrant sought to independently own and operate this railway, we are of the view that it would assess and price the risk in the same way. It would most likely seek long-term contracts underpinned by take-or-pay arrangements. However, any 'protection' afforded by these contractual mechanisms is only as good as the risk of the counterparty. At the end of the day, its exposure is to FMG as the dominant customer, and it would therefore price the risk with a cost of capital consistent with the above discussion.

The two key WACC inputs that are driven by the risk profile of the business are beta and capital structure. The implications of the above are that we have assessed these parameters with sole reference to other iron ore businesses including FMG. As FMG is an emerging producer in the iron ore market, it is important to interpret its data in the context of other established firms, given the WACC estimate should represent a long-term forward-looking estimate.

This assessment is contingent on FMG being the dominant customer. A revised assessment is recommended if another significant customer/s sought to access services from TPI **and** this resulted in a fundamental change to its risk profile.

The other unique consequence of this situation is that in determining the notional credit rating of an 'efficient benchmark firm', the investment grade credit rating (usually BBB) that is generally assumed for regulated infrastructure providers is not necessarily appropriate here. Few mining companies have credit ratings and most have very low gearing levels. FMG does have a rating, and is currently rated B-.

We are therefore of the view that the efficient benchmark firm with this risk profile is likely to be rated speculative grade. This therefore warrants the inclusion of an additional margin to reflect the difference between the cost of debt for a BBB and B rated issuer. As spreads increase significantly below investment grade, it is not appropriate to infer costs based on investment grade spreads.

However, yields on speculative grade bonds are not published in Australia. These yields are published in the US market, so we have applied the difference between BBB and B rated bonds in this market. While there are clearly issues in applying spreads from another jurisdiction, we are of the view that ignoring this additional cost will significantly understate the expected cost of debt for this business. In any case, the US spreads are likely to be lower than the spreads that would apply in Australia given the greater depth and liquidity in this market, noting that the lack of depth and liquidity

here is likely to mean that sub-investment grade borrowers would have to raise debt capital in offshore markets.

Summary of parameters

A summary of our proposed parameters and the rationale for each is provided below.

WACC Estimate for TPI

Parameter	Value	Rationale
Risk-free rate[a]	5.63%	20 day average of the 10 year Commonwealth Government bond yield, as at 30 September 2008.
Debt to value	10%	Based on the mid-point of average gearing levels for comparator sample over the last five years (0 to 20%).
Equity to value	90%	
Debt margin[b]	6.53%	20 day average of: (1) 8 year BBB bond yield + (10 year A bond yield - 8 year A bond yield) averaged over the 20 days ending 30 September 2008, which is the method most recently applied by regulators such as the ACCC and AER in response to the lack of liquidity in the BBB market in Australia; plus (2) 20 day average of US 10 year BBB bond yield – US 10 year B bond yield
Debt-raising costs	0.125%	Margin most commonly applied by regulators to compensate for incremental debt raising costs.
Market risk premium	6.8%	A range of 6% to 7.5% is considered appropriate for the MRP.
Gamma	0	Synergies is firmly of the view that gamma has no value. This is based on: • evident difficulties in estimating a reliable value for gamma (which may be because it has no value); • a strong theoretical foundation, being that since the introduction of the 45-day rule, franking credits are now of no value to the marginal foreign investor (whereas they may have had some value prior to this); and • empirical evidence to support a value of zero, both from the recent literature and our own analysis which confirmed that we cannot conclude that gamma has a value other than zero.
Tax rate	30%	Statutory corporate tax rate.
Asset beta	1.85	This is the average asset beta of our comparator sample, which comprises five Australian iron ore producers.
Debt beta	0	There is no reliable means of estimating a value for debt beta. A debt beta of zero has been applied in most recent regulatory decisions in Australia.
Equity beta	2.05	
Cost of debt	12.29%	
Cost of equity	19.56%	
Post-tax nominal (vanilla) WACC	**18.83%**	

Contents

1 Introduction

Synergies Economic Consulting (Synergies) has been engaged by The Pilbara Infrastructure Pty Ltd (TPI) to undertake a review of its Weighted Average Cost of Capital for. The WACC is to apply to TPI's railway from the Cloud Break iron ore mine to Port Headland (the railway). This report will also respond to issues raised in the Economic Regulation Authority's (ERA's) Issues Paper dated 4 September 2008 (the Issues Paper).

The 260 kilometre railway was commissioned in April 2008. The railway will have an initial capacity of 70 million tonnes per annum (mtpa), with provision for expansion. The railway currently has a single customer Fortescue Metals Group (FMG). Future access may also be sought from a number of junior miners, although it is understood that these volumes will be relatively minimal compared to the volumes that will be railed by FMG.

The purpose of this report is to provide an assessment of an appropriate WACC to apply to the railway. The WACC must represent a reasonable, forward-looking estimate for the business and be consistent with regulatory principles. This report will:

- provide an overview of the methodology and some of the issues underpinning WACC estimation;
- estimate a WACC based on appropriate assumptions for the following parameters:
    - risk-free rate;
    - capital structure;
    - debt margin;
    - equity beta;
    - market risk premium;
    - gamma; and
- consider the treatment and estimation of debt and equity raising costs.

2 Methodological Considerations

2.1 Business Environment

One of the first steps in any WACC analysis is to review the business environment. This includes undertaking a first principles analysis, which is a qualitative assessment of the firm's risk profile used to inform the beta assessment (noting that the focus of the beta assessment is systematic risk only, as will be outlined below). Lally identifies a number of factors to be considered here, including[1]: nature of the product or service; nature of the customer; pricing structure; duration of contracts; market power; nature of regulation; growth options; and operating leverage.

In our view, the nature of the product or service and the market in which it is sold is the fundamental driver and should always be the starting point. The other factors, such as pricing and contracting structure, regulation and market power, will either increase or mitigate the firm's systematic risk relative to similar firms (in the same or a similar market).

As noted above, FMG is currently the sole user of the line and is likely to remain the dominant user in the foreseeable future. FMG is a new player in the iron ore market, with shipments commencing in May 2008. This is a unique situation, at least compared to other regulated below-rail operations in Australia.

With the exception of Queensland Rail (QR), other regulated rail businesses in Australia are vertically separated. QR provides the closest parallel to TPI's situation, because:

- it is a vertically integrated business (QR's below-rail network is owned and managed by a wholly owned subsidiary, QR Network); and
- its regulated central Queensland coal network carries a single commodity (coal).

However, the relevant similarities end here. According to its current forecasts, QR Network's central Queensland coal network will be carrying around 225 million tonnes of export coal in 2009-10, increasing to over 250 million tonnes by 2012-13[2] (this is likely

[1] Lally, M. (2004), op.cit.

[2] QR Network (2008), QR Network's Access Undertaking (2009) – Volume 2, Central Queensland Coal Region Reference Tariffs, September.

to increase even further depending on the progression of major new developments required to meet the expected increase in demand). This coal is hauled over four rail systems servicing over 40 mine developments in the Bowen Basin coalfields. Queensland's export coal mining industry is well established, although it does remain vulnerable to demand changes in the longer term (including changes in Queensland's relative competitiveness).

While the demand for QR Network's regulated central Queensland coal network is directly derived from the demand for coal, the below-rail business is considered a rail transport business. There is considerable diversity in the client base – both in terms of various mine owners and mine sites. Further, QR's structure has now evolved to a point where QR Network essentially functions as a stand-alone business.

This is quite different from TPI's rail network, which is currently dedicated to a single new development, with any third party users only likely to haul relatively small incremental tonnages. It is true that there will be a greater diversity of mines and mine owners that TPI services over time and over time it can be expected TPI's beta will change accordingly. However, at least at the current time, the risk profile of the rail network is inextricably linked with the risk profile of the Cloud Break and Christmas Creek developments, which have an estimated mine life of 20 years.[3]

This unique situation poses a challenge for the beta assessment. Given the extent of TPI's dependence on the risk profile of the mining ventures it has been built to service, we are of the view that it is not appropriate to assess its beta by comparing it to other rail transport businesses. Changes in the demand for FMG's iron ore will be directly translated into changes in demand for rail haulage. Further, the relationship between FMG and TPI means that TPI cannot be 'protected' by long-term contracts or take-or-pay arrangements (which in any case, as noted below, cannot reduce risk relative to the risk of the counterparty to that contract). The existence of regulation has no impact as it does not provide any additional revenue certainty to TPI. Issues such as market power become irrelevant given that TPI has a single dominant customer that is part of the same group.

We are of the view that this is the way that an investor would assess the risk profile of the business. When assessing part of a business, or a new project, a fundamental rule is that the existing corporate WACC should only be applied if the risk profile of that business or project is the same as the risk of the existing business. If the risk profile is different, then a different WACC will be applied.

[3] Economic Regulation Authority (2008), Issues Paper: Determination of the Weighted Average Cost of Capital for the Pilbara Infrastructure's Railway from the Cloud Break Iron Ore Mine in the Pilbara to Port Hedland, p.6.

We cannot identify any ways in which (or reasons why), TPI's systematic risk would differ from the systematic risk of FMG's iron ore business. Even if the new junior miners come on stream, their contribution to revenues, and hence TPI's risk profile, will be relatively minimal. The only way this could change is if a significant third party user obtained access to the railway, and only then if such entry has an impact on systematic risk.

This assessment is not dependent on the relationship between TPI and FMG but is reflective of FMG as an emerging mining company.

An accepted approach to estimating an appropriate WACC for a company is from the perspective of a new entrant into a market. In the case of TPI, a new entrant would be an independent purchaser of the railway. If a hypothetical new entrant sought to independently own and operate this railway, we are of the view that it would assess and price the risk in the same way. It would most likely seek long-term contracts underpinned by take-or-pay arrangements. However, any 'protection' afforded by these contractual mechanisms is only as good as the risk of the counterparty. At the end of the day, its exposure is to FMG as the dominant customer, and it would therefore price the risk with a cost of capital consistent with the above discussion.

The fact that such an entrant would own a railway servicing the mines, rather than the mines themselves, does not change its risk profile. The only way this assessment might change is if significant new developments emerged, which would enable the railway owner to diversify its exposure. As indicated above, the junior mine developments that have been flagged as potential users of the railway are unlikely to contribute sufficient tonnages to achieve any diversification benefits.

The two key WACC inputs that are driven by the risk profile of the business are beta and capital structure. The implications of the above are that we will assess these parameters with sole reference to other iron ore businesses including FMG, which is a listed company. One of the reasons for examining other iron ore businesses is because FMG's data reflects the fact that it is a relatively new player in the market (and while this is one of the factors that makes this situation unique, our decision to focus on the risk profile of the iron ore business is independent of this consideration). Hence, determining benchmarks for the purposes of setting the WACC for pricing purposes needs to be considered in the context of other established iron ore businesses.

As TPI has a very different risk profile to other established below-rail operations in Australia, we are of the view that it is not valid to make comparisons with listed rail firms.

2.2 WACC

A firm's WACC recognises that its capital is provided by two sources, namely lenders and equity investors (that is owners or shareholders), and is equivalent to the weighted average cost of servicing the various classes of financial claims on the firm. Each source of capital or financial claim will involve different risks and hence different costs.

The Issues Paper invites comments as to whether a post-tax or pre-tax approach should be used. Further, if a pre-tax approach is to be used, it questions whether it should be based on the statutory tax rate or some benchmark effective tax rate.

We note that most regulators now apply a nominal post-tax (vanilla) methodology. This formulation adjusts for inflation, taxation and dividend imputation in the cash flows, rather than the cost of capital.[4] One of the reasons this approach has been favoured is to avoid some of the more contentious issues surrounding the application of a pre-tax real approach.

If a pre-tax approach is used, we would have significant concerns with the application of a benchmark effective tax rate. The key issue that arises here is how to determine what this 'benchmark' should be, including being able to demonstrate that it is, and will continue to be, significantly different from the statutory tax rate. The effective tax rate of a business or project is likely to vary through time. Apart from issues in relation to the estimation of a 'benchmark', it is considered reasonable to expect that on average, the tax rate over the long term will be the statutory tax rate. The only circumstances where this may not occur was if the business was in a particularly unique position, for example, all or part of its income was tax exempt.

If an effective tax rate approach is taken the risk of regulatory error is considered to be high, noting that estimation of WACC is already vulnerable to error given the inherent uncertainty underpinning parameter estimation. Given the asymmetric consequences of regulatory error (as outlined at the end of this section), we are of the view that a prudent approach would be the continued application of the statutory tax rate.

The other issue that arises with a pre-tax real methodology is the choice of transformation method. We note that the ERA has previously adopted the market transformation method (which has been the more commonly applied regulatory approach) and would endorse the continued application of that method here.

[4] For example, expected tax payable (and expected values of imputation credits) is captured in the modelling as a cash flow in each year of the analysis. In addition, the cash flows represent the nominal (rather than real) cash flows for each year of the analysis.

2.3 Cost of Equity

2.3.1 CAPM

Appropriateness of the CAPM

The Capital Asset Pricing Model (CAPM) is the most commonly applied methodology used to determine the cost of equity. The simplest version of the CAPM is commonly known as the Sharpe CAPM (or the Sharpe-Lintner CAPM). Its assumptions were set out by Sharpe in 1964 and it is widely used in estimating the cost of equity in both regulatory and commercial applications. However, it is also recognised that its assumptions are highly restrictive.[5]

A large body of theoretical and empirical work has been performed on the CAPM that involves relaxing the original assumptions made by Sharpe. The Sharpe CAPM has effectively been discarded by finance academics based on its restrictive assumptions and its limited ability to explain actual observed returns in equity markets. Alternative specifications have relaxed some of the key assumptions made by Sharpe. For example, the Black CAPM relaxes the assumption that investors can freely borrow and lend at the risk-free rate[6]. The assumption of a single period horizon was relaxed by Merton in 1973[7] and the resulting model is variously referred to as the Merton CAPM, the intertemporal CAPM and the consumption CAPM (where the last is a specific application of the more general intertemporal CAPM).

The complexity of these models (which matches the complexity of the real world) and the lack of unambiguous predictions have led regulators and many practitioners to shy away from their use. The Sharpe CAPM therefore remains the most widely used approach to estimating the cost of equity in regulatory applications.

We note the ERA's intention to apply the CAPM to TPI and the use of an alternative is not being proposed here. However, what this does highlight is the inherent uncertainty underpinning beta estimation and the practical difficulties associated with

---

[5] A key criticism is that it is a single period model that cannot be readily applied in a multi-period setting. Further, almost all of the assumptions on which it is based can be questioned. For example: (1) not all investors can borrow and lend at the risk-free rate; (2) short-selling of physical assets is generally not permitted (with the exception of derivative instruments); (3) many investors will consider the implications of taxes and transaction costs when making investment decisions; and (4) investors tend not to have homogeneous expectations regarding risk and return. On the contrary, much trading activity, and price volatility is driven by differences in expectations (and 'decision models' used by investors to form these expectations), particularly between buyers and sellers.

[6] Black, F. (1972), "Capital Market Equilibrium with Restricted Borrowing," in Journal of Business 45, pp. 444–55.

[7] Merton, R (1973), "An Intertemporal Asset Pricing Model," in Econometrica, 41, 867-887.

applying CAPM in any setting (let alone a regulatory context). The limitations arising from CAPM's assumptions mean that we cannot be confident that CAPM is a complete specification of risk and return. It is important to be aware of these limitations when interpreting any estimates produced using the CAPM and caution should be exercised in placing reliance on them.

Systematic and non-systematic risk

According to the CAPM framework, risk can be divided into two components, being:

- systematic or non-diversifiable risk; and
- non-systematic or diversifiable risk.

Systematic risk refers to those risks that tend to be impacted by changes in general economic activity. These risks will tend to impact the whole market and hence systematic risk is also often referred to as 'market risk'. Investors cannot avoid these risks through diversification.

Non-systematic risk, on the other hand, refers to risks that are unique to a particular firm or project. Because the non-systematic risks associated with different investments are not related, investors can avoid this source of risk by holding a well-diversified portfolio of investments, thus enabling the gains and losses resulting from such risks to offset each other (although the offset may not necessarily be exact).

Investors will therefore only be rewarded for bearing systematic risk via the rate of return. As non-systematic risks can be eliminated by diversification, investors cannot expect to receive any compensation for these risks via a higher rate of return. Instead, they will tend to be modelled in the cashflows.

2.3.2 Asset and equity betas

The systematic risk (β_e or equity beta) of a firm is the measure of how the changes in the returns to a company's stock are related to the changes in returns to the market as a whole. As noted above, it is the only risk factor incorporated in the CAPM.

There are two key determinants of an entity's equity beta:

- business risk arising from the sensitivity of an entity's cash flow to overall economic activity, where more cyclical cash flows are associated with higher betas; and
- financial risk arising from capital structure, where a higher level of debt implies a higher beta.

The asset beta represents the systematic risk of the ungeared entity (and as such includes no financial risk and only business risk). The equity beta incorporates both the business risk and the financial risk for an entity.

In practice, we only observe equity betas (being the estimated betas of listed companies). We do not directly observe asset betas, but we can calculate them from a combination of each observed equity beta and the level of gearing for that entity.[8] The asset beta removes the effect of gearing from the estimate of systematic risk.

There are a number of ways of doing this. The approach that is now used by a number of Australian regulators, including the ACCC, is the Monkhouse formula. We do not dispute that CRA's contention that the Monkhouse formula can be applied for the levering and delvering process. However, we believe that the appropriate specification of the Monkhouse formula is as follows:[9]

$$\beta_e = \beta_a + (\beta_a - \beta_d)[1-(R_d/(1+R_d))(T_c(1-\gamma))]*D/E$$

where:

β_a = beta of assets

β_d = beta of debt

R_d = the cost of debt capital

T_c = corporate tax rate

γ = gamma

D/E = value of debt divided by the value of equity.

We have therefore applied this specification in our analysis.

2.3.3 Debt beta

Treatment of debt beta in other regulatory decisions

The application of the Monkhouse formula requires the adoption of an assumption for the debt beta, which is a measure of the systematic risk borne by debt holders.

---

[8] The difference between an asset beta and an equity beta reflects the additional financial risk to a shareholder arising from the extent to which debt is used to finance the entity's assets. Because debt holders have senior claims to the entity's cash flows and assets, equity holders face an additional risk.

[9] For example, refer: ACCC (2004), Statement of Principles for the Regulation of Electricity Transmission Revenues – Background Paper, p.103. This is different from the specification that is cited by CRA, which is:

$$\beta_e = \beta_a + [(\beta_a - \beta_d)(1-t(1-\gamma))D/E]$$

Notwithstanding that the CAPM was developed in the context of equity markets, not debt markets, a common approach to estimate the debt beta has been to use the structure of the CAPM:

$$\beta_d = (R_d - R_f)/(E(R_m) - R_f)$$

This has the appeal of using a familiar relationship between beta and the market risk premium ($E(R_m) - R_f$). The approach attributes the promised debt risk premium ($R_d - R_f$) to systematic risk. However, given it is recognised that a substantial determinant of the cost of debt is non-systematic default risk, this approach will significantly over-estimate the value of the debt beta.

An alternative approach is to assume the debt beta is zero. In a report prepared for the Queensland Competition Authority (QCA), Lally recommends the application of a debt beta of zero in a regulatory context:[10]

> …on account of the difficulties in estimating the debt beta, the slightness of the error in treating it as zero, the likelihood that the resulting errors are less than those arising from the Authority's current approach, and the likelihood that the errors will be of the less serious type than those arising from the Authority's current approach.

The ACCC considered this issue in the development of its *Statement of Principles for the Regulation of Electricity Transmission Revenues* (Statement of Principles).[11] It noted the uncertainty surrounding the estimate of the debt beta, particularly given that it was not generally used by investors, and that different approaches yield different outcomes. It determined that it would apply a value of between 0 and 0.2. Importantly:

> …the ACCC considers that the debt beta is immaterial as long as the same value is used in the de-levering and re-levering process.[12]

We note that CRA has reached a similar conclusion.

Presumably for this reason, the issues surrounding estimation of the debt beta have received little if any attention in recent regulatory reviews. A number of the state-based regulators (with the exception of the QCA) have applied a value of zero and in many decisions the assumption is not stated at all (this may or may not imply that a value of zero has been adopted).

---

[10] Lally, M. (2004), The Cost of Capital for Regulated Entities, Report prepared for the Queensland Competition Authority, p.75.

[11] Australian Competition and Consumer Commission (2004), Decision: Statement of Principles for the Regulation of Electricity Transmission Revenues – Background Paper, December.

[12] ibid.

More importantly, it is noted that the ACCC has consistently applied a value of zero in more recent decisions, including its recent Draft Decision in relation to ARTC's interstate rail network. The Economic Regulation Authority (ERA) also applied a value of zero in its recent decision in relation to the freight and urban rail networks in Western Australia.[13] A debt beta is no longer considered in electricity transmission, given the current guidelines administered by the Australian Energy Regulator (AER) assumes an equity beta of one.

A summary of a range of regulatory decisions is provided in the following table.

Table 1 Regulatory Precedent: Debt Beta

Decision	Debt Beta Applied
ACCC	
Moomba to Adelaide gas pipeline (2001)	0.06
Amadeus Basin to Darwin gas pipeline (2002)	0.15
Moomba to Sydney gas pipeline (2003)	0.06
Electricity transmission – Powerlink, ElectraNet, VenCorp, SPI PowerNet (2002)	0
Energy Australia (2005)	0
Transgrid (2005)	0
Roma to Brisbane Gas Pipeline (2006)	0
ARTC's interstate network – Draft (2008)	0
Economic Regulation Authority	
Freight and Urban rail networks (2008)[a]	0
ESCOSA	
Electricity distribution (2005)	0
IPART	
Hunter Valley rail network (2004)	0
Electricity distribution (2004)	0 to 0.06
QCA	
Dalrymple Bay Coal Terminal (2005)	0.11
QR (2005)	0.12
Electricity distribution (2005)	0.1
Gas distribution (2006)	0.12

a This was not explicitly stated, however the ERA noted that this assumption had been applied in the Draft Decision. It is also implied by the final parameter assumptions adopted by the ERA based on the application of the Brealey-Myers formula.

[13] This was not explicitly stated in the Final Decision, however the ERA noted that this assumption had been applied in the Draft Decision. It is also implied by the final parameter assumptions adopted by the ERA based on the application of the Brealey-Myers formula.

Implications for this review

We note that in its decision in relation to WestNet Rail, the ERA did reference that it had previously applied the CAPM-based approach (notwithstanding a debt beta of zero was applied in that decision).

The fundamental deficiency of using the CAPM-based approach to derive the debt beta is that it will always overstate the debt beta given the debt margin is largely driven by non-systematic risk factors (this is also observed by CRA). This situation is exacerbated at the current time given the blow-out in credit spreads that have occurred due to conditions in global financial markets, with an increase in the debt margin resulting in a significant increase in the debt beta.

As noted above, the debt beta estimate is not considered an issue provided the same estimate is used in the de-levering and re-levering process. However, that in turn implies that the regulated entity's beta is being set with direct reference to the comparator data. When a higher value of debt beta is applied, for example, it will result in a relatively higher value for the de-levered asset betas (the comparators), and a lower equity beta when the regulated entity's asset beta is re-levered. In other words, this will prove 'immaterial' if the regulated entity's asset beta is set with *direct* reference to the comparator estimates.

This will not always be the case, particularly if the risk profile of the business is different to its comparators. More importantly, the fundamental issue here is whether there is a sound economic basis to support a higher value for the debt beta. As noted above, the cost of debt is largely driven by non-systematic default risk. There is no evidence to suggest that the expansion in credit spreads is due to an increase in the systematic risk of debt (that is, an increase in the covariance between the return on debt securities and the return on the market).

More specifically, there is no evidence that the expansion in credit spreads for corporate debt has been associated with a sudden and worldwide transfer of risk from equity holders to debt holders. In our view, this is simply not a credible assumption as no mechanism can be conceived of through which this sudden world-wide transfer would have occurred.

The more realistic scenario is that the systematic risk of debt has not changed and the movements in credit spreads are based on changes in perceived default risk (worsened by signalling problems associated with trading in the market for debt)[14].

In any case, as outlined above, given that the debt beta itself cannot be readily estimated the actual influence of systematic risk on corporate bond yields remains unknown.

What this highlights is the significant issues associated with deriving the debt beta using the CAPM (which, as noted above, was not designed for application to debt markets). The sensitivity of the debt beta estimate to changes in the debt margin assumes that these changes are solely driven by systematic risk. If this relationship does not hold, which we are firmly of the view is not the case (as has also been accepted by others), it can actually produce an outcome which has no theoretical support and in fact may contradict what is more likely to be the case in practice.

There is currently no robust, accepted methodology of deriving a reliable estimate for the debt beta. Given any CAPM-derived estimate will always overstate the value of the debt beta given the extent to which the debt margin is driven by non-systematic risks, this methodology must be discarded. While we acknowledge that the debt beta may have some positive value, in the absence of any reliable methodology to measure it we are of the view that it should be set at zero.

While setting beta at zero is not controversial in the context of recent regulatory decisions in Australia, it is important to emphasise that this is not because the issue "doesn't matter" provided the same debt beta assumption is used in the de-levering and re-levering process. This could be seen to imply indifference between applying the CAPM-derived debt beta (which is consistently applied in the de-levering and re-levering process) and using a debt beta of zero. Given the contradictory outcomes that a CAPM-derived beta can produce, it should be discarded.

In our view, a beta of zero should be applied because there is currently no robust way of estimating a value for debt beta that measures the systematic risk of debt only. This is particularly important given the asymmetric consequences of error. An assumption of zero has therefore been recommended for the purpose of this analysis.

[14] That is, given the heightened uncertainty associated with corporate debt investors perceive the desire of a debt holder to sell that debt as a 'signal' that the debt holder has inside information about the negative quality of the debt.

2.4 Approaches to estimating beta

There are three basic approaches to estimating systematic risk:

- direct estimation;
- first principles; and
- comparable companies.

An overview of each approach is now briefly provided.

Direct Estimation. If the firm is listed, regression analysis can be used to estimate the relationship between the firm's returns and the returns on the domestic share market index (such as the ASX 200). Several years of trading data is required to provide a statistically meaningful estimate.[15]

First Principles. This approach requires analysing the factors that impact on the sensitivity of a firm's returns to movements in the economy or market. It can be used for two main purposes. First, it can be used to assist in the selection of comparable companies. Second, as the comparable companies analysis will tend to produce a range of plausible estimates for beta, the first principles analysis can assist in determining where the particular firm may be within that range based on its relative risk profile.

Comparable Companies. This approach begins by identifying a set of comparable companies with a similar business and risk profile that are listed on the sharemarket. Using share price information for the companies, their equity betas are estimated using regression analysis. As the companies will have different gearing levels (and hence different financial risk), these equity betas must be 'delevered' to produce an asset beta.

As FMG is a listed entity we will be able to estimate a beta for the firm as a whole. We will also estimate betas for other iron ore producers to assist in putting this estimate in context (assuming it is statistically significant).

2.4.1 Estimation error

Before progressing to the more detailed analysis, it is important to be aware of the susceptibility of beta to estimation error. It is not possible to directly observe a firm's true beta. Instead, estimates are obtained by regressing the historical returns of a firm's shares against the historical returns for a market index, over the same time period. As

[15] We recommend five years of monthly data.

with any statistical estimate, it is measured with uncertainty. This uncertainty is likely to be more pronounced for individual firms. As a consequence, the resulting data estimates can be of limited reliability and caution should be exercised in applying these estimates in a forward-looking analysis.

It is also believed that betas are mean reverting. In other words, over time, the betas of all firms will gradually move towards the equity beta of the market, which is one. This means that future estimates of beta are likely to be closer to one than current estimates.

There are a number of ways to address measurement error. As a starting point, any beta estimates with poor statistical properties[16] should be discarded (this is discussed further below). There are a number of other ways to deal with the uncertainty surrounding the estimation of beta, including:

- adjusting for thin trading, which is a common cause of measurement error, using techniques such as the Scholes-Williams technique;
- adjusting for mean reversion using the Blume adjustment[17]; and
- the formation of portfolios. Portfolio betas have substantially lower standard errors and yield more precise estimates of beta. While there are benefits in using this approach via reductions in the standard error, as more firms are used caution should still be exercised to ensure that they are relevant comparators.

A report by Gray et al provides a useful summary of the various methods of estimating beta, as well as their performance.[18] The study uses historical data to compare the predicted beta estimate in accordance with CAPM, with the actual equity return for the relevant forecast period. The closer the predicted estimate to the actual equity return, the better the estimation technique. A summary of the findings of the report are:

---

[16] The **R^2**, or coefficient of determination, measures the explanatory power of the regression equation (that is, how much of the variability in Y can be explained by X). It takes a value of between 0 and one. For example, an R-squared of 0.7 would suggest that 70% of the variability in the individual share's returns is explained by variability in the returns on the market. The **standard error** measures the sampling variability or precision of an estimate. That is, as the estimate is derived from a sample distribution, it measures the precision of the model parameter. A lower standard error is preferred as it indicates a more precise measure. A third commonly used measure is the **t statistic**. The t statistic is calculated for each coefficient in a regression model (in this case, the beta coefficient) for the purposes of hypothesis testing. The tendency is to test the hypothesis that the regression coefficient is significantly different from zero. This is done within a specified confidence interval (for example, 95%). Generally, the t statistic should exceed two to be considered reliable. These measures have been used in this analysis to screen comparator beta estimates.

[17] The impact of this adjustment is to 'draw' the value of the estimated beta closer to one. The typical adjustment is simply: Adjusted beta = (1/3 * the market beta of one) + (2/3 * estimated beta). This can be reduced to: Adjusted beta = 0.33 + (0.67 * estimated beta).

[18] Gray, S., Hall, J., Bowman, R., Brailsford, T., Faff, R., and Officer, R. (2005), The Performance of Alternative Techniques for Estimating Equity Betas of Australian Firms, Report Prepared for the Energy Networks Association.

- it is preferable to use data periods of longer than four years;
- monthly observations are preferred to weekly observations;
- Blume-adjusted estimates that account for mean reversion provide better estimates;
- statistical techniques that eliminate outliers are preferred, provided the outlier is not expected to re-occur; and
- a beta estimate derived from a sample of firms in an industry is preferred to an estimate for an individual firm.

A further interesting finding was that assuming an equity beta of one for a firm generally outperformed standard regression estimates, and that this may be a more appropriate assumption for beta if data cannot be obtained over a suitably long time period.

Approach applied in this review

There are a number of measures we have implemented here in an attempt to address estimation error. First, we have constructed estimates for a sample of firms that are considered to be of the most relevance to TPI. Second, we eliminated any firms that did not have five years of monthly share price data. Third, we eliminated any estimates from the sample that had a t-statistic of less than 2..

The reason we have applied these filters is because regression analysis is a statistical procedure that is commonly used to estimate beta in the absence of being able to observe the 'true' value of that beta. The explanatory power of the resulting estimate is of fundamental importance. If the resulting estimate has relatively low explanatory power, we cannot be confident that the estimate provides any valuable information regarding the true value of that firm's beta. In other words, the estimate is essentially meaningless.

2.4.2 The asymmetric consequences of error

Finally, it is generally recognised that regulatory error has asymmetric consequences. The Productivity Commission stated:[19]

> - Over-compensation may sometimes result in inefficiencies in timing of new investment in essential infrastructure (with flow-ons to investment in related

[19] Productivity Commission (2001), Review of the National Access Regime, Report no. 17, AusInfo, Canberra, p.83.

markets), and occasionally lead to inefficient investment to by-pass parts of the network. However, it will never preclude socially worthwhile investments from proceeding.

- On the other hand, if the truncation of balancing upside profits is expected to be substantial, major investments of considerable benefit to the community could be forgone, again with flow-on effects for investment in related markets.

In the Commission's view, the latter is likely to be a worse outcome.

In other words, the consequences of setting WACC too low, and discouraging efficient investment in essential infrastructure, are considered worse than setting it too high.

The estimation of WACC is inherently imprecise and hence the probability of specifying a WACC other than the 'true' value is high. For key parameters such as beta and the market risk premium, there is likely to be a range of reasonable estimates rather than a precise value (specific issues in estimating beta are considered in the following section). The Australian Competition Tribunal ('the Tribunal') recognised the range of reasonable outcomes within which a Reference Tariff determination could fall:

> …there is no single correct figure involved in determining the values of the parameters to be applied in developing an applicable Reference Tariff. The application of the Reference Tariff Principles involves issues of judgement and degree. Different minds, acting reasonably, can be expected to make different choices within a range of possible choices which nonetheless remain consistent with the Reference Tariff Principles.[20]

In reality, there is a high probability that the true value of the WACC for a regulated entity may be higher or lower than the estimated value.

Typically, based on our best estimate for WACC we would expect the balance of consequences to be approximately equal (that is, if the consequences of too high a WACC are the same as the consequences of too low a WACC, and the probability of either consequence is the same, the expected value will be zero). However, if the consequences are asymmetric (in this case, the consequence of an under-estimate is worse than the consequences of an over-estimate), then if the probability of either outcome was equal, the expected value will be negative. We therefore need to adjust

[20] Application by GasNet (Australia) Operations Pty Ltd [2003] ACompT 6, para 29.

the probabilities in order to achieve an expected value of zero, which necessitates ensuring that the probability of the worse outcome is lower.

Given the asymmetric consequences of regulatory error, it is therefore important to lower the risk that the true value is higher than the estimated value as this is considered to have more severe social and economic implications.

3 Risk-free Rate

The risk-free rate measures the return an investor would expect from an asset with zero volatility and zero default risk. The yield on long-term Australian Commonwealth Government bonds is the best proxy for a risk-free return as the government can honour all interest and debt repayments. There are two issues to be considered here, that is, the relevant bond maturity and the length of the averaging period.

3.1 Bond maturity

The ten-year Commonwealth Government bond is generally used to determine the risk-free rate. This is consistent with the long-term forward-looking horizon over which it is assumed investors are forming their return expectations under the CAPM. In Australia, the ten-year bond is the longest liquid maturity currently available and is used by most regulators in Australia.

We have therefore used the ten-year Commonwealth Government bond to determine the risk-free rate for this analysis.

3.2 Length of the averaging period

Given the CAPM is intended to reflect expectations as of the day of analysis, it is theoretically correct to base the risk-free rate on the prevailing yield on the date of the valuation. However, problems may occur if there is a spike in yields on the day that the rate is applied. It is therefore now common regulatory practice to average the rate over a short horizon, which typically ranges from between ten and forty days, noting that over such a short horizon the choice of averaging period is likely to be of little consequence.

We have used an averaging period of twenty days, ending on the 30th of September 2008. The average risk-free rate over this period was 5.63%.

4 Inflation

4.1 Inflation Estimate

Historically the most common methodology for calculating expected inflation was using the Fisher equation to solve for the implied inflation rate using nominal and indexed 10 year Commonwealth Government bond yields. At the present time there are a number of problems with this approach.

The massive and ongoing reduction in Commonwealth Government debt means there is now little liquidity in the indexed bond market. The low level of liquidity distorts the price discovery process resulting in yields that are not 'true' market yields and biased inflation estimates. An additional problem is a suspected bias in indexed and nominal bonds. A number of researchers have suggested that there is a downward bias in the yields on Commonwealth Government bonds.

Recent regulatory decisions have turned to forecast inflation as being the appropriate estimate of inflation. For example, recent decisions by the ACCC and AER have estimated a long-term average forecast based on the Reserve Bank's inflation forecasts for the next two and a half years (which is the maximum horizon for these forecasts), and then assumed 2.5% after that (as this is the mid-point of the Reserve Bank's target range). The forecasts provided in the most recent *Statement of Monetary Policy* are provided in the following table.

Table 2 RBA Inflation Forecasts (as at August 2008)

	Dec 2008	June 2009	Dec 2009	June 2010	Dec 2010
Underlying Inflation	4.50	3.75	3.25	3.00	2.75

Source: Reserve Bank of Australia (2008), Statement on Monetary Policy, August, p.62.

A long-term estimate based on this methodology is approximately 2.75%.

While this is not an unreasonable approach, the practical effect is that the long-term estimate is more heavily influenced by the short-term outlook. This outlook will also be sensitive to changes in economic conditions.

The objective of the estimate in this context is to come up with a forward-looking estimate of inflation over a long-term horizon. In our view, the best estimate of inflation over such a long period is the mid-point of the Reserve Bank's target range. This also reduces the risk of forecasting error.

4.2 Conclusion

In our view, the preferred estimate for inflation for TPI is the mid-point of the Reserve Bank's target band, being 2.5%. This is considered the most appropriate forecast over a long time horizon and reduces the risk of forecasting error. The approach previously applied by regulators, which estimated implied inflation based on ten-year Commonwealth nominal and indexed bond yields, is no longer applied due to the recognised bias in the latter.

The forecast inflation must be a long-term estimate as current levels of inflation are not representative over the investment time horizon. A ten year estimate using the RBA's forecast for the next two and a half years and assuming 2.5% thereafter results in an inflation estimate of 2.75%. This is heavily influenced by the short-term outlook. An alternative is to assume in the long-term, inflation will on average, approximate the mid-point of the Reserve Bank's target band.

As a long-term estimate is required here, our view is that 2.5% is the most appropriate assumption.

5 Capital structure

5.1 Methodology

The assessment of capital structure for the purpose of WACC is based on an assessment of an 'optimal' long-term target capital structure for the firm given its risk profile and the industry sector within which it operates. For the purpose of this analysis, capital structure (or gearing) is measured in terms of debt to total value. It should also be expressed in market value terms, rather than book values, however this cannot necessarily be readily observed for all firms, particularly for debt.

While the determination of a firm's target capital structure is typically a detailed process that considers both industry environment and firm-specific factors, the analysis for the purpose of the regulated WACC is typically limited to an examination of appropriate comparators (given this is seen to be indicative of the sustainable capital structure for a firm operating in the relevant industry). We note that CRA's suggested approach is to employ the mid-point of the range of capital structures observed for the selected comparators.

5.2 Analysis

As outlined in section 2.1, we are limiting our comparator sample to iron ore producers (including FMG). We have also limited this to Australian firms, and only those that were also used in the beta assessment (and hence had sufficient share price history and a statistically significant beta estimate). This gives a sample of five firms (FMG, BHP Billiton, Rio Tinto, Gindalbie Metals and Aquila Resources). Further information regarding our sample is provided in Chapter 7.

The gearing levels of an individual firm will change over time for a number of reasons, including the stage of the firm's investment cycle, interest rates and changes in the firm's risk profile. Where possible, we have collected data on the average debt to value ratio for all firms in the sample over the last five years.

It should also be noted that total firm value is based on Enterprise Value. Enterprise Value assumes that any surplus cash that is retained by the firm is used to repay debt. This value is likely to be different to the firm's reported book value, however we consider it the most appropriate proxy for market value. It can also mean that the estimated gearing levels are lower than the actual gearing level of the firm, as it assumes that surplus cash will be used to repay debt although this may not in practice

be the case (for example, the firm may be retaining the cash to fund future expenditure). In general, however, the impact of this assumption should not be material.

A number of the firms in this industry category are very lowly geared (with some being 100% equity funded). This is not considered surprising given the risk profile of this industry. Two of the firms in the sample, Gindalbie Metals and Aquila Resources, have no debt (based on the application of Enterprise Value). BHP Billiton and Rio Tinto are likely to have a higher debt capacity than the other firms given they are larger and more diversified (as reflected in their credit ratings).

The average gearing levels for our sample of five firms over the five years is summarised in the following table.

Table 3 Iron Ore Companies – Average Gearing Levels (Debt to Enterprise Value)

Year	Gearing
2003	4%
2004	3%
2005	21%
2006	8%
2007	12%

Source: Bloomberg

Given that firms' gearing levels change through time, it is usually appropriate to look at a longer term average. For this sample, the average debt to value ratio over the last five years was 10%. In our view, an appropriate capital structure range is likely to be between:

- zero, because many firms in this industry are all equity funded; and
- 20%, which is the highest average gearing level for our sample over the past five years, as well as FMG's 2007 gearing level on a debt to Enterprise Value basis.

This is considerably lower than the assumption that was applied by the ERA in relation to WestNet Rail, which was 35% (which in turn was lower than assumptions applied in other rail regulatory decisions). However, for the reasons outlined in section 2.1, we are of the view that it is inappropriate to compare TPI to other rail businesses as TPI's risk profile is significantly different.

5.3 Conclusions

The capital structure decision needs to be based on an assessment of the likely level of gearing that could be maintained by an efficient benchmark firm operating in this

industry. The industry data suggests that the level of gearing for an iron ore producer in Australia is very low. Further, TPI's risk profile is directly tied to the risks of its single customer, FMG.

FMG's average gearing is the highest of the firms in the sample. This reflects its current situation, which is a newly established operation with high capital needs. We are therefore of the view that it is appropriate to reference the average gearing level of our sample, which is 10%. This is also the mid-point of our recommended range. Given many firms in this industry are all equity funded, such a low level of gearing is considered appropriate for a firm with this risk profile.

6 Debt margin

6.1 Regulatory approach

The cost of debt capital is normally calculated as the risk-free rate plus a margin for credit or default risk. The typical approach to determining the debt margin involves:

- if the firm is unrated, assuming an appropriate 'notional' credit rating, which reflects the risk of default; and
- estimating an appropriate margin based on the difference between the current cost of debt for a firm of that credit rating, and the risk-free rate. This should be estimated over the same time period as the risk-free rate.

A common starting point for the notional credit rating assumption is BBB, or minimum investment grade. In regulatory decisions, assumptions ranging between BBB and A have tended to be adopted.

The debt margin is then normally estimated based on the difference between the yield on ten year BBB corporate bonds and the risk-free rate (averaged over the same twenty day period). However, in more recent times there have been no published yields for ten year BBB bonds given the difficult financial market conditions. The alternative approach that has been employed by the Australian Energy Regulator (AER) and also accepted by the ACCC, is to observe the yield on the longest-dated BBB bond (which is currently eight years) and add the margin between an A-rated 10 year and 8 year bond (as this is considered an appropriate proxy for the difference in yield between a BBB-rated 10 year and 8 year bond).

We note that CRA has suggested that bond holders ex ante expected returns should be adjusted (reduced) to reflect the results of an ex post study of actual returns incorporating interest and principal payments that are not received. The CAPM is a long-term forward-looking model used to estimate returns required to compensate equity and debt holders for investing in the business. As such, it is only *ex ante* returns that are of interest to investors. It is inconsistent with generally accepted modern financial theory to discount such forward looking estimates on the basis of historic realised returns.

6.2 Application to TPI

As discussed previously, TPI's situation is a unique one and hence it cannot be directly compared with other established regulated below-rail businesses. We have therefore assessed TPI's risk profile based on the risk of its single customer, FMG, as this is how we expect a hypothetical new entrant would price access to this railway.

Very few mining companies have a credit rating, although this is to be expected, given most of them carry very low levels of debt (and some may have difficulties raising debt). FMG does have a credit rating, which is currently B--. The only other rated iron ore producers we could identify from our sample are BHP Billiton (A+) and Rio Tinto Limited (BBB). These higher credit ratings reflect the relative size and diversification of these businesses.

The question here is whether a BBB credit rating is appropriate for the 'efficient benchmark firm', or, a below-rail operator of a single railway servicing a single dominant customer. As noted previously, we are of the view that an investor would price this risk based on the risk of the customer, and a lender will take a similar (and more conservative) view. Unless some form of credit enhancement is provided, from a lender's perspective, the credit risk of a loan to the railway can be no better than the credit risk of the major customer.

We therefore propose that the notional credit rating needs to be based on the risk of the underlying customer. As investment grade credit ratings are only likely to be able to be achieved by very large, diversified mining companies, FMG's B- rating is considered a reasonable benchmark. As discussed previously, this assessment may change if another significant customer/s wanted to secure below-rail access from TPI.

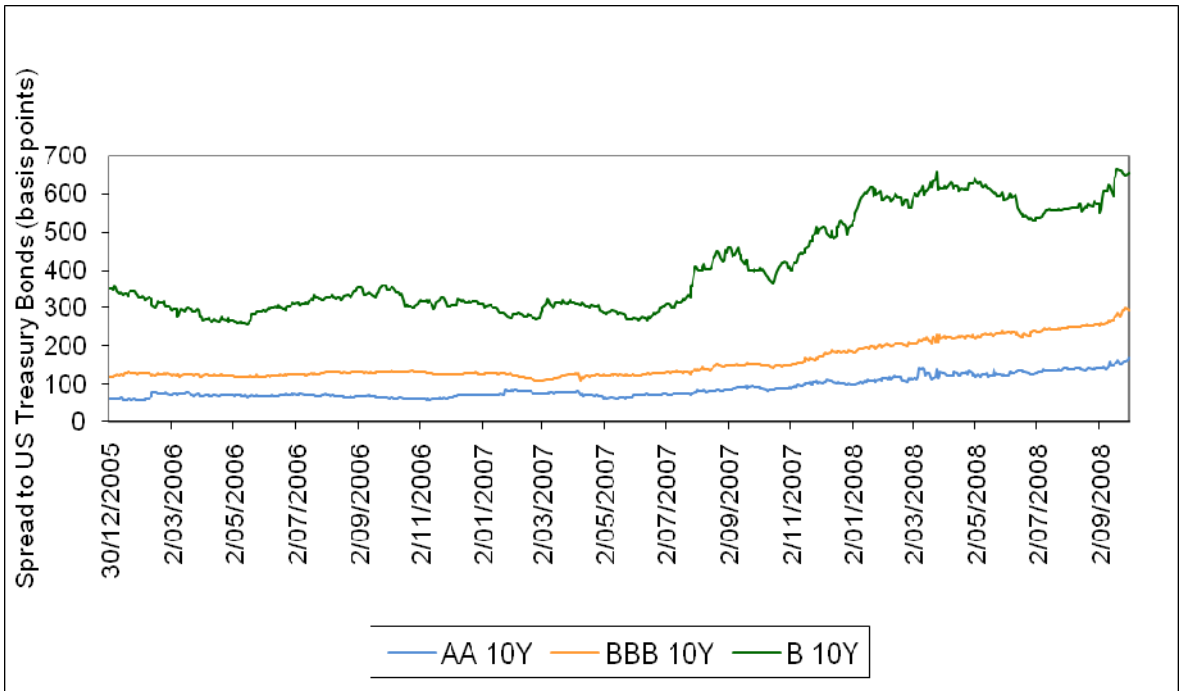
6.3 Quantifying the debt margin

The established methodology outlined above for estimating BBB margins can be used to estimate the margin between BBB and the risk-free rate. However, there are no published bond yields for sub-investment (or speculative) grade debt in Australia (particularly for longer terms). This reflects the relative size and liquidity of the Australian market. The most likely scenario is that a speculative grade borrower would have to go offshore (such as to the US) to raise debt funding (as was the case with FMG).

There is a significant difference between spreads on investment grade and speculative grade debt reflecting investor perceptions of underlying differences in risk between the grade categories. This is particularly evident in the current market environment. For example, Standard and Poor's data (from early September) suggests that the spreads

on speculative grade bonds have widened to 796 points in the US, compared to 283 basis points for investment grade.[21] This is highlighted in the following chart, which compares the spreads on US A, BBB and B rated debt to US Treasury Bonds (10 years) since the beginning of 2006.

Figure 1 US Spreads to 10 Year Treasury Bonds (A, BBB and B)



Data source: Bloomberg

This is one of the most turbulent times in financial markets in recent history and hence these spreads will have blown out considerably (the difference between investment grade and speculative grade was around 200 points one year ago[22]). However, what this does highlight is that assuming an investment grade credit rating may significantly understate the likely expected cost of debt for TPI because the 'efficient benchmark firm' in this case is not likely to be rated investment grade, and the difference in spreads is material.

[21] L. Peek (2008), "Credit Spreads Widen Despite Signs of Recovery", The New York Sun, September 4, 2008.

[22] ibid.

6.4 Conclusion

Inferring information from US spreads and applying to Australian market data clearly presents challenges yet there is no better alternative given the absence of an Australian data source. In any case, we are of the view that the US market data would almost certainly understate the cost of raising speculative grade debt in Australia, given there is significantly more liquidity and depth in the US market. Further, we are using these spreads as a proxy for the difference between BBB and B rated debt.

We have therefore estimated the spread between a BBB bond and the risk-free rate, based on the methodology outlined above. The twenty day average to 30 September 2008 was 303 basis points.

We have then estimated the 20 day average spread between 10 year US BBB and B rated bonds, as at 30 September 2008. This adds another 350 basis points to the cost of debt. The total debt margin is therefore 653 basis points.

7 Equity Beta

As outlined in Chapter 2, as FMG is a listed company it is possible to estimate its beta directly. We have also collected data for other listed Australian iron ore producers. We initially limited our analysis to Australian firms. If this had failed to produce a reasonable sample of estimates based on our criteria below, we would have extended our sample to include firms from other jurisdictions.

Firms had to have at least five years of monthly share price data to be included in our sample. This resulted in a sample of five firms, which are summarised in the table below.

Table 4 Composition of Sample

Firm	Description
Aquila Resources	Aquila Resources Limited is an exploration company with interests in coal and iron ore. Aquila's exploration activities are located in Queensland, Western Australia and South Africa.
BHP Billiton	BHP Billiton Limited is an international resources company. The Company's principal business lines are mineral exploration and production, including coal, iron ore, gold, titanium, ferroalloys, nickel and copper concentrate, as well as petroleum exploration.
Fortescue Metals Group	Fortescue Metals Group Limited is involved in the exploration and mining of iron ore in the Pilbara region in Western Australia.
Gindalbie Metals Limited	Gindalbie Metals Limited is a iron ore exploration and mining company. The Company explores for iron ore in the Mid West Region of Western Australia and its projects include the Karara Magnetite, Mungada Hematite and Lodestone Project.
Rio Tinto Limited	Rio Tinto Limited is an international mining company. The Company has interests in mining for aluminum, borax, coal, copper, gold, iron ore, lead, silver, tin, uranium, zinc, titanium dioxide feedstock, diamonds, talc and zircon. Rio Tinto's various mining operations are located in Australia, New Zealand, South Africa, the United States, South America, Europe and Indonesia.

Source: Bloomberg

As noted in section 2.4.1, for an estimate to be considered statistically significant we require a t-statistic of at least 2. All of the estimates in this sample were statistically significant (in other words, we did not need to discard firms that had the requisite 60 monthly observations but failed our statistical filters).

The resulting equity betas were de-levered to produce an asset beta using:

- the Monkhouse formula (refer section 2.3.2)
- the average gearing levels for each business over the five year period (refer Chapter 6);
- a gamma of 0 (refer Chapter 9); and
- a debt beta of 0 (refer section 2.3.3).

Despite the procedures applied here, estimation error will remain an issue and needs to be kept in mind when drawing any conclusions from the analysis.

The results of the analysis are summarised in the following table.

Table 5 Results of Beta Analysis

Firm	Equity Beta	Average Gearing[a]	t-statistic	Standard Error	Asset Beta
Aquila Resources	1.50	0.0%	2.28	0.6586	1.50
BHP Billiton	1.47	7.7%	6.47	0.2276	1.36
Fortescue Metals Group	3.05	30.5%	2.39	1.2747	2.14
Gindalbie Metals Limited	3.23	0.0%	2.78	1.1632	3.23
Rio Tinto Limited	1.16	10.2%	4.07	0.2849	1.04

a Average over the past five years, Debt to Enterprise Value

Source: Bloomberg

The results are quite diverse. As would be expected, the larger more diversified companies have lower betas compared to the rest of the sample. Aquila Resources (which has interests in both coal and iron ore) has a beta below 2 which is substantially lower than Gindalbie Metals and FMG. Gindalbie Metals and FMG both have equity betas above 3, however FMG has significantly higher gearing. The average asset beta for the sample is 1.85. Both Gindalbie Metals and FMG are emerging producers in the market.

As outlined previously, FMG's beta will reflect the relative newness of this development and the impact of this factor will decrease over time. Under the CAPM framework, we are looking for a long-term, forward-looking estimate that reflects the expected risk profile of the firm over this horizon. For this reason, we are of the view that it is not appropriate to rely on FMG's estimate alone. Further, while it has a t-statistic over 2, it still has a reasonably high standard error.

Our sample is small and diverse, reflecting firms of different sizes, maturity and levels of diversification. The asset beta range is from 1 to over 3. There are issues in moving towards either the lower or upper bound. The lower bound represents large diversified firms, which will have a considerably lower risk profile than a single commodity producer with operations in the one region. On the other hand, the upper bound is influenced by two relatively new producers.

We are therefore of the view that the average asset beta of the sample is an appropriate benchmark. We have therefore applied an asset beta of 1.85. Assuming gearing of 10%, a gamma of 0 and a debt beta of 0, this results in an equity beta of 2.05.

8 Market Risk Premium

8.1 Background

The Market Risk Premium (MRP) is the amount an investor expects to earn from a diversified portfolio of investments (reflecting the market as a whole) that is above the return earned on a risk-free investment. The key difficulty in estimating the MRP arises from it being an expectation and therefore not being directly observable.

Estimates of the MRP have typically relied on estimating a plausible range for the MRP using historical data, and then choosing a point (or constrained range) within this range. Under the CAPM, the MRP estimate should be forward-looking and correspond to the time frame of the asset under analysis (which tends to be long term). As it cannot be observed directly, a number of studies have sought to estimate the historical (or ex post) MRP. Results for Australia have tended to fall within a range of 6 to 8%, although they are sensitive to the assumptions made, particularly in terms of the time period over which they are measured.

With some commentators arguing that the value of the MRP has fallen in recent times, there has been pressure to choose an estimate from the lower end of this range. Regulators are now consistently adopting a value of 6% and movements to an even lower value have been mooted.

8.2 Empirical evidence

8.2.1 Methods used to estimate the MRP

There are two key methods that are used to estimate the MRP: surveys and historical averaging. On face value, surveys have a substantial advantage over historical estimates of the MRP because they are forward-looking. Properly constructed, they should provide actual forward-looking opinions. However, there are a number of key limitations, including:

- they are likely to be more heavily influenced by recent events;
- they tend to reflect short-term expectations;
- estimates are based largely on opinion, which may not necessarily be founded on sound fundamentals; and

- some respondents may have incentives to produce certain outcomes, which can lead to biased results.

There is no reason to believe that surveys are any more efficient in estimating the MRP than historical averaging. Of most concern is the fact that the studies can produce estimates of the MRP that contradict economic and financial theory.

While acknowledging the conceptual correctness of a forward-looking method to estimate MRP, we are not of the view that survey results should be used to derive estimates of MRP. We have therefore focussed on estimates produced using historical averaging.

8.2.2 Evidence from recent Australian studies

Historical averaging has been the most popularly employed method for estimating the MRP. Historical averaging involves observing the measured difference between the risk-free rate (based on the return on government bonds) and the return on the market portfolio[23] (based on the return on the share market index) over a period of time and averaging the rate. While data is readily available for this method it does rely on the assumption that the past is the best indicator of future risk and return expectations. Estimates from several Australia studies are listed in Table 6.

Table 6 Selected Australian estimates of market risk premium

Author	Year	Period	MRP (%)
Officer	1985	1882-1987	7.9
Australian Graduate School of Management	1989	1974-1983	6.3
		1977-1983	11.7
Australian Graduate School of Management	1998	1964-1995 (incl Oct 1987)	6.2
		1964-1995 (excl Oct 1987)	8.1
Hathaway	1995	na	6.6
Davis	1998	na	4.5-7.0
Dimson et al	2002	1900-2000	7.5
Hancock	2005	1974-2003	4.5-5
Hathaway	2005	1875-2005	1 year arithmetic: 7
			10 year arithmetic: 7.2
Gray & Officer	2005	1975-2004	7.7
		1955-2004	6.43
		1930-2004	6.58
		1905-2004	7.15
		1885-2004	7.17

[23] In the case of the return of the market, it represents the universe of investments available in the marketplace.

Author	Year	Period	MRP (%)
Brailsford, Handley and Maheswaran	2006	1883-2005	6.2%
(arithmetic mean, relative to bonds)		1883-1957	6.1%
		1883-1987	6.4%
		1900-2000	6.2%
		1937-2005	5.8%
		1958-2005	6.3%
		1980-2005	6.0%
		1988-2005	5.1%

Source: QCA (2000), Draft decision on QR's Draft Undertaking, Working Paper Number 4; Lally, M. (2004), Estimating the Cost of Capital for Regulated Firms; S. Gray & R. Officer (2005), A Review of the Market Risk Premium and Commentary on Two Recent Papers, A Report Prepared for the Energy Networks Association; J. Hancock (2005), The Market Risk Premium for Australian Regulatory Decisions, The South Australian Centre for Economic Studies; T. Brailsford, J. Handley & K. Maheswaran (2006), A Re-examination of the Historical Equity Risk Premium in Australia, unpublished working paper, p.28.

Recognising the problems inherent in individual estimates, it is common practice to refer to a range for MRP of between 6% and 8%, with the longest horizon studies, with the exception of Brailsford et al, estimating the MRP at above 7%.[24]

It is therefore possible that the true value of the MRP has been well above 6%. What is clear is that there is considerable uncertainty surrounding the estimation of the MRP. We will now consider some of these estimation issues, with a particular focus on the selection of the most appropriate horizon for historical estimation.

8.3 Methodological issues

In the absence of any robust, forward-looking data, estimates based on actual observed MRPs therefore remains the most reliable approach available. The variation in estimates produced by published studies, as outlined above, highlights the vulnerability of the results to the underlying assumptions. It also raises questions regarding the stability of the MRP through time. A summary of the key issues to be considered here is provided below.

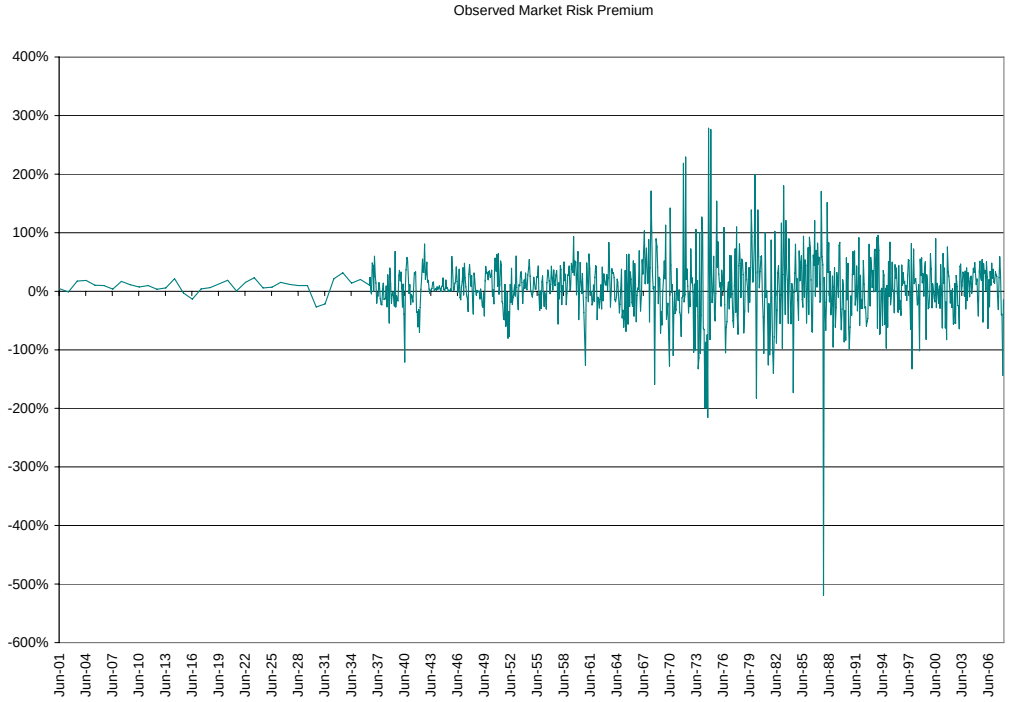
8.3.1 Over what horizon should the estimates be made

The MRP is estimated from historical data relating to the excess return of equities over long term government bond yields. Ex-ante the MRP is assumed to be constant when using the CAPM to estimate the cost of equity. However, ex-post, the MRP is variable over time and consequently there is debate surrounding the period over which it should be estimated.

[24] For example see: Lally, M. (2004), Estimating the Cost of Capital for Regulated Firms and QCA (2000), Draft decision on QR's Draft Undertaking, Working Paper Number 4.

The MRP is extremely volatile in the short-term. We have undertaken analysis based on Australian equity accumulation returns and Government bond yields from June 1901 to October 2007. Prior to July 1936, annual observations of each series have been used with annualised figures based on monthly data being used after this date. Figure 2 shows the MRP for the period in question (it is clear where values change from annual to annualised monthly).

Figure 2 Observed Market Risk Premium



Data source: Bloomberg, RBA and various publications

The overall volatility of the MRP is immediately obvious. It is this feature of the data that makes a longer historical record preferable, of at least 30 years, when computing the average MRP. This has also been endorsed by Gray and Officer.[25]

In computing historical averages for the estimation of an ex-ante MRP, following Gray and Officer, an arithmetic mean is used.[26] The following table contains estimates of MRP (and associated standard deviations) computed over a range of time horizons, the shortest being 16 years and the longest 106 years.

[25] S. Gray & R. Officer (2005), op.cit., p.21.

[26] S. Gray & R. Officer (2005), op.cit.

Table 7 Average MRPs

Start of Period of Averaging (to October 2007)	Average Market Risk Premium (Standard Deviation)
June 1991	8.1% (45%)
June 1981	7.2% (61%)
June 1971	6.2% (68%)
June 1961	6.4% (65%)
June 1951	6.4% (60%)
June 1941	7.1% (56%)
June 1931	6.8% (55%)
June 1921	6.8% (54%)
June 1911	6.8% (54%)
June 1901	6.8% (54%)

Source: **Bloomberg, RBA and various publications**

The estimated averages vary a great deal as additional 10 year blocks of data are included (8.1% down to 6.2%). These estimates are associated with relatively large standard deviations, with the exception of the data since 1991. Thus if one believed that the market has undergone significant change in recent times, a short horizon would be used but this would lead to an imprecise estimate of the MRP.

The preferred alternative to obtain a more precise estimate of MRP is to utilise a longer time period. There is no change in the MRP estimate of 6.8% (with relatively low standard deviation) once the time period contains data dating back to 1931.

From year to year, the MRP is extremely volatile and a longer-term average is required to produce a meaningful estimate. This casts considerable doubt over studies that are attempting to draw valid conclusions regarding the value of the MRP based on a shorter averaging period. While shorter-term studies may reflect the 'current' value of the MRP, the MRP's short-term volatility means that this estimate could well be higher, or lower, in the future. As a consequence, this short-term value cannot serve as a reliable proxy for the long-term, forward looking value of the MRP.

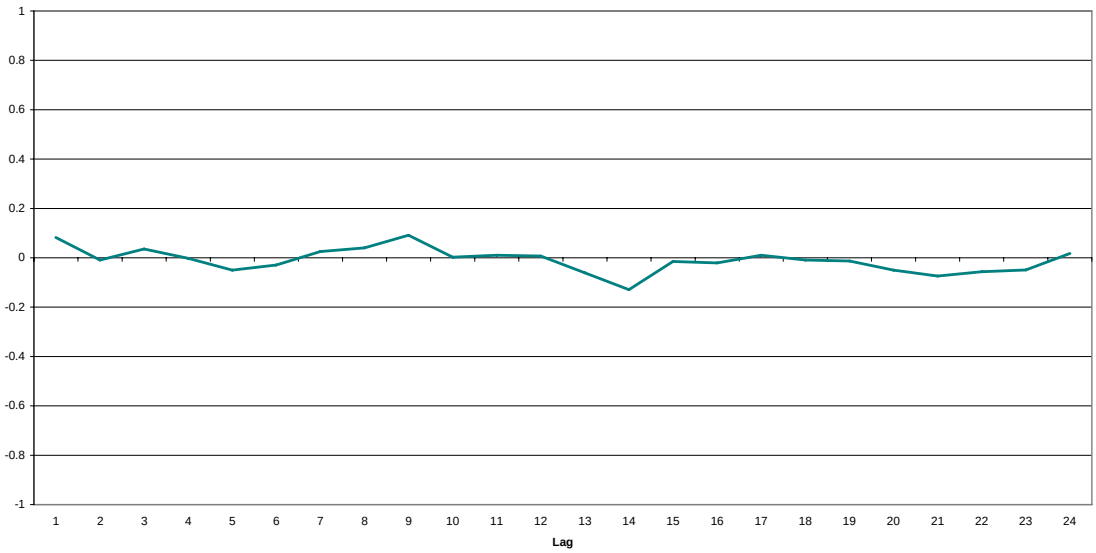
8.3.2 To what extent are any deviations from the mean value persistent?

The MRP is volatile around the mean. Reliance on long-term estimates of the MRP requires confidence that any deviations from the mean are not persistent. To achieve this, an examination of the autocorrelations in the MRP is undertaken which will reveal the degree of persistence in the MRP. This analysis was based on data post July 1936 given that all subsequent data was available at a monthly frequency.

Figure 3 plots the autocorrelations in the MRP (up to a maximum lag of 24 months). It clearly shows there is very little correlation structure in the MRP, with the maximum

autocorrelation coefficient being 0.09. This result indicates that the deviations from the mean of the MRP are not persistent at all. This would suggest that a longer term average of 6.2 to 6.4% is a valid estimate of the future MRP.

Figure 3 Autocorrelation of MRP (maximum lag of 24 months)



If there is clear evidence to demonstrate that structural change has occurred, and that it has impacted the value of the MRP, then it would not be appropriate to use a longer-term historical average that referenced data prior to the point in time when the structural change occurred. This question is addressed in the following section.

8.3.3 Has the MRP changed over time?

To rely on this long-term estimate we must be confident that the MRP has not undergone any significant change over the period. To achieve this, a state-space model treating the observed MRP as an unobserved time-varying expected value plus random noise was developed. The observation equation of this model is given by:

$$MRP_t = E_t^{MRP} + \varepsilon_t \qquad (1)$$

where

MRP_t is the observed MRP series,

E_t^{MRP} is the time-varying expected value of the MRP,

and $\varepsilon_t \sim N(0, \sigma_\varepsilon)$.

The process governing the time-variation in the expected value of the MRP was modelled as a mean-reverting process whereby the expected value of the MRP reverts toward a long-tem mean level. This is represented by the following state equation:

$$(E_{t+1}^{MRP} - \overline{MRP}) = \beta(E_t^{MRP} - \overline{MRP}) + v_t . \qquad (2)$$

where,

$\overline{MRP}$ is the long-term mean MRP,

β is an autoregressive coefficient, and

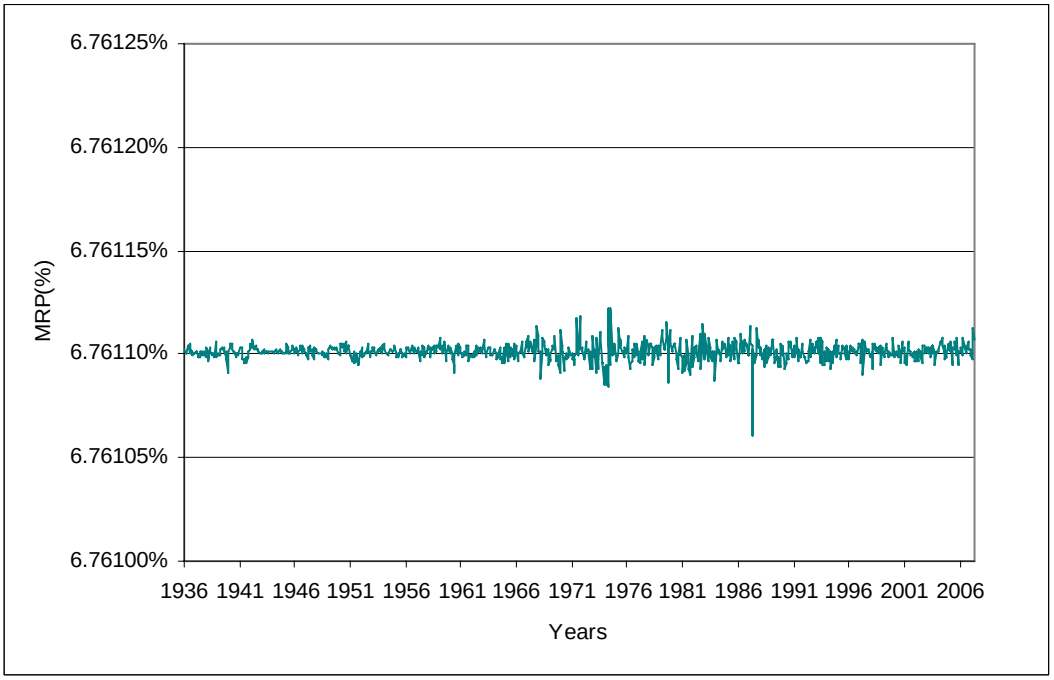
$v_t \sim N(0, \sigma_v)$.

If the estimated value for β < 1, MRP is a mean reverting process where it reverts toward its long-term (or steady state) value of $\overline{MRP}$. Importantly, if this were the case, longer-term historical records can be used to estimate the MRP. If the estimated value for β = 1, MRP is in fact a random walk process and does not revert to a long-term level and hence historical records could not be used to estimate the MRP.

If the estimated value for β = 0, the deviation between the time-varying expected MRP and its long-term level is simply a random process. In this case there is no persistence in the deviations around $\overline{MRP}$. Equations (1) and (2) are in state-space form with the Kalman Filter used to estimate the parameters, $\overline{MRP}$, β , σ_v and σ_ε .

This analysis was based on data post July 1936 given that all subsequent data was available at a monthly frequency. If all the dataset was used this would incorrectly be assuming that all observations were equally spaced in time. Figure 4 plots the estimated time-varying expected value of the MRP and clearly shows there is virtually no variation in the expected value of the MRP. It appears to vary around a constant level over the entire time period.

Figure 4 Observed MRP and time-varying expected value



Source: Synergies analysis of Bloomberg and RBA data

Parameter estimates reported below in Table 8 confirm this pattern. The estimate of $\overline{MRP}$ indicates that the long-term average the MRP is 6.76% and is estimated with a great deal of precision. The estimate of β is not significantly different from 0 and shows that the MRP is mean-reverting in the sense that deviations around $\overline{MRP}$ are simply random draws from $v_t \sim N(0, 0.001)$.

Given that the MRP has found to be a random mean process, we can be confident that it has not undergone a structural shift and long-term records can be used for estimation. Thus the results reported here indicate the MRP of 6.76% is justified.

Table 8 Parameter Estimates

Parameter	Estimate (Standard Error)
β	1.6749e^{-6} (4.1394e^{4})
σ_v	0.0001 (2.6218e^{4})
$\overline{MRP}$	0.0676 (0.0101)
σ_ε	0.5489 (7.2771)

Source: Synergies estimates

8.3.4 Is there sufficient evidence to suggest that the value of the MRP has fallen?

The reliance on estimates of the MRP based on long-term historical averages is appropriate provided there is no evidence of a permanent structural break that has changed the way investors assess risk and return. There are arguably a number of periods through time that could have been postulated to have a led to a change in the MRP. As noted above, possible reasons for a reduction in the future value of the MRP are based on the integration of world capital markets, as well as changes in the cost of acquiring the market portfolio, changes in risk aversion and changes in taxation regimes.

In order for the value of the MRP to be permanently revised (particularly given the asymmetric consequences of error), robust empirical evidence is required to confirm:

- that the value of the MRP has in fact been reduced; and
- what the quantum of that reduction might be.

No such evidence has been produced to date suggesting a fall in the MRP. In fact evidence suggests the opposite is true.

Steven Bishop[27] recently investigated whether the MRP has declined in recent years. He updated a study by Hancock[28] to include data to 2006. The results of the update were to change the MRP estimate from 6% to 7.3% over 33 years ending 2006.

8.4 Conclusions

It is clearly evident that there is considerable uncertainty surrounding the estimation of the MRP. In the short-term, the MRP is volatile and caution should therefore be exercised in attributing trends based on estimates produced over short horizons.

What we have shown is that it is valid to use historical data to estimate an ex-ante MRP given that the 'true' or mean MRP is stationary over time. As the MRP is stationary with no structural changes, issues regarding long-term estimates and short-term estimates are no longer relevant. Based on our analysis, the long-term average MRP is likely to be around 6.8%.

---

[27] S. Bishop (2007), "Market Risk Premium – Commentary on Recent Papers", A Report to the Essential Services Commission of Victoria, 24 October.

[28] The South Australian Centre for Economic Studies, "The Market Risk Premium for Australian Regulatory Decisions: Preliminary Report" April 2005.

We believe a value of between 6% and 7.5% is a reasonable range for the MRP. As there is overwhelming evidence to suggest that the true value exceeds the regulatory precedent of 6%, we argue that the appropriate MRP estimate is 6.8%. We will therefore apply a value of 6.8%.

9 Gamma

9.1 Background

The cost of capital is traditionally calculated on an after-corporate tax basis. With dividend imputation, corporate tax paid prior to the distribution of dividends can be credited against the tax payable on the dividends at a shareholder level.

In other words, corporate tax is a prepayment of personal tax withheld at a company level. Gamma (γ) is the proportion of the corporate tax which can be claimed as a tax credit against personal tax, that is, it is the value of personal tax credits. Once this value has been determined, then either the WACC or the cash flows to which WACC is applied is adjusted to reflect the value of the tax credit to investors.

Gamma is the product of two inputs which must be estimated:

- the proportion of tax paid that has been distributed to shareholders as franking credits (the distribution rate); and
- the value the marginal investor places on $1 of franking credits, referred to as the value of franking credits.

While the distribution rate can be generally observed from taxation statistics, the value of franking credits cannot be directly observed. The value of franking credits is determined at the level of the investor and is influenced by the investor's tax circumstances. The value of gamma is between zero (no value from franking credits) and one (full value of franking credits).

Determining an appropriate value for gamma has proven reasonably contentious. Regulators are now consistently adopting a value of 0.5. However, strong evidence is accumulating to suggest that the value of gamma has fallen significantly, and in fact zero is now the best estimate.

As noted above, there are two key inputs into the estimation of gamma, which are related by the equation:

gamma = V x D

where V is the value of franking credits[29] and D is the distribution rate.

[29] φ is used instead of V in a number of studies

Based on statistics supplied by the Australian Taxation Office, Hathaway and Officer estimate that approximately 71% of franking credits are distributed to shareholders.[30] However, only 32% of the distributed franking credits were redeemed.[31] This suggests that a significant number of shareholders did not utilise, or were unable to utilise, their franking credits.

Imputation credits are only available in respect of company tax paid on income subject to Australian taxation. For gamma to equal one all income must be domestically taxable. What is clear is that different shareholders value franking credits differently, as their tax status determines whether their credits are able to be redeemed.

If the shareholder is an Australian taxpayer, then they are subject to Australian personal income tax and can offset the prepayment of this tax at the corporate level against their own personal liabilities. If they are not subject to Australian personal income tax, such as non-residents and tax-exempt individuals or entities, then the company tax paid cannot be offset, and no additional value is therefore derived.

In relation to the redemption of credits, the major issue in the literature is therefore whose ability to redeem imputation credits is relevant for the assessment of the value of gamma. This is considered in the following section.

9.2 The identity of the marginal investor

9.2.1 Marginal investor is a foreign investor

Theoretical and empirical basis

Officer's seminal work on dividend imputation specified that gamma is the proportion of the *marginal* shareholder's personal income tax on dividend income that had been prepaid at the corporate level (rather than the average shareholder's). The marginal shareholder is the price-setting investor. The price at which this shareholder transacts becomes the market clearing price, or the price equating the demand for capital by the firm with supply that will determine the firm's cost of capital.

The key question is therefore the identity of the marginal investor. In open capital markets such as Australia, which have large capital requirements but an insufficient internal capital source, external capital must be drawn upon. In the context of

[30] Hathaway, N. and Officer, R. (2004), The Value of Imputation Tax Credits: Update 2004, Unpublished Working Paper, Capital Research Pty Ltd.

[31] Australian Taxation Office (2005), "Taxation Statistics 2002-03", Australian Government.

imputation credits this means that both foreign and domestic investors will hold shares in Australian companies.

As noted above, non-resident shareholders are unable to derive any direct benefit from franking credits. Previously this could be indirectly derived via the trading of shares around dividend dates. Schemes were established by investment banks to allow foreign investors to extract value from franking credits, which relied on these investors selling their shares to domestic investors in the period leading up to the payment of the dividend (that is, before the shares go 'ex dividend', which is when the holder is no longer entitled to receive that dividend). The domestic purchasers would receive the cash dividend and franking credit, and subsequently sell the share back to the foreign investor at a small premium.

Some twelve years after becoming aware of these schemes the Commonwealth Government changed the Australian taxation law to introduce a minimum period of holding, requiring that shareholders have to be 'at risk' for a period of time in order to obtain the benefit of franking credits. This amendment, called the 45-day rule, was effective from 1 July 1997, although was not introduced until some time later (July 1999).

Under this law, investors are required to hold shares for a period of 45 days during a qualification period around the dividend event (without substantial hedging) in order to be eligible to rebate franking credits against their tax liabilities. This therefore significantly extended the window over which the previous trades between foreign and domestic investors could be made, to the extent that the extra price risk borne by the parties meant that such transactions were no longer worthwhile.

As a consequence, the return to a foreign investor comprises dividends and capital gain only, whereas the return to a domestic investor comprises dividends, capital gain and franking credits. If both foreign and domestic investors had the same expectations about the future earnings of the firm, which is a well-established tenet of economic theory, then the foreign investor would demand a lower price than the domestic investor, as the foreign investor receives a relatively lower return.

Therefore, in the presence of insufficient domestic capital it is expected that foreign investors shall be the marginal investors. As outlined above, even if the clear majority of the shareholders are domestic but there is some reasonable presence of foreign investors, then economic theory dictates that the marginal investor will be foreign because this investor will set the market-clearing price that determines the cost of capital.

In Australia, one can therefore conclude that as the price-setting investor in the 'average' firm is most likely to be foreign, franking credits will not be accorded a value in the pricing of shares.[32] They may have value to domestic investors, but they are not the marginal investor that sets share prices. While they may have had some value prior to the introduction of the 45-day rule, there is no longer any basis for foreign investors to derive any benefit from these credits and their value in setting share prices will therefore be zero.

There is established empirical support for this proposition. For example, the results of a 2004 study by Cannavan, Finn and Gray:

> …are consistent with the notion that nonresidents are the marginal price-setting investors in large Australian firms.[33]

A recent study by Feuerherdt, Gray and Hall (2007), which was based on an analysis of the value of imputation tax credits on hybrid securities, drew similar conclusions:

> Our results are consistent with the notion that security prices are set by a marginal investor who does not value franking credits. However, it should be emphasised that our discussion of the marginal investor hypothesis does not form the basis for an assumption leading to the result. Simply, the empirical evidence is that security prices do not incorporate any value for imputation credits. Even if a theory were proposed in which security prices were set by the average investor base, the empirical result would be unchanged.[34]

Issues raised by regulators

It is noted that the notion that the marginal investor is foreign has not necessarily been accepted by regulators. There are two arguments that have been made here. Firstly, many regulated businesses have a 'unique' domestic shareholder base (for example, they are government owned businesses) and hence the marginal investor won't be a foreign investor. However, this argument is erroneous as WACC parameters are determined with reference to an 'efficient' benchmark firm. For the reasons outlined above, it is appropriate to conclude that such a firm would have at least some of its shares held by foreign investors. The other difficulty with this argument is that assuming that some companies have domestic marginal investors and others have

---

[33] Cannavan, D., Finn, F. and Gray, S. (2004), "The Valuation of Dividend Imputation Tax Credits in Australia", Journal of Financial Economics, p.168.

[34] Feuerherdt, Gray and Hall (2007), "The Value of Imputation Tax Credits on Australian Hybrid Securities", forthcoming publication in the International Review of Finance, p.3.

foreign marginal investors would require segmentation of the Australian sharemarket, which is not feasible.

Secondly, it has been proposed that if we are to consider the presence of foreign investors, we should be using an international CAPM to determine the WACC, not a domestic CAPM (and hence, all parameters would need to be respecified in a global market context). For example, the QCA submitted this argument in two recent final decisions, being Queensland Rail and the Dalrymple Bay Coal Terminal, stating that if a choice is to be made, the domestic CAPM should be used as an international CAPM will produce a lower WACC and hence disadvantage the infrastructure owner. This issue will be addressed below.

In any case, we are not proposing that franking credits do not have value to some investors – the key, as stated by Officer, is the value to the marginal investor. Although, the study by Feuerherdt, Gray and Hall referred to above refutes the notion that security prices incorporate a value for franking credits, even if these prices are set by the average investor.

A paper by Gray and Hall[35] (2006) finds that setting gamma to zero does not, unlike the values of gamma maintained by regulators, violate the deterministic relationship between the value of franking credits, the market risk premium and the corporate tax rate. Thus, taking gamma of zero is both agreed to by the theory and empirical bulk, and also is robust to the applicability of this assumption.

9.2.2 International versus domestic versions of the CAPM

The CAPM is normally specified as a domestic version, which means that its key parameters (being the risk-free rate, beta and the market risk premium) are specified based on Australian market data. Some suggestions have been made that an international CAPM should be used, recognising the increasing integration of world capital markets and the presence (and hence influence) of foreign investors in the Australian market. It assumes that capital markets are fully integrated, with international capital flows unrestricted, and investors exhibiting no home country bias.[36]

A number of versions of the model have been developed and typically require specification of the key parameters in a global market context (for example, using a

[35] Gray S. and Hall, J. (2006), "The Relationship Between Franking Credits and the Market Risk Premium", Unpublished Working Paper, University of Queensland.

[36] Lally, M. (2004a), The Cost of Capital for Regulated Entities: Report Prepared for the Queensland Competition Authority, p.28.

global share price index instead of the All Ordinaries index).[37] As noted by the Strategic Finance Group, this is not practical:[38]

> Clearly, re-estimating all WACC parameters as they would be in the absence of foreign investment is an impossible task and this approach must be rejected. That is, all WACC parameters should be estimated as they are, not as they would be if a particular theoretical assumption were to hold.

In any case, Feuerherdt, Gray and Hall argue that exclusion of the foreign investor from the consideration of gamma but not other WACC parameters is inconsistent. That is, the conclusion that foreign ownership is not applicable:

> …has been criticised on a number of grounds, not least of which is the fact that every other parameter used to estimate the cost of capital *is* affected by the trading of foreign investors (e.g. the yield on Australian government bonds would likely be quite different if foreign capital were not allowed into Australia.)[39]

In practice, the international CAPM has not been widely used. This is for a number of reasons:

- there are a number of alternative models that have been specified, however there remains no consensus view on which one should be used;
- the model is relatively complex to apply and its parameters are difficult to estimate, particularly the exchange rate covariances; and
- there is no empirical evidence to suggest that it provides a better estimate of the expected cost of equity. For example, a study by Koedijk et al found that the domestic CAPM only yielded a significantly different estimate from the international CAPM for three percent of firms in their sample.[40] They attribute this to a dominance of country factors in individual stock returns.

One of the key reasons that the international CAPM may not provide a superior estimate of the expected cost of equity is because of the continued existence of home country bias. That is, despite the globalisation of world capital markets, investors

---

[37] The model was originally developed by Solnik. Refer: Solnik, B. (1974), "The International Pricing of Risk: An Empirical Investigation of the World Capital Market Structure", in The Journal of Finance, vol.29, no.2.

[38] Strategic Finance Group (2004), The Value of Imputation Franking Credits: Gamma, Report for AGL in Relation to ESC Electricity Distribution Review, p.9.

[39] Feuerherdt, Gray and Hall (2007), op.cit.

[40] Koedijk, K., Kool, C., Shotman, P. and van Dijk, M. (2002), "The Cost of Capital in International Financial Markets: Local or Global?", in Journal of International Money and Finance, vol.21 (6).

continue to favour domestic stocks.[41] This may be partly due to the information asymmetries faced by domestic investors considering investments in overseas firms. A survey by Strong and Xu also revealed that fund managers' recommendations were biased towards their home market.[42]

The fact that home bias still exists does not mean that substantial integration of world capital markets has not occurred, nor does it mean that the marginal investor could not be a foreign investor. What is evident is that the markets are not *fully* integrated. If markets are not fully integrated, then it is not appropriate to apply an international CAPM. Certainly, it has not proven a superior model, and until such evidence becomes available (if and when it does), there is no basis for rejecting the domestic CAPM in favour of such an alternative. After considering the estimation difficulties and lack of empirical support to demonstrate the superiority of an international CAPM, over the domestic version, Lally concludes:[43]

> …in the face of an issue like this in which the truth lies somewhere between two models, a conservative approach is desirable, i.e., choosing the model yielding the higher estimate for the cost of capital, on the grounds that understating the cost of capital may lead to businesses failing to invest, and this is the more serious of the two possible errors… Taking account of all these points, I recommend the use of a domestic version of the CAPM.

It has also been suggested that if an international CAPM is not adopted, then all CAPM parameters would need to be respecified as if foreign investors had no influence on the Australian market. However, this suggests that the Australian market is completely segmented from the world market. Given that in reality foreign investors exert significant influence on all financial markets, this is not only virtually impossible to do, but would also abstract from the reality of the practical influences on asset pricing in today's domestic market.

This rate of return is being used to determine prices and will drive investment decisions that are made with regard to current and expected market conditions. It should therefore reflect the rate of return that an investor would require, rather than the theoretical return that an investor would command in either a fully segmented or fully integrated market. As noted above, these parameters should therefore be estimated "as they are".

---

41 For example, see: Stulz, R. (1999), Globalisation of Equity Markets and the Cost of Capital, National Bureau of Economic Research, NBER Working Papers, 7021.

42 Strong, N. and Xu, X. (2003), "Understanding the Home Equity Bias: Evidence from Survey Data", in Review of Economics and Statistics, vol.85, pp.307-312.

43 Lally, M. (2004a), op.cit., p.31.

We have therefore applied the domestic CAPM to determine the cost of equity, including gamma, estimated using readily observable market data that may be influenced by the presence of foreign investors. Expectations of future returns will be formed based on the actual environment facing investors. Specified in this way, the domestic CAPM does not unrealistically assume complete separation from global markets. The domestic CAPM will therefore serve as a better proxy for the international CAPM, without assuming that the Australian market is fully integrated with world markets.

9.3 Empirical estimates

The introduction of the 45-day rule is a significant and permanent structural change to the Australian market. It is significant because prior to the introduction of this rule, foreign investors could derive some benefit from franking credits by trading their shares with domestic investors around dividend dates. Although this benefit may not necessarily have been equivalent to the full value, this suggests that these credits had at least some value to these investors.

Foreign investors were never able to directly benefit from franking credits - these credits were only valuable to them to the extent that they could be sold to resident tax-paying investors that could utilise them. As it is no longer possible for foreign investors to 'sell' these credits, they are now worthless to them.

In examining the literature, the main focus should therefore be on more recent studies, particularly those undertaken since the introduction of the 45-day rule (which, as noted above, was effective from 1997 yet only introduced in 1999). In 'dissecting' the literature in this way, it is important to note that the key issue is the time period over which gamma was valued.

Most of the later studies span both time periods. To the extent this is the case, and if it is accepted that the value of gamma has fallen significantly since the 45-day rule came into effect (perhaps to zero), this will produce an upward bias in the results of these studies. Before these studies are examined, a brief overview is provided of one of the most common methodologies that has been used to estimate the value of gamma.

9.3.1 Dividend Drop-Off Studies

One of the most commonly applied methodologies used in studies that have sought to estimate the value of gamma is the dividend drop-off approach. As a firm's share price will typically fall following the payment of a dividend (which is seen to be driven by

the activities of short-term arbitrage traders), dividend drop-off studies examine the amount of the price change.

The difficulty here, however, is that it is extremely difficult to decompose this change into the value of the dividend itself and the value of the franking credits that are attached to that dividend. These variables are highly correlated, posing a number of methodological challenges for these studies. The reason for this correlation is that franking credits are linearly determined by the value of the cash dividend, as shown by:

$$FC = Div \times f\left(\frac{t}{1-t}\right)$$

Where:

FC = franking credit

Div = cash dividend

f = franking proportion (or proportion of personal tax pre-paid at the corporate level)

t = the contemporaneous corporate tax rate.

This relationship will lead to a problem called multicollinearity and its presence will significantly reduce the ability to interpret the value of the estimates.

Regression analysis is used to test the existence and strength of the relationship between a dependent variable and one or more independent variables (in this case, our two independent variables are dividends and franking credits). The results of the regression will tell us the extent to which changes in the dependent variable are explained by the independent variables. If the independent variables are related, it will not be possible to isolate the impact of each of these variables in interpreting that relationship – this is multicollinearity.

It is therefore extremely important to keep this issue in mind when examining the results of dividend drop-off studies. We note, however, that regulators continue to place emphasis of dividend drop-off studies without addressing this very significant issue. As we have previously proposed, reliance on data that may not be statistically meaningful significantly increases the risk of error, where such error can have serious consequences for a regulated infrastructure owner.

It is also important to note that most studies (at least in the first instance) seek to establish a value for franking credits (V). As noted above, this must be multiplied by

the distribution rate to obtain a value for gamma (γ). Where we have done this below, we have assumed a distribution rate of 71%.

Overview of recent studies

Hathaway and Officer (2004)

Hathaway and Officer studied the relationship between the price change on the ex-dividend date and the cash dividend and franking credit paid, using data from 1988 to 2002.[44] Their methodology sought to isolate the additional drop-off in the share price that is attributable to the franking component from the drop-off that is due to the cash component.

They draw conclusions from the large firms for the purposes of reliability, and take credits to be priced at around 50% of their face value, giving an estimate of gamma of 0.355. In addition, they find that the market values cash dividends at around 80% of their face value.

There are a number of issues with this study. As noted previously, one of the main problems with studies of this nature is the collinearity between the two independent variables, being dividends and franking credits. Given the high degree of correlation between dividends and franking credits also means that a separation of their values is difficult. Further, there are no levels of significance reported. Given the increase in standard errors encountered in regressions with high collinearity, the significance of the results is reduced.

Beggs and Skeels (2005)

Beggs and Skeels used a similar approach to Hathaway and Officer, although producing different results.[45] Using data from the Commsec Share Portfolio database over the period from 1986 to 2004, they tested six tax regime changes on the value of franking credits. Some notable results include that:

- from 1987 to 1997, and for 2000, the value of franking credits was not shown to be significantly different from zero;

[44] Hathaway, N. and Officer, R. (2004), op.cit.

[45] Beggs, D. and Skeels, C. (2005), "Market Arbitrage of Cash Dividends and Franking Credits" Working Paper #947, University of Melbourne, Department of Economics.

- since the last tax change (being the rebate on unused franking credits), the value of unused credits was seen to significantly increase. From 2001-2004, the value of the drop-off was 0.57. This translates to a value for gamma of 0.41; and
- the majority of the sample failed to reject the hypothesis that cash dividends are fully valued.

Whilst these results were found to be statistically significant, they should be interpreted with caution as the independent variables are again perfectly collinear, except for changes in the franking proportion and the corporate tax rate.

Bellamy and Gray (2004)

The study by Bellamy and Gray uses a similar methodology to that of Hathaway and Officer, but makes a variety of econometric extensions with an aim of improving robustness.[46] Whilst the rationale of Hathaway and Officer was preserved insofar as the stock price change was decomposed into cash dividend, franking credit and in some instances market return, eight models in total were estimated. These eight models differed in terms of whether:

- the ex-date price was kept raw or adjusted for expected returns;
- the dependent variable was defined as the drop-off ratio or the stock return; and
- the estimation was performed by ordinary least squares or weighted least squares. Under the latter, observations were weighted by their "informativeness", specifically, a higher weighting was given to higher-yielding, low-volatility stocks.

Bellamy and Gray conclude that the market places no value on franking credits and fully values cash dividends. They believe that the most robust approach to use was to adjust the ex-date price for expected returns, and give a higher weighting to more "informative" stocks (ie, higher yield, low volatility).

Further, while some recommendations are made about research design, it is not possible to separately and reliably estimate the value of dividends and franking credits. That is, irrespective of the adjustments made in an attempt to address multicollinearity, it will always be a problem. The correlation between the two in this sample was 0.85.

[46] Bellamy, D. and Gray, S. (2004), Using Stock Price Changes to Estimate the Value of Dividend Franking Credits, Working Paper, University of Queensland.

Whilst this study specifically pertained to the estimation of the value of franking credits and not gamma, it is important to note that if franking credits have no value to the marginal investor then gamma must be zero, irrespective of the distribution rate.

Cannavan, Finn and Gray (2004)

Cannavan, Finn and Gray seek to test whether the introduction of the 45-day rule has impacted the value of gamma.[47] Rather than use the dividend drop-off method, they sought to infer the value of cash dividends and franking credits from the relative prices of share futures and the underlying shares on which these contracts are written, based on a no-arbitrage framework.

The authors noted that the data behaved well in-line with the no-arbitrage relationship and as such the model is substantially reliable. This is a key benefit over estimation via the dividend drop-off technique. In terms of overall conclusions, it is again found that the market fully values cash dividends, consistent with the theory.

The most fundamental conclusion is that after the introduction of the 45-day rule, the market does not value franking credits. In a manner similar to that of Bellamy and Gray, a constraint is also imposed in which the franking credits are given zero value after 1 July 1997. The finding that this constraint cannot be rejected is further support of the hypothesis that gamma is no longer valued by the market.

This study did find that franking credits were potentially valued at up to 50% of their face value prior to the introduction of the 45-day rule (suggesting a value for gamma of up to 0.36). Since then, however:[48]

> …we find no evidence of any positive value at all in imputation credits after the introduction of the 45-day rule. The increased costs and risks involved in transferring imputation credits make it infeasible to engage in this strategy even for the highest-yielding stocks…This means that in a small open economy such as Australia, the company's cost of capital is not affected by the introduction of a dividend imputation system. The company must produce the same return for the marginal stockholder whether an imputation system exists or not if the marginal stockholder receives no value from imputation credits.

[47] Cannavan, D., Finn, F. and Gray, S. (2004), op.cit.

[48] ibid., p.192.

Feuerherdt, Gray and Hall (2007)

This paper tests the value of imputation credits based on the prices of hybrid securities.[49] A key reason for examining these securities is:

- the signal-to-noise ratio is considered higher than for ordinary shares, reducing the multicollinearity problem associated with the dividend drop-off methodology (which they have therefore applied here); and
- hybrid issues tend to be marketed exclusively to domestic investors. Hence, in order to address regulators' concerns regarding the relevance of foreign investors in setting the value of imputation credits, they have chosen an environment where trading is likely to be almost exclusively domestic-based.

The study examples three samples (ordinary shares, reset preference shares and convertible preference shares) over three different time periods, recognising the tax law changes relating to the introduction of the 45-day rule in 1997 and imputation credit rebateability in 2000.

The results found no evidence of mean drop-off ratios of greater than one. If cash dividends are fully valued, the franking credit has no value. This finding held across all three samples. The key conclusions from this study were cited above, being that the marginal investor is a foreign investor who does not value franking credits.

Summary of results

The results of these studies are summarised in the following table:

Table 9 Summary of Key Studies

Study	Methodology	Time Period for Estimation	Value of franking credits (V)	Value of gamma (γ)[a]
Studies pre-45 day rule				
Bruckner, Dews and White (1994)	Dividend drop-off	1987-1990	0.34	0.24
		1990-1993	0.69	0.49
Partington & Walker (1999)	Contemporaneous pricing of shares with and without franking credits	1995-1997	0.96 (average)	0.68
Recent studies				
Hathaway and Officer (2004)	Dividend drop-off	1988-2002	0.5	0.36
Beggs & Skeels (2005)	Dividend drop-off	1987-2000,2000	0	0
		2001-2004	0.57	0.41

[49] C. Feuerherdt, S. Gray & J. Hall (2007), op.cit.

Study	Methodology	Time Period for Estimation	Value of franking credits (V)	Value of gamma (γ)[a]
Bellamy & Gray (2004)	Dividend drop-off (adjusted)	1995-2002	0	0
Cannavan, Finn & Gray (2004)	Analysis of futures and physical market (no arbitrage framework)	Pre- 45 day rule	Up to 0.5 (high-yielding stocks)	0.36
		Post- 45 day rule	0	0
Feuerherdt, Gray and Hall (2007)	Dividend drop-off, hybrid securities	Pre-1997 (45 day rule) Post-1997 to 2000 Post 2000	0	0

Note: Assumes a distribution rate of 71%.

A number of studies have concluded that franking credits have some value, although the estimates vary considerably. More importantly:

- these studies include data from the period prior to the introduction of the 45 day-rule. This will produce an upward bias in the estimated value of gamma, given that franking credits would appear to have had some value prior to this change, and a zero value following the change; and
- a number of methodological issues have been identified. One of the most significant ones that is consistently encountered is the multicollinearity that will arise in dividend drop-off studies due to the strong relationship between the value of cash dividends and franking credits.

A number of studies have concluded that the value of franking credits is zero (or, we cannot reject the hypothesis that they have no value). One of the more notable recent works is the study by Cannavan, Finn and Gray, which, using an arguably more robust methodology than dividend drop-off studies, concluded that since the introduction of the 45-day rule, franking credits are of no value to the marginal investor.

We now summarise the results of a relatively simple diagnostic test we have undertaken as a further test of the hypothesis that the value of gamma is not different to zero.

9.3.2 Simple diagnostic

In order to circumvent the host of econometric and sampling issues involved with estimating gamma, a basic and simple behaviour test can prove fruitful. The test aims to determine whether or not the market responds, on average, differently to franked dividends from how it responds to unfranked dividends.

In particular, it tests whether or not the ratio of the ex-date price change to cash dividends is significantly greater for franked dividends than unfranked dividends.

That is, if it is found that shares with franked dividends behave in a manner that is not significantly different from shares with unfranked dividends on the ex-dividend date, this would lead to the conclusion that franking credits are valued at zero (leading to a zero value of gamma).

If, on the other hand, shares with franked dividends do behave in a manner that is significantly different, it would be concluded that this difference is due to the market placing value on franking credits. If this were the case, gamma would not be zero and further empirical investigations would need to be undertaken to estimate its value.

The data used in this investigation was sourced from Bloomberg and contains observations on firms listed in the S&P ASX 200 from January 1996 to January 2006. Trusts and other entities which have a dissimilar tax structure to companies were excluded, resulting in 3188 observations in total. Whilst this sample only spanned the top 200 stocks, because ex-date behaviour is analysed it is important to exclude thinly-traded stocks from the dataset (otherwise large errors may be introduced due to lags).

There is still considerable thinness in trading in this sample: of the 3188 observations, 36% (1140) have a delay of more than one day in price observations about the ex-dividend date. However, only 96 observations have a delay of more than three days, which takes dividends paid on Mondays into consideration and these were excluded. Partially franked dividends were excluded from the examination as this avoids complications in selecting an appropriate level of franking as the cut-off point.

For the full period, there were 516 events with unfranked dividends and 2138 events with fully franked dividends. The sample standard deviations of the drop-offs ratios were such that a test for equality of variance would conclude that the standard deviations of the samples were unequal[50]. As a consequence, the common parametric test for equality of means is invalid so the simple, non-parametric paired test is used instead.

The sample of fully franked events is substantially larger than that of unfranked events, so a random sample of it is taken to produce the same number of observations, which was then paired with the full set of unfranked observations. If the theoretical hypothesis is true (that is, the market value of franking credits is zero), it should be the case that half of the fully franked drop-off ratios are greater than the unfranked drop-off ratios.

[50] F-test for variance equality: $s_1 = 5.6736$, $s_2 = 1.9994$, p-value < 0.0001

There was found to be insufficient evidence to reject this hypothesis[51] and as such it is concluded that the market responds equally to fully franked and unfranked dividends. The same test is used for the sample of data from 1 July 1997 onwards as the parametric test is invalid[52] and the nonparametric test leads to the same conclusion[53]. This evidence that the market does, on average, respond equally to fully franked and unfranked dividends is further evidence that the market places no value upon franking credits.

This test can also be extended to see whether the drop-off for franked dividends behaves significantly differently from unfranked dividends if franking credits are valued at some proportion of their face value.[54] In this case, the proportional value will be 50% and 100%. In other words, rather than testing the hypothesis that the value of franking credits do not have a value other than zero, we are testing the hypothesis that these credits have some value, which in this case is either 0.5 or 1.

It has already been found that the market behaves the same way for franked and unfranked dividends on the ex-date, by only moving on average by the amount of the cash dividend. It is important to question, however, whether the data could perhaps disguise franking credits having a value of 50% and 100% of face value, yet still behaving as observed. If it is found that these new ratios (with franking credits assumed to be valued at 50% and 100% of face value) are significantly different across franked and unfranked dividends, this would be inconsistent with the actual market data. As such, this would imply that if franking credits had a significant nonzero value the data would not disguise this. Thus, this would provide further evidence that the market does not value franking credits.

The sample data was again restricted to observations after 1 July 1997 and to fully-franked and unfranked dividends. The same nonparametric test is used and it is found that the ratios are different across fully-franked and unfranked dividends with a half-valued franking credit[55] and with a fully-valued franking credit[56].

On this basis, we can reject the hypothesis that franking credits have a value of 0.5 or 1. In addition, we believe this is likely to be the finding irrespective of the value tested for

---

51 Paired sample test: sample proportion = 0.527, theoretical proportion = 0.50, p-value = 0.11

52 F-test for variance equality: $s_1 = 6.0972$, $s_2 = 2.0996$, p-value < 0.0001

53 Paired sample test: sample proportion = 0.528, theoretical proportion = 0.50, p-value = 0.12

54 That is, rather than consider the ratio of price decline to cash dividend, the ratio of price decline to cash dividend and some proportion of the face value of the franking credit is considered.

55 Paired sample test: sample proportion = 0.590, theoretical proportion = 0.50, p-value < 0.0001

56 Paired sample test: sample proportion = 0.595, theoretical proportion = 0.50, p-value < 0.0001

the valuation of franking credits. This inconsistency with the result for the ratio of price decline to cash dividend only is further evidence that the market does not value franking credits.

9.3.3 Conclusion

A number of studies have sought to estimate the value of gamma and the results vary considerably. The key concerns we have with some of these studies are that:

- studies using the dividend drop-off methodology need to be treated with extreme caution given the collinearity between dividends and franking credits. While Bellamy and Gray's methodology sought to adjust for this, they concluded that it is not possible to separately value the two;
- the introduction of the 45-day rule resulted in a major structural change that has fundamentally impacted the value of franking credits. Studies that seek to estimate gamma using data prior to this date will over-estimate the value of gamma.

Recent robust empirical investigations have concluded that the value of franking credits is zero since the introduction of the 45-day rule (Bellamy and Gray, 2004; Cannavan, Finn and Gray, 2004; Feuerherdt, Gray and Hall, 2007).

This is based on the key assumption that the marginal investor is foreign. It is appropriate to make this assumption under the standard domestic CAPM framework, as this acknowledges the practical and significant influence foreign investors have in the Australian market.

Additionally, a basic but informative test of the market's behaviour with regards to the ex-date price response finds that for fully-franked and unfranked dividends, the market responded equally to the cash dividend only, which is further evidence of the worthlessness of franking credits. As an extension to this model, it was tested whether or not franking credits were valued by the market at 50% and at 100% of their face value, which was emphatically rejected. All in all, there is insufficient evidence to reject the theoretical hypothesis that franking credits are worthless. Fundamentally, the implication of these findings is that gamma should be set to zero. This also means that there is no basis for adopting an assumption of 0.5.

On the basis of this evidence we believe that it is appropriate to assume a value of zero for gamma. This includes:

- evident difficulties in estimating a reliable value for gamma (which may be because it has no value);

- a strong theoretical foundation, being that since the introduction of the 45-day rule, franking credits are now of no value to the marginal foreign investor (whereas they may have had some value prior to this); and
- empirical evidence to support a value of zero, both from the recent literature and our own analysis which confirmed that we cannot conclude that gamma has a value other than zero.

A value of 0.5 was originally adopted in early regulatory decisions and has since become regulatory precedent. However, these decisions were made prior to the introduction of the 45 day rule, and were relying on studies that will not have assessed its potential effect on the value of gamma. We are of the view that there is sufficient evidence to now review the fundamental basis of this assumption.

10 Debt and Equity Issuance Costs

10.1 Introduction

When an organisation acquires assets, one of the costs is the transaction cost associated with obtaining the required funds to purchase or construct the asset. The asset owner must be compensated for the transaction costs (both equity and debt raising costs) or an investment in the asset would not occur as it would have a negative NPV (on average) in a competitive market. It is therefore usual to expect an allowance for the notional costs of raising debt and equity to finance new investments.

In addition to the initial costs, there are on-going debt and equity issuance costs. The most common assumption applied for recovery of debt issuance costs in regulatory decisions has been inclusion of a 12.5 basis point adjustment to the cost of debt. Ongoing equity raising costs are normally only considered where there is a large capital expansion and the equity portion of the funding is greater than could be funded from retained earnings.

CRA agrees[57] that these costs are well accepted as being legitimate costs of running a business. There are a number of questions that need to be answered:

- the quantum of the initial and ongoing costs. This is a question that can only be answer by empirical evidence; and
- the treatment of the cost. Are the costs included in the regulated asset base (RAB), or are they a WACC adjustment.

10.2 Initial Costs

10.2.1 Equity raising costs

Equity raising costs are a legitimate cost of running a business. The owner must be compensated for such costs or business investments would not be undertaken in a competitive market. A key issue is the quantum of the costs.

The evidence from the United States is different to that in Australia. Lee[58] et al provide benchmark numbers on the cost of raising equity in the United States. This paper

[57] Issues Paper 'Determination of the Weighted Average Cost of Capital for The Pilbara Infrastructure's Railway from the Cloud Break Iron Ore Mine in the Pilbara to Port Headland' September 4, 2008, page 17.

suggested that the average direct cost for an initial public offering of equity was 11%. These costs varied depending upon the size of the funds raised, e.g. for funding of less than 10 million USD the cost was 16.96% of funds raised while for 500 million USD the equivalent cost was 5.72%.

Ritter[59] also found that the equity raising costs had a large fixed cost element. For large issues the average equity raising cost was 9.34%. A recent study[60]of 1,297 US issues found that, on average, the equity raising costs were 9.61% of funds raised.

Australian evidence is slightly different. The ACCC analysed five recent Australian equity raisings for infrastructure businesses. They found that the equity raising cost percentage varied with the size of the proceeds being raised. The average cost was 3.55%. This assumption has been applied in most Australian regulatory decisions where equity raising costs have been accepted.

As the Australian study had a sample size of only five, the results of the study should not be considered definitive. In our opinion, 3.55% is at the lower end of a reasonable range. Allen Consulting Group (ACG)[61] added another two observations to the sample and estimated equity raising costs to be 3.83% being the median of the sample.

We analysed 75 equity issues completed prior to October 2007. The costs that were available to be analysed were the direct equity costs associated with underwriting. Therefore these costs included only the selling, underwriting and management costs. They did not include the legal or accounting costs required with an equity issue. ACG have previously estimated that the legal and accounting costs amount to approximately 60 basis point[62].

We found that for the total sample of 75 firms, the direct equity costs (excluding accounting and legal costs) amounted to 4.27% of the capital raised. Importantly we segmented the sample to extract infrastructure-type firms. As infrastructure firms newly listed on the ASX are limited in quantity, we used capital intensive industries as a suitable proxy. We wanted a reasonable size sample to improve the accuracy of the results. The larger the appropriate sample, the more confidence in the results as volatility reduces dramatically.

---

58 Lee, I., S. Lochhead and J. Ritter, *The Costs of Raising Equity Capital,* The Journal of Financial Research, Spring 1996, p.62

59 J.R. Ritter, *The Costs of Going Public*, Journal of Financial Economics 19 1987.

60 G. Lee, *Three Essays in Equity Offerings and Related Issues,* Phd Dissertation, Graduate School of Vanderbilt University, December 2006, p58

61 ACG Report 'Debt an Equity Raising Transaction Costs' 2004, prepared for the ACCC

62 ibid

Our study was based on an initial number of 75 observations, with the segmented capital intensive sub-sample being 23. The results of the findings are displayed in the table below. For capital intensive industries, the direct costs of raising equity are 5.1% (excluding legal and accounting costs, which are equivalent to 0.6%). Our estimate of the total direct equity raising costs is therefore 5.7%.

Table 10 Equity Raising Costs

Industry	Costs
Engineering & Construction	3.5%
Mining	5.8%
Iron/Steel	5.0%
Oil & Gas	4.5%
Coal	4.0%
Average	**5.1%**

Source: Bloomberg

10.2.2 Debt raising costs

The debt margin reflects a premium for credit and liquidity risk, however it does not include any allowance for the actual costs of raising debt. In practice, an efficient benchmark firm will incur transaction and administration costs in raising and managing debt. It is therefore now increasingly common practice to include a separate allowance for these costs.

Initial debt raising costs were considered in the access undertaking for Dalrymple Bay Coal Terminal (DBCT). DBCT had argued successfully to be compensated for additional up-front debt raising costs required to be incurred in obtaining funding for the establishment of the terminal. The Queensland Competition Authority (QCA) engaged ACG[63] to investigate the quantum of the debt raising costs.

ACG concluded that in addition to up front financing fees there is typically a commitment fee payable of between 30% and 40% of the debt margin. They estimated that the initial debt raising costs for an infrastructure business is 100 basis points. The QCA accepted this amount.

10.2.3 Treatment of up-front costs

Where it is appropriate to compensate for up-front debt and equity raising costs as is the case with TPI, the reimbursement can be by one of two possible ways. The costs can

[63] The Allen Consulting Group (2004), Dalrymple Bay Coal Terminal: Financing Costs, September.

be converted to a perpetuity using a real WACC with an allowance calculated each year to recoup the costs for the asset owner.

The alternative method is to increase the RAB by the relevant debt and equity raising cost and apply the normal WACC. Capitalising the financing costs would result in the costs being treated in the same way as the assets for which the funds were raised. Either approach applied properly is NPV neutral.

The second method is the most common in regulatory practice.

We suggest that an allowance for initial debt and equity raising costs is applied to TPI based on:

- for debt raising costs, an allowance of 1% (on the assumed level of debt funding); and
- for equity raising costs, an allowance of 5.7% (on the assumed level of equity funding).

10.3 Ongoing Costs

10.3.1 Equity raising costs

Over time, the operations of a business will grow. With respect to equity, the capital expenditure required to fund the growth of operations will normally be funded from retained earnings. However, when major capital expenditure is required and new equity must be raised, additional equity raising costs will be incurred.

Major capital expenditure will usually incur additional equity raising costs because retained earnings are generally insufficient to fund such expenditure. These will need to be recouped otherwise the expansion will result in a negative NPV. Adjusting the RAB for the additional equity raising costs transparently overcomes this problem (this adjustment would be the 5.7% allowance applied to the equity portion of the new capital expenditure). Recoupment of equity raising costs in this fashion would be NPV neutral.

10.3.2 Debt Raising Costs

It is now an increasingly common practice to include a separate allowance for ongoing debt raising costs, either as an increment to the debt margin or as an allowance in the cashflows.

Unlike the debt margin, these ongoing costs are less specific to the business, although may vary depending on the volume of debt raised and the manner in which it is raised, noting that there are some economies of scale in raising and managing debt. Referencing previous regulatory decisions (which have sourced estimates of these costs from financial institutions) is therefore considered appropriate. Allowances approved in recent regulatory decisions are included in the following table.

Table 11 Debt margin: recent regulatory decisions

Regulator (year)	Industry	Allowance
ACCC (2008)	Rail	12.5 basis points
ERA (2008)	Rail	12.5 basis points
QCA (2006)	Electricity distribution	12.5 basis points
ESCOA (2005)	Electricity distribution	12.5 basis points
ICRC (2004)	Water	12.5 basis points
IPART (2005)	Gas	12.5 basis points
QCA (2005)	Rail and electricity distribution	12.5 basis points
ESC (2005 - draft)	Electricity distribution	12.5 basis points
IPART (2005)	Rail	12.5 basis points
IPART (2004)	Electricity distribution	12.5 basis points
QCA (2004)	Ports	12.5 basis points
ICRC (2004)	Rail and electricity distribution	12.5 basis points

An assumption of 12.5 basis points is now consistently applied in regulatory decisions.[64]

We note that in its recent Draft Decision in relation to ARTC's interstate network, the ACCC made reference to a 2004 report by ACG[65]. Based on this report the ACCC concluded that 8.3 basis points was considered a fair allowance for ARTC's debt raising costs for the interstate network. If ARTC was expected to be pricing closer to the ceiling it would have rejected its submitted allowance of 12.5 basis points in favour of this lower estimate.[66]

The data referenced in this decision is based on the costs of a firm issuing its own debt (based on Medium Term Note issues). The analysis included underwriting fees, legal and roadshow costs, the fixed costs of obtaining an issuer credit rating, registry fees

[64] The most notable exception was the 2002 decision with respect to GasNet, where the Australian Competition Tribunal overturned a decision by the ACCC and allowed a margin of 25 basis points, which was submitted by GasNet.

[65] The Allen Consulting Group (2004), Debt and Equity Raising Transaction Costs, Report prepared for the Australian Competition and Consumer Commission, December.

[66] Australian Competition and Consumer Commission (2008), Draft Decision: Access Undertaking – Interstate Network, Australian Rail Track Corporation, April, p.152.

and paying agent fees. It was not evident that these costs included the (substantial) costs associated with establishing and running a treasury operation. These costs include staffing, compliance costs, data subscription services (such as Bloomberg and Reuters) and information technology costs. If these costs have not been included, this estimate will understate the costs of a firm issuing its own debt.

In our view, the data provided in the ACG report does not provide sufficiently compelling evidence to move from the established precedent of 12.5 basis points. Our concerns with the analysis are that:

- the estimates do not necessarily cover all of the relevant costs that would be incurred in establishing and maintaining a debt issuance facility; and
- the costs will be sensitive to the type and volume of funding obtained, and these costs are likely to vary through time.

We are also of the view that reliance should only be placed on objective data sources (ACG has sought to do this with the estimates cited above) rather than say, surveys of investment banks.

In our view, the evidence provided in the ACG report provides insufficient justification to depart from established precedent that has been supported by market and empirical data. We would therefore consider that 12.5 basis points remains reasonable.

10.4 Conclusion

The costs of raising debt and equity funding to develop and expand major infrastructure is a legitimate cost that needs to be compensated. Compensation for both initial and ongoing debt and equity raising costs need to be provided. Our recommendations are:

- the initial equity raising costs are 5.7% of the benchmark equity funding portion of the RAB and initial debt raising costs are 1% of the remaining debt funding portion; and
- for ongoing costs, debt issuance costs of 12.5 basis points should either be added to the debt margin or included as an allowance in the cashflows (we have assumed the former treatment). Equity raising costs for subsequent major capital expansions should be added to the RAB in proportion to the benchmark equity funding level.

11 WACC Estimate

The resulting estimate for WACC is summarised in the following table.

Table 12 WACC Estimate for TPI

Parameter	Value
Risk-free rate[a]	5.63%
Debt to value	10%
Equity to value	90%
Debt margin[b]	6.53%
Debt-raising costs	0.125%
Market risk premium	6.8%
Gamma	0
Tax rate	30%
Asset beta	1.85
Debt beta	0
Equity beta	2.05
Cost of debt	12.29%
Cost of equity	19.56%
Post-tax nominal (vanilla) WACC	**18.83%**

a 20 day average 10 year Commonwealth Government bond yield as at 30 September 2008.

b 20 day average of: {8 year BBB bond yield + (10 year A bond yield - 8 year A bond yield) as at 30 September 2008} + {20 day average of US 10 year BBB bond yield – US 10 year B bond yield}