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ECONOMIC CONSULTING

The Rate of Return to Apply to ARTC's Hunter Valley Coal Network

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Executive Summary

Synergies Economic Consulting (Synergies) has been engaged by the Australian Rail Track Corporation (ARTC) to provide an opinion on the appropriate Weighted Average Cost of Capital (WACC) to apply to its Hunter Valley Coal Network (the HVCN) for the purpose of its forthcoming access undertaking review.

This review is being conducted in a very challenging industry and financial market environment. While the demand outlook is currently more subdued, the inherently cyclical nature of the coal industry is likely to seek growth pressures emerge at some point in the future, which can place further pressures on the network and supply chain capacity. However, the industry is also currently experiencing one of the most difficult periods in its history, with Australian thermal coal producers' position on the global cost curve deteriorating, as evidenced in a report from Port Jackson Partners commissioned by the Minerals Council of Australia. The full implications of this for ARTC's risk profile remain uncertain.

The other key issue for this review is how to estimate the market-sensitive parameters in the post-GFC environment. These difficulties have become particularly evident in estimating the return on equity. Historically, Australian regulators estimated the Sharpe Lintner (SL CAPM) return on equity by combining a prevailing estimate of the risk free rate with a long term historical average market risk premium (MRP). With the risk free rate remaining at historical lows, this approach results in a very low return on equity. This in turn implies that the return on equity required by investors has also (materially) fallen, which is considered neither reasonable nor plausible in this environment.

A number of Australian regulators have reviewed their methodology in light of this. In our view, the most pragmatic approach adopted by an Australian regulator is IPART's methodology, which combines a historical average WACC range with a WACC range based on prevailing market estimates. This is applied to both the return on equity and debt. In our view, IPART is the only Australian regulator that has sought to effectively address this problem, with the Australian Energy Regulator (AER) still estimating the return on equity by combining the prevailing risk free rate with a (currently) 6.5% MRP, which still largely reflects long run historical average estimates for the MRP. The AER will, however, estimate the return on debt using a ten year trailing average.

Based on the above assessment, the WACC that is recommended for ARTC is shown in the table below. This is compared to our understanding of the current WACC that was agreed in 2011. We have also compared this against the approach that would be applied by IPART to estimate the market-sensitive parameters under its revised methodology as we consider this to be the most reasonable regulatory benchmark. The risk free rate, MRP

and DRP estimates for IPART included in the table below are from its most recent market update published in February 2015.

Proposed WACC

Parameter	2011	Synergies' Proposed	IPART
Risk free rate	5.16%	3.01%	3.9%
Capital structure (debt to value)	52.5%	52.5%	52.5%
Debt risk premium	4.56%	n/a	2.65%
Debt raising costs	0.095%	0.095%	0.095%
Market risk premium	6%	7.9%	7.2%
Inflation	2.5%	2.5%	2.5%
Gamma	0.5	0.25	0.25
Tax rate	30%	30%	30%
Asset beta	0.54	0.54	0.54
Debt beta	0	0	0
Equity beta	1.13	1.13	1.13
Return on equity	11.95%	11.93%	12.04%
Return on debt	9.82%	6.67%	6.65%
Post tax nominal (vanilla) WACC	**10.83%**	**9.17%**	**9.21%**
Pre tax nominal WACC	**11.83%**	**10.81%**	**10.87%**
Pre tax real WACC	**9.1%**	**8.11%**	**8.16%**

a The reason a DRP is not specified is because we have estimated the return on debt as an average of the ten year historical average return on debt (i.e. ten year average risk free rate and debt risk premium) and the prevailing return on debt (i.e. prevailing risk free rate and debt risk premium).

The recommended estimates result in a similar return on equity to what was agreed in 2011. This is consistent with the hypothesis discussed in this report, which is that equity investors are not necessarily revising their return expectations downward given the significant reduction in the risk free rate. Instead, it is likely that these expectations are more stable through time. We have retained the same asset beta as the previous review although given the 'structural cost competitiveness problem' facing Australian coal producers it is possible that ARTC's systematic risk has increased.

The return on debt is nearly 3% lower, which reflects the reduction in the risk free rate and DRP, despite our approach giving 50 per cent weight to historical estimates in recognition that the efficient benchmark firm will have raised debt historically that should be able to be refinanced when it matures, not at the reset date.

Overall, our approach is most similar to the methodology that is now applied by IPART. The main difference is the return on equity: we have combined a higher MRP (which similar to IPART, puts equal weight on historical and forward-looking estimates) with the prevailing risk free rate. IPART also applies a risk free rate that reflects historical and

prevailing rates, which would be higher than our risk free rate. On balance, IPART's approach results in a slightly higher return on equity than our approach.

We also note that in its revised Draft Determination on the WACC to apply to rail networks, the Economic Regulation Authority has proposed to apply a 7.9% MRP (which is the same as our estimate). This is based on the Wright approach, which we use to inform our MRP estimate but do not solely rely upon it.

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1 Introduction

Synergies Economic Consulting (Synergies) has been engaged by the Australian Rail Track Corporation (ARTC) to provide an opinion on the appropriate Weighted Average Cost of Capital (WACC) to apply to its Hunter Valley Coal Network (the HVCN) for the purpose of its forthcoming access undertaking review.

Under the *Competition and Consumer Act 2010* (the CC Act), access prices should:[1]

> i. be set so as to generate expected revenue for a regulated service or services that is at least sufficient to meet the efficient costs of providing access to the regulated service or services; and
>
> ii. include a return on investment commensurate with the regulatory and commercial risks involved…

WACC estimation is inherently uncertain and is particularly challenging in a regulated context, which requires the estimation of a forward-looking WACC that will remain fixed for the duration of the regulatory period (at least under the framework as currently administered by the Australian Competition and Consumer Commission (ACCC)). Under incentive regulation the WACC is set with reference to efficient benchmarks, having regard to prevailing conditions in capital markets.

Ensuring that ARTC is able to recover an appropriate return on investment is integral to achieving the Objects Clause under the CC Act, which includes to:[2]

> …promote the economically efficient operation of, use of and investment in the infrastructure by which services are provided, thereby promoting effective competition in upstream and downstream markets…

This review is being conducted in a very challenging industry and financial market environment. While the demand outlook is currently more subdued, the inherently cyclical nature of the coal industry is likely to seek growth pressures emerge at some point in the future, which can place further pressures on the network and supply chain capacity. However, the industry is also currently experiencing one of the most difficult periods in its history, with Australian thermal coal producers' position on the global cost curve deteriorating.[3] The implications of this remain uncertain.

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1 S.44ZZCA

2 S.44AA

3 Port Jackson Partners (2012). Opportunity at Risk, Regaining our Competitive Edge in Minerals Resources, Report Commissioned by and Prepared for the Minerals Council of Australia.

In the meantime, ARTC's *2015-2024 Hunter Valley Corridor Capacity Strategy*, which is based on prospective volumes determined by the Rail Capacity Group (RCG), identifies a number of projects that are necessary to increase capacity on key segments of the network. There is also an ongoing need for asset replacement expenditure.

The starting point for our analysis is the methodologies and parameter inputs underpinning the WACC agreed between ARTC and industry in 2011. One of the key issues for this review is whether these methodologies and inputs (such as beta, gearing and gamma) remain appropriate in estimating a forward-looking WACC for ARTC. We must also have regard to relevant developments in Australian regulatory precedent, noting that there is very limited guidance as to how the ACCC might approach some of these issues in the current environment.

This report is structured as follows:

- section 2 examines the choice of model in the context of recent regulatory developments;
- section 3 addresses gearing;
- section 4 addresses the return on equity;
- section 5 address the return on debt;
- section 6 addresses gamma; and
- section 7 concludes.

2 Model choice

2.1 WACC formula

The approach most commonly applied to estimate WACC in Australian regulatory regimes is the post-tax nominal 'vanilla' WACC[4]:

$$WACC = R_e \frac{E}{E+D} + R_d \frac{D}{E+D}$$

Where:

Re = return on equity
E = value of equity
Rd = return on debt
D = value of debt.

This is consistent with the approach commonly used by regulators including the ACCC. This formulation adjusts for inflation, taxation and dividend imputation in the cash flows, rather than the cost of capital.[5] We have applied this approach for the purpose of this review.

2.2 Estimating the return on equity

2.2.1 Sharpe-Lintner CAPM

To date, the model that Australian regulators (including the ACCC) have applied to estimate the return on equity is the Sharpe-Lintner Capital Asset Pricing Model (SL CAPM). 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 will tend to impact the whole market and cannot be avoided by investors through diversification.[6] It is only these risks that are assumed to be compensated by the WACC.

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4 This formulation is often referred to as "WACC 3" – see Officer, R.(1994). The Cost of Capital under an Imputation Tax System, in Accounting and Finance, vol. 34(1), pp 1- 18.

5 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.

6 Non-systematic risk, on the other hand, refers to risks that are unique to a particular firm or project. 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.

Under CAPM the required return on equity is expressed as a premium over the risk- free return as follows:

$$E(Re) = Rf + \beta e * [E(Rm) - Rf]$$

Where:

Re	= the cost of equity capital
Rf	= the risk free rate of return
[E(Rm) – Rf]	= the market risk premium
E( )	indicates the variable is an expectation
βe	= the systematic risk parameter (equity beta).

2.2.2 Recent regulatory developments

National energy framework

One of the more significant regulatory developments in WACC in recent times has been in energy. In 2012, the Australian Energy Market Commission (AEMC) approved changes to the framework used to regulate energy network businesses (the National Gas Rules and National Electricity Rules),[7] including the assessment of the rate of return. While the limitations of the SL CAPM have always been known, the AEMC's review focussed on some of these limitations and the outcomes it has been producing when applied in a prescriptive, formulaic way, as has been the practice of most Australian regulators:[8]

> The Commission also expressed concern that the provisions create the potential for the regulator and/ or appeal body to interpret that the best way to estimate the allowed rate of return is by using a relatively formulaic approach. This may result in it not considering the relevance of a broad range of evidence, and may lead to an undue focus on individual parameter values rather than the overall rate of return estimate.

These concerns have become more pronounced since the Global Financial Crisis (GFC), when risk free rates have fallen to historical lows, resulting in low return on equity outcomes when the low risk free rate is combined with a 'static' long-run average market risk premium (MRP). These concerns were particularly evident when this return on equity was compared with the return on debt, with debt margins blowing out

[7] Australian Energy Market Commission (2012). Final Position Paper, National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012, National Gas Amendment (Price and Revenue Regulation of Gas Services) Rule 2012.

[8] Australian Energy Market Commission (2012). p.23.

considerably following the GFC. As there was seen to be no logical reason as to why equity holders had reduced their return expectations relative to lenders (with equity holders being the residual claimants on the firm), this has been seen as symptomatic of problems with the SL CAPM and the way it has been applied.

The AEMC therefore concluded that a broader range of relevant estimation methods, models, financial market data and other evidence should be taken into account by the Australian Energy Regulator (AER) in assessing the allowed rate of return. This more flexible approach is now reflected in the revised energy regulatory framework, which formerly prescribed the SL CAPM.

However, the AER's Rate of Return Guidelines (the AER's Guidelines) that were produced following these changes still retains Sharpe CAPM as its core 'foundation model'.[9] The AER has specified that it will have regard to other models and evidence, including the Black CAPM[10], in determining where it might select point estimates from the range determined for beta. It also proposes to use the forward-looking Dividend Growth Model[11] (DGM) in the range of evidence used to estimate the MRP.

In effect, however, the AER gives little practical weight to these alternative models. The majority of regulated network businesses submitting regulatory proposals under the AER's Guidelines have sought to apply a 'multi-model' approach, estimating the return on equity using a weighted average of estimates from the SL CAPM, Black CAPM, DGM and Fama-French three factor model[12]. This has been consistently rejected by the AER in favour of sole reliance on the SL CAPM. This issue is one of a number of matters that are being appealed by NSW energy network businesses and will therefore be subject to review by the Australian Competition Tribunal.

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9 Australian Energy Regulator (2013). Better Regulation, Explanatory Statement, Rate of Return Guideline, December.

10 There is consistent and strong evidence to show that the Sharpe-Lintner CAPM will tend to underestimate the return on equity for low beta stocks (or stocks that are less risky than the market) and overestimate the return for high beta stocks. The Black CAPM seeks to address the issue by enhancing the Sharpe CAPM to relax its restrictive assumption that investors can freely borrow and lend at the risk free rate. It replaces the risk-free rate with the 'zero beta return', or the return on an asset with a beta of zero (or no covariance with the market). This return tends to be higher than the risk-free rate.

11 The Dividend Discount Model is a forward-looking model that has the advantage of not specifying any relationship between risk (or any other specified factor) and return. This model projects the firm's future expected dividend stream (which is assumed to grow at a certain rate) and then solves for the discount rate that equates that future dividend stream to the current market price. This discount rate is the required return on equity.

12 The Fama-French model assumes that a firm's return on equity is a function of its systematic risk, firm size and the book to market ratio.

IPART

The Independent Pricing and Regulatory Tribunal (IPART) has also undertaken a detailed review of its WACC methodology.[13] It has revised its approach to rate of return based on an acknowledgement of the issues associated with application of the SL CAPM post the GFC, in particular, combining a long run MRP with a prevailing or 'spot' risk free rate. In initiating this review, IPART observed:[14]

> We use an expected MRP based on long-term historic averages. Very long-term measures of the MRP may provide a guide to long-term future returns assuming that the MRP is mean reverting. But, if market conditions are volatile, the current expected MRP may vary from the long-term average for significant periods. For example, since the GFC there have been extended periods of time where the actual MRP has moved significantly in the opposite direction to the risk free rate. When using a short-term estimate of the risk free rate and a historic-based MRP this movement in prices is not captured in the CAPM cost of equity.

It applies what we consider to be a reasonably pragmatic approach to the problem, where it estimates the feasible WACC range based on:

- a range based on long run averages
- a range based on current market data.

The mid-points of these two ranges form the lower and upper bounds for the WACC range. In selecting the final WACC, the default position will be the mid-point of the WACC range. However, IPART will also reference its monthly 'uncertainty index'. If the current index value is more than one standard deviation from the long-term average value of zero, it will consider moving away from the mid-point. It is also noted that as part of this review, IPART also reverted to the use of a ten year term to maturity to estimate the risk free rate and debt margin (having previously aligned this with the length of the regulatory period).

Under IPART's new approach, it will still use long run historical averages of the MRP, which it values at between 5.5% and 6.5%, to estimate its long term average WACC range. Its current WACC range will use current market data, including the current implied MRP, which is estimated using DGM estimates. Other regulators, including the

[13] Independent Pricing and Regulatory Tribunal (2013a). Review of WACC Methodology – Research, Final Report, December.

[14] Independent Pricing and Regulatory Tribunal (2012). Review of Method for Determining the WACC, Dealing with Uncertainty and Changing Market Conditions, Other Industries – Discussion Paper, p.46.

QCA and ERA, have reviewed the way they propose to estimate the MRP, which is discussed further in section 4.2.

IPART also now publishes semi-annual updates (in February and August) of current market conditions and the prevailing WACC ranges and mid-points for each industry sector. In its most recent update for February 2015[15], IPART's indicative ranges for the risk free rate and MRP is provided below.

Table 1 IPART market update – February 2015 (estimates as at 31 January 2015)

	Risk free rate	MRP
Prevailing (40 day average)	2.7%	8.3%[a]
Long term (10 year average)	4.9%	6.0%
Mid-point	3.8%	7.2%

a mid point

Source: http://www.ipart.nsw.gov.au/Home/Industries/Research/Market_Update

2.2.3 Implications for this review

The above highlights that there has been at least some recognition by Australian regulators of the practical difficulties that have emerged in applying the SL CAPM in the current environment, particularly as the risk free rate remains low. In the post-GFC environment, with global financial market conditions remaining unstable, it remains unclear as to whether conditions will revert to what we observed prior to the GFC, or whether there is a 'new normal'.

These changes support the consideration of estimates from a broader range of models and evidence, as reflected in the rule changes implemented for energy network businesses in 2012. In our review, the AER's response to those changes does not go far enough, with its most recent cost of equity estimates for network businesses determined in final and preliminary decisions published in April 2012, effectively still combining the historical average MRP (6.5 per cent) with the prevailing (low) risk free rate.

For example, for NSW energy network businesses, the return on equity is over 3% lower than the return on equity determined for the current access arrangement period (set back in 2009). This largely reflects the reduction in the risk free rate. We note that the AER applied a long run average MRP of 6% in these decisions but increased this to 6.5% shortly thereafter. We do not consider that it is reasonable to assume that equity investors have reduced their forward-looking return expectations by more than 3% over this period. An alternative (and we consider more plausible) presumption is that rather

[15] Refer: http://www.ipart.nsw.gov.au/Home/Industries/Research/Market_Update

than investors' return expectations fluctuating through time in accordance with rises and falls in the risk free rate, they will exhibit more stability (in real terms).

This has been the basis of the Wright approach, for example[16]. Rather than assuming that the MRP remains relatively constant through time, the Wright approach assumes that the overall return on equity remains reasonably stable. It therefore estimates the MRP as the difference between a long term average of the return on the market and the current risk-free rate.

What is clear is that a different approach needs to be taken, particularly if the SL CAPM is to continue to be used as the primary model to estimate the return on equity. In our view, the most pragmatic approach that has been taken in addressing this issue by an Australian regulator is the approach employed by IPART, which involves estimating two WACC ranges (using the SL CAPM), one based on long term averages and the other prevailing market rates.

We will consider the outcomes that will result from this as part of our analysis.

2.3 Estimating the return on debt

2.3.1 Recent regulatory developments: the trailing average approach

In Australian regulatory regimes the return on debt is reset at the beginning of the regulatory period and remained fixed for that period. Under this approach, also referred to as the 'on the day' approach, the return on debt is based on prevailing rates and set over a short averaging period (up to forty days) prior to the start of the next regulatory period.

A key implication of the 'on the day' approach to setting the return on debt is that in order to minimise the risk of mismatch between the regulated return on debt and the firm's actual cost of debt, the firm would have to refinance and/or hedge its entire debt portfolio over the short averaging period when the return on debt is reset by the regulator.

As part of the 2012 changes to the national energy framework referred to above, it was recognised that more efficient debt management practice is to maintain a staggered debt maturity profile, involving the progressive refinancing of (long term) debt through time. This in turn means that the return on the debt set in the WACC will therefore reflect the

[16] S. Wright (2012). Review of Risk Free Rate and Cost of Equity Estimates: a Comparison of UK Approaches with the AER, 25 October. http://www.aer.gov.au/sites/default/files/RAAP%20Appendix%205.D.PDF

cost at which debt was raised or refinanced historically, as well as prevailing market rates (for debt that is maturing and must be refinanced).

This also reflects the reality that the majority of regulated businesses are established brownfields facilities that undertake incremental investment for growth and asset replacement. These businesses will have established portfolios of debt with existing contractual commitments to make interest payments based on the prevailing rates at the time the debt was issued (which will have been at various points in time). It is neither feasible, nor efficient, to assume that the business would be refinancing that debt at the start of each regulatory period.

The 'trailing average' approach has been developed to complement this type of debt management strategy. The key features of the approach are that:

- the return on debt is effectively estimated as a long term average. In effect, this means that one-tenth[17] of the prevailing (ten year) return on debt is 'averaged in' to produce an updated return on debt estimate each year; and
- prices are then updated annually to reflect the updated return on debt estimate.

The national energy framework now allows the return on debt to be estimated based on the trailing average, the on the day approach or a hybrid of the two. However, the AER has expressed a preference for the trailing average approach, which is the only method currently allowed for in its Rate of Return Guidelines. It noted that this was also more consistent with the practices that regulated network businesses are currently adopting. It observed:[18]

> …the trailing average portfolio approach allows a service provider—and therefore also the benchmark efficient entity—to manage interest rate risk arising from a potential mismatch between the regulatory return on debt allowance and the expected return on debt of a service provider without exposing itself to substantial refinancing risk.
>
> Thus, we consider that holding a (fixed rate) debt portfolio with staggered maturity dates to align its return on debt with the regulatory return on debt allowance is likely to be an efficient debt financing practice of the benchmark efficient entity under the trailing average portfolio approach.

[17] In our view, the better approach is to weight each year's estimate in accordance with the approved forecast capital expenditure profile (meaning that in years when new borrowings are higher, the prevailing rate in that year will be given a higher weight). This more effectively manages the mismatch between the actual and regulated cost of debt on new borrowings.

[18] Australian Energy Regulator (2013). Better Regulation, Explanatory Statement, Rate of Return Guideline, December, p.158.

WA's Economic Regulation Authority (ERA) has also recently determined that it will depart from its preferred on the day approach and accept the application of a hybrid weighted trailing average approach for ATCO Gas Australia.[19]

Recognising the difficulties associated with estimating the benchmark return on debt in recent years, the ACCC published a Position Paper on this topic in April 2013.[20] In this paper the ACCC sees merit in the trailing average (or a portfolio) approach, although was not necessarily in favour of an annual adjustment[21]. It has not published any further thinking on this.

As noted above, IPART also produces a WACC range based on long term historical averages, including the return on debt (this is then combined with the WACC range estimated using current rates). It concluded that:[22]

> In estimating the cost of debt, we try to build up an estimate of the efficient cost of capital that is consistent with investors' expectations. We had previously adopted the view that current market rates were the best predictor of future rates and that investors' expectations reflected this. However, we observe that, in practice, the cost of capital used in project evaluations or business valuations are often more stable than current market rates and informed by longer term expectations.

It made it clear that this was what it considered to be consistent with its competitive market objective (that is, what is the efficient cost of capital for a firm operating in a competitive market), which does not mean that it is seeking to replicate actual financing practice. IPART will not apply an annual update to the return on debt.

2.3.2 Implications for this review

We consider that the trailing average better reflects prudent and efficient debt management practice. This also highlights the importance of ensuring that the regulatory framework complements, rather than drives, commercial practice (provided that practice is efficient). We acknowledge that the ACCC's current position on the trailing average is not known, noting its reluctance to adopt an approach that would

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[19] Economic Regulation Authority (2015). Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems, 1 July.

[20] Australian Competition and Consumer Commission (2013). Estimating the Cost of Debt, A Possible Way Forward, April.

[21] We also note that if annual updating is not favoured, an adjustment could be made via an end of period true-up mechanism.

[22] Independent Pricing and Regulatory Tribunal (2013b). WACC Methodology, Research – Draft, September, p.13.

involve annual updates to the return on debt (which has also been previously rejected for ARTC).

However, we are firmly of the view that fully resetting the return on debt at the start of each regulatory period based on prevailing market rates implies a debt management strategy that is neither feasible nor efficient. Indeed, that strategy that it implies is rather perverse, which is to assume that an infrastructure provider with a sizeable debt portfolio would enter the market once every five years and refinance all of its debt over a short averaging period (which is not likely to be possible).

It is more reasonable to assume that the efficient benchmark firm has an established debt portfolio of long term debt that is progressively refinanced through time. Importantly, this means that the return on debt in the WACC is reset having regard to the cost of debt raised historically. As noted by IPART, this does not mean we are having regard to the firm's actual borrowing costs – instead, we are replicating competitive market outcomes. This is examined further in section 5.

2.4 The asymmetric consequences of regulatory error

One of the key risks faced by ARTC that is not compensated by the WACC is regulatory error. As we have previously submitted, it is widely accepted that regulatory error tends to have asymmetric consequences. The Productivity Commission has stated:[23]

> - Over-compensation may sometimes result in inefficiencies in timing of new investment in essential infrastructure (with flow-ons to investment in related 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. Given the imprecise nature of WACC estimation (particularly in terms of a number of underlying parameters, such as beta and the market risk premium), the probability of

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

regulatory error is likely to be high. It is therefore considered important for regulators to adopt a conservative approach when estimating WACC.

Given WACC estimation is an imprecise science (particularly in relation to beta, as outlined below, which is a key driver of WACC), it is not possible to reliably assess, even with the benefit of hindsight, whether a WACC has been set 'too high' or 'too low' relative to the expectations of investors. While it is extremely important to ensure that the proposed estimate is robust, observing the history of WACC reviews in regulatory processes suggests a tendency to seek a degree of precision that is simply unrealistic in practice (and indeed observing the evolution of decision-making in the context of the national energy framework, this has probably only worsened).

It therefore remains extremely important to remain mindful of the risks and consequences of error in this process.

3 Gearing

3.1 Approach

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 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 be readily observed for all firms, particularly for debt.

Consistent with other WACC parameters, Australian regulators apply a benchmark WACC, that is, the WACC that would apply to an efficient benchmark firm in the same industry with the same risk profile. This is consistent with the objective of incentive regulation, which bases costs on efficient benchmark targets. This therefore means that the capital structure assumption is similarly based on establishing what the maximum efficient long term gearing level for the business might be. It is not based on the firm's actual gearing. This also ensures that the firm is not rewarded for maintaining an inefficient capital structure.

Of all of the WACC parameters determining the optimal benchmark capital structure is especially imprecise. Generally, we would expect to observe the gearing levels of firms in the same industry to cluster within a range, although this range could be quite wide. Further, the level of gearing maintained by a firm at any one point in time will be influenced by a number of factors, including its forward-looking capital expenditure requirements.

Over time, we tend not to observe material changes in benchmark gearing levels, particularly in a regulated context.

3.2 Assessment

The level of gearing in the WACC determined in 2011 was 52.5%. Overall, we consider that in order to justify a change in the benchmark gearing, this would need to be based on either:

- a material and persistent change in ARTC's risk profile, suggesting that it could sustain either more or less debt; and/or
- a material difference in the average gearing levels maintained by similar firms.

ARTC's risk profile is examined further as part of the assessment of beta (refer section 4.3). While the focus of this assessment is on systematic risk only, this analysis does not

support a conclusion that there has been a material change in its risk profile, although it is possible that its asset stranding risk has increased with the market downturn (which is not reflected in the beta estimate given the CAPM assumes that returns are normally distributed).

We have also examined the average gearing levels maintained by the comparator firms in our beta sample over the five year horizon of the beta analysis. For the US Class 1 railways, the range for gearing is between 22 per cent and 66 per cent, with an average of around 40 per cent. As these businesses are vertically integrated with above-rail operations that are exposed to competition (including from alternative forms of transport), we would expect them to have a higher risk profile and hence lower debt capacity.

For regulated businesses in Australia, 60% gearing is the most commonly applied assumption for water and energy utilities, who have a lower risk profile than ARTC. The gearing levels established for other regulated railways are provided in the table below.

Table 2 Regulated railways' gearing levels in Australia

Entity (Regulator)	Gearing Level
Aurizon Network CQCN (QCA)	55%
ARTC Interstate	50%
Brookfield Rail (ERA)	Current: 35% Proposed in Draft Decision: 25%
The Pilbara Infrastructure (ERA)	Current: 30% Proposed in Draft Decision: 20%

On the basis of the above, we see no reason to vary from ARTC's existing gearing assumption of 52.5%. The ACCC has previously determined that a BBB rating is appropriate for ARTC[24] and we similarly see no reason to change that assessment.

[24] Australian Competition and Consumer Commission (2010). Position Paper in Relation to the Australian Rail Track Corporation's Proposed Hunter Valley Rail Network Access Undertaking, 21 December.

4 Return on equity

4.1 Risk free rate

4.1.1 Methodology

The risk-free rate represents the return than an investor can expect from a risk-free asset. Risk in financial investments is driven by the extent to which the actual return on an investment differs from the return that the investor expected when making the investment. Risk can therefore be viewed as the variance in returns around the expected return.

In Australia, as in most economies, the best proxy for a risk-free investment is the current yields on sovereign government bonds. This is seen as risk-free as the government is theoretically able to honour all interest and principal repayments. For this reason, Commonwealth Government Securities (CGS) are used as the proxy.

However, the key issue in using CGS as the proxy for the risk-free rate comes when choosing the appropriate bond maturity to adopt. Commercial practice commonly adopts CGS maturities that match the life of their issued bonds or when they have invested in long-life assets, the longest maturity for which there is a CGS with enough liquidity to provide an accurate estimate of the yield. Accordingly, the ten year (nominal) Commonwealth Government bond is typically considered the longest dated liquid bond and represents the most relevant benchmark to apply.

The next issue to deal with is the averaging period that is used for assessing the risk-free rate. Given that the CAPM is a model which reflects a forward looking view of the required returns on an investment it is theoretically correct to base the risk-free rate on the prevailing yield on the date of the valuation. In regulation, the average yield is calculated over a relatively short period as taking an estimate on any one day could be influenced by temporary perturbations in the market.

4.1.2 Current estimate

As noted previously, the risk free rate has been at historically low levels. This is shown in the following figure.

Figure 1 Yield on 10-year CGS, 1969 to Current

Data source: Reserve Bank of Australia

As discussed above, a key concern is that combining the prevailing risk free rate with a long run average MRP will result in a return on equity that is materially below the return that an investor in the market might require. We consider that this issue is best addressed via the approach used to estimate the MRP (see below).

We have estimated the risk free rate over a 20 day period ending 30 June 2015. The resulting estimate is 3.01 per cent (annual effective).[25]

4.2 Market Risk Premium

4.2.1 Background

The market risk premium (MRP) represents the amount that an investor expects to earn from a diversified portfolio of investments, representing the whole of a given market, which is in excess of the return on a risk-free asset.

A key difficulty in the estimation of the MRP is that it is not directly observable in the financial markets and instead needs to be derived from information that is readily observable. Therefore, estimates of the MRP have traditionally placed a heavy weighting on historical data and derived a range for the MRP that is plausible given what has been observed in the market. This also assumes that the MRP that has been observed

[25] This based on the arithmetic average of the RBA's estimate of the 10-year yield of CGS based in the dataset F2.1 Capital Market Yields – Government Bonds.

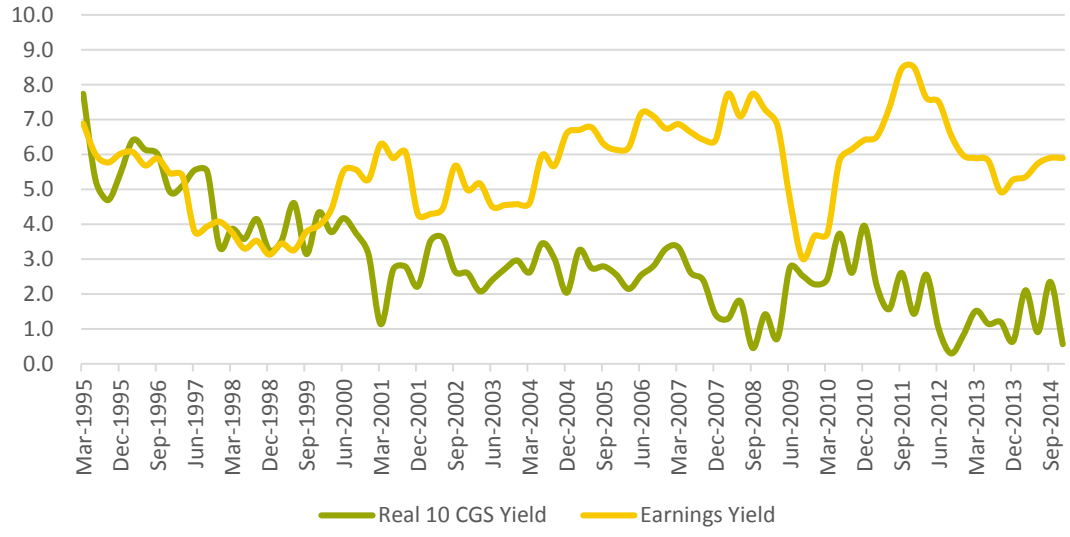
historically can provide a reliable estimate of the forward-looking MRP, having regard to the prevailing conditions in financial markets.

There have been many papers that have tried to quantify the historical MRP in the Australian market, and results have been somewhat consistent. The range of estimates is usually between 6% and 8% although there is considerable variance in the estimates based in the timeframe used and the adjustments made to data to represent changes in the structure and data retention practices of the market over the course of over a century.

Up until the GFC there had been some commentary on a possible decrease in the MRP. Based on this, there had been increased pressure to choose an estimate from the lower end of the above range. During that time, regulators almost always produced an estimate of around 6%. However, since the GFC it is more likely that the MRP has risen.

This may be evidenced at a high level by the fact that earnings yields for listed companies and the real yield on Commonwealth Government Securities (CGS) have been divergent since approximately 2000. The divergence has been caused earnings ratios staying near constant and the yield on ten year CGS decreasing over the period - this is evidenced in Figure 2 below. It could be surmised that the MRP has had to increase by at least an offsetting amount that equals the fall in the risk-free rate.

Figure 2 Listed equity earnings and Sovereign Bond Yields



Note: Earnings yield is calculated as the 12-month trailing earnings-to-price ratio for the MSCI Australia Index.
Data source: Bloomberg, RBA, Yieldbroker & Synergies calculations

As discussed previously, with the risk free rate falling to historical lows in recent years (refer above), this has resulted in significant reductions in the expected return on equity if it is estimated by combining that prevailing risk free rate with a historical average

MRP. This in turn implies that investors have materially reduced their forward looking return expectations in what remains an inherently risk market environment.

The nature and extent of any relationship between the MRP and risk free rate has been the subject of some debate. However, regardless of whether there is unequivocal evidence supporting a direct and measurable relationship between the risk free rate and MRP, there is no clear logic or evidence to suggest that the significant reduction in the risk free rate that has occurred in recent years should impact equity returns to the same extent. Instead, the more logical and plausible conclusion is that as the risk free rate has fallen the MRP has risen.

As noted previously, IPART expressed these concerns in initiating an industry-wide review of its approach to WACC in 2012, stating that in current market conditions, its methodology (which was consistent with the approach applied by most Australian regulators) was producing a WACC that is too low.[26] It stated that:[27]

> The rationale for using long-term average data to estimate the MRP is that such an estimate provides a proxy for current expectations about this premium. This approach served well from early 2000 to 2008, when interest rates were fairly stable in Australia. But since the GFC we have witnessed substantial dislocations in financial markets that have affected interest rates and investor perceptions of risk and required returns on equity...
>
> It suggests that the GFC may have altered investors' perceptions of the risk of equity investment, and hence they require a higher return on equity. Since its initial spike, the MRP has fallen but it does not appear to have returned to pre-GFC levels in Australia.

This has prompted most Australian regulators, including IPART, to review their approach to estimate the MRP (which will be discussed below), although in some cases, including the AER, this has not gone far enough to ensuring that the return on equity estimate is more likely to reflect the returns required by investors in the prevailing market.

4.2.2 Overview of literature on MRP estimation

There are currently three main methods that are used to estimate the MRP:

- historical averaging

[26] Independent Pricing and Regulatory Tribunal (2012). p.9.

[27] Independent Pricing and Regulatory Tribunal (2012). p.15.

- dividend growth models (DGMs)
- survey results.

It is worthwhile reviewing each of these methods in some detail to explore their applicability to the calculation of the MRP in the Australian context.

Historical Averaging

Historical averaging is the most popular of the above methods for estimating the MRP, particularly in a regulated context. Historical averaging takes the *ex ante* measures of two things of which the difference is the MRP. These are:

- market returns (a share price index comprising total returns); and
- the risk-free rate (the prevailing CGS yield).

The differences are then averaged by one of two methods: geometric averaging or arithmetic averaging.

Methodological Issues

There are a number of issues that arise in the use of historical averaging of the MRP. The first is the period over which the historical data should be analysed. There are two schools of thought on what time frame should be used. One school suggests that the longest time-period available should be used. This assumes that risk premiums over time are stable on average and that an investor's view of pricing risk in the market has also not changed over time.

Another school suggests that only recent data is relevant to the estimation of the MRP. This attempts to address the assumptions made when using the longest-run average as mentioned above. It allows for the estimate to reflect any changes to investors' view of the MRP if there has been structural changes in the market, for example, the introduction of dividend imputation. However, using shorter time periods of data also means there is an increase in the standard errors associated with any estimate that is derived. This makes it difficult to derive a statistically meaningful estimate. There is also an issue that estimates based on a short time period will not sufficiently form a basis for a long-term forecast.

Based on the above, it is important that an estimate attempts to balance these two trade-offs; that the estimate is the best estimate available and is not biased. Using the longest time period possible may give the best estimator (in terms of the standard error of the estimator being low) but it may be biased in terms of taking into account a period or periods where market conditions do not resemble the market conditions that are

expected to be encountered in the future. On the other hand, as noted above, a shorter time period is likely to have a higher standard error. This was the conclusion made by Gray and Officer: [28]

> A long period of data provides better statistical precision (the mean estimate has a lower standard error), but data from long ago may be less representative of current circumstances. It is generally agreed, however, that the minimum period required to provide sensible estimates is 30 years.

A second issue is the method by which an average is calculated. There are two choices when it comes to calculating averages: an arithmetic mean and a geometric mean. This is a well-known inequality in mathematics commonly referred to as the Arithmetic Mean - Geometric Mean (AM-GM) Inequality. This inequality shows that the arithmetic mean will, on average, be higher than the geometric mean by an amount equal to roughly half of the variance of the underlying data, in this case, the historical excess returns.[29] Based on this, there is no difference in the level of efficiency or accuracy between the two methods, but rather a difference in the interaction of the variance of the initial data and the methodology used to calculate the mean. This has important impacts on the choice between the two for averaging the historical excess returns.

Based on the above, there is an imperative to choose a method that provides an estimate that is suitable for the model in which it is being applied. Gray and Officer also commented on this and concluded that the preferred method of estimating a forward-looking MRP is using the arithmetic mean: [30]

> The MRP is to be used in the CAPM to compute the cost of equity expressed in annual terms. Therefore, we require an estimate of the expected return, over the next year, on the market portfolio over and above the risk-free rate. What return do we expect on the market portfolio over the next year, relative to the risk-free rate? The historical data provides us with many observations on what the market returned relative to the risk-free rate over a one-year period. To the extent that each of these observations should be given equal weight, a simple arithmetic average is appropriate.

They conclude that the best estimate is the arithmetic mean due to the fact that the CAPM is a single-period model. As such, an estimate of the *discrete* return is best suited as it acts

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[28] 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, p.21.

[29] Bradford Cornell (1999). The Equity Risk Premium: The Long-Run Future of the Stock Market, John Wiley & Sons, New York, p. 38.

[30] 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, p.21.

as an estimate of the MRP for the period that is being analysed and includes no compounding, as would be assumed if using the geometric mean. This conclusion was also made by Hathaway, who refers to the geometric mean as the CAGR (compounded annual growth rate):[31]

> …the arithmetic average is the appropriate one to use for unbiased forward estimates of expected returns but the CAGR or the continuous rates are the ones to use for historical performance data.

We are also of the view that the best method for the forward-looking estimate of the MRP is the arithmetic average for the reasons outlined above - specifically that the CAPM is a single-period model and therefore a discrete return estimate for the period should be used. We have used the arithmetic mean of historical excess returns in our analysis.

Methods used by Australia regulators

There are multiple methods used to quantify the MRP by the historical averaging methodology, including the Ibbotson, Siegel and Wright approaches.

We believe that the Siegel method of estimating the historical excess returns is flawed for the following reasons. The Siegel method is the same as the Ibbotson method except that the final estimation of the historical excess return is for the amount of 'unexpected' inflation that occurred in Australia prior to 1990. This 'unexpected' inflation caused the real yields on government bonds to be lower than expected and therefore investors were caught unaware by the change in the inflation. Therefore, the Siegel approach seeks to adjust the historical excess return downwards by around 1.9%.

However, there has not been sufficient evidence in support of this approach. Reference can be made to information presented by NERA[32], which shows that there has historically been periods where inflation has been higher and lower than expected. On the whole it shows that 'unexpected' inflation does not differ from zero over the period. NERA based its observations on the Livingstone survey and the ASA-NBER survey.

Given the evidence above, we have not used the Siegel method in our calculation of historical excess returns. However, we have adopted the Ibbotson and Wright approaches. We note that in a revised Draft Decision on the WACC methodology to

[31] N. Hathaway (2005). Australian Market Risk Premium, Capital Research Pty Ltd., p. 55.

[32] NERA (2013). The Cost of Equity for a Regulated Energy Utility: A Response to the QCA Discussion Paper on the Risk-Free Rate and the MRP, A report for United Energy and Multinet Gas, pp. 26

apply to rail networks issued in November, the ERA is now proposing to solely rely on the Wright approach to estimate the MRP.[33]

Dividend Growth Models

All dividend growth models (DGMs) are based on the premise that the value (price) of a stock is determined solely by the cashflows (dividends) that it provides to shareholders.[34] Therefore, today's stock price should be the sum of all expected future dividends, discounted at a rate that takes into account the time value of money (the risk-free rate) and the riskiness of the asset (the MRP). The simplest DGM is a constant growth rate model as outlined below in Equation 1:

Equation 1. Dividend Growth Model - Constant Growth, One-stage[35]

$$P_t = \frac{D_t}{R_t^f + MRP_t - g}$$

That is, the current price of the asset is equal to the dividend for the current period (D_t) discounted by the risk-free rate (R^f) plus the MRP minus the expected long-term growth rate of the dividend (g). Given that the current price, current dividend and the risk-free rate can be observed easily, only the future growth of the dividend needs to be estimated and the system can be solved for the MRP. In recognition of the issues identified above, some Australian regulators (including the AER, IPART and the Queensland Competition Authority (QCA)) are giving more regard to DGM estimates in recognition that estimates derived from historical averages may not be appropriately representative of the forward-looking MRP (see below). There are a few contentions that surround the use of DGMs in the Australian regulatory context, these are explored below.

The structure of the DGM

There are many possible structures to the DGM which embody different assumptions about the various inputs to the model. These are split into three distinct groups:

- One-stage model (Gordon growth model as seen above in Equation 1);
- Two-stage models – which allow for a period of extraordinary dividends followed by terminal growth; and

[33] Economic Regulation Authority (2014). Review of the Method for Estimating the Weighted Average Cost of Capital for Regulated Railway Networks, Revised Draft Decision, 28 November.

[34] M. Gordon (1962). The investment, financing, and valuation of the corporation. Greenwood Press.

[35] M. Gordon (1962).

- Three-stage models – which allow for a period of extraordinary dividends, followed by a transition period to the terminal growth stage.

These are expanded on below.

One-stage DGM

The one-stage DGM provides a simple and accessible estimate of the value of a firm or index but is limited to firms that are growing at a stable rate that is somewhat near their long-term average growth rate. When used on an index, as in the estimation of the MRP, the long-term growth rate of dividends for the index can be used as it represents an average sample of dividends which should be rather close to the long-term growth rate.

The main downfall of the one-stage DGM is that the model is extremely sensitive to the growth rate. The derived MRP has a perfectly proportional relationship with the assumed growth rate.

Two-stage DGM

A two-stage DGM allows for a more detailed level of analysis as there are two growth periods in the model. It is useful when there is a period where dividends are expected to grow at a level that is different to the long-run average.

Equation 2. Two-stage Dividend Growth Model

$$P_0 = \sum_{t=1}^{t=n} \frac{D_t}{(1+k_{e,hg})^t} + \frac{P_n}{(1+k_{e,hg})^n} \; where \; P_n = \frac{D_{n+1}}{(k_{e,st} - g_n)}$$

Where:

D_t = Expected dividends per share in year t
K_e = Cost of Equity (hg: high Growth period; st: stable growth period)
P_n = Price (terminal value) at the end of year n
g = Extraordinary growth rate for the first n years
g_n = Steady state growth rate forever after year n.

This represents the price of the stock based on the present value of the dividends during the extraordinary stage and the present value of the terminal price. The two-stage DGM provides a better estimate of the MRP if there are two distinct stages of growth in the dividends to be modelled. There are only two issues with this methodology. The first is the decision around the length of extraordinary dividend growth and the second is reconciling the fact that it is assumed that the extraordinary dividend growth will regress to the terminal growth rate immediately, with no transition period.

Three-stage DGM

The three stage DGM allows for a transition period between the extraordinary period of dividend growth and the terminal growth period:

Equation 3. Three-stage Dividend Growth Model

$$P_0 = \sum_{t=1}^{t=n1} \frac{EPS_0 * (1+g_a)^t * \Pi_a}{(1+k_{e\,,hg})^t} + \sum_{t=n1+1}^{t=n2} \frac{D_t}{(1+k_{e\,,hg})^t} + \frac{EPS_{n2} * (1+g_n) * \Pi_n}{(k_{e\,.st} - g_n)(1+r)^n}$$

Where:

EPS_t = Earnings per share in year t
D_t = Dividends per share in year t
G_a = Growth rate in high growth phase (lasts n1 periods)
G_n = Growth rate in stable phase
Π_a = Payout ratio in high growth phase
Π_n = Payout ratio in stable growth phase
K_e= Cost of equity in high growth (hg), transition (t) and stable growth (st).[36]

The three-stage dividend growth model relaxes many of the simplifying assumptions contained within the previous models but does so by increasing the complexity of calculation – this is because there are many more inputs that need to be derived to facilitate the calculation of the MRP.

We are of the view that the DGM provides one of the best estimates of the forward-looking MRP. The two-stage and three-stage models provide much more reliable results than the constant growth model, provided that quality data is available for the inputs.

Survey Evidence

Survey evidence of the MRP relies on polling informed market observers (such as portfolio managers, CFOs and academics) to gauge their expectation of the future MRP. Some Australian regulators, including the AER, rely on survey results to inform their calculation of the MRP. Most recent studies used include:

- Fernandez et al (2013): 73 respondents were applying a mean MRP of 5.9% (6.0% median);
- KPMG (2013): 19 respondents were applying a median MRP of 6.0% (6.0% mode);

[36] All dividend growth models taken from Damodaran (2012). Investment Valuation: Tools and Techniques for Determining the Value of Any Asset, Chapter 13.

- Fernandez et al (2013): 17 respondents were applying a mean MRP of 6.8% (5.8% median);
- Asher and Hickling (2013): 46 respondents were applying a mean MRP of 4.8% (5.0% median, 6.0% mode); and
- Fernandez et al (2014): 93 respondents were applying a mean MRP of 5.9% (6.0% median).[37]

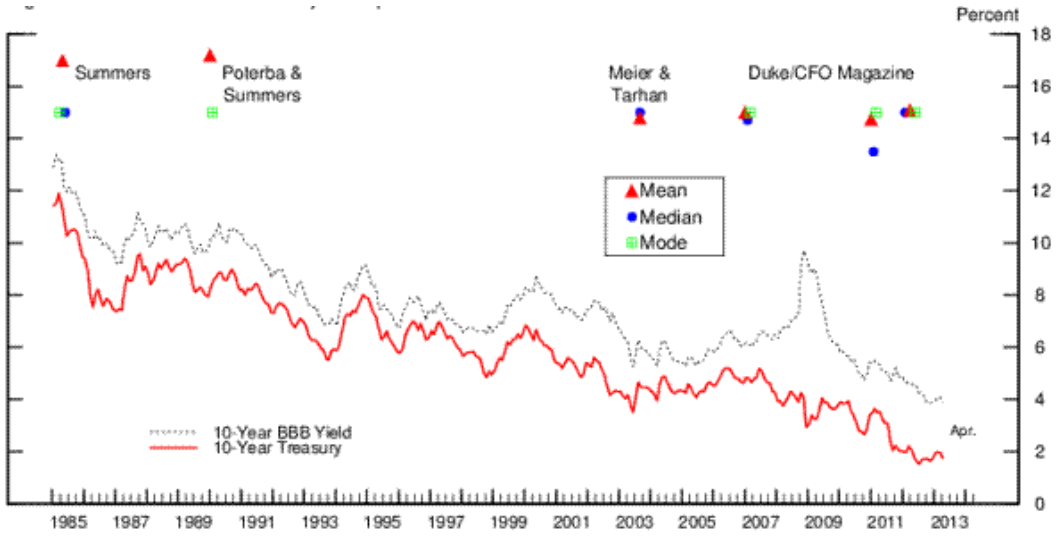
Survey studies do have the advantage of being forward-looking, which satisfies one of the assumptions of the CAPM. However, they face a number of significant restrictions. Survey results:

- can be affected by the volatility of recent events, which can significantly limit the reliability of these estimates as a long-term, forward-looking estimate;
- are based on opinions, which may not necessarily have any basis in financial fundamentals; and,
- are vulnerable to bias, particularly if some of the respondents have incentives to produce certain outcomes.

Another particularly topical point in terms of assessing the market evidence of the changes in MRP is the stickiness of corporate hurdle rates – this has been assessed quite extensively in US market-based literature, as seen below in Figure 3. The graph shows that there has been a distinct divergence between the hurdle rates required by companies and the yields on both Treasury and corporate bonds.

[37] Fernandez, Linares, Acín, Market Risk Premium used in 88 countries in 2014, IESE Business School, June 2014; Asher and Hickling, Equity Risk Premium Survey, Actuary Australia, December 2013; Fernandez, Arguirreamalloa and Linares, Market Risk Premium and Risk Free Rate used for 51 countries in 2013, IESE Business School, June 2013; KPMG, Valuation Practices Survey 2013, February 2013; Fernandez, Arguirreamalloa and Corres, Market Risk Premium used in 82 Countries in 2012, IESE Business School, January 2013.

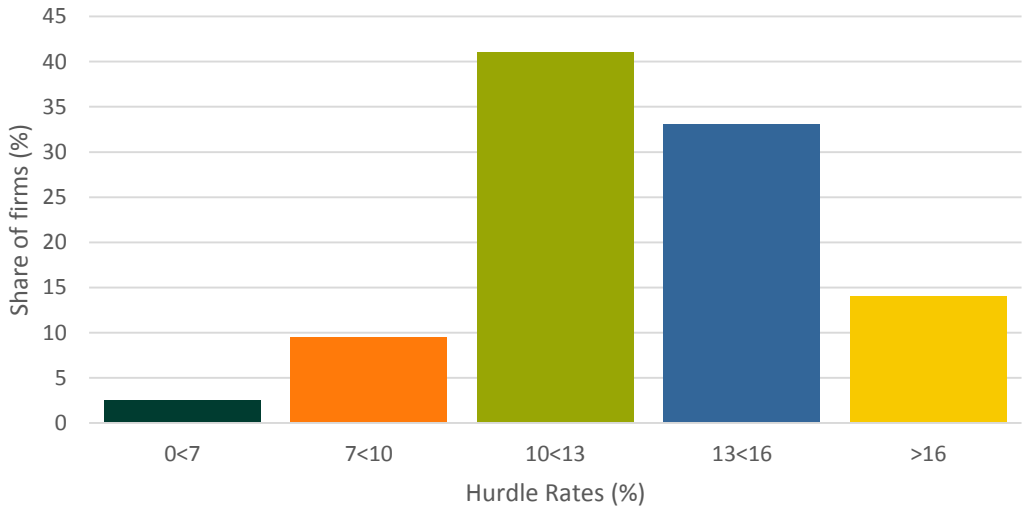
Figure 3 Hurdle rates derived from US survey data comapred with US Treasury yields



Data source: US Federal Reserve

There is also some evidence of the same issue in Australia presently. The graph below shows the results from a recent survey of CFOs by Deloitte.

Figure 4 Hurdle rates for investment decisions, Australian surveyed firms



Data source: Deloitte (2014), CFO Survey Q3 2014, RBA

The results show that the current hurdle rate for new investment is on average between 10 per cent and 13 per cent, which would place the average margin between the hurdle

rate and WACC at approximately 3 per cent.[38] The respondents to the survey were also asked if they changed their hurdle rate often, with the most frequent response being "very rarely". Based on the raw survey results, it could be assumed that the WACC is somewhere between 7 per cent and 10 per cent based on a risk-free rate of 3 per cent. This would equate to a required return on equity somewhere in the 9 per cent to 15 per cent range (based on 50 per cent gearing and a cost of debt of 5 per cent).

This result would be in direct contradiction with the MRP survey results which are presented above. This lends some weight to the argument that the survey results for MRP and not an efficient estimate and do not match results from other survey data.

The Australian Competition Tribunal has also stated that there are certain criteria that should be met in order to provide accurate estimate of the MRP though the use of survey data. It concluded the following: [39]

> Surveys must be treated with great caution when being used in this context. Consideration must be given at least to the types of questions asked, the wording of those questions, the sample of respondents, the number of respondents, the number of non-respondents and the timing of the survey. Problems in any of these can lead to the survey results being largely valueless or potentially inaccurate. When presented with survey evidence that contains a high number of non-respondents as well as a small number of respondents in the desired categories of expertise, it is dangerous for the AER to place any determinative weight on the results.

From this, we can surmise that surveys need to meet three broad criteria in order to provide an informed estimate of the MRP:

- they must be timely;
- there must be clarity around what question the respondents were asked to answer; and
- the survey must gauge the market's view of the MRP and not the view of a small, unrepresentative sample.

[38] Reserve Bank of Australia (2015). Managing Two Transitions – Speech at the Corporate Finance Forum by Philip Lowe, 18 May 2015, Sydney.

[39] Application by Envestra Ltd (No 2), ACompT 3, Paragraphs 162-163.

We note that SFG Consulting has assessed a number of current survey results and concluded that none of the available surveys meet the criteria set out by the Tribunal above.[40] We concur with this finding.

Based on this analysis, there is no reason to believe that surveys are any more efficient at estimating the MRP than using historical averaging. Indeed, they could be misleading. Therefore, we find that there is no utility in analysing survey data in estimating the value of the MRP.

4.2.3 Regulatory Methods of Estimation

There have numerous regulatory decisions in the last year that have provided estimates of the MRP. These are summarised below in Table 3. There is a range of estimates from 5.5 per cent through to 7.9 per cent. There is also analysis below on the build-up of MRP estimations by various regulators in the Australian jurisdiction.

Table 3 Previous Regulator MRP Decisions

Regulator	Date	Industry	MRP (%)
AER	April 2015	Electricity	6.5
IPART	February 2015	Policy	7.2 (avg. of 6.0 and 8.3)
QCA	February 2015	Water	6.5
ERA	November 2014	Rail	7.9
ERA	October 2014	Gas	5.5
QCA	September 2014	Rail	6.5
IPART	July 2014	Rail	7.1 (avg. of 5.5 – 8.7)

Australian Energy Regulator

The AER has not prescribed an estimate of the MRP in its Rate of Return Guideline and instead, reviews this at the time of each determination. It reviewed the estimates produced by different approaches in Draft and Final Determinations published for network businesses in April 2015. This reflects the methodology set out in its Rate of Return Guideline.[41]

[40] SFG Consulting (2013). Testing the Reasonableness of the Regulatory Allowance for the Return on Equity, Report for Aurizon Network, Report for Aurizon Network, 11 March. http://www.qca.org.au/getattachment/5c7abe7f-6c47-49a3-8fd0-5528c38fa0f0/Annex-A-%E2%80%93-SFG-Testing-the-Reasonableness-of-the-Re.aspx

[41] Australian Energy Regulator (2013a). Better Regulation, Rate of Return Guideline, December.

Table 4 AER MRP calculations from April 2015 Draft and Final Decisions

Method	Estimate (%)	Notes
Long-term Average Excess Returns	5.1 – 6.5	Lower-bound is 20 basis points above the geometric average and the upper-bound is set at 6.5.
Dividend Growth Model	7.4 – 8.6	Based on the utilisation of an AER derived dividend growth model (two- and three-stage models)
Survey Evidence	6.0	Multiple surveys utilised.
Conditioning Variables	n/a	AER uses dividend yield, credit spreads and implied volatility to condition (that is, adjust) the historical excess return estimates.

Based on the above evidence, the AER maintained a point estimate for the MRP of 6.5 per cent. The AER uses discretion in the weights that it applies to each piece of evidence and is not transparent as to if and how such weights are determined (that is, it is more likely to reflect the application of subjective judgment).

We have a number of concerns with the AER's approach, including its reliance on surveys, which as noted above, we do not consider can be used to inform an estimate of the MRP.

The key concern is that in effect, the AER continues to put most weight on historical average estimates. In particular, we note that DGM estimates, which have formed the upper bound of the AER's range, have increased materially over the course of the determinations made since its Rate of Return Guideline was published. For example, when the Guideline was published the upper bound of the DGM estimates (and the AER's MRP range), was 7.5 per cent.[42] It set its point estimate at 6.5 per cent. In its most recent determinations made in April 2015, the upper bound of its DGM estimates had increased to 8.6 per cent.[43] It maintained its point estimate at 6.5 per cent.

The AER rationalises this based on ongoing concerns it has with the application of DGM estimates. It also considered that the higher estimates that regulated network businesses were submitting has been largely driven by the low risk free rate. It remains unsatisfied that there is a relationship between the MRP and risk free rate.

As noted previously, regardless of whether there is unequivocal evidence supporting a direct and measurable relationship between the risk free rate and MRP, there is no clear logic or evidence to suggest that the significant reduction in the risk free rate that has

[42] Australian Energy Regulator (2013b). Better Regulation, Explanatory Statement, Rate of Return Guideline, December.

[43] For example, refer: Australian Energy Regulator (2015). Final Decision, Endeavour Energy Distribution Determination 2015-16 to 2018-19, Attachment 3 – Rate of Return, April.

occurred should impact equity returns to the same extent. For example, IPART has observed:[44]

> Estimating the expected MRP using current market data is not conditional on an inverse relationship between the MRP and the risk-free rate. It is sufficient that the expected MRP is variable. The expected MRP changes over time since investors' risk aversions and perceptions about the average-risk investment change. On this ground, we expect that using current market data reflecting these dynamics will enable us to more accurately estimate the extra returns that would be required by investors for shifting their money from a riskless investment to an average-risk investment.

In our view, the AER's approach is effectively no different from the approach it applied prior to the AEMC's rule changes, resulting in a return on equity that reflects a long run historical average MRP and a prevailing risk free rate. This will underestimate the expected return on equity.

Independent Pricing and Regulatory Tribunal

As noted previously, IPART's approach estimates two WACC ranges: one derived from current estimates (based on DGM estimates) and one derived from historical averages.

IPART provides updates of market parameters every six months. Its estimates from the February 2015 Market Update are provided below.

Table 5 IPART MRP calculations from February 2015 Market Update

Method	Estimate (%)	Notes
Historical MRP	6.0	Based on the arithmetic average of excess market returns net of risk-free rates. This is the mid-point of the range of 5.5 to 6.5.
Implied MRP using the following methods: - Damodaran (2013) - Bank of England (2002) - Bank of England (2010) - SFG method – Economic Indicators - SFG method – analyst forecasts - Bloomberg's Method	7.4 – 9.2	The lowest estimate forms the lower bound and the highest estimate forms the upper bound.

The February 2015 mid-point MRP estimate is 7.2 per cent.

[44] Independent Pricing and Regulatory Tribunal (2013a). p.28.

Economic Regulation Authority

The ERA is currently undertaking a review of the methodology it applies to estimate the WACC for rail networks. In its first Draft Determination for this review released in June 2014, the ERA's assessment of the MRP was primarily informed by historical averages and the DGM.[45] It arrived at a range of 5 per cent to 7.5 per cent and stated that it will apply judgement as to where it will select the point estimate at any point in time. For that Draft Determination, it proposed a value of 6 per cent.

In a further turn of events the ERA fundamentally changed its approach to estimating the MRP for rail networks. In a revised Draft Decision issued in November, it is now proposing to solely rely on the Wright approach.[46]

The current estimate it has proposed is 7.9 per cent. While we support the use of the Wright approach because it a robust theoretical foundation, given MRP estimation is still highly uncertain, we have concerns about placing 100 per cent weight on a single approach.

Table 6 ERAWA MRP calculations from November 2014 Rail Decision

Method	Estimate (%)	Notes
Wright Approach	7.9	Estimates the return on equity for the market over the long-term and subtracts the contemporaneous risk-free rate to calculate the MRP.

Queensland Competition Authority

The QCA has estimated the MRP using the methodologies outlined in the table below.

Table 7 QCA MRP calculations from September 2014 Aurizon Draft Decision

Method	Estimate (%)	Notes
Ibbotson Historical Averaging	6.5	Long-run historical excess returns, chosen from a range of 5.8 to 6.6. 6.5 was chosen as it came from the longest time-frame of high-quality data available, from 1958 to 2013.
Siegel Historical Averaging	5.5	Same as above but makes adjustments for "unexpected" inflation in Australia.
Survey Evidence / Independent Expert Reports	6.8 (including adjustment for imputation)	Both surveys and independent export reports provided a median estimate of 6.0
Cornell Method	7.1	Based on the Cornell method DGM.

[45] Economic Regulation Authority (2014a). Review of the Method for Estimating the Weighted Average Cost of Capital for the Freight and Urban Rail Networks, Draft Determination, 5 June.

[46] Economic Regulation Authority (2014c). Review of the Method for Estimating the Weighted Average Cost of Capital for Regulated Railway Networks, Revised Draft Decision, 28 November.

The QCA concluded a review of its WACC methodology in August 2014. Historically, the QCA had been very reluctant to depart from its long term precedent MRP of 6 per cent. It has now acknowledged that:[47]

> There is no question that market volatility increased during the GFC and that the market risk premium was probably elevated as a result. While volatility has largely subsided, the question is whether the market risk premium remains at an elevated level and to what extent.

The QCA will continue to rely on the four methods identified above. It proposes to now apply a more 'flexible' approach based on judgement. It concluded that 6.5 per cent is the most appropriate value at the current time. For the reasons outlined above in our discussion of the AER's approach, we consider that when combined with a prevailing estimate of the risk free rate, this produces an expected return on equity that is too low in the current environment.

4.2.4 Current Estimate of the MRP

We are of the view that the MRP should be estimated through the following methodologies:

- Ibbotson historical excess returns using Brailsford et al corrected data;
- the Wright approach of historical excess returns; and
- a suite of dividend growth models.

Our estimates of the MRP based on the most current data are as follows:

Table 8 Current Estimates of the MRP

Methodology	Estimate	Weighting
Ibbotson Historical Excess Returns	6.42%	25%
Wright Historical Excess Returns	8.32%	25%
Dividend Growth Models	8.41%	50%
Weighted Average MRP	**7.89%**	

Source: Synergies calculations

In regard to the choice of weightings for each methodology we have adopted a process similar to that of IPART whereby we give an equal weighting to estimates based on historical averages and the forward-looking DGM. Within the historical average

[47] Queensland Competition Authority (2014). Final Decision, Cost of Capital: Market Parameters, August, p.22.

methodologies we equally weight the Ibbotson and Wright approaches as they provide estimates of the historical excess returns at two ends of a spectrum:

- at one end, the Ibbotson approach assumes that the MRP is fixed over time and the required return on the market varies proportionately with the risk-free rate; and
- at the other end, the Wright approach assumes that real returns over time are more stable and the MRP varies inversely with the risk-free rate.

We consider that an average of the two provides a robust estimate of the MRP based on historical excess returns.

For the DGMs, we apply equal weighting to all four sub-models as we think there is ample differentiation between assumptions in the models to provide an appropriate estimate when they are averaged.

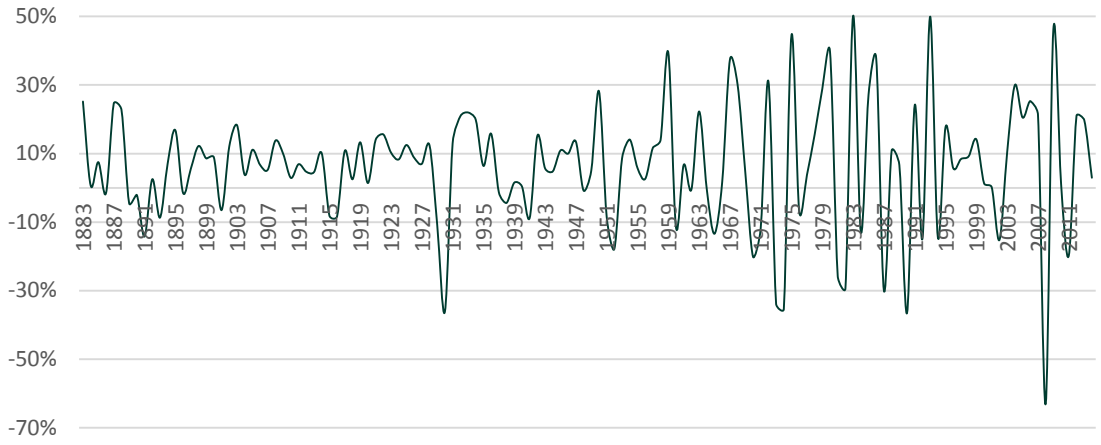
Ibbotson Historical Averaging

We have used the data provided in Brailsford et al[48] to compile a dataset of the historical returns from 1883. This data set is only current to 2012 so we have updated the data set using their methodology to December 2014.

From this we are able to calculate the historical excess returns by calculating the difference between the returns on the accumulation index and the return on government bonds for the given year. Figure 5 below shows the excess returns over the 1883 to 2014 period.

[48] T. Brailsford, J. Handley, and K. Maheswaran. (2012). The Historical Equity Risk Premium in Australia: Post-GFC and 128 Years of Data. Accounting and Finance, 52 (1), pp.237-247.

Figure 5 Excess return on Australian Equities, 1883 to 2014



Data source: Brailsford et al & Synergies Calculations

Returns from 1984 onwards were adjusted for the introduction of dividend imputation with an assumed gamma of 0.25 (see section 6). The estimates will have to be re-calculated if a different gamma is applied.

One important assumption to note is that the Ibbotson historical averaging creates an estimate of the MRP that is essentially fixed in nature and allows for the derivation of a required return on equity that moves one-for-one with the risk-free rate. This means that the required return on equity will be only increase when yields on the risk-free asset increase and vice-versa. The problems with this outcome have been identified previously.

Wright Historical Averaging

The Wright historical averaging method assumes that the real required return on the market remains constant over time, in contrast to the Ibbotson approach which provides for a fixed MRP. This means that the MRP is perfectly negatively correlated with the risk-free rate. An increase (decrease) in the risk-free rate will cause a decrease (increase) in the MRP to allow the real return on the asset to be maintained at the same level over time.

We have implemented this methodology with adjustments for dividend imputation with gamma set to 0.25.

Dividend Growth Models

We have utilised four dividend growth models in our estimation of the MRP. This is based on the selection of models used by IPART. They are as follows:

- Damodaran DGM[49] - a constant growth in dividends over the first five years of the model based on the geometric average of the forecast dividend growth rates of analysts over the same five years. After five years, the dividend growth rate defers to the constant long-term growth rate.
- Fuller and Hsia DGM[50] - a three-stage DGM that assumes there is four years of extraordinary growth followed by an eight year transition to the long-term constant growth rate.
- Bank of England 2010 DGM[51] - a three-stage model similar in construction to the Damodaran model used above. Growth for the first three years is set based on analysts' EPS growth forecasts for one, two and three years ahead. Growth in the fourth year is equal to the long-term EPS growth forecast by analysts before, in the fifth year, reverting to the long-term constant growth rate.
- Gordon constant growth DGM[52] - a one-stage growth model based on the long-term constant growth rate.

Long-term growth rate

We also adopt IPART's view on the long-term constant growth rate. This estimates a long-term constant growth rate of 5.5 per cent (nominal). This is based on an estimate by Lally[53] of long-term average growth of Australian real GDP of 3 per cent nominalised by the expected inflation rate in Australia of 2.5 per cent, the mid-point of the inflation target as set by the Reserve Bank of Australia.

4.2.5 Recommended MRP

Our recommended MRP estimate is 7.9 per cent. This estimate is informed by three different approaches and we consider that it is more likely to result in a return on equity estimate that is commensurate with the returns required by investors in the current market. In effect, it puts 50 per cent weight on historical averages and 50 per cent weight on forward-looking estimates, which is similar to the approach applied by IPART. This

[49] A. Damodaran (2013). Equity risk premiums (ERP): Determinants, estimation and implications – The 2013 edition, pp. 63-73.

[50] R. Fuller and C. Hsia (1984). A Simplified Common Stock Valuation Model. Financial Analysts Journal, Vol. 40, No. 5 (Sep. - Oct., 1984), pp. 49-56.

[51] Bank of England (2010). Interpreting Equity Price Movements Since the Start of the Financial Crisis, pp 24-33.

[52] M. Gordon (1962). The Investment, Financing, and Valuation of the Corporation. Greenwood Press.

[53] M. Lally (2013). The Dividend Growth Model, 4 March, p 17.

is also similar to the estimate proposed by the ERA in its Draft Determination for rail networks, which exclusively relies on the Wright approach.

4.3 Beta

ARTC's current WACC is based on an equity beta of 1.13, which reflects an asset beta of 0.54 and gearing of 52.5 per cent. While betas can vary through time, either through changes to the riskiness of the firm relative to the market, or a change in the riskiness of the market, it is not an inherently volatile parameter. To the extent that such volatility is observed, it is more likely to reflect noise in the data or estimation error. We certainly do not observe such volatility in regulators' assessments of beta, at least in Australia.

Accordingly, ARTC's current beta is the starting point for this analysis. Having regard to the previous analysis we undertook in 2009, the focus of this assessment is whether there is any evidence or arguments to suggest that ARTC's risk profile, and beta estimate, have changed sufficiently to warrant the application of a different beta.

4.3.1 Overview

Asset and equity betas

As explained in section 2.2.1, the CAPM assumes that investors are only rewarded for bearing systematic risk through the rate of return. The systematic risk (β_e or equity beta) of a firm is a measure of how the changes in the returns of a company's stocks are correlated to the changes in the return of the market as a whole (measured by the returns on the share price index of the relevant market). It can be generalised by the following formula:

Equation 4. Equity Beta

$$\beta_e = \frac{cov(r_e, r_m)}{var(r_m)}$$

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. With the market assumed to have a beta of one, firms with cash flows that are more sensitive to domestic economic activity (compared to the market) will have a higher beta and vice versa; 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.

The CAPM requires an estimate of the equity beta. As explained in more detail below, one of the primary methods used to estimate equity betas is to regress returns on the firm's shares against the returns on the relevant sharemarket index. If our firm of interest is not listed, we need to construct a sample of appropriate comparator firms. However, in order to able to compare the amount of systematic risk that is prevalent between different firms, we need to be able to compare them without the inclusion of financial risk arising from differences in leverage. Consequently, we need to remove financial risk by 'delevering' equity betas to their respective asset betas. Once we have determined the asset beta (or asset beta range) for our target firm, that estimate is then relevered based on the target firm's level of gearing.

As noted above, 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 on the entity's cash flows and assets, equity holders face additional risk.

There are a number of different approaches that can be used to convert between asset and equity betas. The ACCC uses the Monkhouse approach, which is the approach we have applied in this analysis. This is shown in the following formula:

Equation 5. The Monkhouse beta transformation formula

$$\beta_e = \beta_a + (\beta_a - \beta_d) * \left\{1 - \left[\frac{R_d}{(1+R_d)}\right] * [T_c * (1-\gamma)]\right\} * \frac{D}{E}$$

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.

As part of this assessment we will assess the systematic risk facing ARTC by estimating asset betas of appropriate comparator firms and then adjusting the estimate for ARTC's gearing in order to derive a suitable equity beta.

Debt beta

The WACC determined for ARTC in 2011 applied a debt beta of zero, which was also consistent with the approach proposed by the ACCC.[54]

4.3.2 Approaches to Estimating Beta

Alternative approaches

There are three basic approaches to estimating systematic risk:

- direct estimation
- first principles analysis
- comparable companies analysis.

An overview of each approach is now briefly provided.

Direct estimation. As noted above, 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.[55] As ARTC is not a listed entity, its equity beta cannot be estimated in this way.

First principles analysis. This approach requires analysing the factors that impact on the sensitivity of a firm's returns to movements in the economy or market. 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. We are also believe it is useful to undertake this prior to reviewing comparable companies as understanding the risk profile of the firm will help in the selection of comparable companies.

Comparable companies analysis. 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 explained above, as the companies will have different gearing levels (and hence different financial risk), these equity betas must be 'delevered' to produce an asset beta.

[54] Australian Competition and Consumer Commission (2010).

[55] We recommend five years of monthly data.

To estimate a beta for ARTC, we have analysed comparable firms. These are firms that have similar business risks and have betas that can be meaningfully interpreted. To gain an appreciation of where ARTC is situated within the range, a first principles analysis has been undertaken. This will assist in refining the range, as well as to interpret where ARTC may be positioned within it. We have also used the first principles analysis to assess the extent to which ARTC's systematic risk profile has materially changed over the last five years.

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. It is possible that there is considerable 'noise' in both data series, which can result in measurement error. This is particularly likely in the data history for the individual firm. 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 should be discarded (such as a very low R^2 or a high standard error).[56] 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;

[56] 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 more 'noise' in the data, the less it pertains to the underlying relationship and hence the lower the R^2. 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.

- adjusting for mean reversion using the Blume adjustment[57];
- the formation of portfolios. Portfolio betas have substantially lower standard errors and yield more econometrically sensible estimations. 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 2005 report by Gray et al provides a useful summary of the various methods of estimating beta, as well as their performance.[58] The study uses historical data to compare the predicted beta estimate in accordance with the 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:

- 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.

As noted in section 2.4, it is generally recognised that regulatory error has asymmetric consequences. While it is important to give due regard to this principle when setting all WACC parameters, the susceptibility of beta estimation to error means that a cautious approach should be undertaken.

4.3.3 Recent regulatory precedent

Other relevant regulatory decisions regarding WACC for railway infrastructure are summarised below in Table 9.

[57] 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). Bloomberg adjusts its equity beta estimates in this way.

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

Table 9 Recent beta decisions for Australian regulated entities

Regulated Entity (Regulator)	Asset Beta	Gearing	Equity Beta
Aurizon Network (QCA) – 2010 and 2014 (Draft)	0.45	0.55	0.8
RailCorp Hunter Valley (IPART) - 2014	0.42 – 0.5	0.4-0.5	0.7-1.0
Brookfield Rail (ERA) – Current - 2008	0.65	0.35	1.00
Brookfield Rail (ERA) – Proposed in Draft Decision - 2014	0.7	0.25	0.93
The Pilbara Infrastructure (ERA) – Current - 2008	1.00	0.30	1.43
The Pilbara Infrastructure (ERA) – Proposed in Draft Decision - 2014	1.25	0.20	1.56

Source: Queensland Competition Authority (2014), Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue Independent Pricing and Regulatory Tribunal (2014), NSW Rail Access Undertaking - Review of the rate of return and remaining mine life

The rationale for the determinations made for the rail networks is provided below.

Aurizon Network

Aurizon Network received a Draft Decision on its maximum allowable revenue for the next regulatory period ('UT4') from the QCA in September 2014. The estimate of the equity beta was arrived at based on the following range:

- 0.35 – a theoretical beta contained in a valuation report of DBCT by Grant Samuel; and
- 0.49 – an empirical estimate of the asset beta of a sample of international and domestic toll-road companies.

The mid-point of 0.42 also coincidently matched with the point estimate of beta for the international and domestic regulated energy and water businesses included in the sample. The mid-point estimate of 0.42 was rounded up to 0.45 to maintain Aurizon Network's beta estimate from the previous regulatory period.

We do not agree with the selection of comparator companies by the QCA as they do not provide a suitable sample for estimating the systematic risks faced by a heavy haul coal network.

Regarding the use of the Grant Samuel estimate for the lower bound, we note that beta estimates for its comparator sample were not adjusted for differing levels of gearing between individual companies. According to Grant Samuel, delevering and relevering equity betas to reflect a defined capital structure introduces significant estimation error. Also, Grant Samuel's justification of an equity beta range of 0.7 to 0.8 (based on the 0.35

asset beta) for DBCT was limited to a brief qualitative assessment of the characteristics of DBCT's revenues: [59]

> A beta in the range of 0.7-0.8 has also been adopted for DBCT. While this appears low, none of the other listed ports are regulated and in Grant Samuel's view, the regulated nature of the asset (and certainty of its cash flows) warrants a lower beta.

The estimation was based on this short qualitative assessment because the only comparable firm that Grant Samuel could find, Asciano, had only been listed for two years. This means that there was insufficient data to provide an accurate assessment of DBCT's beta. Based on this we find that Grant Samuel's estimate is not robust and shouldn't be relied upon in any way.

We also do not consider that tollroads provide a suitable comparator for the estimation of beta. They have fundamentally different demand drivers. Usage patterns are also likely to vary between networks, including (amongst other things) the nature and extent of congestion on alternative routes. We also find that in the sample of toll road companies provided by the QCA there is no clear correlation between demand for the tollroad and broader economic variables.

The QCA has also drawn parallels between Aurizon Network and regulated energy and water network businesses. The main thing these firms have in common is that they are subject to regulation. However, the similarities end there. We cannot see how a firm that services an industry that is exposed to changes in the demand and supply of coal could be considered to have similar systematic risk to firms that provide an essential service, which at least in the case of household consumption, is largely invariant to changes in economic activity.

The 2012 Port Jackson Partners report commissioned by the Minerals Council of Australia further highlights the stark contrast between electricity and water utilities and a below rail network that exclusively services the coal industry.[60] This report highlights the significant challenges facing Australian coal producers as their position on the global cost curve deteriorates, which has already been evidenced by mine closures in the Hunter Valley. This 'structural shift' in Australia's relative competitiveness will see ARTC exposed to higher volume risk. The implications of this are considered further below.

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[59] Grant Samuel (2010). Independent Expert's Report in response to Proposal from Brookfield Infrastructure Partners L.P. Available from: http://www.asx.com.au/asxpdf/20101005/pdf/31syckz9jm60bv.pdf, p. 289.

[60] Port Jackson Partners (2012). Opportunity at Risk, Regaining our Competitive Edge in Minerals Resources, Report Commissioned by and Prepared for the Minerals Council of Australia.

RailCorp Hunter Valley

RailCorp Hunter Valley received an asset beta of 0.42 to 0.5 in its five yearly review of return on capital and depreciation by IPART.[61] It was based on the following comparators:

- energy utilities (US, UK, AU, NZ) – found to have an average asset beta of 0.45;
- water utilities (US, UK, AU, NZ) – found to also have an average asset beta of 0.45;
- Aurizon Network – asset beta of 0.45.

This translated into an equity beta range of 0.7 to 1, based on 40% to 50% gearing. In its last determination made for ARTC's HVCN in 2009, it determined an equity beta range of 0.7 to 1, assuming 50% to 60% gearing.

For the reasons outlined above, we do not consider that energy and water utilities are appropriate comparators for a heavy haul rail network.

Brookfield Rail

Betas for Brookfield Rail were determined as per the methodology originally set out in the Allen Consulting Group's paper entitled *Railways (Access) Code 2000: Weighted Average Cost of Capital*. Brookfield Rail's beta was set based on a set of comparator firms that included listed rail infrastructure businesses in the United States and Canada as well as listed transport infrastructure and services firms in Australia and New Zealand.

Currently, the methodology for determining beta under the WA rail access regime is under review by the ERA. As noted in the table above, the ERA is proposing to increase the asset beta for Brookfield Rail from 0.65 to 0.7, which is primarily based on updated empirical evidence (using largely the same sample). However, because it is proposing to reduce the gearing (based on evidence from this same sample), it will actually reduce the equity beta from 1 to 0.93.

The Pilbara Infrastructure

The Pilbara Infrastructure (TPI) was originally determined to have an asset beta of 1.0. The ERA's consultant at the time, CRA, expressed the view that there would be some sharing of risk between mines and an independent ore-carrying railway and as a result

[61] Independent Pricing and Regulatory Tribunal (2014). NSW Rail Access Undertaking – Review of the Rate of Return and Remaining Mine Life, From 1 July 2014.

the asset beta for such a railroad would lie somewhere between the beta for a diversified freight railway and the beta for iron ore mining.

Similar to Brookfield Rail, in its current review the ERA is proposing to increase the asset beta for TPI to 1.25, which again reflects an increase in the average beta of its comparator sample. Even though the ERA is proposing a reduction in gearing, TPI's equity beta will still increase from 1.43 to 1.56 given the increase in the equity beta is material.

4.3.4 Current estimates

First principles analysis

A first principles analysis is a qualitative assessment of ARTC's risk profile, the aim of which is to identify a suite of systematic risk factors and determine their likely impact on the asset beta. An updated assessment is provided in Appendix A.

There are two key changes that have emerged since the last review. The first, as noted above, is what Port Jackson Partners describe as the "structural cost competitiveness problem"[62] facing the export coal industry. This suggests that the difficulties that the industry is facing is not just another downturn in the cycle. Instead, as market conditions improve and coal prices begin to rise, Australian producers could emerge from this downturn with considerably lower market share. While it could be some time before the nature and extent of this structural shift becomes clearer, ARTC's exposure to volume risk is likely to have increased.

The second change is the introduction of long term contracts. However, these contracts do not protect ARTC from volume risk in the medium to long term, as contracts mature and are either not renewed, or a renegotiated at lower volumes. In the short term, producers may have difficulties meeting take or pay commitments.

Indeed, we note the comments made by the Minerals Council of Australia (NT Division) in response to the Essential Service Commission of South Australia's (ESCOSA's) ten year review of the Darwin to Tarcoola railway, where ESCOSA referred to Aurizon Network in the context of WACC. It states:[63]

> MCA-NTDs view is that the systematic risk of a single commodity railroad is expected to be closely correlated to the systematic risk of the industry it serves. For example, the Central Queensland Coal Network ('CQCN') owned and maintained by

[62] Port Jackson Partners (2012). p.10.

[63] Minerals Council of Australia (NT Division) (2015). Submission to the 2015 Draft Report of the Tarcoola-Darwin Railway: Ten Year Review, June, p.32.

> AN, a rail transport business whose revenue is nearly wholly derived from the haulage of coal primarily bound for export markets. If international coal markets stagnated, or prices fell even further than they are today, many coal producers who have been experiencing operating margin pressures could potentially cease operations altogether. As a result, even though AN has entered into take-or-pay contracts to mitigate against such risks, take-or-pay arrangements do little to protect AN if coal producers face insolvency.

Accordingly, it is possible that ARTC's systematic risk has increased (and this only further reinforces the stark contrast between ARTC and regulated electricity and water network businesses). However, at least while the implications of the current industry environment remains uncertain, there is no case to conclude that ARTC's systematic risk has reduced.

Comparable Companies Analysis

The first step in the comparator company analysis involves identifying a set of companies that face similar systematic risk to ARTC. We have selected companies from two sectors:

- international and Australian rail companies
- Australian industrial transport companies.

In compiling the sample, we applied a number of filters with two key aims, being to ensure that:

- the business activities of the firm are sufficiently relevant to ARTC; and
- the sample was statistically robust, given the issues with estimation error that were outlined above. Despite the filters being applied here, estimation error will remain an issue and needs to be kept in mind when drawing any conclusions from the analysis.

The filters applied were as follows:

- at least five years of monthly data is necessary for each firm. We applied a minimum threshold of 58 observations;
- beta estimates with a t-statistic of less than two were excluded; and
- beta estimates with a R^2 of less than 0.1 were excluded.

Companies were further screened using the company description to ensure suitability of comparison. We also sense-checked asset beta outcomes for outliers however none were present in the sample.

The sample of international rail companies is dominated by the US Class 1 railways, which reflects the dearth of suitable domestic comparators (Aurizon still has an insufficient share price history to meet our requirement of having five years of monthly data). Caution clearly needs to be exercised in relying on international comparators. For example, in a 2002 report for the ACCC[64], the Allen Consulting Group concluded that foreign comparators could be used provided they operate in jurisdictions with comparable legal systems to Australia, such as North America and the UK. The other key issue with these firms is that they are vertically integrated, which is considered further below.

Four companies remained in our sample of Australian industrial transport firms. While we recognise that Australian firms would be considered the most relevant, if an estimate is of poor quality, we are of the view that very limited if any reliance can be placed on it. In other words, in our view, the risks associated with drawing conclusions from highly unreliable estimates exceed the disadvantages from having a sample with no domestic comparators. As the same time, we agree that caution must be exercised in interpreting estimates for foreign comparators.

Estimates of beta

The estimates for the comparator companies are shown below in Table 10.

Table 10 Estimates of Comparator Groups for ARTC HVCN

Firm	Asset Beta	R-squared	Standard Error	t-statistic
International Rail Companies				
Union Pacific (US)	0.72	0.53	0.12	8.105
CSX Corporation (US)	0.69	0.60	0.13	9.463
Norfolk Southern (US)	0.66	0.46	0.15	7.128
Canadian National (Canada)	0.50	0.15	0.17	3.274
Canadian Pacific (Canada)	0.63	0.24	0.26	4.260
Kansas City Southern (US)	0.84	0.44	0.19	6.836
Genesee & Wyoming (US)	0.83	0.47	0.19	7.270
Asciano Limited (AUS)	0.48	0.31	0.14	5.100
United Stationer (US)	0.74	0.34	0.22	5.508
Providence and Worcester Railroad (US)	0.85	0.20	0.21	3.866

[64] The Allen Consulting Group (2002), Final Report: Empirical Evidence on Proxy Beta Analysis for Regulated Gas Transmission Activities, Report for the Australian Competition and Consumer Commission

Firm	Asset Beta	R-squared	Standard Error	t-statistic
Australian Industrial Transport Companies				
Sydney Airport (AUS)	0.27	0.14	0.19	3.069
Qube Holdings Limited (AUS)	0.86	0.27	0.23	4.677
Lindsay Transport (AUS)	0.64	0.12	0.33	2.870
CTI Logistics (AUS)	0.57	0.03	0.58	1.366

Source: Synergies Calculations, Bloomberg

The average for the two groups is shown below in Table 3.

Table 11 Beta estimates for comparator firms

Industry	Number of firms	Average asset beta	Lowest	Highest	Range of outcomes based on one standard deviation from the mean	Number of firms from the sample within one standard deviation of the mean
Railways	10	0.704	0.48	0.85	0.56 to 0.83	5
Australian Listed Industrial Transportation	4	0.585	0.27	0.86	0.34 to 0.83	2

Data source: Bloomberg

4.3.5 Conclusion: Beta estimate for ARTC

The comparable companies analysis derived an average asset beta for the two comparator industries of 0.704 for rail operators (predominantly US railways) and 0.585 for Australian industrial transport firms. Asset betas in recent relevant rail regulatory decisions in Australia range from 0.42 to 1.25, although we have noted concerns with the evidence relied upon in some of these decisions.

In order to be able to put ARTC's asset beta in the context of its comparators, it is useful to compare ARTC with the rail and industrial transport firms that have been referenced based on the first principles analysis.

Table 12 Comparison between ARTC and US coal and rail firms

Dimension	ARTC	Railways	Industrial Transport
Nature of the product or service, nature of the customer	The demand for ARTC's services are based on the demand for coal in overseas markets. However, there is a strong correlation between: (1) world GDP and world coal production; and (2) Australian and world GDP. This highlights that ARTC's	Class 1 Railroads transport a mix of commodities. Overall, demand drivers will be different depending on the commodity. For example, Intermodal freight carried to domestic markets would have higher systematic risk compared to ARTC.	The industrial transport group has varying types of products, from air service in the case of Sydney Airport to commercial and industrial transport by QUBE and CTI. The demand for these services will be more directly correlated with domestic economic activity.

Dimension	ARTC	Railways	Industrial Transport
	volume risk is systematic in nature.	These firms therefore also have a considerably more diversified revenue base compared to ARTC, which would reduce risk.	
Pricing structure	The pricing structure contains both a fixed and variable component. This has not changed since the previous review.	Since 2006, protection has been provided to captive shippers[65] via the SAC test, which limits the price charged by Class 1 railroads to the rate that would be applied by a stand-alone railroad were the industry free of entry barriers. Will have fixed and variable drivers, similar to ARTC.	Pricing structure will vary between firms.
Duration of contracts with customers	Recently shifted to long-term contracts.	Long-term contracts.	The duration and nature of contracting will differ between firms.
Market power	Market power exists given ARTC controls natural monopoly infrastructure. The regulatory framework prevents this from being exercised. There is some countervailing buyer power.	Class 1 railroads operate in a competitive market environment. Existing regulatory oversight should constrain exercise of market power in relation to captive shippers. However, some participants have called for re-regulation given market power is perceived to exist wherever a single shipper or receiver is serviced by a single railroad.	Firms in this group will have varying degrees of market power. Sydney Airport is likely to have the most market power of firms in the sample.
Form of regulation	Revenue cap regulation, which currently provides revenue certainty for term of the regulatory period.	As noted above, the Surface Transportation Board presides over a range of matters, including the application of the SAC test. It is also able to set maximum rates if there are concerns that a railroad has been engaging in anti-competitive conduct.	Sydney Airport is subject to light-handed price monitoring and the others in the sample are not subject to regulation.
Growth options	ARTC has growth options available that will need to be completed to facilitate the long-run expansion of the Hunter Valley. These expansions are also to service coal basins that are further away from the port.	The presence of growth options is likely to be firm-specific.	The presence of growth options is likely to be firm-specific.
Operating leverage	ARTC has high operating leverage.	Likely to have lower operating leverage.	With the exception of Sydney Airport, likely to have lower operating leverage.

[65] 'Captive shippers' are generally defined as shippers that have no other alternative for transportation of their product or the receipt of inputs.

The average raw asset beta estimates of 0.704 for railroad companies and 0.585 for industrial transport businesses are higher than ARTC's current asset beta of 0.54. Considerable caution needs to be exercised when setting ARTC's asset beta in reference to these estimates (which include foreign comparators).

The main difference between ARTC and the US Class 1 railways is that the latter operate in a more competitive market environment, particularly for those commodities where rail must compete with other transport modes, such as intermodal. However, we also note that some concerns have been expressed by captive shippers in the US regarding the market power held by the Class 1 railways. It can also be said that their demand risk is more diversified across a range of commodities and industries. This is similarly the case for industrial transportation firms. In contrast, ARTC's Hunter Valley network is fully exposed to the Australian export coal industry, which as highlighted previously, is facing significant pressures in retaining and growing market share into the future.

As it is subject to a revenue cap ARTC is likely to have more revenue certainty however only for the duration of the regulatory period. ARTC is also likely to have higher operating leverage, which suggest a higher value for beta.

While this information, supported by the first principles analysis, cannot provide a more precise estimate for ARTC's asset beta, ARTC's current asset beta remains below the lower bound of the range for the comparable companies. As noted above, it is possible that on balance, the structural shift in the relative competitiveness of the export coal industry has actually increased ARTC's systematic risk. However, at least while the nature and extent of this shift remains uncertain, there is no case to conclude that ARTC's systematic risk has reduced. The existence of term contracts provides limited protection in the medium to long term, noting that in any case, this is more likely to align ARTC more closely to the practices of the US railways that have been referenced as comparators.

Finally, we note that these beta estimates are best described as estimates of 'Sharpe CAPM' risk, which is known to have a number of deficiencies, including its assumption that risk is solely determined by reference to the expected covariance of returns with the market return. There is a significant body of academic evidence that suggests that the simplistic estimates of 'Sharpe CAPM' beta tend to under/overestimate the true return required by the market for firms with low/high measured betas.[66] Actual risk is likely to be better described by the more complex intertemporal CAPM, which takes into

[66] Refer: F. Black (1972). Capital Market Equilibrium with Restricted Borrowing. Journal of Business, 45, pp. 444–454; F. Black (1993). Beta and Return. Journal of Portfolio Management, 20, pp. 8–18; and F. Black, M. Jensen and M. Scholes (1972). The Capital Asset Pricing Model: Some Empirical Tests, in M. Jensen, ed. Studies in the Theory of Capital Markets, New York: Praeger, 79–121.

account that investors care about returns over multiple periods rather than a single period. There is also evidence to suggest that returns are influenced by factors other than systematic risk, including firm size and book to market ratios.[67] This further highlights the significant uncertainties that remain with estimating beta (notwithstanding the techniques that can be applied to reduce estimation error).

On balance, we propose to retain ARTC's current asset beta of 0.54. While it is possible that its beta has actually increased, there is certainly no case to reduce it. Assuming gearing of 52.5% and a gamma of 0.25, this equates to an equity beta of 1.13.

[67] Refer: E. Fama, and K. French (1993). Common Risk Factors in the Returns on Stocks and Bonds. Journal of Financial Economics, 33, pp. 3–56; and E. Fama and K. French (2004). The Capital Asset Pricing Model: Theory and Evidence, Journal of Economic Perspectives, 18, pp. 25–46.

5 Return on debt

5.1 Credit Rating

ARTC's return on debt has been previously estimated based on a BBB credit rating. We have maintained this assumption for the current review.

5.2 Approach used to estimate the return on debt

As noted in section 2.3, a number of Australian regulators – including the AER, IPART and the ERA - have made what is a significant change to the way that the return on debt is estimated. These changes involve the use of historical data to estimate the return on debt.

This moves away from the historical 'on the day' approach, which effectively assumed that the firm refinances its entire debt portfolio as the start of each regulatory period. Instead, it is more appropriate to recognise that the efficient benchmark firm is a brownfields infrastructure facility with existing borrowings. Further, it is recognised that the more efficient debt management strategy is to progressively refinance debt through time, rather than be forced to refinance debt as a consequence of the regulatory reset.

In our view, the trailing average approach is the best approach, along with annual updates to reflect changes in prevailing market rates. However, we understand that the ACCC has previously expressed concerns regarding the annual resets (noting that this could also be addressed by a one-off 'true up' at the end of the regulatory period). If this approach is not to be adopted, we still consider that the return on debt should at least partially reflect the cost of debt raised historically.

Accordingly, we have proposed an approach that is similar to the approach adopted by IPART, which is to estimate the return on debt based on:

- a ten year average of the ten year BBB debt yield; and
- the prevailing ten year BBB return on debt.

We have then applied an average of these two estimates. This is still placing material weight (50 per cent) on the prevailing return on debt, noting that it would only be given a ten per cent weight under the trailing average applied by the AER. However, we recognise that if the return on debt is not being updated annually, the return on debt will not 'pick up' maturing debt being refinanced at prevailing market rates. We therefore consider that if the estimate is to remain fixed for the five year regulatory period, this is at least partly addressed by putting 50 per cent weight on prevailing estimates at the

start of the period. Again, this is consistent with what IPART does, noting that it does not intend to update its return on debt estimate during the regulatory period.

The approach that we have applied to estimate each is described below.

5.3 Historical average return on debt

We have estimated the ten year historical average of the BBB return on debt using RBA data, where estimates are published back to January 2005. We consider this simpler than using Bloomberg data given Bloomberg did not publish a ten year BBB estimate for much of this period.

We have estimated this based on the total yield. This is because the cost of debt raised historically will reflect the then prevailing risk free rate, as well as the debt risk premium (DRP). This is also consistent with the approach used by IPART to estimate the return on debt, except that it separately estimates:

- a ten year average risk free rate and prevailing risk free rate; and
- a ten year average DRP and prevailing DRP.

However, where we differ from IPART is that we have only applied the prevailing risk free rate to estimate the return on equity and then applied a higher MRP.

A key issue that has to be addressed with the use of RBA data is that the average tenor of the bonds in its ten year sample has been less than ten years. We have therefore extrapolated the ten year estimate to arrive at a 'true' ten year estimate, based on the slope of its yield curve (which is calculated using its three, five, seven and ten year yields). We note that the AER has recognised this and also extrapolates the RBA's ten year estimates, although does so in a different way.

The RBA currently only publishes estimates as at the last day of each month. We have therefore taken a simple average of these monthly estimates for the ten years to the end of June 2015. The estimate is 7.9% (annual effective).

5.4 Current return on debt

We have estimated the current return on debt as the sum of our current risk free rate (3.01%) and the current DRP.

Noting that Bloomberg has only recently recommenced publishing a ten year BBB estimate, we have also examined the use of this data to inform the current estimate. We have therefore elected to use two methods to estimate the current DRP. They are as follows:

1. calculating the implied DRP on BBB BVAL curves as provided by Bloomberg;
2. using the spread to CGS for BBB rated non-financial bonds as supplied by the RBA.

We believe that these provide the most transparent estimations of the DRP for a regulated business. These will be explored in more detail below.

5.4.1 Bloomberg BVAL Curves

Bloomberg provides estimates of BBB-rated Australian corporations under its Bloomberg Valuation service, also referred to as 'BVAL'. The BVAL curves use a proprietary algorithm to derive bond prices which are then used to construct a yield curve. The inputs to the BVAL models include direct observations of bond prices through trading and historical tracking of the bond compared to comparable firms if there is thin data available for the given security. Another method used to address thin trading is that the data can be supplemented by the use of the historical correlation of price movements with observed comparable bonds.

We have calculated the implied DRP as the difference between the yield on ten year BBB-rated Australian corporate bonds and the ten year CGS yield.

Table 13 Implied DRP using Bloomberg BVAL Curves

Bloomberg BVAL Curve	Estimate
BBB Corporate	5.14%
Australian CGS	3.01%
Implied DRP	2.15%

Source: Bloomberg

5.4.2 RBA estimates

The RBA started publishing its own proprietary estimate of yields on non-financial corporate bonds in December 2013. We note that the RBA uses Bloomberg BVAL estimates for individual non-financial corporate bonds to derive yield estimates for a given tenor by utilising a statistical smoothing method[68] to estimate the yield. This method places higher weights on yields close to the tenor being estimated and

[68] More specifically, a Gaussian smoothing kernel that provides a weighted estimate of the yield at a target maturity based on the assumption that weighting are normally distributed around the target tenor.

decreasing weights on yields as tenors move away from this point. On this methodology, the RBA stated:[69]

> This method recognises the fact that the observed spreads on bonds with residual maturities close to the target tenor contain more information about the underlying spread at that tenor than spreads on bonds with residual maturities further away. The advantage of the Gaussian kernel over other more simplistic weighting methods, such as an equally weighted average, is that it uses the entire cross-section of bonds, albeit with weights approaching zero as the distance of the bonds' residual maturity from the target tenor increases. This provides a robust method capable of producing estimates even when the number of available observations is relatively small.

As noted above, the RBA currently only produces estimates as at the end of each month. We have therefore taken an average of the most recent two month-ends (May and June). We note that the AER interpolates daily estimates between the two month ends (which we expect would not produce a materially different result). We have also extrapolated the estimates to ten years, based on the approach described above. This results in a ten year BBB DRP of 2.31% (annual effective).

5.4.3 Current DRP estimate

The average of the two DRP estimates is 2.23%.

We believe that the use of publicly available datasets provides for an open and transparent estimation of the DRP. The RBA's data and methodology is openly available and uses data from Bloomberg. Bloomberg's data service is one of the most common platforms for the access of robust and independent market data. Combining estimates from these two data sources will in our opinion, form the best estimate of the prevailing DRP.

5.5 Proposed return on debt estimate

The two return on debt estimates are therefore:

- a ten year average yield of 7.9%
- a prevailing yield of 5.24% (risk free rate of 3.01% and DRP of 2.23%).

[69] RBA (2013), New Measures of Australian Corporate Credit Spreads, accessed at http://www.rba.gov.au/publications/bulletin/2013/dec/3.html

This results in a mid-point return on debt estimate of 6.57%. We have added an allowance for debt raising costs of 0.095%, consistent with the last review, resulting in a total return on debt estimate of 6.67%.

6 Gamma

6.1 Overview

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 is 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. In the post-tax nominal vanilla approach applied by the ACCC, the adjustment is made to the cash flows.

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 (or theta).

A gamma of 0.5 was applied in ARTC's WACC agreed in 2011.

6.2 Recent regulatory precedent

Determining an appropriate value for gamma has proven very contentious in regulation. Historically, most Australian regulators have applied a value of 0.5. In its 2009 WACC guidelines review, published in its *Statement of Regulatory Intent* (SoRI), the AER increased the value of gamma to 0.65.

As the national energy framework provides for the appeal of decisions under merits review, Energex, Ergon Energy and ETSA Utilities (now SA Power Networks) appealed the AER's application of a gamma of 0.65 in their revenue determinations. In that review, it was accepted that the distribution rate applied should be 0.7, which is directly observable from Australian tax statistics. The key issue was the value of theta.

As part of the review process, the Australian Competition Tribunal (the Tribunal) commissioned a 'state of the art' dividend drop-off study[70] from SFG Consulting to

[70] The dividend drop off study is one of the most common empirical approaches used to estimate the value of theta. The estimate is based on an analysis of the change in share price following the payment of a dividend. One of the key

estimate theta, which was subject to intense scrutiny. This study arrived at a value of theta of 0.35, which combined with the distribution rate results in a gamma of 0.25. The Tribunal accepted this value and overturned the AER's decision, concluding:[71]

> The Tribunal is satisfied that SFG's March 2011 report is the best dividend drop-off study currently available for the purpose of estimating gamma in terms of the Rules. Its estimate of a value of 0.35 for theta should be accepted as the best estimate using this approach.

The AER then applied a value of 0.25 in decisions made under the SoRI.[72]

The AER subsequently reverted to a value of 0.5 in its most recent Rate of Return Guidelines review finalised in December 2013, although we note that it has subsequently revised this down to 0.4 based on revised estimates from equity ownership studies (see below).

The AER's decision was based on a review of the 'conceptual definition' of theta and a dismissal of market value studies as being of any relevance in valuing theta. It has sought to redefine theta in several ways, including as the 'utilisation value' and the 'before-personal-tax and before-personal-costs value'.

In effect, these varying definitions equate to measuring theta based on the rate at which credits are redeemed by investors (the redemption rate), such that every taxpayer entitled to redeem an imputation credit is assumed to value it at the full face amount. As a consequence, the AER primarily relies on equity ownership statistics to estimate theta. It is also important to note that under the SoRI, the AER previously used taxation statistics as an estimate of the redemption rate, which is conceptually similar to relying on equity ownership statistics, but also subsequently accepted that taxation statistics could only serve as an upper bound for theta.[73]

We consider the AER's decision is fundamentally flawed because the purpose of estimating gamma in this context is to arrive at a *value* from the perspective of investors. In forming their return expectations, investors will consider what they expect to earn from dividends, capital gains and (potentially) imputation credits. Further, to the extent that the investor places a value on imputation credits, they will consider the costs, risks

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difficulties with this is attributing the change in share price to the value of the dividend and the value of the franking credit that is attached to it. This leads to the statistical problem of multicollinearity.

71 Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9, para.29.

72 A gamma of 0.65 continued to be applied to electricity transmission network businesses because it was prescribed in the National Electricity Rules. The value of gamma is no longer prescribed in the National Electricity Rules.

73 Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9, para.33.

and tax implications associated with redeeming them (not the 'before-personal-tax and before-personal-costs value').

Depending on how this is valued, this will impact the return that the investor will otherwise expect to receive from dividends and capital gains. Under the framework applied by the ACCC and other regulators, the total allowed return on equity is reduced by the value ascribed to imputation credits. If the value of imputation credits is overstated, the required return on equity will be set too low (and vice versa).

We note that nearly all energy network businesses lodging regulatory proposals since the AER's Rate of Return Guidelines were finalised continue to propose a gamma of 0.25, reflecting a theta of 0.35, based on the Tribunal's decision. This also references an updated version of SFG Consulting's 'state of the art' dividend drop off study prepared for the Tribunal, which shows that the value of theta remains around 0.35 and hence the value of gamma is still 0.25.[74]

The AER has rejected these proposals. We note that the NSW network businesses have lodged an appeal on the value of gamma, along with other aspects of the AER's determination. While they identify a number of errors in the AER's assessment of gamma, the issues largely hinge on the AER's 'conceptual definition' of theta as this then influences the methods it uses to estimate it.

We note that IPART continues to apply a gamma of 0.25. Many other Australian regulators still apply 0.5 (with the QCA applying 0.47). We note that the ERA has aligned with the AER and applied a value of 0.4 in its most recent decision for ATCO Gas Australia.[75]

6.3 Recommended value

The Tribunal process concluded in 2011 reviewed the issue of gamma in detail. While this considered gamma within the context of the National Electricity Rules, this requires the same approach to gamma as is applicable here, which is to arrive at a *value* for gamma. This must be considered from the perspective of an investor.

The SFG Consulting study that was commissioned as part of the Tribunal's review was subject to unprecedented scrutiny. The Tribunal concluded that this was the 'best dividend drop-off study currently available' and there is no evidence to suggest that this

[74] A number of reports have been submitted to the AER on this matter. Refer: SFG Consulting (2014). An Appropriate Regulatory Estimate of Gamma, Report for Jemena Gas Networks, ActewAGL, APA, Networks NSW (Ausgrid, Endeavour Energy and Essential Energy), Energex, Ergon, Transend, TransGrid and SA Power Networks.

[75] Economic Regulation Authority (2015).

does not continue to be the case, with an updated version of this study demonstrating that the value of theta continues to be around 0.35.

We therefore recommend a value for gamma of 0.25 for ARTC, reflecting a distribution rate of 0.7 and theta of 0.35.

7 Conclusion

Based on the above assessment, the WACC that is recommended for ARTC is shown in the table below. This is compared to our understanding of the current WACC that was agreed in 2011.

We have also compared this against the approach that would be applied by IPART to estimate the market-sensitive parameters under its revised methodology as we consider it has taken the most pragmatic approach to estimating WACC in the post-GFC environment. Accordingly, we consider this to be the most reasonable regulatory benchmark. The risk free rate, MRP and DRP estimates for IPART included in the table below are from its most recent market update published in February 2015.

Table 14 Proposed WACC

Parameter	2011	Synergies' Proposed	IPART
Risk free rate	5.16%	3.01%	3.9%
Capital structure (debt to value)	52.5%	52.5%	52.5%
Debt risk premium	4.56%	n/a	2.65%
Debt raising costs	0.095%	0.095%	0.095%
Market risk premium	6%	7.9%	7.2%
Inflation	2.5%	2.5%	2.5%
Gamma	0.5	0.25	0.25
Tax rate	30%	30%	30%
Asset beta	0.54	0.54	0.54
Debt beta	0	0	0
Equity beta	1.13	1.13	1.13
Return on equity	11.95%	11.93%	12.04%
Return on debt	9.82%	6.67%	6.65%
Post tax nominal (vanilla) WACC	**10.83%**	**9.17%**	**9.21%**
Pre tax nominal WACC	**11.83%**	**10.81%**	**10.87%**
Pre tax real WACC	**9.1%**	**8.11%**	**8.16%**

a The reason a DRP is not specified is because we have estimated the return on debt as an average of the ten year historical average return on debt (i.e. ten year average risk free rate and debt risk premium) and the prevailing return on debt (i.e. prevailing risk free rate and debt risk premium).

The recommended estimates result in a similar return on equity to what was agreed in 2011. This is consistent with the hypothesis discussed in this report, which is that equity investors are not necessarily revising their return expectations downward given the significant reduction in the risk free rate. Instead, it is likely that these expectations are more stable through time. We have retained the same asset beta as the previous review although given the 'structural cost competitiveness problem' facing Australian coal producers it is possible that ARTC's systematic risk has increased.

The return on debt is nearly 3% lower, which reflects the reduction in the risk free rate and DRP, despite our approach giving 50 per cent weight to historical estimates in recognition that the efficient benchmark firm will have raised debt historically that should be able to be refinanced when it matures, not at the reset date.

Overall, our approach is most similar to the methodology that is now applied by IPART. The main difference is the return on equity: we have combined a higher MRP (which similar to IPART, puts equal weight on historical and forward-looking estimates) with the prevailing risk free rate. IPART also applies a risk free rate that reflects historical and prevailing rates, which would be higher than our risk free rate. On balance, IPART's approach results in a slightly higher return on equity than our approach.

We also note that in its revised Draft Determination on the WACC to apply to rail networks, the Economic Regulation Authority has proposed to apply a 7.9% MRP (which is the same as our estimate). This is based on the Wright approach, which we use to inform our MRP estimate but do not solely rely upon it.

A First principles analysis

Previously, we have considered the following factors and deem them to still be suitable for the purpose of this assessment:

- nature of the product or service
- nature of the customer
- pricing structure
- duration of contracts
- market power
- nature of regulation
- growth options
- operating leverage.

A number of these assessment factors contain systematic risks that may be correlated with each other. That is, the impact of one of the risk factors could be amplified or dampened by another risk factor considered. Hence, while the impact of each risk factor is analysed in isolation, we consider the net impact of the risk factors on the systematic risk of ARTC. The first two factors are indissolubly linked and will be considered together.

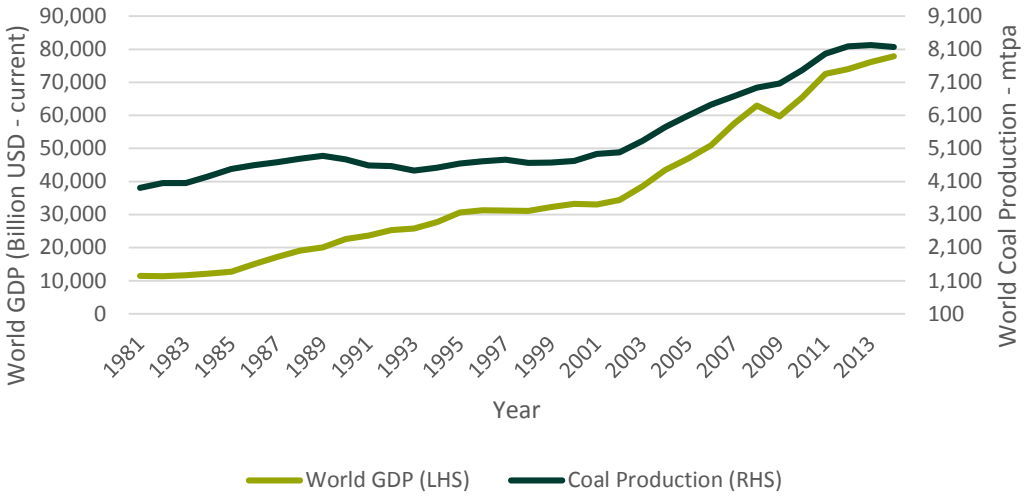
For the reasons outlined above, the focus of this review is whether there have been any material changes to ARTC's risk profile to warrant the application of a different beta.

A.1 Nature of the product / nature of the customer

A.1.1 To what extent is demand risk systematic in nature

Given the nature of the product that is hauled in the Hunter Valley Coal Network, namely thermal coal, there is a need to understand the relationship between the demand for the product and underlying economic activity.

Figure A.1 World GDP and World Coal Production

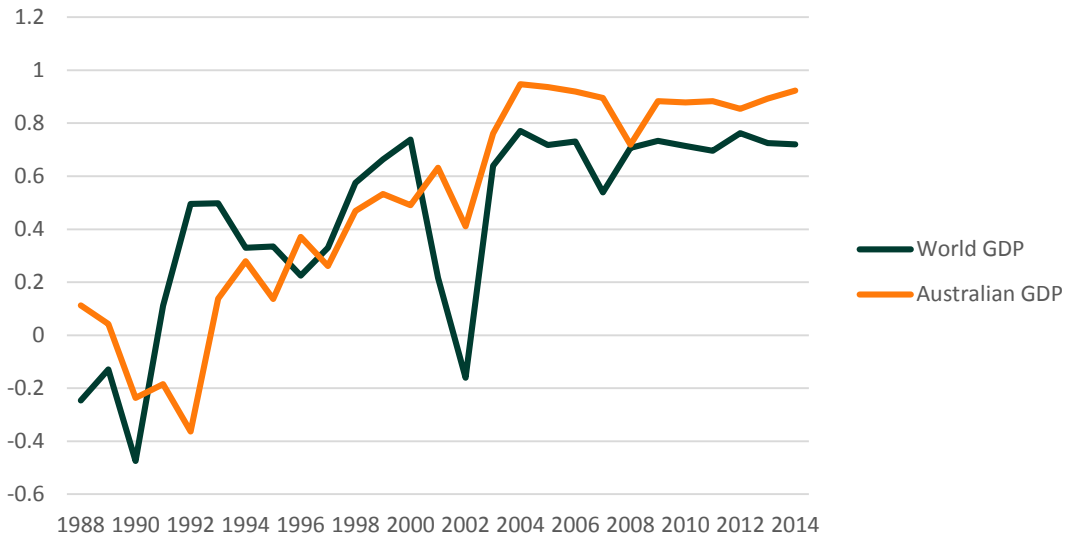


Data source: BP Statistical Review of World Energy 2015 & World Bank DataBank World Development Indicators.

Figure A.1 shows the relationship of global coal production and world GDP which shows there is a significant correlation between the two measures. If we measure the correlation of the differences over the same period, we see there is a correlation of approximately 0.36 over the whole period, which is relatively strong correlation between the two variables.

Over the same time period, the strength of the correlation between Australian GDP and world GDP has increased, as evidenced in Figure 3 A.2 below.

Figure A.2 Figure 3 Six-year trailing correlation of world coal production and the Australian & World GDP



Data source: Synergies calculations, BP Statistical Review of World Energy 2015 & World Bank DataBank World Development Indicators.

If we also analyse the correlation between Australian GDP and world coal production, there is a stronger correlation at 0.55 over the whole period. It also shows that there is an increase in correlation over time as evidenced above. From this we can assume that the changes in coal exports and their impact on the Australian economy is a risk that is systematic in nature as there is a link between the growth in GDP and the growth in coal production. This is to be expected given the global nature of the coal market and its importance to the Australian economy.

The remaining domestic demand for thermal coal will be underpinned by demand for electricity for both residential and industrial purposes. While residential demand for electricity will be less sensitive to domestic economic activity, industrial demand will exhibit greater sensitivity.

Overall, there is a relationship between the demand for thermal coal and Australian domestic economic activity. In the short to medium term, the ultimate impact on ARTC's revenue will be influenced by its exposure to volume risk, which will be discussed in the form of regulation section below. However over the longer term, ARTC is not protected against material and sustained demand reductions if contracts are not renewed and mines are forced to close. The significance of this risk is highlighted at the current time given the challenging conditions facing Hunter Valley coal producers.

In terms of costs, those costs that are variable, being operating and maintenance, will have some relationship with general movements in the domestic economy. As ARTC's costs are mainly fixed, the impact of variable costs on its systematic risk profile is

therefore expected to be relatively small, although the impact of having a high fixed costs base is likely to be significant (this is discussed further below under operating leverage).

A.1.2 Current market conditions

The correlation between world GDP and coal production highlights the inherently cyclical nature of the industry. However, the downturn that is currently being experienced is potentially seeing the industry entering a different phase, underpinned by concerns regarding the relative competitiveness of Australian producers and their position on the world cost curve. This has already been evidenced by a number of mine closures in the Hunter Valley region.

This was highlighted in a 2012 report by Port Jackson Partners for the Minerals Council of Australia.[76] It highlights how Australia's position on the world cost curve has been deteriorating. For example, in thermal coal it is noted that:[77]

> …only six years ago, 63% of Australia's thermal coal production fell within the first two quartiles of the global cost curve. In 2012, this has fallen to 28%.

In thermal coal, it concludes that:[78]

> …the majority of the project pipeline is at risk. Ranked by price needed for investment, the most attractive projects are overwhelmingly in other countries. The proportion of Australia's production in the lower half of the cost curve has fallen from 63% to 28% since 2006 and only 15% of potential capacity falls into this category. Poor economics are exacerbated by project delays which have been increasing over the past decade.

It is therefore evident that this is not simply another downturn in the cycle. What this suggests is an underlying structural competitiveness problem, which means that as commodity prices improve, Australian producers are still facing a decline in market share.

The existence of term contracts provides only limited protection to ARTC. Noting that the industry has already been seeking reductions in coal royalties, in the short term this could also see pressures on the ability to meet take or pay commitments. In the longer

[76] Port Jackson Partners (2012). Opportunity at Risk, Regaining our Competitive Edge in Minerals Resources, Report Commissioned by and Prepared for the Minerals Council of Australia.

[77] Port Jackson Partners (2012). p.25.

[78] Port Jackson Partners (2012). p.10.

term, we could see more contracts not being renewed as they expire (or being renewed for lesser volumes), along with more mine closures.

A.2 Pricing structure

Pricing structure refers to the extent to which the firm's pricing arrangements either mitigate or increase its exposure to systematic risk. An important consideration here will be whether prices have a fixed and variable component.

Consistent with other capital-intensive infrastructure businesses, ARTC's tariff structure has a fixed and variable component. To the extent that a greater proportion of the tariff (and hence revenues) is fixed, this gives ARTC some protection in the event of economic shocks, provided that fixed tariff component is largely aligned with its fixed cost base. While ARTC is subject to a revenue cap it will be largely protected from any impact of changes in volumes of the variable component of these revenues, although this protection only exists for the duration of the regulatory period. The other risk is that ARTC incurs costs which are subsequently not approved by the regulator and hence cannot be passed through to customers. This is a source of regulatory risk.

As ARTC's tariff structure has largely remained unchanged since the previous review, there is nothing to suggest that its systematic risk profile has changed based on this factor.

A.3 Duration of contracts

One of the key differences from the previous review is that ARTC now enters into long term (ten year) contracts with customers. We expect that this is more typical of the industry, including the US Class 1 railways that are used as comparators in the beta analysis.

On the one hand, the existence of long term contracts provides ARTC with revenue certainty. However, this also depends on the extent to which the contracts provide surety in relation to prices and/or volumes. As noted above, given the nature and extent of the current downturn, ARTC remains highly exposed to volume risk in the medium to long term. Term contracts can also constrain the business from varying certain provisions that it might have otherwise sought to review due to a change in the market or its risk profile (unless customers agree to re-open the contracts).

A.4 Market power

ARTC does possess some market power in relation to the Hunter Valley network, particularly when compared to its position in the intermodal network, where rail is

subject to intense competition from road on parts of that network. The existence of market power will tend to mitigate systematic risk.

This market power is to some extent reduced by the potential for countervailing power on the buyer side. There are two main points to consider when considering countervailing power argument. The first is that countervailing power will be reduced if the buyer does not have access to a bona-fide viable substitute. The second, which is semi-conditional on the first concept, is that the buyer must have significant buying power so that the quantum of loss from a failed negotiation would fall harder on the seller of the service than itself.

Currently, there are two major rail companies utilising the Hunter Valley coal network, Aurizon and Pacific National, who currently hold market shares of approximately 40 per cent and 60 per cent respectively. This means that when the above-rail holder holds and negotiates access rights, there should be a significant amount of countervailing power held by the buyers (and indeed this is not likely to be materially diluted if contracts held directly by end users are factored into the analysis).

At the same time, given there currently no viable substitutes for delivering the coal freight task in the Hunter Valley, this will reduce the extent to which countervailing power can be exerted by buyers. However, we note that at least some of this countervailing power can be exerted via the regulatory process, including via coordinated submissions through industry cooperatives or bodies.

An additional dimension to the degree of market power held by ARTC is the co-ordinated approach that is taken to the management of coal supply chain issues through the Hunter Valley Coal Chain Coordinator function. This body, which is made of industry participants and ARTC works with a view to maximising the Hunter Valley coal network's efficiency and hence the region's competitiveness in world coal markets. This means that all participants in this coal chain are working towards a set of common objectives and have some influence over coal chain operations and performance.

A.5 Form of regulation

ARTC's systematic risk will be affected by the form of regulation, as this determines ARTC's exposure to volume risk. To the extent that it is subject to a pure revenue cap it will be relatively insulated from this risk compared to a firm that is regulated under a price cap, although importantly, this protection is only for the duration of the relevant regulatory period.

It is noted that in a number of regulatory decisions regulators have not sought to explicitly attribute any increment in the asset beta for a price cap over a revenue cap (and

vice versa) and accordingly the implications of the form or regulation for beta remain very unclear. In any case, the nature of regulation remains unchanged from the previous review of ARTC's WACC.

A.6 Growth options

Growth options refer to the potential to undertake significant new investment, particularly in new areas or products. Chung and Charoenwong argue that businesses that have a number of valuable growth opportunities, in addition to their existing assets, will tend to have higher systematic risk compared to firms that don't have these opportunities.[79]

This can be illustrated if we consider two firms of the same value. One business has few growth opportunities, so that the value of the business will largely reflect the earning capacity of the assets already in place. The other business has the same value, however has fewer assets in place but a number of growth opportunities which have some value.

Of the two firms, the one that would be most affected by economic shocks is the one that has the greater portion of its value represented by growth opportunities. This is due to the fact that assets not yet invested in are at greater risk of being deferred or mothballed in economic downturns. This will be reflected in the company's equity beta, which would be higher. Overall, Chung and Charoenwong's empirical results strongly support this hypothesis.

ARTC's capital requirements reflect investment in growth assets as well as the replacement of aging network infrastructure. Growth expenditure will have some relationship with conditions in world coal markets (but not necessarily replacement expenditure). Overall, given the long term growth outlook for the Hunter Valley coal industry, much of which will come from growth opportunities in more distant regions such as the Gunnedah Basin, ARTC retains valuable growth options, the nature and timing of which will continue to be sensitive to the world coal price outlook.

A.7 Operating Leverage

ARTC's cost base is largely fixed, with only a relatively small proportion of its costs sensitive to volumes. This is typical for a rail infrastructure provider. High operating leverage is associated with higher systematic risk, as these fixed costs will still be

[79] K. Chung and C. Charoenwong (1991). Investment Options, Assets in Place and the Risk of Stocks. Financial Management, Vol.3.

incurred irrespective of actual volumes (and revenues). We would expect that ARTC's operating leverage remains largely unchanged since its previous review.

As this first principles analysis is being used to determine where ARTC would be positioned with respect to a range of beta estimates sourced from comparators, the impact of operating leverage on this decision will depend on ARTC's operating leverage relative to these comparators.

We understand that ARTC's operating leverage is similar to that of other rail network providers. However, its comparator group comprises US Class 1 railways and Australian industrial transport firms, who we expect would have lower operating leverage.