Estimating a WACC for the APT Allgas Distribution Network

Key issues in the current environment

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Executive Summary

Synergies Economic Consulting (Synergies) has been engaged by the APA Group (APA) to review aspects of the Weighted Average Cost of Capital (WACC) to apply to the APT Allgas Energy Pty Ltd (APT Allgas) gas distribution network as part of its forthcoming review by the Australian Energy Regulator (AER).

As part of this review, we have been asked to address the following questions:

1. What is the best estimate of the equity beta for a benchmark efficient service provider in the circumstances of APT Allgas (that is, a benchmark efficient service provider facing the same degree and nature of non-diversifiable risk)?
2. What is a reasonable basis for estimating the debt risk premium for a benchmark efficient service provider in the circumstances of APT Allgas?
3. What is the best estimate of the value of tax imputation credits (gamma), having regard to the most recent research in this area?
4. To what extent is the global financial crisis (and the market conditions that have been experienced following the commencement of the crisis) continuing to have an impact on the expected value of the market risk premium?

Our review has had regard to the relevant provisions in the National Gas Law (NGL), the National Gas Rules (NGR), the previous decision for Allgas made by the Queensland Competition Authority (QCA) in 2006, relevant AER precedent and other relevant regulatory precedent.

A summary of our conclusions in relation to each question is as follows.

Equity beta

The paucity of relevant and reliable data has unfortunately precluded us from being able to draw any robust conclusions regarding APT Allgas' equity beta based on an updated empirical analysis. At worst, in the absence of this data the most appropriate starting point for the equity beta estimate is one, which was also the assumption that was most commonly applied to energy network businesses prior to the AER's WACC Statements.

A detailed first principles analysis was undertaken. This is used to provide context to the equity beta assessment, including informing an opinion of the extent to which APT Allgas' beta might differ from the 'benchmark' gas distribution network business. The observations we made from this analysis are as follows:

1. The demand for gas for residential use has *some* relationship with domestic economic activity, because:
   - the demand for gas has a positive income elasticity of demand;
   - APT Allgas' key growth market is new housing developments, which are positively correlated with domestic economic activity;
   - APT Allgas does not have substantial market power. It faces strong competition from substitutes in all of the applications for which gas is used, in particular, the competition that it is exposed to from solar energy (and to a lesser extent, heat pump technology) in the water heating market, which is its largest potential market in the residential sector. Queensland has one of the lowest penetrations of gas in dwellings of any Australian state. While a number of the factors that influence the choice of energy source are not related to the domestic economy (such as government policy initiatives), what is relevant to this assessment is that:
     - to the extent that demand has a relationship with domestic economic activity (via income and new dwelling construction activity), gas is exposed to higher market risk because it is a 'fuel of choice' relative to electricity, which increases the sensitivity of the firm's revenues to domestic economic activity (costs are considered separately below);
     - more importantly, this significantly reduces its market power, which is examined separately below.
2. Industrial and commercial demand will generally be more sensitive to economic activity. This demand accounts for a relatively higher proportion of the demand for gas in Queensland relative to the other States. Together, industrial and commercial demand accounts for over 60% of APT Allgas' total revenue.This suggests higher exposure to systematic risk.
3. A reasonable proportion of revenues vary with throughput (over 50% in the Volume Class, which includes residential and commercial customers and accounts for over 70% of revenue), while the majority of its cost base is fixed. This provides some protection from systematic risk however it still leaves the balance of this revenue exposed to changes in volumes.
4. There is no additional protection for revenues from industrial customers via term contracts, with only one industrial customer currently subject to a contract.

5. The impact of form of regulation also needs to be considered. It is recognised that while the implications of this for beta have generally seen to be unclear, the reality is that:
   - APT Allgas is exposed to higher volume risk under a price cap;
   - it has been established that this volume risk is systematic in nature;
   - demand and costs are not related.
6. Normally in energy network infrastructure, incumbents possess substantial market power, which is often seen to have a dampening effect on beta. However APT Allgas does not possess substantial market power because of the strong competition gas faces from substitutes, particularly in the residential sector in Queensland where it has a lower penetration relative to most of the other states. It also faces countervailing power from buyers in the industrial sector which is not mitigated by term contracts. We consider that reduced market power is one of the key factors in determining APT Allgas' beta and a strong differentiator between it and other gas distribution firms, as well as electricity.
7. The impact of growth options on beta is not considered to be material here.
8. APT Allgas has high operating leverage, which is a significant contributor to systematic risk. However, we have no evidence to suggest that it is different from other comparable businesses, provided their activities are mainly focused in gas distribution. What it does do is magnify the impact of APT Allgas' exposure to market risk on the firm's returns.

In conclusion, we have identified some fundamental differences between between gas and electricity network businesses and between APT Allgas and other gas distribution networks in Australia. The key differences that are relevant to systematic risk are:

- industrial and commercial customers account for a much higher proportion of APT Allgas' total volumes compared to the other states where gas penetration in the residential sector is much higher. Revenue from these customers represents of 60% of APT Allgas' total revenue. In general, industrial and commercial demand will have a higher correlation with economic activity compared to residential demand;
- gas is a 'fuel of choice' compared to electricity, which is connected to every building. The exposure to competition from substitutes dilutes market power, with market power generally seen as reducing a firm's exposure to systematic risk. In the residential sector, this dilution is exacerbated in the case of APT Allgas relative

to the other states because gas has a much lower penetration in households compared to most of the other states.

As outlined above, as a starting point an equity beta of one is considered appropriate to apply to the 'average' or benchmark gas network business. The differences we have identified suggest that APT Allgas has higher systematic risk compared to the average gas network business and hence an equity beta above one is appropriate.

We have concluded that an equity beta of 1.1 remains the best estimate to apply in the circumstances, based on the provisions contained in the NGR. This is consistent with the previous assessment made by the QCA. That assessment recognised the difference between the Allgas network and other distribution networks in Australia, in particular, its higher exposure to industrial and commercial demand. It also recognised the differences between gas and electricity networks and the former's greater competition from substitutes. There is no persuasive evidence to depart from this estimate.

Debt risk premium

Estimation of the debt risk premium (or debt margin) has already been subject to considerable scrutiny and debate. The focus of our review has been on how to estimate a ten year BBB+ debt margin using Bloomberg data given the cessation of publication of key data previously relied upon by the AER (this data was used to extrapolate the seven year Bloomberg BBB yield to derive a ten year yield).

It is concluded that a reasonable alternative is to use the implied term structure of the BBB yield curve, that is, extrapolate the seven year yield based on the difference between the five and seven year yields. We compare the use of this method against the actual Bloomberg ten year BBB yield over a period of time when this data was still published, being the two years prior to its cessation of publication in 2007. The average difference was only 4 basis points.

In estimating the debt margin both Bloomberg and CBA Spectrum face the same problem of limited market data. Each data provider uses a different method to fit their yield curves to the data, which is reflected in the historical difference between their published yields (noting that this difference has varied through time). As the method used by each data provider is proprietary it is not possible to directly compare them or understand what might be driving the differences.

While the AER has sought to develop a robust method to test the predictive ability of each data provider's yield curve for the purpose of selecting which one to use at each regulatory review (noting that both may be used), this is only done with reference to instruments with shorter maturities. This does not necessarily enable us to draw any

robust conclusions regarding the extent to each data provider is a more reliable source when estimating the yields on longer terms BBB bonds.

In our opinion, to estimate a ten year BBB+ yield the most prudent approach would be to take an average of CBA Spectrum and Bloomberg yields (with the CBA Spectrum estimate based on its BBB+ yield curve and the Bloomberg estimate based on its BBB yield curve, which also includes BBB+ bonds). In order to estimate the ten year Bloomberg yield we recommend extrapolating its seven year BBB yield based on the difference between the five and seven year yields, as outlined above. We consider that this is the most appropriate approach to use until liquidity returns to the market for long-term low investment grade corporate debt.

Gamma

Our assessment of gamma considered the two key inputs underpinning this estimate, being the distribution rate and the value of franking credits (or theta). We do not accept that the AER's preferred estimate of 0.65 is the best estimate for gamma under the NGR, noting that this issue has also been debated at length in other regulatory reviews.

Distribution rate

In our opinion, the AER's assumption of a 100% distribution rate is not the most reasonable assumption that could be applied in the circumstances. We therefore consider that the distribution rate should be based on the average distribution rate that is observed in the market and is most commonly applied by practitioners, which is 71%.

The AER has acknowledged that there is some uncertainty regarding the value of retained credits. Particularly given the asymmetric consequences of error, we do not consider that it is appropriate to set the distribution rate as if retained credits were fully valued. In our opinion, it is more reasonable and plausible to assume they have no value. This in turn supports an assumption for the distribution rate of 71%.

Franking credits

Overall, we consider that it is important to consider a number of studies to value theta. One of the reasons the evidence the AER has considered is so limited is because it has concluded that a 'structural' break occurred with tax law changes implemented in 2000, which in turn means that it will only consider analysis that only includes post-2000 data. The evidence it relied upon in concluding that this structural break occurred was the Beggs and Skeels study.

Reports prepared by SFG and Synergies that have previously been submitted to the AER showed that the Beggs and Skeels results do not provide sufficiently reliable evidence to demonstrate that a structural break occurred. This assumption by the AER is critical to its conclusions and given the asymmetric consequences of error, the evidence of a structural break must be robust and reliable. As we do not consider that evidence to be sufficiently robust and reliable, it is not appropriate to assume that a structural break has occurred and hence it is valid to include studies that have used data prior to 2000 in the scope of our review.

We concur with the AER's consultants, McKenzie and Partington, who advocate consideration of a range of studies. We consider that this is particularly important given the inherent uncertainty associated with valuing theta. All of the studies we have identified have sought to estimate the value of theta using market data. This includes dividend drop-off studies, as well as alternative methods of estimating theta using market data.

Of the studies we examined, excluding Beggs and Skeels' 1986-1988 sub-period, the estimate for their post-2000 sub-period is the highest estimate for the value of theta (0.57), which is the estimate that has been adopted by the AER. While it has stated that this is not a 'lower bound', it is the lower of its two point estimates. A number of other studies have concluded that the value of theta is zero.

Value of gamma

In our opinion, this evidence shows that a value of zero should at least be included within the bounds of a reasonable range. As we do not accept that the distribution rate should be set at 100%, the upper bound for this range would be 0.4, based on the Beggs and Skeels study (0.71 * 0.57).

We have therefore concluded that the most reasonable range for the value of gamma is between 0 and 0.4. In selecting a point estimate from within this range we would recommend the mid-point, which is 0.2.

Market risk premium

The value that has been applied by the AER since its WACC Statements for electricity transmission and distribution were finalised in May 2009 is 6.5%. This was an increase from the value of 6% that the AER has most commonly applied in the past in recognition of the effects of the global financial crisis. More recent evidence has emerged to suggest that the medium-term forward-looking market risk premium (MRP) is higher than this value (this was analysis by Officer and Bishop which was submitted to the AER by the Victorian electricity distribution network businesses).

The key theme that remains in the financial markets is one of uncertainty. While both positive and negative sentiments have been expressed regarding the outlook for the global economy, including the possibility of a 'second wave' of the global financial crisis, it is difficult to predict what the most likely scenario will be.

The Officer and Bishop analysis suggests that the value of the forward-looking MRP is most likely to be above 6.5% (and is more likely to be between 7% and 8% over the next five years). The analysis we have undertaken that compares the historical returns on debt and equity also suggests that to the extent that debt margins spiked following the commencement of the crisis and have continued to remain at these levels, the premium that equity investors now require will have similarly increased.

We are therefore of the opinion that currently, 6.5% is likely to be a 'lower bound' estimate of the forward-looking MRP.

'Reasonableness' check

We have also undertaken analysis reviewing the average difference between the cost of debt and equity since 1990 (inclusive and exclusive of the global financial crisis). Since the global financial crisis in 2008 and sub-prime collapse in 2007, the actual returns to equity holders have diminished and debt holders are demanding greater yields due to the risk and illiquidity in the market.

The consequence of this current situation is that when the weighted average cost of capital is calculated by a regulator based on the standard regulatory approaches and assumptions, the difference between the estimated cost of equity and the cost of debt has contracted. This result is due to the actual cost of equity being highly volatile. Additionally the return on equity is estimated from the historical data. The cost of debt is estimated using current market data and as a consequence of the global financial crisis, the outcomes we observe in the current market are not consistent with the long term relationship between debt and equity.

This implausible result can be overcome by using established relationships between the cost of debt and the cost of equity, at least as the basis of a 'reasonableness check' on the overall estimates. This reasonableness check compares the difference between the estimated cost of debt and equity derived during these turbulent and uncertain times and the average difference that has prevailed over the longer term. This approach will ensure that the estimated WACC is consistent with established finance theory during these difficult market conditions.

As a reasonableness check, based on the observed historical differences the cost of equity should be at least 4.5% above the observed cost of debt. This is considered conservative because the average difference between 1990 and 2007 was around 6%.

Based on the parameter estimates we have recommended the difference between the estimated cost of debt and equity is 3.19%. Overall, the key issue that we have identified for APT Allgas is the beta estimate, as outlined above. Based on the parameter estimates applied above, if the AER applied an equity beta of 0.8 (as it did in its decision for Jemena Gas Networks) the difference between the cost of equity and the cost of debt would only be 1.24%.

Such a significant contraction in the return required by equity holders relative to debt holders is neither reasonable nor plausible, especially in the current market environment. Apart from the fact that we do not consider that such a beta is appropriate given the systematic risk profile of the APT Allgas network, it risks materially under-compensating equity providers, which in turn will impact its ability to fund its investments.

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1.1 Synergies Economic Consulting (Synergies) has been engaged by the APA Group (APA) to review aspects of the Weighted Average Cost of Capital (WACC) to apply to the APT Allgas Energy Pty Ltd (APT Allgas) gas distribution network as part of its forthcoming review by the Australian Energy Regulator (AER).

1.2 As part of this review, we have been asked to address the following questions:

1. What is the best estimate of the equity beta for a benchmark efficient service provider in the circumstances of APT Allgas (that is, a benchmark efficient service provider facing the same degree and nature of non-diversifiable risk)?
2. What is a reasonable basis for estimating the debt risk premium for a benchmark efficient service provider in the circumstances of APT Allgas?
3. What is the best estimate of the value of tax imputation credits (gamma), having regard to the most recent research in this area?
4. To what extent is the global financial crisis (and the market conditions that have been experienced following the commencement of the crisis) continuing to have an impact on the expected value of the market risk premium?

1.3 This report is structured as follows:

- section 2 sets out the context for determining WACC
- section 3 examines issues in estimating the cost of debt
- section 4 compares the cost of debt and equity in the current environment
- section 5 considers the market risk premium
- section 6 examines the equity beta
- section 7 examines gamma
- section 8 concludes with a 'reasonableness check' of the key WACC parameters.

2 Background

2.1 In undertaking this review we have had regard to the following:

- the relevant provisions in the National Gas Rules;
- the Queensland Competition Authority's (QCA's) previous determination for Allgas;
- relevant AER precedent; and
- the asymmetric consequences of error.

2.2 National Gas Law and Rules

2.2 The Objective of the National Gas Law (NGL) is as follows:

> The objective of this Law is to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas.

2.3 The revenue and pricing principles include that:

- the service provider should be able to recover the efficient costs of providing the Reference Services (Rule 24(2));
- the service provider should be provided with sufficient incentives in order to promote economic efficiency with respect to the Reference Services, including incentives to invest (Rule 24(3)); and

> A reference tariff should allow for a return commensurate with the regulatory and commercial risks involved in providing the reference service to which that tariff relates. (Rule 24(5))

2.4 The National Gas Rules (NGR) contains the following provisions in relation to the rate of return (Rule 87).

> 1) The rate of return on capital is to be commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services.
>
> 2) In determining a rate of return on capital:
>
> (a) it will be assumed that the service provider:
>
> (i) meets benchmark levels of efficiency; and

(ii) uses a financing structure that meets benchmark standards as to gearing and other financial parameters for a going concern and reflects in other respects best practice; and

(b) a well accepted approach that incorporates the cost of equity and debt, such as the Weighted Average Cost of Capital, is to be used; and a well accepted financial model, such as the Capital Asset Pricing Model, is to be used.

2.5 The NGR also provides that any forecasts or estimates are arrived at on a reasonable basis and must represent "the best forecast or estimate possible in the circumstances" (Rule 74(2)).

2.3 The asymmetric consequences of error

2.6 It has been recognised that regulatory error tends to have asymmetric consequences. The Productivity Commission stated:[1]

- 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.

2.7 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. This in turn risks compromising the Objective of the NGL, as well as being inconsistent with a number of the relevant revenue and pricing principles.

2.8 The estimation of WACC is inherently imprecise and hence the probability of specifying a WACC other than the 'true' value is high. For key parameters such as beta, gamma and the market risk premium, there is likely to be a range

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

of reasonable estimates rather than a precise value. The Australian Competition Tribunal ('the Tribunal') recognised the range of reasonable outcomes within which a Reference Tariff determination could fall:[2]

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

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

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

2.11 One possible approach that has been applied to deal with this issue is to specify parameters such as beta, gamma and the market risk premium in terms of a range and then select a point estimate from the upper bound of this range in recognition of the asymmetric consequences of regulatory error. Lally states:[3]

> Given that there is some uncertainty as to the correct parameter estimates, and that the consequences of judging excess profits to exist when they do not is more severe than the contrary error, my view is that one should choose a WACC value from the higher end of the distribution…

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

[3] M. Lally (2004). The Weighted Average Cost of Capital for Gas Pipeline Businesses, Report Prepared for the New Zealand Commerce Commission, University of Wellington.

2.12 This range can be set with reference to empirical evidence. Alternatively, a probability distribution of estimates can be determined. This involves assigning a standard deviation to the estimate and then selecting a value from a specified percentile of the distribution. For example, if a value from the 75th percentile is selected, this implies that there is only a 25% probability that the true WACC is higher than this selected value.

2.13 This approach has been applied by the New Zealand Commerce Commission in the regulation of gas.[4] It has also been applied by IPART in its determination in relation to the Hunter Valley coal network, where a range was estimated for beta (based on ranges for the key underlying parameters) and a point estimate selected above the mid-point in this range.[5]

2.14 Another means of specifying the probability distribution is by using a technique such as Monte Carlo analysis. This technique can also be used as a 'reasonableness check' against specified ranges, which has been done by both the Australian Competition and Consumer Commission and the QCA (although this technique still requires a degree of judgment to be applied in determining the inputs to be used).

2.15 In conclusion, it is important to give due regard to the imprecise nature of WACC estimation and the more severe consequences which can arise if the regulated WACC underestimates the true value. This in turn risks compromising the Objective of the NGL as well as being inconsistent with a number of the relevant revenue and pricing principles.

[4] Commerce Commission (2004). Gas Control Inquiry Final Report; Commerce Commission (2008). Authorisation for the Control of Supply of Natural Gas Distribution Services by Powerco Ltd and Vector Ltd, Decisions Paper, 30 October.

[5] Independent Pricing and Regulatory Tribunal (2009). New South Wales Rail Access Undertaking – Review of the Rate of Return and Remaining Mine Life from 1 July 2009, Rail Access – Final Report and Decision, August.

3 Estimating the Debt Margin

3.1 Introduction

3.1 The AER has assumed a notional credit rating of BBB+ for electricity network businesses and we note that the same assumption has been applied in its recent decision for Jemena Gas Networks.[6] We do have a concern that a BBB+ rating may no longer be compatible with 60% gearing for this business since the commencement of the global financial crisis. However, we have not been asked to review this assumption in detail at this stage and have therefore assumed that BBB+ will be applied to APT Allgas.

3.2 Prior to the sub-prime crisis in 2007, there were a small number of debt issues in the BBB+ market for terms of ten years or greater. This market allowed the ten year yield for BBB+ rated securities to be calculated. The two main independent financial data providers, CBASpectrum[7] and Bloomberg[8], each calculated the yield.

3.3 CBA Spectrum publishes a separate BBB+ yield curve. Bloomberg only publishes a BBB yield curve and it is understood that its sample of bonds includes BBB, BBB+ and BBB-. References to 'BBB' in this section in the context of Bloomberg estimates are therefore assumed to refer to all bonds in this category, including BBB+ and BBB-. We observe that no adjustment is made to Bloomberg's published BBB yield by the AER (or other Australian regulators) when estimating the debt margin for a firm with an assumed BBB+ credit rating.

3.4 Since the sub-prime crisis (and the global financial crisis that followed it), it has been considerably more difficult for BBB rated businesses to issue securities with a ten year maturity. This in turn has made it difficult to estimate a yield on ten year BBB rated securities.

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6 Australian Energy Regulator (2010a). Jemena Gas Networks, Access Arrangement Proposal for the NSW Gas Networks, 1 July 2010 – 30 June 2015, June.

7 CBASpectrum is an analytical platform developed in 2001 by the Commonwealth Bank, providing users with a measure of the underlying fair-value yield of Australian bonds.

8 Bloomberg LP provides financial software tools such as analytics and equity trading platform, data services and news to capital markets.

3.5 In 2007 Bloomberg ceased publishing the ten year BBB yield due to the lack of liquidity in the debt market. More recently, the yields that were used to extrapolate the Bloomberg seven year yield to estimate a ten year yield are now no longer published (being the seven and ten year AAA yields). The focus of this section is how to estimate a ten year BBB yield using Bloomberg data in the absence of these AAA yields. We will also provide our opinion on the most appropriate basis for estimating the debt margin in the current circumstances.

3.2 Overview of the problem

3.6 Table 1 provides details of the bonds included by Bloomberg in the calculation of the eight year BBB yield on the 10th of June 2008 (when the eight year BBB yield was still published). Note the small number of issues (seven) included and importantly, that the longest dated bond was February 2013, four years short of the period for which the yield is being estimated – eight years.

Table 1 Bonds included in the 8 year BBB yield calculation

Ticker	Coupon	Maturity	Price	Fair Value	Yield
FBG	6.25	3/17/2010	100.83	100.55	5.12
BQDAU	6.00	12/02/2010	99.86	99.76	6.10
DXSAU	6.75	2/08/2011	100.08	100.6	6.69
ORGAU	6.50	10/06/2011	99.38	99.03	6.79
TABAU	6.50	10/13/2011	98.59	98.99	7.16
WESAU	6.00	7/25/2012	96.48	95.69	7.28
SNOWY	6.50	2/25/2013	94.44	95.62	8.27

Source: Bloomberg

3.7 To estimate the ten year BBB yield, Bloomberg users had to adjust shorter yields. A commonly used approach to estimate the ten year yield was to use the longest dated BBB yield and adjust this yield by the term structure of the nearest yield curve that published a ten year yield. For example, when the eight year BBB, eight year A and ten year A yields were available, the ten year BBB yield was estimated by adding the difference between the eight and ten year A yields to the eight year BBB yield. The assumption underlying this adjustment was that the BBB yield curve between eight and ten years was parallel to the yield curve between eight and ten years for A rated bonds.

3.8 More recently, the longest published Bloomberg yield has been a seven year yield. This was extrapolated to ten years based on the difference between the seven and ten year AAA yields. As at June 2010, the eight and ten year AAA yields are no longer published. The problem now is that Bloomberg does not

publish any ten year yield other than the Commonwealth Government bond yield.

3.3 Solution

3.9 To estimate the ten year BBB corporate yield an alternative approach must be adopted using the seven year BBB yield. The alternative suggested here is to extrapolate the published seven year BBB yield to a ten year yield assuming that the term structure between five and seven years is applicable to the period for seven to ten years. For example, if the seven year BBB yield if 6% and the five year BBB yield is 5% then the estimated ten year BBB yield is estimated as:

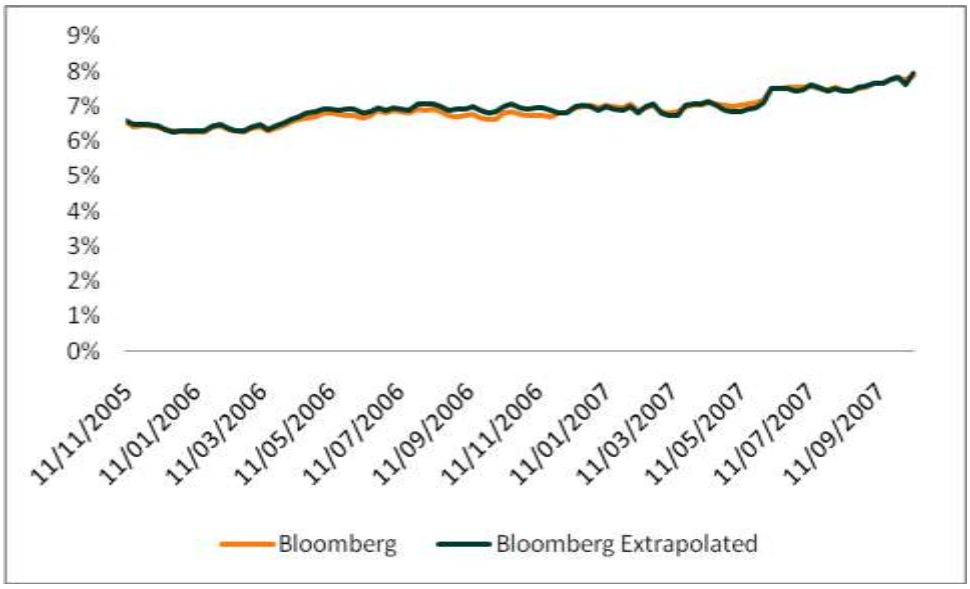
$$6\% + (6\% - 5\%)/2 \times 3 = 7.5\%.$$

3.10 Figure 2 below compares the ten year BBB extrapolated yield with the published ten year BBB yield. As noted above, the ten year BBB yield ceased to be published by Bloomberg in October 2007. For the two years[9] prior the average yields were 6.89% for the published ten year BBB yield and 6.93% for the extrapolated ten year yield. Over this period the difference between the two yields was therefore 0.04% or 4 basis points, which is minimal.

3.11 Changes in the yields are also strongly positively correlated. As the yields are strongly positively correlated at 0.971, changes in the extrapolated ten year BBB yield almost perfectly mirror the published ten year BBB yield.

[9] Two years was chosen as this was the only time that data was consistently available

Figure 1 Published Bloomberg ten year BBB yield and extrapolated yield



Data source: Bloomberg

3.12 When the global financial crisis passes and the long term BBB bond market becomes more liquid (presuming this occurs), data providers should again be able to supply estimates of yields for BBB rated securities. It is noted however, that the relatively small size of the Australian market means that liquidity issues are always likely to exist for ten year BBB debt.

3.13 Given the small partially reflective sample of corporate bonds, it is important to continue to use an independent, transparent and reputable data provider so that all users have confidence in the estimates. We consider that Bloomberg data should continue to be referenced in the AER's process and that a ten year BBB yield can be estimated by extrapolating the seven year yield based on the difference between the five and seven year yields.

3.4 Recommended approach for estimating the debt margin

3.14 Both Bloomberg and CBA Spectrum face the same problem of limited market data. Each data provider uses a different method to fit their yield curves to the data, which is reflected in the historical difference between their published yields (noting that this difference has varied through time). As the method used by each data provider is proprietary it is not possible to directly compare them or understand what might be driving the differences.

3.15 There may also be alternative ways to fit the curve to market data, which we have not investigated in any detail here. However, there are clear advantages in using data from recognised, independent providers that operate in the financial

markets. In this regard, we recognise that there are practical difficulties associated with referencing CBA Spectrum data as it is only available to CBA customers.

3.16 While the AER has sought to develop a robust method to test the predictive ability of each data provider's yield curve for the purpose of selecting which one to use at each regulatory review (noting that both may be used), this is only done with reference to instruments with shorter maturities. This does not necessarily enable us to draw any robust conclusions regarding the extent to each data provider is a more reliable source when estimating the yields on longer terms BBB bonds. We can observe that the 'preferred' data provider has varied in regulatory decisions made since this method was introduced, which in our opinion, further highlights the potential problems (presuming the method used by each has remained unchanged over this period).

3.17 In our opinion, to estimate a ten year BBB+ yield the most prudent approach would be to take an average of CBA Spectrum and Bloomberg yields (with the CBA Spectrum estimate based on its BBB+ yield curve and the Bloomberg estimate based on its BBB yield curve, which also includes BBB+ bonds). In order to estimate the ten year Bloomberg yield we recommend extrapolating its seven year BBB yield based on the difference between the five and seven year yields, as outlined above. We consider that this is the most appropriate approach to use until liquidity returns to the market for long-term low investment grade corporate debt.

4 Cost of debt and equity in the current market environment

4.1 Background

4.1 It is a well established finance theory that the cost of equity is more expensive than the cost of debt due to the risk characteristics of the two sources of funds. Equity holders would normally require and receive, on average, a higher rate of return than debt holders. Since the global financial crisis in 2008 and sub-prime collapse in 2007, the observed returns to equity holders have diminished and debt holders are demanding greater yields due to the increase in risk and illiquidity in the market. This compression in actual equity returns can be expected to result in a significant increase in the forward-looking return on equity.

4.2 The consequence of this current situation is that when the weighted average cost of capital is determined by a regulator based on the standard regulatory approach and assumptions, we have observed a contraction in the differential between the estimated cost of equity and the cost of debt. This is not consistent with what we would expect. That is, there is no reasonable or plausible explanation as to why the returns expected by equity holders would have reduced relative to debt holders.

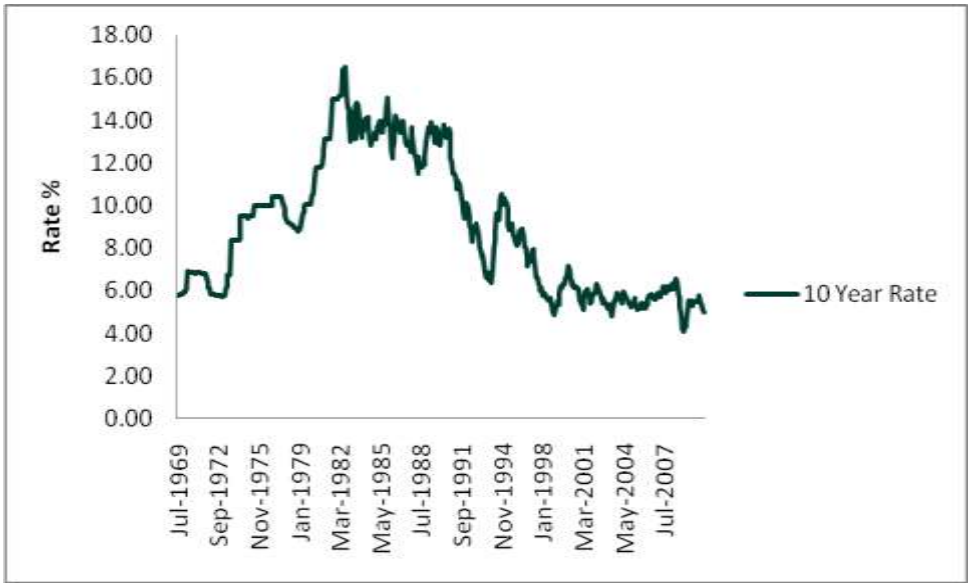
4.3 In essence, this anomaly emerges because the cost of equity is estimated using historical data (reflecting long-term averages) and the cost of debt is estimated using current market data.

4.4 Consider the calculation of the cost of equity. The key variables are the equity beta, the market risk premium and the risk free rate. The equity beta is normally estimated from a sample of comparator firms and it is then used as a forward looking estimate. The underlying assumption is that the equity beta is stationary and that the sensitivity between the business operations and the market that has been observed in the past will continue to apply in the future.

4.5 The risk free rate proxy is normally the yield on the ten year Commonwealth Government bond. Figure 2 displays the ten year Commonwealth Government bond yield from 1969 to today. The yield has varied from a high of 16.5% in August 1982 to 4.09% in January 2009, with a current yield in August 2010 of

4.98%. The calculation of the cost of equity uses the current yield[10] as the 'best' estimate of the forward-looking risk free rate.

Figure 2 10 Year Commonwealth Government Bond Rate: 1969 to 2010

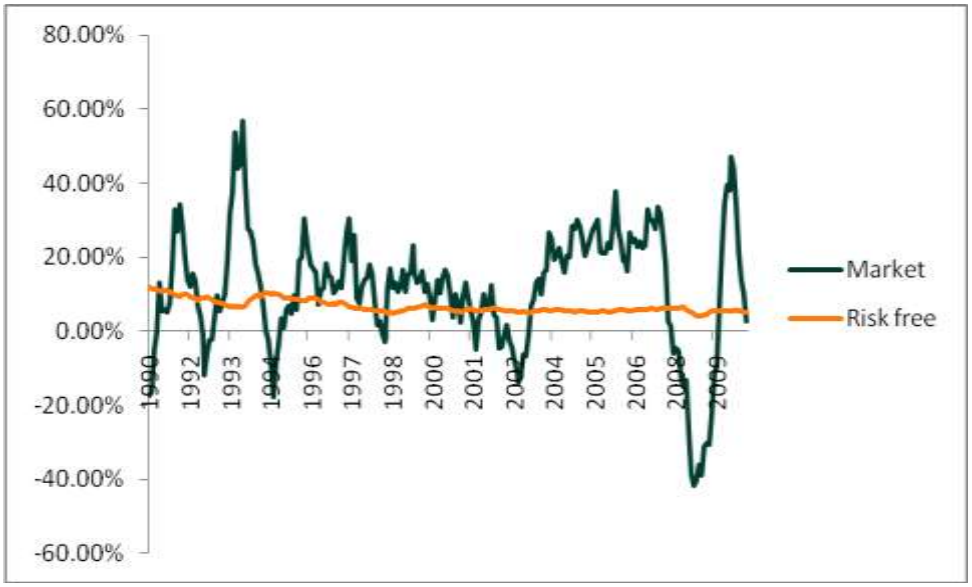


Source: Reserve Bank of Australia

4.6 The market risk premium (MRP) is the expected return on the market less the risk free rate. This variable is normally estimated as a long term historical average. A long term average is used as because in the short term, the MRP is extremely volatile. Figure 3 displays a yearly market return and risk free rate. The difference between the two is the MRP. The annual MRP to October 1993 was (approximately) positive 57% while the annual MRP in November 2008 was negative 47%.

[10] Normally averaged over a 20 to 40 day period.

Figure 3 Market risk premium: 1990 to 2010



Data source: RBA and Bloomberg

4.7 The cost of equity is estimated using a rate on the day (risk free rate), a medium term historic average equity beta (beta is estimated over five years) and a long term market risk premium (typically estimated over at least a forty year period). Following the extreme market conditions that have been experienced since the commencement of the global financial crisis, there is a risk that estimates derived in the traditional manner will materially understate the actual returns required by equity holders in the current market. This in turn will affect the ability of a regulated business to raise new equity capital.

4.8 We recognise that this issue is not easy to resolve. However, we consider that it is necessary to determine the historical relationship between debt and equity and to use this relationship as a 'reasonableness check' on any forward looking estimate. This reasonableness check is necessary to ensure a WACC is not determined that is based upon an implausible relationship between debt and equity.

4.2 Debt/equity relationship

4.9 The capital structure of an organisation is the mixture of debt and equity used to finance its investments. There are a number of capital structure theories that attempt to explain the relationship between debt and equity. The most

prominent positive theory from the finance/economics paradigm is that by Modigliani and Miller[11].

4.10 The Modigliani and Miller approach explains the choice regarding the amount of debt funding relative to equity funding as being a trade-off between the tax deductibility of debt and the bankruptcy costs associated with debt. In their seminal paper on cost of capital, corporate valuation and capital structure they assumed either implicitly or explicitly that:

- capital markets were frictionless
- individuals could borrow and lend at the risk free rate
- there were no bankruptcy costs
- the firm only issues two types of capital being risk free debt or risky equity
- all firms are in the same risk class
- only corporate taxes were considered
- all cash flows were in perpetuity with no growth
- managers were wealth maximisers acting in shareholders' interests
- both insiders and outsiders had the same information set.

4.11 Using these simplifying assumptions, Modigliani and Miller were able to develop the optimal capital structure theory and establish a number of important propositions. The simplifying assumptions do not detract from the model but rather add to the models ability to predict or explain 'real world' phenomena[12].

4.12 Importantly, Modigliani and Miller establish the relationship between the cost of debt and the cost of equity[13]:

> That is, the expected yield of a share of stock is equal to the appropriate capitalization rate for a pure equity stream of the class, plus a premium

[11] F. Modigliani and M. Miller (1958). The Cost of Capital, Corporation Finance, and the Theory of Investment, American Economic Review, June pp. 261-297; F. Modigliani and M. Miller (1963). Corporate Income Taxes and the Cost of Capital: A Correction', American Economic Review, June, pp. 433-442.

[12] Refer: M.Friedman (1966). The Methodology of Positive Economics, Essays In Positive Economics, University of Chicago Press, pp. 3-16.

[13] Modigliani F. and M. Miller, June 1958, p. 271

related to financial risk equal to the debt-to-equity ratio times the spread between the capitalization rate for a pure equity stream and the cost of debt.

4.13 To summarise, the capitalisation rate for a pure equity stream is the cost of equity for an all equity funded business. Debt is cheaper than equity due to the risk borne by debt holders compared to the risk borne by equity holders. As the firm becomes more reliant on debt or more heavily geared, the cost of equity increases. The cost of equity increases due to the financial risk introduced by debt funding. The financial risk is that debt holders have a priority over equity holders to the cash flows of the business. The equity holders' priority/claim over the firm's cash flows is diluted by the introduction of debt funding.

4.14 The Modigliani and Miller proposition can be easily tested by examining the historical relationship between the cost or return to equity and the cost or return to debt.

4.3 Historical relationship

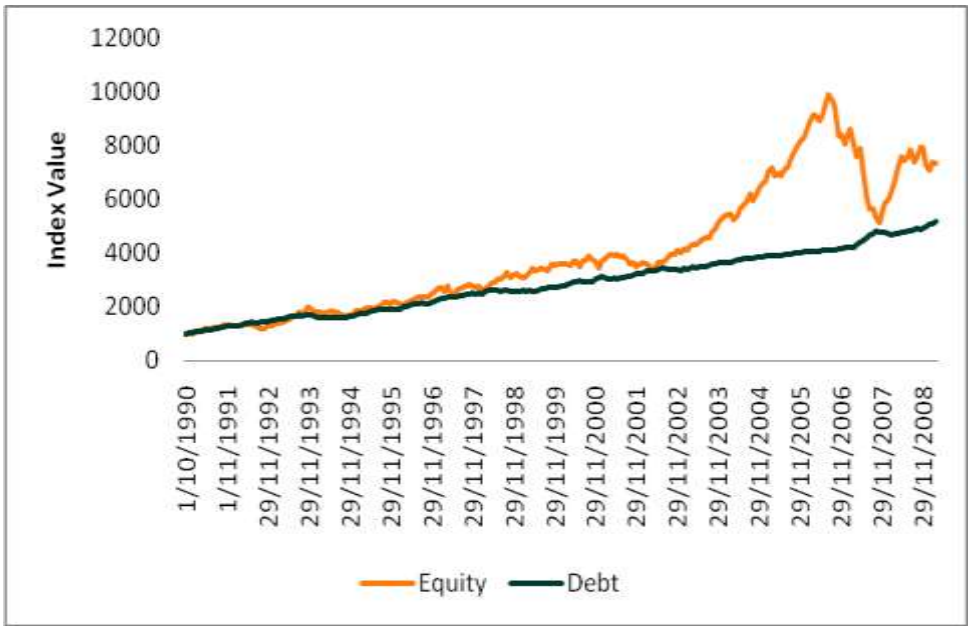
4.15 To establish the relationship between the returns to equity and the returns to debt, an equity index can be compared to a debt index. In the case of equity, the index should measure both capital gains and dividends. In the case of debt, the index should measure the cost of debt both in terms of yields on debt and also the change in the market value of a debt portfolio.

4.16 The equity index chosen is the All Ordinaries Accumulation Index. This index measures the total return to equity investors. It captures both market movements (that is, capital gains) and dividends. The index includes 500 companies and it accounts for approximately 99% of total Australian listed equity market weighted by market capitalisation.

4.17 The debt index is the UBS Australian Composite Bond Index. Most bond and fixed interest funds benchmark their performance against this index. The composition of that index is approximately 20 per cent government bonds, 30 per cent semi government bonds, 20 per cent sovereign fund bonds and 30 per cent corporate debt securities.

4.18 Figure 4 displays the relationship between the All Ordinaries Accumulation Index and the UBS Australian Composite Index from 1990 to August 2010, a 20 year period. To facilitate comparison, the indices have been reset to 1,000.

Figure 4 Equity v debt indices: January 1990 to August 2010



Data source: Bloomberg and UBS

4.19 The correlation between the two indices is 0.91, indicating a strong positive relationship between the two. This established strong positive relationship can be relied upon as a reasonableness check. This issue will be returned to later.

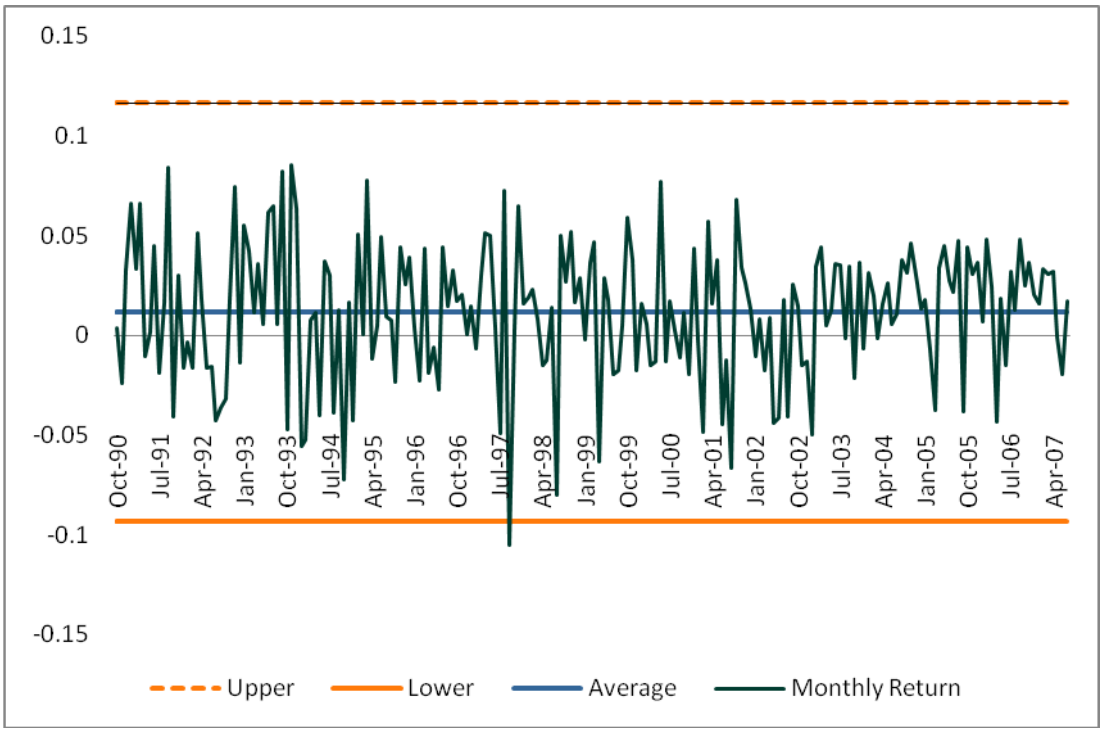
4.20 Figure 3 also displays the volatility in equity returns, particularly since the sub prime collapse in September 2007. The volatility in equity will be discussed next.

4.4 Equity behaviour

4.21 Figure 4 is a control chart mapping historical returns on equity from 1990 until August 2007, which was just prior to the sub-prime collapse. A control chart is a tool that can be used to monitor process variation. The aims of a control chart are to visualise the degree of natural variation in the process and to detect the presence of special causes or when the process is 'out of control'.

4.22 The upper and lower control limits represent the process when it is stable. The control chart is based on the properties of the normal distribution. The control limits are set at plus or minus three standard deviations from the average, which represents 99.73% of the normally distributed variation in a process.

Figure 5 Equity returns: October 1990 to August 2007



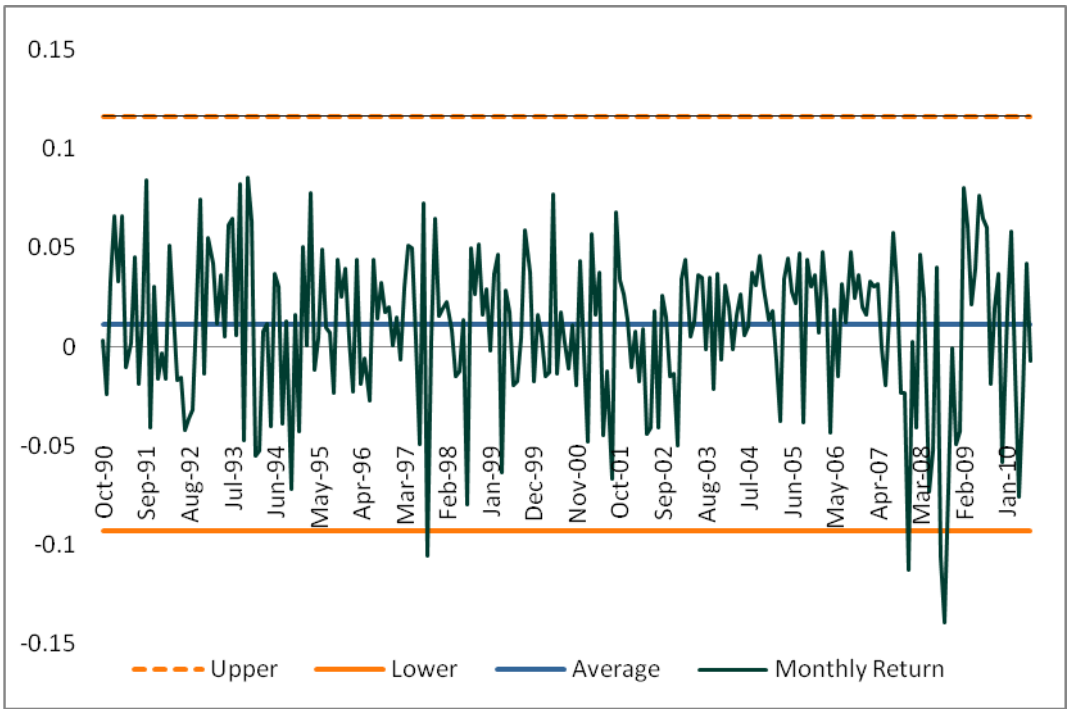
Data source: Bloomberg

4.23 Figure 5 shows that there is natural variability in the return to equity holders. The variability is normally within the control limits indicating that the process or changes in return are normal. The figure displays a dip outside the lower control limit in October 1997 being the Asian Crisis[14]. Over the entire period the average return to equity holders was 14.8% per annum.

4.24 Figure 6 extends the analysis to August 2010.

[14] The 27th October 1997 crash saw the Hong Kong's Hang Seng Index fall 6% and Japan's Nikkei fell 2% on the day.

Figure 6 Equity returns: October 1990 to August 2010



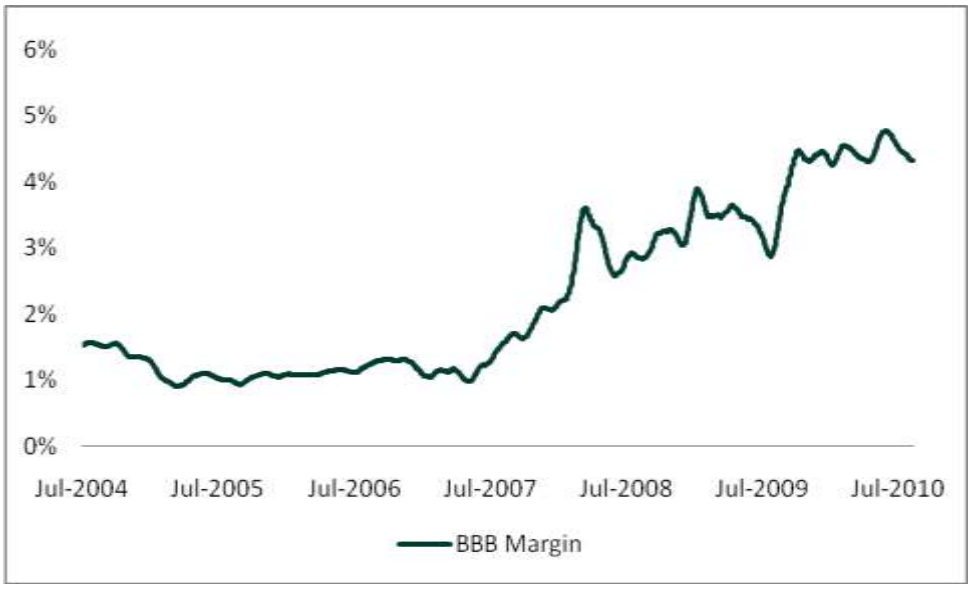
Data source: Bloomberg

4.25 The impact of the sub-prime collapse and the global financial crisis is clearly seen above. From August 2007, the normal volatility in equity returns moved below the lower bound of the control range. Caution must therefore be exercised when estimating equity returns from this sub period. Based on this analysis, this sub period is clearly not indicative of what normally happens with regard to equity returns. Alternatively, there may have been a change in the way investors assess and/or price risk (that is, a structural change) however this would be difficult to reliably determine without several years of data.

4.5 Debt behaviour

4.26 The cost of debt is normally calculated as the risk free rate plus the appropriate debt margin. The debt margin applicable to a regulated energy business is the margin between the yield on a ten year BBB+ corporate bond and the yield on a ten year Commonwealth Government bond (noting that as outlined previously, Bloomberg only publishes a single BBB yield curve, hence the reference to 'BBB' and not 'BBB+' in the following figures). Figure 7 displays the ten year BBB debt margin for the period of three years prior to the sub prime collapse and three years following the sub prime collapse (estimated using Bloomberg data).

Figure 7 BBB debt margins

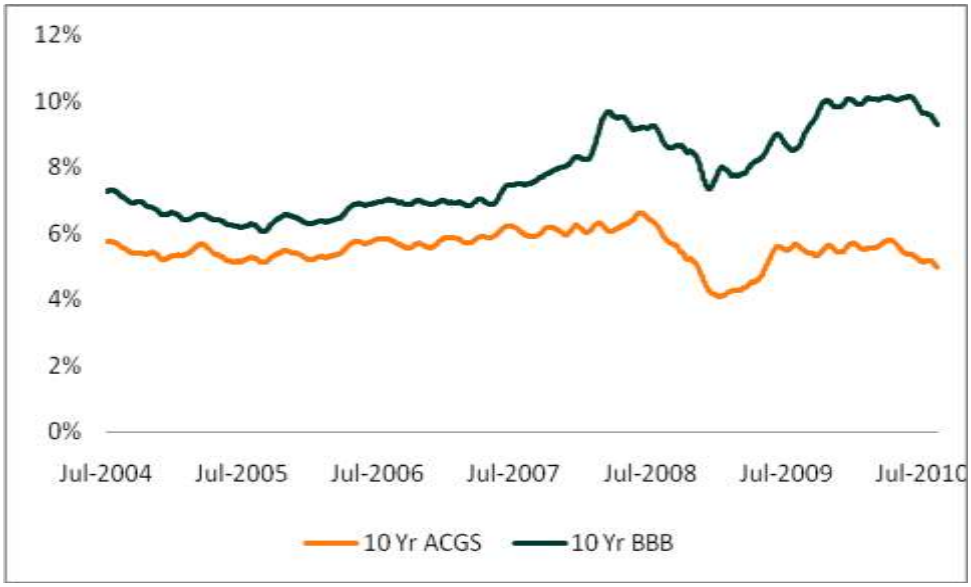


Source: Bloomberg

4.27 Prior to the sub prime collapse in 2007, the debt margin varied around 1% to 2%. With the sub prime collapse and the global financial crisis, the debt margin has increased to nearly 5%.

4.28 Figure 8 displays the yield on ten year BBB corporate bonds and the ten year Commonwealth Government bond yield. The yield on Commonwealth Government bonds has fallen in response to the sub prime collapse while the yield on BBB rated bonds has increased due to illiquidity in the market, resulting in an increase in the debt margin. One of the key reasons for this is because in times of crisis, there will be a 'flight to quality' as risk-averse investors seek a 'safe haven' for their funds in lower risk assets. This in turn will increase the price of (and drive down the yields on) these low-risk assets.

Figure 8 BBB yields and the risk free rate of return

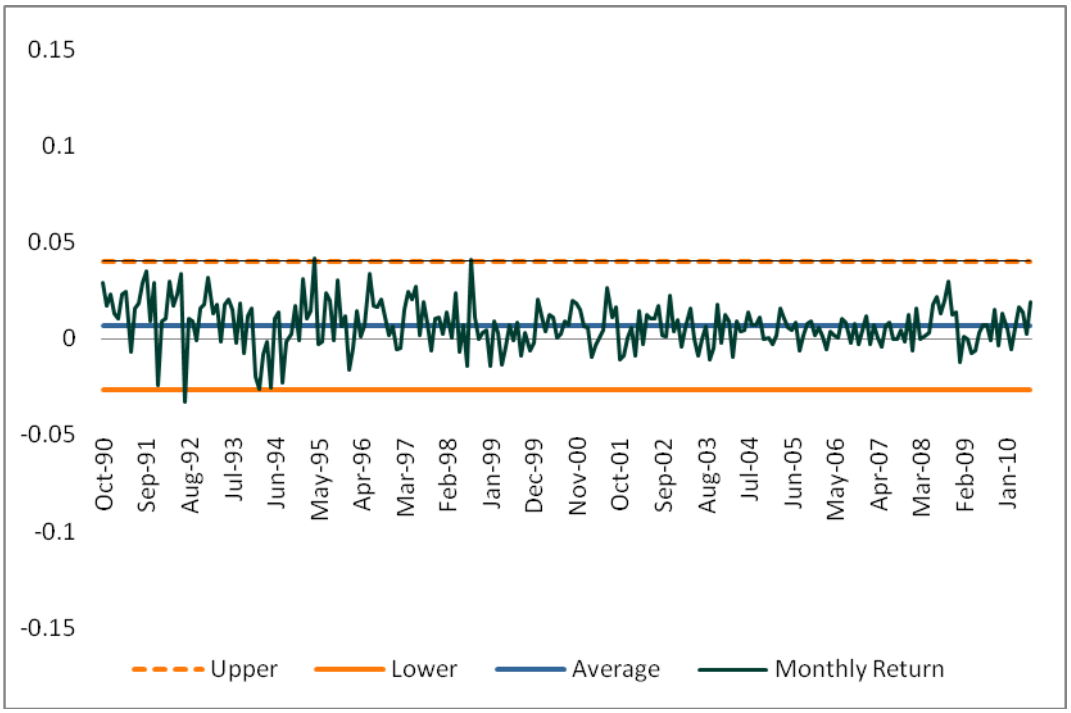


Source: Bloomberg and RBA

4.29 The cost of or return on debt can be estimated from the UBS Australian Composite Index. Figure 9 is a control chart indicating changes in the bond index. The figure displays index returns over a 20 year period from October 1990 to August 2010. The control chart displays the variability in debt returns and importantly it indicates that the process is in control even with the sub prime collapse and the global financial crisis.

4.30 The average debt return to August 2007 was 8.86% and to August 2010, the average return was 8.73%. This indicates that the variability in the cost of, or return to, debt has a normal amount of variability around a mean and that the mean return is relatively constant.

Figure 9 UBS Australian bond index returns



Source: Bloomberg and RBA

4.31 In summary, the UBS Australian Composite Bond Index has remained within the bounds of the control range while the All Ordinaries Accumulation Index has fallen below the lower bounds of this range due to the effects of the global financial crisis.

4.6 Implications

4.32 Calculating the WACC using parameters and estimates derived from financial markets in a state of crisis could result in an estimate that is inconsistent with accepted finance theory and is implausible.

4.33 The cause of the problem is known. The Capital Asset Pricing Model (CAPM) is used to estimate the cost of equity. While the model works perfectly in theory, it has a number of application issues. For example, the risk free rate parameter is estimated as a rate of the day, the equity beta is estimated over the medium term and the market risk premium is a long term estimate.

4.34 The cost of debt is the observed ten year yield on BBB+ rated corporate bonds. Due to illiquidity in the market, the yield on the bonds have risen substantially since the sub prime collapse while the yield on the Commonwealth

Government ten year bond has fallen. The overall effect is that the cost of equity has fallen and the cost of debt has risen.

4.35 The estimated parameters are then used as forward looking estimates. This is appropriate if the past is a reasonable approximation of the future. Clearly the equity control chart has shown that at present this is not the case. Past calculations using today's observations will not necessarily be reasonable estimates of the future.

4.36 The implausible relationship between debt and equity can be remedied by relying upon established finance theory and processes that are 'in control'. During the period 1990 to 2007 the average equity return derived from the All Ordinaries Accumulation Index was 14.8%. The average return on a portfolio of debt securities including corporate and government debt of differing duration was 8.73%. The average difference between an equity portfolio with an equity beta of one and a mixture of corporate and government debt is 6.07%.

4.37 The average return on equity during a period that includes the effects of the current global financial crisis is 11.58%. The difference between the return on debt of 8.73% and equity of 11.58% is 2.85%.

4.38 The WACC reasonableness check is the difference between the cost of debt and the cost of equity. The difference should be at worst 2.85% and on average 6.07%.

4.39 It is logical to argue that the adjustment should be 6% rather than 3% because 6% is the average difference that prevailed between 1990 and 2007 (that is, prior to the sub-prime collapse). A conservative approach would to take the mid-point between 3% and 6%, which is 4.5%.

4.7 Conclusion

4.40 The cost of equity is more expensive than the cost of debt due to the risk characteristics of the two sources of funds. Equity holders would normally require and receive, on average, a higher rate of return than debt holders. Since the global financial crisis in 2008 and sub-prime collapse in 2007, the actual returns to equity holders have diminished and debt holders are demanding greater yields due to the risk and illiquidity in the market.

4.41 The consequence of this current situation is that when the weighted average cost of capital is calculated by a regulator based on the standard regulatory approaches and assumptions, the difference between the estimated cost of

equity and the cost of debt has contracted. This result is due to the actual cost of equity being highly volatile. Additionally the return on equity is estimated from the historical data. The cost of debt is estimated using current market data and as a consequence of the global financial crisis, the outcomes we observe in the current market are not consistent with the long term relationship between debt and equity.

4.42 This implausible result can be overcome by using established relationships between the cost of debt and the cost of equity, at least as the basis of a 'reasonableness check'. This reasonableness check compares the difference between the estimated cost of debt and equity derived during these turbulent and uncertain times and the average difference that has prevailed over the longer term.

4.43 As a reasonableness check, based on the observed historical differences the cost of equity should be at least 4.5% above the observed cost of debt. This is considered conservative because the average difference between 1990 and 2007 was around 6%. This reasonableness check is applied in section 8.

5 Market risk premium

5.1 Background

5.1 In its previous decision for the APT Allgas distribution network the QCA determined a market risk premium (MRP) of 6%.

5.2 In its WACC Statements, the AER determined a MRP of 6.5% in recognition of the market conditions prevailing following the commencement of the global financial crisis (GFC). It has consistently applied this assumption in decisions made for both gas and electricity following the finalisation of the WACC Statements in May 2009. It has however flagged that a recovery from the GFC is likely to see it revert back to what is sees as the "long-term equilibrium" of 6%.[15] In its decision in relation to ETSA Utilities, it stated:[16]

> The AER considers that the Australia market is showing continued signs of recovery from the GFC and that there are some indicators that the MRP may have already returned to the long-term equilibrium of 6 per cent... The AER notes that a MRP of 6.5 per cent may be considered as conservative when accounting for current prevailing conditions, but notes that there is still insufficient evidence at this time to justify departure from the MRP determined in the SORI to one consistent with a more stable economic outlook.

It is noted that in this decision, it commented that the most relevant context was Australian capital market conditions, rather than international conditions.[17]

5.2 Current market conditions

5.3 While some signs of a global economic recovery had clearly emerged, renewed uncertainty has entered the market, emanating from concerns such as the risk of default by Greece. More recently, a 'second wave' to the crisis has been mooted. The Assistant Governor of the Reserve Bank recently acknowledged the risk that the world could fall into a double dip recession but the likelihood is hard to quantify.[18] The uncertainty regarding the global outlook was one of

[15] Australian Energy Regulator (2010b). Final Decision, South Australia Distribution Determination 2010-11 to 2014-15, May.

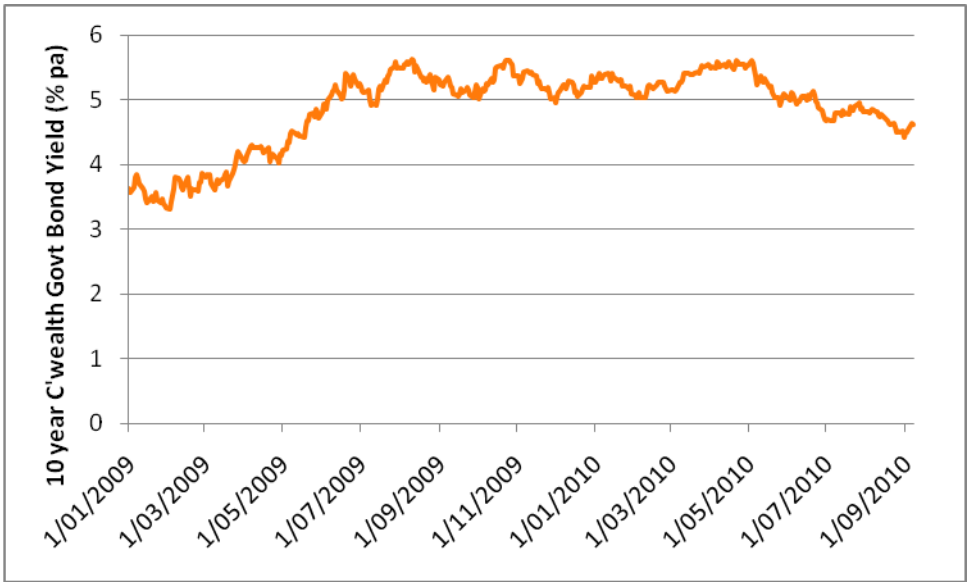
[16] Australian Energy Regulator (2010b). p.175.

[17] Australian Energy Regulator (2010b). p.175.

[18] "Risk of Double Dip Recession: Debelle", The Sydney Morning Herald, http://www.smh.com.au/business/risk-of-doubledip-recession-debelle-20100831-148ou.html

the reasons cited by the Reserve Bank of Australia in leaving the cash rate unchanged following its September 2010 meeting (being the most recent meeting held as at the date of preparation of this report).[19] It is also noted that the risk-free rate has reverted back towards the levels observed in the first half of 2009, as shown in Figure 10.

Figure 10 Risk-free rate: 1 January 2009 to 7 September 2010



Data source: Bloomberg

5.4 The following Box contains observations from a number of prominent organisations and commentators that have expressed concerns regarding the outlook for the world economy. We recognise that this is not fully representative of the sentiment across the entire market and that positive sentiments have also been expressed. We are not in a position to conclude whether the 'negative' or 'positive' scenario is more likely. However, this does support our contention that the outlook for the market remains uncertain.

[19] Reserve Bank of Australia (2010). Statement by Glenn Stevens, Governor: Monetary Policy Decision, 7 September, www.rba.gov.au.

Box 1 Observations on future of the world economy

Reserve Bank of Australia (2010), Financial Stability Review, March.

"Market sentiment in the major advanced economies remains fragile, and vulnerable to the possibility that further bad news could trigger a renewed heightening of risk aversion. The situation in the Asian region is very different; with the main risks at present being those associated not with risk aversion, but with rapid credit growth and rising asset prices." (p.2)

"Confidence, however, remains fragile. A particular concern, focused on Europe, is the effect of the build-up in government debt on sovereign credit risk and the potential for contagion to other funding markets. More generally, investors are wary about the resilience of economic and financial conditions to the withdrawal of the extraordinary stimulus policies that supported the recovery. An ongoing concern is the interplay between the financial sector and the real economy, as in many countries credit supply remains tight and loan losses continue to weigh on bank profits." (p.3)

World Bank (2010), Global Economic Prospects, Summer.

"...the very high government deficits and debt levels in several high-income countries (notably, Greece, Ireland, Italy, Portugal and Spain) has provoked a great deal of volatility in international financial (and even commodity) markets. So far, the main impacts for developing countries have been limited to a generalized decline in stock-market valuations, a significant fall in bond issuance in May (some due to seasonality), and an increase in volatility and a realignment of global currencies as the euro has depreciated against the dollar—to the benefit of exporters in countries tied to the euro, but to the detriment of those tied to the dollar." (Topical Appendix p.1)

The Economist Intelligence Unit (2010). The Global Recovery Starts to Weaken. September.

That said, many of the region's (EU) banks remain fragile and, to a greater extent than their US peers, vulnerable to funding constraints as a result of their dependence on the wholesale markets. It is estimated that euro zone and UK banks will have to refinance around €3.3trn of debt by 2015. The difficulties of refinancing on this scale in current market conditions and the higher costs likely to be faced by many banks augur ill for a robust recovery in credit in the EU over the short and medium term. (http://gfs.eiu.com/Article.aspx?articleType=gef&articleId=1147358499&secID=1)

The Economist Intelligence Unit (2010). Global Outlook Summary, August.

In the euro zone, concerns over government solvency continue to overshadow all else...We think Greece, for example, will eventually default, probably in 2012.(p.2)

OECD (2010). OECD Economic Outlook, Volume 2010/1, Number 87, May.

However, risks to the global recovery could be higher now, given the speed and magnitude of capital inflows in emerging-market economies and instability in sovereign debt markets...Overheating in emerging-market economies also poses a serious risk. A boom-bust scenario cannot be ruled out, requiring a much stronger tightening of monetary policy in some non-OECD countries, including China and India, to counter inflationary pressures reduce the risk of asset-price bubbles. (pp.9-10)

5.5 While we agree that the outlook for the Australian market is of primary relevance, it will continue to be strongly influenced by conditions in global markets and cannot be considered in isolation from them. It is clear that the Australian economy was not affected as severely as other economies as a consequence of the GFC. However, just as it is not possible to predict if a second wave of the crisis will be experienced, if it did occur it is not possible to predict how this will impact global capital markets or the Australian domestic market.

5.6 As outlined above, the AER increased the MRP to 6.5% in 2009 in consideration of the impacts of the GFC. Subsequent submissions have been lodged questioning whether this increase is sufficient. For example, the Victorian electricity distribution businesses lodged analysis by Officer and Bishop, who are both highly respected practitioners in the finance field in Australia.[20] Officer

[20] Professor B. Officer & Dr. S. Bishop (2009). Market Risk Premium, Estimate for 2011 – 2015, October.

and Bishop maintain that it is important to ensure that the forward-looking rate of return is commensurate with current market conditions and that, at the current time, the forward-looking MRP is well above the historical average as a consequence of the crisis.

5.7 As outlined previously, concerns have previously been expressed regarding the use of forward-looking estimates of the MRP, particularly as the short-term MRP is inherently volatile. Officer and Bishop's estimates are based on the implied volatility of options on the ASX 200 and spreads on corporate debt. They consider that recent advances in the derivation of these estimates provides sufficiently reliable evidence to justify a departure from the previously used method of using a long-term historical average MRP, noting that they anticipate that it will eventually revert to this mean, at which time, it would be appropriate to revert to this long-term average value method.

5.8 They consider this long-term average to be 7%. They estimate the forward-looking MRP to be 11% and consider the best estimate of the MRP over the period between 1 January 2011 and 31 December 2015 is between 7% and 8%. The Victorian distribution businesses proposed a MRP of 8%.The AER did not consider the evidence submitted by these businesses to be sufficiently persuasive to warrant a departure from its preferred estimate of 6.5%, noting that market conditions had "stabilised" since this decision was made.[21]

5.9 The Officer and Bishop analysis suggests that the value of the forward-looking MRP is more likely to be between 7% and 8% between 2011 and 2015. The analysis we have undertaken in section 4 that compares the historical returns on debt and equity also suggests that to the extent that debt margins spiked following the commencement of the crisis and have continued to remain at these levels, the premium that equity investors require will have similarly increased and we have no reason to believe that it will fall, at least for as long as this uncertainty remains in the market.

5.10 We are therefore of the opinion that currently, 6.5% is likely to be a 'lower bound' estimate of the forward-looking MRP . Based on the analysis presented in section 4, while there continues to be debate over parameter estimates such as the MRP, we consider it important to undertake an overall reasonableness check of the resulting cost of debt and equity estimates against the actual

[21] Australian Energy Regulator (2010c). Draft Decision: Victorian Electricity Distribution Network Service Providers, Distribution Determination 2011-2015, June, p.503.

returns that were observed historically (particularly when market conditions were more stable). This is examined further in section 8.

6 Beta

6.1 QCA history

6.1 In 2006 the QCA determined an equity beta for APT Allgas of 1.1. This decision was informed by a first principles analysis.[22] The main observations that were made about the systematic risk profile of the APT Allgas network are summarised below.

6.2 First, the QCA noted that commercial and industrial customers accounted for a significant proportion of demand and that this consumption will be more closely related to economic conditions than residential consumption. This in turn exposes the business to some systematic risk. It concluded that this exposure was higher than comparable service providers in other states:[23]

> ...it is clear that Queensland service providers have a much higher proportion of commercial and industrial consumption to total consumption, than do their counterparts in other states. Industrial and commercial consumption is likely to be closely linked to prevailing economic conditions, whereas residential consumption is likely to be less affected by changes to economic conditions. As such, the Authority is of the view that the systematic risk of the Queensland service providers is likely to be higher than the systematic risk of the service providers in other states.

6.3 Second, it considered that gas distributors had a greater level of systematic risk than electricity distribution because gas businesses are exposed to more competition from alternative energy sources:[24]

> The Authority is of the view that, in many instances, gas is a fuel of choice, while everyone generally connects to electricity. Because it is a fuel of choice, it faces competition from other sources of energy such as electricity and LPG. As such, the Authority accepts that the gas distributors will be subject to a greater level of systematic risk than the electricity distributors and that a higher equity beta is justified.

[22] Queensland Competition Authority (2006). Final Decision – Revised Access Arrangement for Gas Distribution Networks: Allgas Energy, May.

[23] Queensland Competition Authority (2006). p.75.

[24] Queensland Competition Authority (2006). p.75.

6.4 A review of the betas of comparable companies was undertaken by the QCA's consultant, the Allen Consulting Group. At the time, the measures were seen as being affected by the dot-com bubble, which in turn was seen as compressing the equity beta estimates for the Australian and US comparators examined. The QCA therefore concluded that "empirical estimates are not currently sufficiently accurate to be heavily relied upon."[25]

6.2 Other precedent

6.5 Prior to the Victorian Essential Services Commission's (ESC's) 2008 decision in relation to gas distribution, an equity beta of one was commonly applied to gas distribution and transmission. In this decision, the ESC determined an equity beta of 0.7.[26]

6.6 The ESC's decision was based on empirical analysis undertaken by its consultant, the Allen Consulting Group (we note that a first principles analysis was not undertaken).[27] ACG examined both Australian and US firms. The ESC concurred with ACG that more weight should be put on the Australian estimates although some regard should still be given to the US evidence. Based on ACG's results, it concluded that an equity beta range of 0.5 to 0.8 was most appropriate.[28]

6.7 ACG was subsequently engaged by the Joint Industry Associations (JIA) to consider the issues associated with estimating beta for electricity transmission and distribution businesses as part of the development of the AER's WACC Statements.[29] In this report, ACG highlighted significant problems with the data. In referring back to its analysis undertaken for the ESC in 2007/08, it suggested that the measurement period that was used in informing the ESC's decision was one of unusually low volatility and hence "depressed beta estimates for regulated electricity transmission and distribution businesses relative to other businesses." It states:[30]

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25 Queensland Competition Authority (2010). pp.75-76.

26 Essential Services Commission (2008). Gas Access Arrangement 2008-2012, Final Decision – Public Version, March.

27 Allen Consulting Group (2007). Empirical Evidence on Proxy Beta Values for Regulated Gas Distribution Activities, Report to the Essential Services Commission of Victoria, June.

28 Essential Services Commission (2008). p.476.

29 The Allen Consulting Group (2008). Beta for Regulated Electricity Transmission and Distribution, Report to Energy Networks Association, Grid Australia and APIA, September

30 The Allen Consulting Group (2008). p.1.

> Estimation of betas is subject to a high degree of imprecision, and the Australian data that are available for the estimation of the beta of a regulated electricity transmission or distribution business are depressingly poor. Upper bounds on confidence intervals for estimates of an equity beta value (at a gearing of 60 per cent debt to assets) from the set of portfolios of Australian businesses range from 0.9 to 1.2…
>
> Taking into account the limitations of the data set, the size and incompleteness of statistical error margins around the beta estimates, and evidence of a recent rising trend in beta estimates, we do not consider that current empirical evidence on beta values would provide convincing or persuasive evidence to conclude that the (60 percent geared) equity beta for a regulated electricity transmission or distribution business is different from 1.

6.8 ACG reiterated these views in a further report produced for the JIA in 2009 in response to the AER's draft decision. ACG was critical of the AER's proposed equity beta range of 0.44 to 0.68, which was based on the advice of Professor Henry. ACG restated its previous conclusions:[31]

> The strength of the empirical evidence that is available cannot demonstrate that the true value may not lie materially above (or below) the range of the central estimates. We remain of the view expressed in our previous report that, if the full imprecision of the current beta estimates is taken into account, there is not persuasive evidence for concluding that the equity beta for a benchmark electricity transmission or distribution entity is different to the previously adopted value of 1.

6.9 SFG Consulting also examined the AER's sample and was similarly critical:[32]

> In summary, it is difficult to imagine any set of estimates faring worse on these "key objective criteria." In my view, this indicates that the data that is required to produce reliable estimates simply does not exist. The estimates that have been produced are neither plausible nor economically reasonable and should not be afforded material weight.

[31] The Allen Consulting Group (2009). Australian Energy Regulator's Draft Conclusions on the Weighted Average Cost of Capital Parameters: Commentary on the AER's Analysis of the Equity Beta, Report to Energy Networks Association, Grid Australia and Australian Pipeline Industry Association, January.

[32] SFG Consulting (2009), The Reliability of Empirical Beta Estimates: Response to AER Proposed Revision of WACC Parameters, Draft Report Prepared for ENA, APIA and Grid Australia, 28 January.

6.10 Significant concerns have therefore been expressed regarding the quality of the data relied upon by the AER in determining equity beta to apply to electricity transmission and distribution businesses.

6.3 Review of the data

6.3.1 Estimation error

6.11 We examined current betas for a sample of Australian and US gas distribution firms. As highlighted above, one of the key issues with examining beta estimates for comparable companies is estimation error.

6.12 It is not possible to directly observe a firm's true beta. Instead, estimates are obtained by regressing the historical returns of a firm's shares against the historical returns for a market index, over the same time period. As with any statistical estimate, it is measured with uncertainty. This uncertainty is likely to be more pronounced for individual firms. As a consequence, the resulting data estimates can be of limited reliability and caution should be exercised in applying these estimates in a forward-looking analysis.

6.13 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.

6.14 There are a number of ways to address measurement error. As a starting point, any beta estimates with poor statistical properties[33] should be discarded (this is discussed further below). There are a number of other ways to deal with the uncertainty surrounding the estimation of beta, including:

- adjusting for thin trading, which is a common cause of measurement error, using techniques such as the Scholes-Williams technique;

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

- adjusting for mean reversion using the Blume adjustment[34] (which has generally been rejected by regulators for application in a regulatory context); and
- the formation of portfolios. Portfolio betas have substantially lower standard errors and yield more precise estimates of beta. While there are benefits in using this approach via reductions in the standard error, as more firms are used caution should still be exercised to ensure that they are relevant comparators.

6.15 A report by Gray et al provides a useful summary of the various methods of estimating beta, as well as their performance.[35] The study uses historical data to compare the predicted beta estimate in accordance with CAPM, with the actual equity return for the relevant forecast period. The closer the predicted estimate to the actual equity return, the better the estimation technique. A summary of the findings of the report are:

- 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.

6.16 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.

[34] 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).

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

6.3.2 Our preferred approach

Procedure

6.17 The key approach we apply in undertaking beta analysis is follows. First, we construct a sample of firms that are considered to be of most relevance to our firm of interest, recognising that there are no listed firms existing that will provide a 'like for like' comparison.

6.18 Second, we eliminate any estimates from the sample that had a t-statistic of less than two and an R-squared of less than 0.1 (noting that firms with t-statistics of less than two also tend to have very low R-squareds). The reasons for applying these filters are as follows.

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

6.20 The t-statistic is used to test statistical significance. It is calculated by dividing the standard error of the estimate by the beta coefficient. 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 high standard error indicates that the underlying distribution is large. A lower standard error is preferred as it indicates a more precise measure. This is done within a specified confidence interval (usually 95%). We have applied a threshold value of two in testing the statistical significance of our estimates.

6.21 The R-squared, or coefficient of determination, measures the explanatory power of the regression equation (that is, how much of the variability in the dependent variable can be explained by the independent variable). A low R-squared indicates that little of the variability in the returns on the relevant share can be explained by returns on the market. For a given level of 'noise' in the data, a beta estimate approaching zero will normally be accompanied by a very low R-squared.

6.22 We note that a low R-squared could legitimately reflect circumstances where the independent variable explains little of the variability in the dependent variable (that is, the returns of the market have limited bearing on the returns

of the firm). We would still maintain that an R-squared of less than 0.1 (or 10%) should still be viewed with caution, as this suggests that less than 10% of the variability in the firm's returns is explained by the returns on the market. However, of the two tests presented here, we view the t-statistic as more important.

6.23 We also note Gray et al's recommendations in relation to the formation of portfolios, as portfolio betas tend to have lower standard errors.[36] The benefits of the portfolio approach are only likely to accrue where the starting sample size (before the application of any statistical filters) is large. That is, the 'savings' or improvements in the standard error is a function of the average standard error of the sample and the number of firms in the sample.[37] We are therefore of the opinion that the sample must be of a reasonable size in order for this technique to be able to be applied.

6.24 Third, we eliminate any firms that have less than sixty months of data as we agree with Gray et al that monthly observations are preferable to weekly.

Outcome

6.25 There are only two listed Australian gas distribution businesses in our sample, being Envestra and APA Group. No Australian firms were eliminated based on our statistical filters. Six US firms remained in our sample (following application of the statistical filters), being: EQT Corporation, Ferrellgas Partners, Delta Natural Gas, Chesapeake Utilities, Northwest Natural Gas Company and South Jersey Industries. However, of these six firms it would appear that only Northwest Natural Gas is primarily engaged in gas distribution.

6.26 We consider that three firms (one of which is a US firm) is an inadequate sample to enable any robust observations to be made regarding betas of gas distribution firms. We therefore concur with ACG that in the absence of more reliable data, there is no persuasive case to depart from an equity beta of one, which we must also emphasise reflects the 'average' or 'benchmark' firm.

6.27 We do not accept that the starting point is 0.8, which was applied by the AER in the Jemena decision for example. Apart from the fact that this decision was based on the same dataset that has been subject to the concerns set out in section 6.2 above, it is not evident that there has been any detailed analysis

[36] S. Gray, J. Hall, R. Bowman, T. Brailsford, R. Faff, and R. Officer (2005).

[37] F. Choi, ed.(2003). International Finance and Accounting Handbook, Third Edition, John Wiley and Sons, p.23.

undertaken of the firm's systematic risk profile, including potential differences in the riskiness of gas relative to electricity.

6.28 In considering where APT Allgas might sit relative to the average firm, it is necessary to undertake a first principles analysis, which is set out below.

6.4 First principles analysis

6.29 A first principles analysis is a qualitative assessment of the firm's risk profile, the aim of which is to identify its systematic (or non-diversifiable) risk factors and assessing their likely impact on the asset beta. Lally identifies a number of factors to be considered here, including[38]:

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

6.30 A number of these factors are interrelated – that is, the impact of one factor on beta could either be increased or lessened by another factor. Hence, while the impact of each factor can be considered in isolation, the overall assessment will reflect the net impact of the factors in combination. Before these factors are examined a brief overview of the APT Allgas network is provided.

6.4.2 Overview of the APT Allgas network

6.31 APT Allgas owns and operates one of the two gas distribution networks servicing the major population centres in South East Queensland. The network is over 2,800 kilometres in length and services over 75,000 users.[39] It covers the

[38] M. Lally (2008). The Weighted Average Cost of Capital for Gas Pipeline Businesses, 28 October.

[39] http://www.apa.com.au/our-business/gas-transmission-and-distribution/queensland.aspx

region south of the Brisbane river to the northern tip of New South Wales, with separate networks in Toowoomba and Oakey.

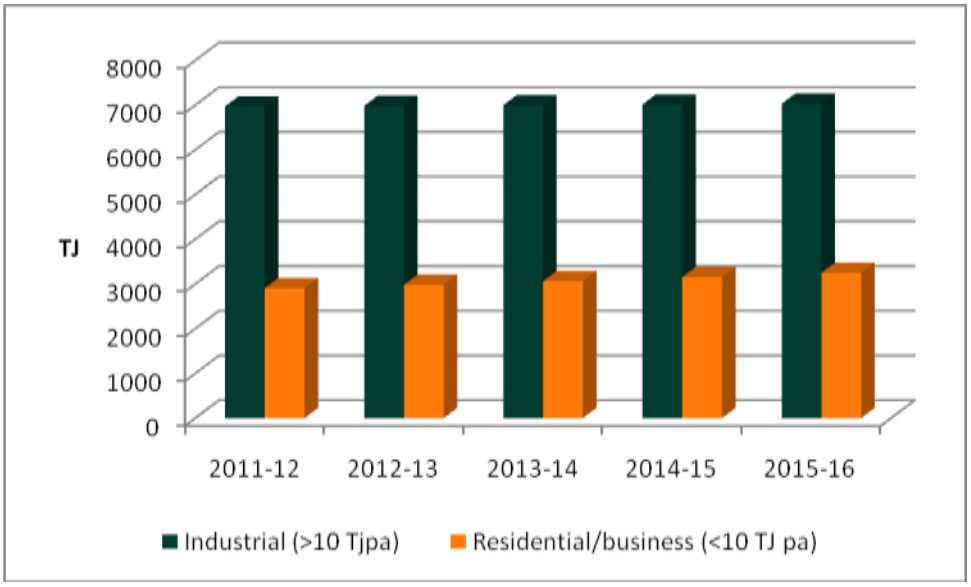
6.32 The two main customer classes are the Volume Class and Demand Class. Volume Class customers usually consume less than 10 TJ per annum. This category therefore includes residential and business customers.[40] Demand Class customers consume 10 TJ or more per annum and hence are the larger industrial customers.

6.33 Volume Class customers account for over 99% of customer numbers but less than one-third of total volumes. That is, around 70% of demand (in volume terms) is from industrial customers. In revenue terms however, Volume Class customers are projected to account for around 73% of total revenue, compared to 27% for Demand Class. APA has advised that residential customers account for around 38% of total revenue. This in turn means that around 32% of revenue is from commercial customers and 30% is from industrial customers.

6.34 The following figure shows forecast demand for the Volume and Demand classes for the horizon of the next Access Arrangement period.

[40] APA Group (2010). APT Allgas Energy Pty Limited, Load Forecast, Effective 01 July 2011 – 30 June 2016, 8 September, p.6.

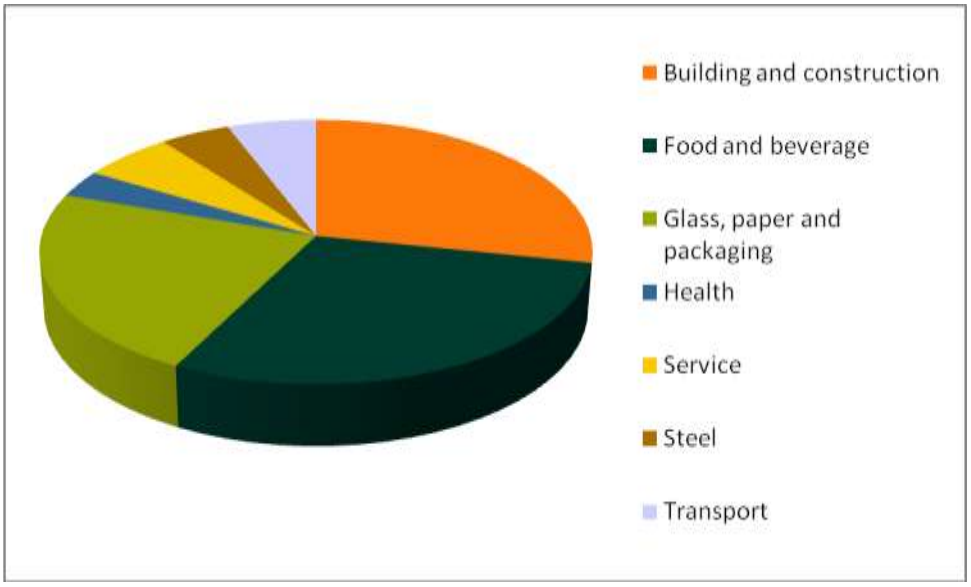
Figure 11 Volume forecasts by customer class



Data source: APA Group (2010). APT Allgas Energy Pty Limited, Load Forecast, Effective 01 July 2011 – 30 June 2016, 8 September, p.3.

6.35 Of the industrial customers, one customer, which is in the glass, paper and packaging sector accounts for approximately 14% of total forecast demand for the Demand Class. The top five customers account for close to 30% of forecast demand, with the top ten accounting for around 43.5%. Forecast demand by sector is shown in the following figure.

Figure 12 Volume forecast for industrial customers (Demand Class) by sector (2011-12 to 2015-16)



Data source: APA Group.

6.36 The food and beverage sector accounts for approximately 29% of forecast demand, followed by building and construction (around 28%). The next largest sector is glass, paper and packaging, accounting for around 23% (as outlined above, APT Allgas' largest customer is in this sector).

6.37 The key drivers underpinning these demand forecasts are discussed further below.

6.4.3 Nature of the product/nature of the customer

6.38 The first of the two factors that are considered as part of the first principles analysis are closely linked and so will be considered together.

6.39 For the purpose of beta, the objective of understanding the underlying market for the relevant product is to identify the key drivers of demand and the extent to which these drivers have a relationship with domestic economic activity. Systematic risk measures the sensitivity of the firm's returns to changes in economic activity. Demand only explains part of this, being revenues (albeit a very important part). The sensitivity of returns will also be influenced by the relationship between demand and costs. This is considered separately under the factor 'operating leverage'.

6.40 As outlined above, gas is used by residential, commercial and industrial customers. It is therefore important to understand each sector's contribution to

total demand (and hence changes in volume), the key demand drivers and their relationship with domestic economic activity.

6.41 The International Energy Agency states that the utilisation of gas in a region will be influenced by a number of factors that have influenced the historical development of the industry, including:[41]

> ...the overall demand for energy in stationary uses and the underlying economic activity driving that demand; the proximity of resources and the cost of delivering them to market; the competitiveness of gas against alternative fuels; climate (which affects, in particular, the need for fuel for space and water heating); technological developments affecting the way gas and alternative energy sources are used; and the policy, geopolitical and regulatory environment.

6.42 It summarises the main drivers of gas demand in the residential and industrial sectors as follows.

Table 2 Drivers of gas demand

Sector	Economic	Price	Policies	Technology
Residential	Some remaining potential for raising boiler efficiency, including in CCGT combined heat and power plants.	Gas use in buildings is relatively insensitive to price (in absolute or relative terms).	Standards, labelling and subsidies for insulation and efficient (low-emission) boilers/coolers can strongly affect demand.	Improved efficiency and reliability of condensing boilers could boost deployment and lower gas demand.
Industrial	Industrial production is the main driver; less scope for efficiency gains compared with buildings.	Limited short-term switching capability and gas usually the preferred fuel for new equipment (boilers and processing).	In some countries, gas price regulation and policy can favour gas use for environmental reasons.	Some remaining potential for raising boiler efficiency, including in CCGT combined heat and power plants.

Source: International Energy Agency (2009). World Energy Outlook, OECD/IEA, p.375.

6.43 These drivers are explored in more detail in the next section. The implications of this for beta will then be considered.

[41] International Energy Agency (2009). World Energy Outlook, OECD/IEA, p.374.

Residential demand drivers

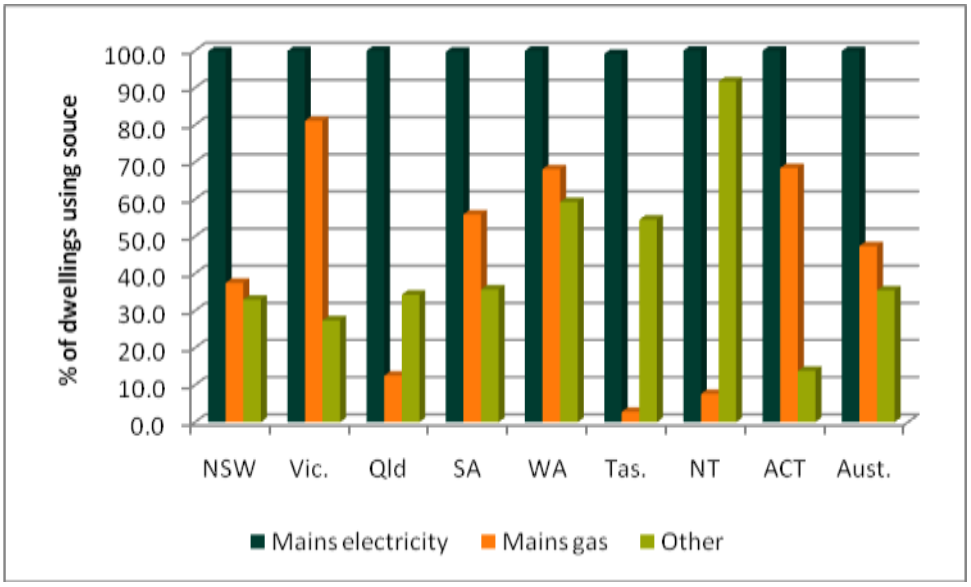
6.44 As concluded by the QCA, gas is generally considered a 'fuel of choice' that faces competition from other energy sources. This contrasts with electricity, which is a 'fuel of necessity' and is typically connected to every building. As noted by the International Energy Agency:[42]

> Gas can be substituted by at least one other fuel in every application (transformation and end uses), such that inter-fuel competition is typically keen. Although flexibility is very limited in the short term — most gas users are not physically capable of switching to an alternative fuel at short notice — end users are almost always faced with a choice of fuel when deciding what type of energy-consuming equipment to install, whether it is a boiler, heating or cooling system, or power plant.

6.45 The source of energy used for residential purposes varies by State, which is also likely to reflect differences in factors such as climate and government policy. The following figure shows the percentage of households that utilise each energy source in each Australian State and Territory in 2008.

[42] International Energy Agency (2009). World Energy Outlook, OECD/IEA, p.378.

Figure 13 Energy sources used in dwellings (2008)



Data source: Australian Bureau of Statistics (2008). Environmental Issues: Energy Use and Conservation, Catalogue 4602.0.55.001 Table 3.5.

6.46 As would be expected, as a 'fuel of necessity' electricity is used in nearly 100% of dwellings in each State and Territory (reflecting connections to the network). In Queensland, only 12.5% of dwellings utilise mains gas, which is notably lower than the other states, with the exception of Tasmania and the Northern Territory.

6.47 These differences are significant in this context. First, it highlights a fundamentally important difference between a gas and electricity network business. Second, this in turn could lead to differences in the systematic risk of the APT Allgas network relative to the 'average' distribution pipeline business or benchmark firm. It is therefore important to understand what these differences are, what factors influence the demand for gas relative to alternative energy sources and to what extent they are relevant to systematic risk.

6.48 Gas can be used for a number of different purposes in the home, including cooking, heating and hot water. The use of gas in the home will in the first instance be influenced by the connection to (or ability to connect to) the distribution network. For the purpose of establishing its demand forecasts, APA distinguishes between new and existing dwellings. This is because most of the growth opportunities in the residential sector are for new dwelling starts, including new housing estates.[43]

[43] APA Group (2010).

6.49 APA has observed that if an existing dwelling is not already connected to gas, it is less likely to switch to gas appliances, particularly if the lead time for connection and installation is a driver in the purchase decision (this is discussed further below). Growth in its customer volumes is therefore heavily dependent on the state of the construction industry and new housing starts.[44] This also further highlights how contestable gas is as an energy source, given electricity will always be connected to these new homes.

6.50 The use of gas will then be driven by decisions regarding the use of different appliances for different applications in the home. As noted above, as a 'fuel of necessity', electricity is generally connected to every home and can be used for all applications requiring energy. As a 'fuel of choice, gas can be used for some, but not all of these applications.

6.51 These decisions in turn will be influenced by a number of factors, including income, energy efficiency, the environment and government policy initiatives. These factors will also vary depending on the appliance. For example, APA has observed that:[45]

> …drivers in the selection of hot water system (sic) include Government policy, cost and lead times for installation, whereas the selection of a cooking appliance is more likely to be a lifestyle choice, driven by personal preference.

6.52 APA has analysed trends in residential consumption in detail as part of the development of its volume forecasts. The key issues and risks that it has identified, and their implications for demand, are summarised below.[46]

Competition from electricity for cooking appliance selection

6.53 This choice will be driven by income, lifestyle and personal preference. In the past, the key benefits of gas over electricity in cooking were seen to be instant heat and controllable temperature. However, the development of more responsive electric induction cook-tops could potentially erode this advantage, particular if the consumer is making a decision regarding the

44 APA Group (2010). p.12.

45 APA Group (2010). p.13.

46 APA Group (2010). pp.13-30.

upgrade/replacement of an existing electric cooking appliance. In Queensland, mains gas was used in 15.8% of dwellings for cooking appliances in 2008.[47]

Competition for electricity for space heating appliance selection

6.54 As outlined above, the potential market for this in APT Allgas' service area is small. In Queensland, less than 1% of dwellings used mains gas for heating purposes in 2008, although 55.4% did not use a heater at all.[48]

6.55 High penetration of reverse cycle air conditioners is emerging is a key competitor. If a customer already has (or requires) an air conditioner this eliminates the need to purchase an additional appliance for heating needs. They also offer operating cost advantages.

Competition from other fuels for hot water system appliance selection

6.56 Natural gas hot water systems are the largest sources of demand in the residential sector. In Queensland, 7.4% of dwellings used mains gas for water heating in 2008, which was down from 9.2% in 2005.[49] 59.8% of dwellings used electricity, with 49.3% using off-peak electricity. This was the highest level of off-peak electricity use for this purpose across all of the Australian States and Territories.[50]

6.57 The other key competitor for hot water appliances is solar. Solar heating overtook mains gas as a source of fuel for water heating in Queensland in 2008, being used in 8.5% of dwellings (compared to 7.4% for mains gas).[51] This increased from 5.6% in 2002 and 5.9% in 2005.[52] In its demand forecast, APA observes:[53]

> Solar hot water systems enjoy high awareness and well established 'sustainable/green' market positioning, due to Government financial

47 Australian Bureau of Statistics (2008). Environmental Issues: Energy Use and Conservation, Catalogue 4602.0.55.001 Table 3.7.

48 Australian Bureau of Statistics (2008). Table 3.8.

49 Australian Bureau of Statistics (2008). Table 3.10.

50 Australian Bureau of Statistics (2008). Table 3.10.

51 Australian Bureau of Statistics (2008). Table 3.11.

52 Australian Bureau of Statistics (2008). Table 3.11.

53 APA Group (2010). p.15.

support and combined extensive advertising and promotion by a well-resourced sales and manufacturer sector.

6.58 It notes that the comparative high cost of purchasing and installing solar hot water is currently mitigated by a number of rebates and incentives for solar hot water purchase and installation, including:[54]

- RECS created by solar hot water lower the cost of purchase by up to $1,200;
- The Federal Hot Water Rebates reduces the cost of purchase by $1,000 for solar hot water;
- The Queensland Government Solar Hot Water Rebate offers a rebate of $600 (or $1,000 for pensioners and low income earners) for installation of a solar hot water system.
- Brisbane City Council offers a $50 discount on the plumbing inspection fee for newly installed solar hot water systems.

6.59 No such incentives are currently available for choosing gas hot water. The Queensland Government implemented a Residential Gas Installation Rebate Scheme, which provided a $200 to $500 incentive to replace existing electric appliances with gas, however this ceased in August 2009.

6.60 The other key source of competition that is emerging is heat pump hot water systems, which are also eligible for certain Government rebates and incentives. They are quick and easy to install as they can easily be connected to the existing electricity supply, which is particularly important if the consumer is replacing an existing electric storage unit that has failed (connection can be done on the same day, whereas it can take up to fifteen days to connect a natural gas to a dwelling[55]). They also offer operating cost advantages compared to conventional storage systems.[56]

6.61 As part of the Queensland Government's ClimateSmart 2050 Strategy, the Queensland Government introduced a mandatory requirement that all new houses and townhouses are required to install a greenhouse efficient hot water

54 APA Group (2010). p.16.

55 APA Group (2010). p.16.

56 APA Group (2010). p.16.

system, which is gas, solar or heat pump.[57] From 1 January 2010, this requirement will be extended to existing homes but only when the existing electric hot water system needs replacement (this applies to electric resistance systems only, which is the most common type of system). It also only applies where the home is located in a reticulated natural gas area.

6.62 APA has analysed the impact of this on demand as part of the development of its load forecasts. It anticipates a zero per cent share of this market for the following reasons:

- a report it cites by George Wilkenfield and Associates argues that the most influential factors in influencing the decision to replace a hot water system when the existing unit fails are the initial capital cost and speed of replacement:
  - natural gas can be disadvantaged in terms of speed of replacement as it can take up to fifteen days to install;
  - natural gas does not have a high initial capital cost however is currently disadvantaged relative to solar and heat pumps given the Government incentives;
- natural gas selection is also disadvantaged by a lack of qualified installers. APA observes:[58]

> While 61% of home owners will make a plumber or hot water specialist their first point of contact in the case of hot water failure, only 28% of Queensland plumbers are licensed gas fitters. The remaining 72% have a clear disincentive to recommend a hot water unit that they are not qualified to install.

6.63 As noted previously, APT Allgas' growth market has been identified as new dwellings and housing estates. The mandatory requirement applying to new dwellings has been in place since 2006. However, between 2005 and 2008, the use of mains gas hot water has fallen rather than risen in Queensland, having being overtaken by solar. APA's conclusions regarding the impact of the extension of this requirement to existing dwellings therefore do not appear to be unreasonable, particularly if regard is given to the reasons set out above.

[57] Department of Infrastructure and Planning. Electric Hot Water System Phase Out: The Facts, http://www.dip.qld.gov.au/resources/factsheet/sustainable-living/electric-hot-water-system-phase-out.pdf

[58] APA Group (2010). p.18.

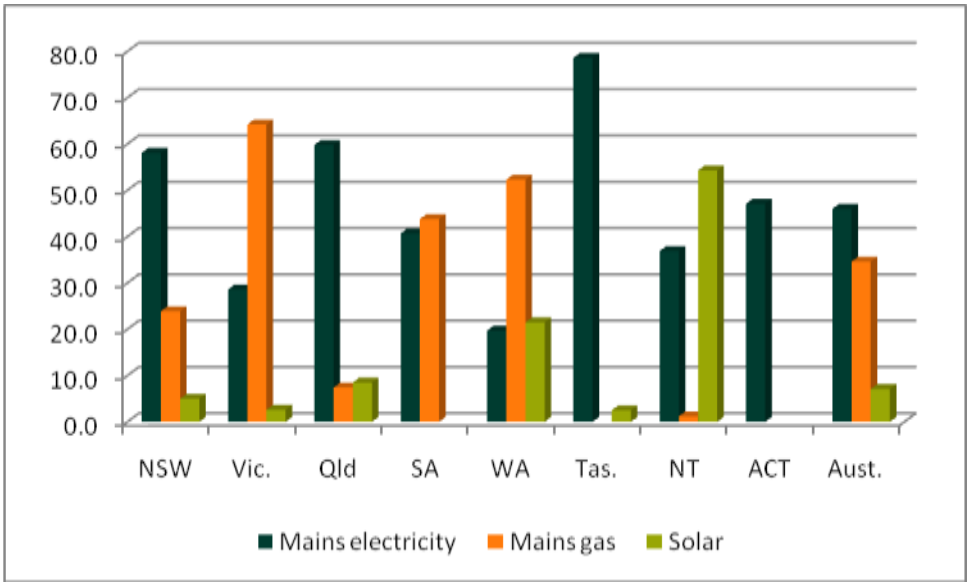
6.64 The final factor influencing the demand for gas in water heating is the demand for water. APA observed a decline in consumption for its Volume Class customers between 2006-07 and 2007-08, which was attributed to the decline in water usage as a consequence of the drought in Queensland (noting that this sector includes residential and commercial customers).[59] As a consequence of the drought many households installed water efficient devices (such as low flow shower heads), which will result in a permanent reduction in water consumption into the future. Despite the combined capacity of South East Queensland dams being at 95.3%, in September 2010 average daily consumption remains at 149 litres per person per day[60], which is only slightly above the target level of 140 litres per person per day introduced by the Queensland Water Commission in 2007 when the region was in the grip of the severe drought.

6.65 Overall, while natural gas hot water systems are the highest consumers of gas used in Queensland homes (and hence important to residential demand), the utilisation of mains gas for hot water is very low in Queensland compared to most of the other Australian states. The following figure compares the utilisation of electricity, mains gas and solar in each State in 2008.

[59] APA Group (2010). p.25.

[60] http://www.qwc.qld.gov.au/. As at 3 September 2010.

Figure 14 Energy sources used for hot water appliances in dwellings (2008)



Data source: Australian Bureau of Statistics (2008). Environmental Issues: Energy Use and Conservation, Catalogue 4602.0.55.001 Table 3.10.

6.66 Based on the preceding analysis, the outlook for mains gas penetration in this market could be a further decline, particularly while the Government incentives remain in place for solar and heat pump technologies.

6.67 This section has demonstrated the intensity of competition that APT Allgas is exposed to in the residential sector. This in turn is evidenced by the $700,000 in marketing costs that has been forecast for the business (as advised by APA).

6.68 However, while a number of risks have been identified for APT Allgas, the key issue for beta is the extent to which these risks are systematic, or non-diversifiable, in nature. This question is considered below.

Commercial and industrial demand drivers

6.69 Competition from substitutes is also relevant in the commercial and industrial sectors. For example, APA has advised that there remain significant industrial loads in Brisbane that would be able to use natural gas that continue to source their energy from coal.

6.70 Once a decision has been made to connect to gas, or employ gas-fired technology, the consumption of gas by commercial and industrial customers

will tend to be driven by changes in economic activity. The International Energy Agency observes that:[61]

> In all markets, the level of economic activity is the primary determinant of demand for natural gas: economic growth typically correlates closely with increasing gas use in those sectors in which it is already well established.

6.71 It also notes that technological improvements (including energy efficiency) "will impact fuel choice and gas consumption in all sectors."[62] It considers that the potential for technology-induced efficiency gains will be greater in the commercial and residential sectors, which will also be influenced by Government policies and incentives.

6.72 As outlined in section 6.4.2, the food and beverage sector accounts for approximately 29% of forecast demand for APT Allgas over the next regulatory period. Production in this sector would be expected to be less sensitive to movements in the general economy. However, the next two largest sources of demand, being building and construction (around 28%) and glass, paper and packaging (around 23%), will be more sensitive to movements in the general economy. New housing starts are generally recognised as being an indicator of domestic economic activity. This will not only influence demand from industrial customers in the building and construction sector, but as previously outlined, will be a key driver of residential demand for APT Allgas given most of the growth in this sector is from the construction of new dwellings and housing estates.

Nature of the product/nature of the customer: implications for APT Allgas beta

6.73 This section will consider the implications of the preceding analysis for APT Allgas' systematic risk. While such an analysis will not arrive at an estimate for beta, what it will inform is how this risk profile compares to the 'average' (or benchmark) Australian gas distribution business. This will be examined at the end of this section.

[61] International Energy Agency (2010). p.375.

[62] International Energy Agency (2010). p.385.

Residential sector

6.74 The relevant question for the assessment of beta is the sensitivity of returns to domestic economic activity and how this might be influenced by the nature of the product or service and the nature of the customer. As noted previously, the focus of this section has been on demand, which drives revenues, because the impact of costs is considered under a separate factor, being operating leverage, which is examined below. The relationship between demand and revenue is examined under 'pricing structure'.

6.75 In relation to residential demand, the main factors to be considered here are:

- the income elasticity of demand;
- other potential linkages between residential demand and domestic economic activity;
- competition from substitutes, which is relevant in assessing exposure to market risk as well as market power (which is considered separately below).

6.76 Residential demand may be considered less sensitive to income, at least in the short run. Change in income is likely to have less influence over the day to day energy consumption however it could influence the choice of appliances. There are few estimates available of the income elasticity of the demand for gas. An Australian study by Akmal and Stern showed that residential electricity demand is income inelastic, whereas residential gas demand has an income elasticity that is greater than one.[63] This suggests that gas demand does have some sensitivity to changes in income, particularly compared to electricity.

6.77 The other main linkage between residential demand and economic activity is in APT Allgas' key growth area, which is new housing starts. The construction of new dwellings will be influenced by movements in the general economy:[64]

> Housing starts are a leading economic indicator and are an important source of information when it comes to the general economic outlook. Changes in starts directly impact on the housing and construction industry and indirectly impact on those industries that depend upon it.

[63] M. Akmal and D. Stern (2001). The Structure of Australian Residential Energy Demand, Working Papers in Ecological Economics, The Australian National University, Canberra.

[64] J. Flaherty and R. Lombardo (2000). Modelling Private New Housing Starts in Australia, Pacific Rim Real Estate Society Conference.

6.78 A paper by Flaherty and Lombardo sought to model the relationship between housing starts and GDP. They found that the relationship operates with a lag and the general state of the economy does clearly influence housing starts:[65]

> The results…confirm that this is indeed the case; developers or builders take account of current and past GDP information.

6.79 In our opinion, the key issue for APT Allgas' systematic risk profile is competition from substitutes, which has been addressed in detail above, reflecting the QCA's previous conclusion that gas is a 'fuel of choice'. The reason that competition from substitutes is relevant is because the availability of substitutes will influence the extent to which the firm is exposed to market risk, including the extent to which it can increase its prices in response to changes in demand and/or costs. More importantly, it also influences the extent to which the business can exercise market power (which is considered separately below).

Industrial and commercial sectors

6.80 While we consider that this is some relationship between APT Allgas' residential demand and domestic economic activity, the consumption of gas by the commercial and industrial sector could be expected to be more closely related to movements in the general economy. In a report prepared of the Commerce Commission in New Zealand, where commercial and industrial customers account for a higher proportion of gas demand, Lally concluded that the beta of a gas business is likely to be higher than electricity: [66]

> The supply of gas or electricity to commercial and industrial users constitutes an intermediate product whose demand will be driven by the demand for final goods and services. The demand for these final goods and services is likely to be more sensitive to macro economic shocks than the demand for electricity or gas by residential users. So, with gas supply more heavily tilted towards commercial and industrial users than for electricity, the demand for gas is likely to be more sensitive to macro economic shocks. This implies a higher asset beta for the gas pipeline businesses than for the electricity lines businesses.

We concur with this assessment.

[65] J. Flaherty and R. Lombardo (2000).

[66] M. Lally (2008), The Weighted Average Cost of Capital for Gas Pipeline Businesses, October, pp.63-64.

Composition of APT Allgas' revenue base compared to other gas distribution businesses

6.81 The preceding analysis has already highlighted potential differences in the demand drivers between states, particularly in relation to residential demand. It is also important to compare the sectoral composition of gas demand for other distribution network businesses in Australia.

6.82 As outlined in section 6.4.2, Volume Class customers (being less than 10 TJ per annum) account for less than one third of volumes in the APT Allgas network, which includes residential and commercial customers. Information for other distribution businesses is presented below. When comparing with the other businesses it is important to note that in some cases the data is presented based on Volume Class (which would include residential and small commercial customers) or by sector (that is, residential and other). Data was also sourced over different time periods, depending on availability. However it is expected that the customer composition would not vary significantly through time.

- Country Energy (Wagga Wagga): volume customers = 57%[67]
- Envestra (Victoria): residential customers = 75%[68]
- Envestra (Albury): residential customers = 74%[69]
- Multinet (Victoria): residential customers = 88%[70]
- SP AusNet (Victoria): residential customers = 83%[71]
- Jemena (New South Wales): residential customers = 30%, residential and business (equivalent to APT Allgas' Volume Class) = 41%[72]
- ACTEW AGL (ACT): residential customers = 65%, residential and business (equivalent to APT Allgas' Volume Class) = 85%[73].

[67] Country Energy Gas Networks (2010). Access Arrangement for the Wagga Wagga Natural Gas Distribution Network, July, p.6.

[68] Essential Services Commission (2008). Gas Access Arrangement Review 2008-12, Final Decision – Public Version, March, p.536. Average over forecast period (2007 to 2012).

[69] Essential Services Commission (2008). p.536. Average over forecast period (2007 to 2012).

[70] Essential Services Commission (2008). p.536. Average over forecast period (2007 to 2012).

[71] Essential Services Commission (2008). p.536. Average over forecast period (2007 to 2012).

[72] Jemena Gas Networks (2009). Access Arrangement Information, Appendix 5.2, NEIR: Natural Gas Projections NSW Jemena Gas Networks to 2019, August, p.49. Average 2008-2012.

[73] Actew AGL (2009). Natural Gas Projections for Actew AGL Distribution, Prepared by the National Institute of Economic and Industry Research, May, p.45. Average 2008-2012.

6.83 This shows that the composition of APT Allgas' demand is different from the other states, with the exception of Jemena's NSW distribution network. One of the key reasons for this difference would be the higher demand for gas for heating purposes in the southern states. As noted above, it is used by less than 1% of dwellings in Queensland for this purpose. On the other hand, for heating purposes it is used by 17% of dwellings in New South Wales, 66.5% in Victoria, 26.6% in South Australia and 35.1% in Western Australia.[74] Residential demand for gas for heating purposes will be heavily influenced by climatic conditions, which is not correlated with domestic economic activity.

Conclusions

6.84 Overall, we can conclude the following.

First the demand for gas for residential use has *some* relationship with domestic economic activity, because:

- the demand for gas has a positive income elasticity of demand;
- APT Allgas' key growth market is new housing developments, which are positively correlated with domestic economic activity;
- APT Allgas does not have substantial market power. It faces strong competition from substitutes in all of the applications for which gas is used, in particular, the competition that it is exposed to from solar energy (and to a lesser extent, heat pump technology) in the water heating market, which is its largest potential market in the residential sector. Queensland has one of the lowest penetrations of gas in dwellings of any Australian state. While a number of the factors that influence the choice of energy source are not related to the domestic economy (such as government policy initiatives), what is relevant to this assessment is that:
  - to the extent that demand has a relationship with domestic economic activity (via income and new dwelling construction activity), gas is exposed to higher market risk because it is a 'fuel of choice' relative to electricity, which increases the sensitivity of the firm's revenues to domestic economic activity (costs are considered separately below);
  - more importantly, this significantly reduces its market power, which is examined separately below.

[74] Australian Bureau of Statistics (2008). Table 3.8.

6.85 APA has advised that the residential sector accounts for less than one-third of volumes on the APT Allgas network and around 38% of total revenue.

6.86 Second, industrial and commercial demand will generally be more sensitive to economic activity. As noted above, industrial and commercial demand accounts for a relatively higher proportion of the demand for gas in Queensland relative to the other States. Together, industrial and commercial demand accounts for over 60% of APT Allgas' total revenue.

6.87 We cannot use this assessment to quantify the potential magnitude of APT Allgas' volume-related systematic risk or estimate the impact of this on beta. However, we can conclude that based on these factors, this will suggest a higher beta for APT Allgas relative to the other major distribution networks in Australia.

6.4.4 Pricing structure

6.88 Of key interest here is what proportion of APT Allgas' revenues from providing gas distribution services is fixed and how much is variable. In the short-term, it is the variable proportion that is 'at risk' depending on changes in demand (the extent to which such demand risk might be systematic in nature was considered in the previous section). The revenue protection provided by the fixed component depends on the length of the contract, which is only relevant for industrial customers.

6.89 There are two main components to the tariff charged to customers, being a fixed charge or capacity component, and a volumetric charge. Volume Class customers pay a 'Standing Charge' (the fixed component), plus a volumetric charge depending on daily usage (there are three tariff categories or volume bands for this component). Demand Class customers have a similar tariff structure however there are five volume bands for the volumetric component.

6.90 Of key interest here is the revenues from the Volume Class given these customers account for around 73% of total revenue (noting that this includes both residential and commercial customers). This in turn would reflect the fact that this sector accounts for the majority of customer numbers and each of these customers would be paying a Standing Charge. Over the term of the access arrangement period the Standing Charge will account for approximately 42% of forecast revenues from Volume Class customers. That is, over 50% of revenues are volume-sensitive for this customer class.

6.91 To the extent that this demand has some systematic component, this volume-sensitive proportion of revenues contributes to APT Allgas' systematic risk. This issue also needs to be considered within the context of any further protections provided in its contracts, which are considered below, as well as the form of regulation.

6.4.5 Duration of contracts with customers

6.92 The existence of term contracts that commit customers to a certain volume provides some protection to revenues, at least for the term of the contract (and provided the counterparty remains solvent). This is usually only relevant for industrial customers.

6.93 APA has advised that only one of its industrial customers has a contract. These contracts only tend to be written if new capital expenditure is required to facilitate the connection of that customer to the network. Otherwise, a customer's usage can be terminated as and if required. Residential and commercial volumes are delivered via a Use of System Agreement with the retailer. APA has advised that users can disconnect at any time under this arrangement.

6.94 We can therefore not conclude that term contracts provide APT Allgas with any additional revenue certainty.

6.4.6 Market power

6.95 Most natural monopoly service provides possess market power. This is a key reason why these assets are subject to regulation, which significantly constrains the ability of the business to exercise that power to its advantage.

6.96 While APT Allgas clearly has a monopoly over the gas distribution network, the extent to which it is able to exercise market power will ultimately be driven by the availability of substitutes for gas as an energy source. In other words, while APT Allgas may have market power in relation to access to its distribution network, it has no real ability to exploit this market power if the underlying demand for gas is subject to competitive market forces. Lally observes:[75]

[75] M. Lally (2004). The Weighted Average Cost of Capital for Gas Pipeline Businesses, Report Prepared for the New Zealand Commerce Commission, University of Wellington, p.36.

> In respect of gas pipeline businesses, they seem to be local monopolists but their monopoly power may be diluted by the countervailing power of their large customers and the presence of competing power sources. So, if monopoly power affects beta, then the effect of any such countervailing power and competing energy sources would be to mitigate that beta effect.

6.97 Differences in market power have previously influenced regulatory decisions in relation to beta. For example, the asset beta that the ACCC determined for the Australian Rail Track Corporation's (ARTC's) interstate network (0.65)[76] is materially higher than the asset beta it has proposed for the Hunter Valley coal network (0.5).[77] Both decisions relate to a below-rail network. However, the key difference is that the demand for access to ARTC's interstate freight network is vulnerable to intermodal competition from alternative transport modes such as road and air. In its decision for the interstate network, it stated:[78]

> ...it should be noted that ARTC operates under some market demand and price constraints due to inter-modal competition. This is the principle reason it operates well below its revenue ceiling on major segments. As such, it bears some market risk and if the economy does badly (or well) ARTC will lose (or gain) business and profits. This is different to a typical regulated business, such as electricity distribution or transmission, that can simply raise prices if demand drops and, therefore, bears far lower market risk.

6.98 APT Allgas is similarly exposed to market risk. Gas has a relatively low market share in Queensland compared to the other states and has no real prospects for growth. In the residential sector, it is particularly exposed to competition when the customer is making a decision as to the type of appliance to install. As noted above, the market where consumers are able to exercise most choice is in the new housing market. Activity in this market will be related to movements in the general economy.

6.99 This issue is also relevant in the industrial sector. With the top ten customers accounting for around 43.5% of volumes in this sector, these buyers will be in a

[76] Australian Competition and Consumer Commission (2008). Final Decision, Australian Rail Track Corporation, Access Undertaking – Interstate Rail Network, July.

[77] Australian Competition and Consumer Commission (2010). Australian Rail Track Corporation Limited, Hunter Valley Coal Network Access Undertaking, Draft Decision.

[78] Australian Competition and Consumer Commission (2008). pp.155-156.

position to exert countervailing power. This is particularly significant given the absence of long-term contracts in this sector. Apart from the exposure to competition from substitutes, the existence of this countervailing power further reduces APT Allgas' market power.

6.100 Overall, consumers have significant countervailing power given their ability to switch to an alternative source of energy supply. Given the absence of contracts, APT Allgas' revenues have no additional protection from losses in volumes in the short to medium-term. Further, given its operating leverage is high (refer below), the loss of a major customer has no real impact on costs as the majority of APT Allgas' costs are not avoidable.

6.101 The presence of market power tends to have a dampening effect on beta. Conversely, other things being the same, the absence of market power in an entity will tend to result in it having a higher beta than another which is possessed of market power. Based on the arguments outlined above, the availability of substitutes means that APT Allgas does not possess market power in the markets that it operates in.

6.4.7 Nature of regulation

6.102 APT Allgas will be subject to a price cap form of regulation. In theory, a business that is subject to a price cap form of regulation compared to a revenue cap is exposed to higher systematic risk to the extent that:

- the volume risk it is exposed to is systematic in nature
- demand and costs are not related (the majority of APT Allgas' cost base is fixed, as will be discussed below).

6.103 In the development of its WACC Statements, the AER noted that the form of regulation may influence a regulated service provider's exposure to systematic risk, provided the two above arguments hold. However, in its final WACC Statements it noted that neither industry nor users considered that there was a case to set a different equity beta depending on the form of control. The AER concurred with this.

6.104 We accept that the implications of the form of regulation for beta are unclear. It is difficult to empirically estimate the contribution that each of the different systematic risk factors have on beta, let alone form of regulation (which would necessitate having a sample of firms that are identical in all respects other than for the form of regulation). However, this does not necessarily mean that no distinction should be made.

6.105 On the one hand, we note that regulators including the AER have concluded that it is not possible to distinguish betas based on the form of regulation. It has also been stated that the regulatory regime protects the business from systematic risk.[79]

6.106 The AER considers that this factor is significant. For example, in its decision in relation to Jemena in the context of assessing the benchmark credit rating it effectively concluded that the similarities between gas and electricity businesses are more important than the differences, with these similarities including regulation "under comparable frameworks" and the fact that the infrastructure has "natural monopoly characteristics" (on this point, we have shown that APT Allgas has considerably less market power than an electricity network business).[80]

6.107 If the assumed similarity in the regulatory regimes is to be the key driver of the regulator's assessment of beta, not only does it fail to give any recognition to the fundamental differences between the businesses (particularly in relation to market power), it will overstate the protection that is provided by businesses subject to a price cap compared to a revenue cap, given they are exposed to volume risk. Otherwise, there is no incentive for a regulated business to bear responsibility for volume risk if it is not compensated for bearing that risk. This is particularly important to a business that has very limited market power.

6.4.8 Growth options

6.108 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 (or 'assets in place'), will tend to have higher systematic risk compared to firms that don't have these opportunities.[81]

6.109 The impact of growth options on beta in a regulatory context is not necessarily clear. If this assessment was based on the analysis of an efficient benchmark firm (that was not regulated), it could be argued that the implications of growth options need to be recognised, regardless of the impact that regulation has on

[79] For example, refer: Australian Energy Regulator (2009a). Electricity Transmission and Distribution Network Service Providers, Statement of the Revised WACC Parameters (Transmission), Statement of Regulatory Intent on the Revised WACC Parameters (Distribution), p.249.

[80] Australian Energy Regulator (2010a). p.183.

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

the value of the firm and its risk profile. Alternatively, if the existence of regulation is recognised as part of the assessment, then the presence of growth opportunities may arguably be excluded.

6.110 The projected capital expenditure for demand growth for the APT Allgas network is only small over the next regulatory period. This factor will therefore not have an impact on the beta assessment.

6.4.9 Operating leverage

6.111 Operating leverage measures the proportion of the firm's cost structure that is fixed. All other things being the same, a high proportion of fixed costs will increase beta, as it magnifies the impact on free cash flows of any economic shock.

6.112 Like other gas distribution networks, the majority of APT Allgas' costs are fixed. High operating leverage is associated with higher systematic risk, as these fixed costs will still be incurred irrespective of actual volumes. As noted previously, this is important because beta measures the sensitivity of the firm's returns (revenues less costs) to changes in economic activity.

6.113 As this first principles analysis is being used to determine where APT Allgas would be positioned relative to the benchmark gas distribution network, the impact of operating leverage on this decision will depend on the extent to which its operating leverage differs from this firm. Further, if we were using the comparator data to estimate a beta for APT Allgas, it would also be necessary to consider any differences between the operating leverage of these firms relative to APT Allgas (which we are not proposing in this case).

6.114 While APT Allgas' operating leverage is high, we have no evidence to suggest that this situation is any different from the 'average' gas distribution business in Australia. What it does do is magnify the impact on returns of its exposure to market risk given the availability of substitutes and APT Allgas' low market power, as discussed above.

6.4.10 Conclusions: first principles analysis

6.115 The first principles analysis is used to provide context to the equity beta assessment, including informing an opinion of the extent to which APT Allgas' beta might differ from the 'benchmark' gas distribution network business.

6.116 In conclusion, what we can observe is that:

1. The demand for gas for residential use has *some* relationship with domestic economic activity, because:
   - the demand for gas has a positive income elasticity of demand;
   - APT Allgas' key growth market is new housing developments, which are positively correlated with domestic economic activity;
   - APT Allgas does not have substantial market power. It faces strong competition from substitutes in all of the applications for which gas is used, in particular, the competition that it is exposed to from solar energy (and to a lesser extent, heat pump technology) in the water heating market, which is its largest potential market in the residential sector. Queensland has one of the lowest penetrations of gas in dwellings of any Australian state. While a number of the factors that influence the choice of energy source are not related to the domestic economy (such as government policy initiatives), what is relevant to this assessment is that:
     - to the extent that demand has a relationship with domestic economic activity (via income and new dwelling construction activity), gas is exposed to higher market risk because it is a 'fuel of choice' relative to electricity, which increases the sensitivity of the firm's revenues to domestic economic activity (costs are considered separately below);
     - more importantly, this significantly reduces its market power, which is examined separately below.
2. Industrial and commercial demand will generally be more sensitive to economic activity. Industrial demand accounts for a relatively higher proportion of the demand for gas in Queensland relative to the other States. Together, industrial and commercial demand accounts for over 60% of APT Allgas' total revenue. This suggests higher exposure to systematic risk.
3. A reasonable proportion of revenues vary with throughput (over 50% in the Volume Class, which accounts for over 70% of revenue), while the majority of its cost base is fixed. This provides some protection from systematic risk however still leaves the balance of this revenue exposed to changes in volumes.
4. There is no additional protection for revenues from industrial customers via term contracts, with only one industrial customer currently subject to a contract.

5. The impact of form of regulation also needs to be considered. It is recognised that while the implications of this for beta have generally seen to be unclear, the reality is that:
   - APT Allgas is exposed to higher volume risk under a price cap;
   - it has been established that this volume risk is systematic in nature;
   - demand and costs are not related.
6. Normally in energy network infrastructure, incumbents possess substantial market power, which is often seen to have a dampening effect on betaHowever, APT Allgas does not possess substantial market power because of the strong competition gas faces from substitutes, particularly in the residential sector in Queensland where it has a lower penetration relative to most of the other states. It also faces countervailing power from buyers in the industrial sector which is not mitigated by term contracts. We consider that reduced market power is one of the key factors in determining APT Allgas' beta and a strong differentiator between it and other gas distribution firms, as well as electricity.
7. The impact of growth options on beta is not considered to be material here.
8. APT Allgas has high operating leverage, which is a significant contributor to systematic risk. However, we have no evidence to suggest that it is different from other comparable businesses, provided their activities are mainly focused in gas distribution. What it does do is magnify the impact of APT Allgas' exposure to market risk on the firm's returns.

6.5 Conclusions: recommendations for beta

6.117 The paucity of relevant and reliable data has unfortunately precluded us from being able to draw any robust conclusions regarding APT Allgas' equity beta based on updated empirical analysis. At worst, in the absence of this data the most appropriate starting point for the equity beta estimate is one, which was also the assumption that was most commonly applied to energy network businesses prior to the AER's WACC Statements. This is considered the most reasonable assumption to make in these circumstances.

6.118 As a starting point this equity beta of one can be seen to apply to the 'average' or benchmark network business. Our first principles analysis has identified some fundamental differences between between gas and electricity network

businesses and between APT Allgas and other gas distribution networks in Australia. The key differences that are relevant to systematic risk are:

- industrial and commercial customers account for a much higher proportion of APT Allgas' total volumes compared to the other states where gas penetration in the residential sector is much higher. Revenue from these customers represents of 60% of APT Allgas' total revenue. In general, industrial and commercial demand will have a higher correlation with economic activity;
- gas is a 'fuel of choice' compared to electricity, which is connected to every building. The exposure to competition from substitutes dilutes market power, with market power generally seen as reducing a firm's exposure to systematic risk. In the residential sector, this dilution is exacerbated in the case of APT Allgas relative to the other states because gas has a much lower penetration in households compared to most of the other states.

6.119 The differences we have identified suggest that APT Allgas has higher systematic risk compared to the average gas network business and hence an equity beta above one is appropriate. We consider that an equity beta of 1.1 remains the best estimate to apply in the circumstances, based on the provisions contained in the NGR.

6.120 This is consistent with the previous assessment made by the QCA. That assessment recognised the difference between the APT Allgas network and other distribution networks in Australia, in particular, its higher exposure to industrial demand. It also recognised the differences between gas and electricity networks and the former's greater competition from substitutes. There is no persuasive evidence to depart from this estimate.

7 Gamma

7.1 Background

7.1 The gamma previously applied by the QCA in the 2006 determination for Allgas was 0.5. Prior to the AER's decision to increase the value of gamma to 0.65 in its statements that apply to electricity transmission and distribution network service providers (the AER's WACC Statements),[82] this has been the value most commonly applied by Australian regulators.

7.2 Following the finalisation of its WACC Statements in 2009, the AER has consistently applied its preferred value of 0.65 to electricity distribution. It has also applied this value in gas distribution decisions, including its most recent decision in relation to Jemena Gas Networks, where it concluded that:[83]

> …0.65 is the best estimate of gamma arrived at on a reasonable basis currently available, as required by rule 74 of the NGR.

7.3 It also considered that this value is consistent with the revenue and pricing principles contained in section 24 of the NGL and will contribute towards the achievement of the Objective of the NGL (refer paragraph 2.2).[84] The evidence and arguments relied upon by the AER in arriving at its conclusion are largely consistent with the evidence and arguments it relied upon in its WACC Statements and subsequent rebuttals of alternative proposals put forward by regulated energy network businesses.

7.4 We note that the AER's preferred value continues to be contested by gas and electricity network businesses in regulatory proposals made since the finalisation of its WACC statements, with values of 0.2 and 0.5 proposed. We also note that it is currently the subject of a number of merits review applications before the Australian Competition Tribunal, including applications by ETSA Utilities, Ergon Energy, ENERGEX and Jemena Gas Networks.

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82 Australian Energy Regulator (2010a).

83 Australian Energy Regulator (2010a). p.227.

84 Australian Energy Regulator (2010a). p.227.

7.2 Issues with the AER's preferred value for gamma

7.5 The AER's position in relation to gamma clearly remains contentious. In our opinion, this is because there are fundamental problems with each of the key inputs relied upon by the AER in arriving at its gamma estimates. In particular, if regard is given to the evidence that was relied upon by the AER in supporting its position, a value of gamma of 0.65 is not considered reasonable, nor does it represent the "best forecast or estimate possible in the circumstances", as required under section 74 of the NGR.

7.6 Extensive submissions have already been made to the AER on this issue. We therefore propose to limit our discussion to the key problems that have been identified with its preferred gamma estimate, based on its assessment of the distribution rate and the value of franking credits (theta). Each of these inputs is discussed below. This discussion includes our opinion as to the most reasonable value (or range of values) for each input based on the requirements of the NGR.

7.3 Distribution rate

7.3.1 Issues with the AER's decision

7.7 The key issue of contention in relation to the distribution rate has been the value of retained credits. While the AER considers that 71% is a reasonable estimate of the proportion of credits distributed in a year, it also considers that those credits retained within the firm are likely to have some value to investors and therefore the distribution rate should lie somewhere between 70% and 100%.[85] It has maintained that a rate of 100% remains appropriate because it:[86]

- is consistent with the Officer WACC framework, which clearly assumes a perpetuity scenario
- simplifies the framework for estimating gamma, which is particularly important due to the difficulty associated with reliably estimating the value of retained credits

[85] Australian Energy Regulator (2010a). p.213.

[86] Australian Energy Regulator (2010a). p.214.

- is consistent with the post-taxation framework…which assumes a perpetuity scenario and thus the full distribution of free cash flow each period.

The value of retained credits

7.8 The AER notes that if considering the value of the retained credits, the distribution rate should lie somewhere between 70% and 100%, which in turn suggests that the value of these retained credits must be somewhere between zero and 100%. However, its decision is consistent with retained credits being fully valued.

7.9 The AER's decision is based on advice received from Associate Professor Handley. Handley's most recent advice to the AER was provided as part of the review of the regulatory proposals submitted by the South Australian and Queensland electricity distribution networks.[87]

7.10 One of Handley's contentions is that the retained cash flow can be reinvested and it will earn the firm's cost of capital. This contention is irrelevant to the valuation of retained credits because imputation credits cannot be reinvested. They are only of value to resident shareholders once the dividends are distributed. Confusing imputation credits with free cash flows results in the erroneous conclusion by Handley that a 100% payout ratio is appropriate.

7.11 Handley questions the payout of around 70%. He disregards the twenty three years of evidence since the introduction of dividend imputation regarding payout ratios. Based on an examination of ATO taxation statistics, it is evident that firms consistently have paid out, on average 70% of the franking credits.[88]

7.12 Assuming that undistributed credits have the same value as distributed credits ignores the time value of money and contradicts the advice provided by another of the AER's consultants, McKenzie and Partington[89]. McKenzie and Partington agree that the payout ratio should be less than 100%:[90]

> In short, assuming a payout of 100 percent is likely to overstate the value of undistributed franking credits.

[87] J. Handley (2009). Advice on Gamma in Relation to the 2010-2015 QLD/SA Electricity Distribution Determinations, Memorandum to the AER, 20 October 2009.

[88] Synergies Economic Consulting (2009). Memorandum to Ergon Energy and ENERGEX, Gamma: New Analysis Using Tax Statistics, May.

[89] M. McKenzie & G. Partington (2010). Report to AER: Evidence and Submissions on Gamma, March.

[90] M. McKenzie & G. Partington (2010). p.27.

7.13 McKenzie and Partington agree that the timing of the payout of the credits and the discount rate need to be considered to value the credits. As these two variables are unknown and they are required to be known to be able to estimate the payout ratio, the payout ratio must lie between 70% and 100%.

7.14 Since the introduction of dividend imputation in 1987, the payout ratio has been consistently below 100%. Firms have paid out, on average 70% of the franking credits each year. Therefore firms have consistently retained 30% of the franking credits. If firms have consistently retained franking credits and these credits are only of value as distributed credits in the hands of Australian resident shareholders, the value of undistributed credits must be less than 100%.

7.15 Further evidence regarding undistributed franking credits being valued at less than 100% can be obtained from the Beggs and Skeels study that is relied upon by the AER to value theta.[91] This study provides evidence indicating that shareholders value distributed cash dividends at 81 cents in the dollar. It seems illogical to conclude that distributed cash dividends are valued at 81% while undistributed franking credits are valued at 100%.

7.16 If distributed cash dividends are valued at 81% and the AER's consultants have stated that the value of undistributed credits is less than 100%, a more plausible scenario is to ignore the value of undistributed franking credits. Given the twenty years of corporate behaviour with regard to dividend payouts since the introduction of dividend imputation, the effects of the time value of money and discounting could well result in the retained credits having a negligible value today and therefore can be ignored.

7.17 Another argument made by the AER in ascribing a value to retained franking credits is that these credits can be distributed via share buybacks, bonus share issues or some other form of dividend streaming (for example). While it is possible for this to occur, firms have always had this ability. In an environment where there are numerous way to distribute credits other than by payment of dividends, franking account balances have increased. For example in 2007 the reported aggregate of franking accounts was $148 billion, up from $132 billion in the previous year.[92]

[91] D. Beggs & C. Skeels (2006). Market Arbitrage of Cash Dividends and Franking Credits. Economic Record, 82, 239–252.

[92] Australian Taxation Office. Taxation Statistics 2006-07, Table 6: Company Tax.

7.18 Market evidence regarding franking account balances does not support the AER's argument. Firms do not distribute all of the available credits even though they may have the ability to do so via cash dividends, dividend reinvestment plans, share buy backs and bonus shares.

7.19 There are many opportunities for companies to distribute the credits but still the franking account balance increases. It is therefore questioned as to why these franking account balances increase when credits are only of value when distributed to shareholders. In our opinion, a plausible answer is the retained credits are not of much value to shareholders and certainly not as valuable as the AER suggests.

7.20 Following the finalisation of the AER's Statement of Regulatory Intent, ETSA Utilities has commissioned Professor Bob Officer to review the estimation of the distribution rate as part of its regulatory proposal to the AER.[93] Officer disagrees with the AER's conclusion that the time value loss where credits are retained is not material: [94]

> The only time when the franked dividends attached to retained earnings (the franking account balance) have any value is when they are distributed. Moreover, the only time in which any of them would be distributed would be when the payout ratio is greater than 100%. Empirical evidence demonstrates that the overall distribution rate is significantly below 100%.

7.21 He concludes: [95]

> Assumptions of 100% distribution are unrealistic and not correct since a significant proportion of the franking credits are probably never distributed as franked dividends. It is incorrect to assume that all credits are eventually distributed...Long term averages estimate the economy wide distribution rate at about 70% and listed companies rarely exceed this rate.

[93] Professor R. Officer (2009). Estimating the Distribution Rate of Imputation Tax Credits: Questions Raised by ETSA's Advisers, 23rd June.

[94] Professor R. Officer (2009). p.1.

[95] Professor R. Officer (2009).

Simplification of the framework

7.22 In its 2009 Draft Decision for ETSA Utilities the AER rejected this response based on the advice of its consultant, Associate Professor Handley.[96] Handley continues to place reliance on a theoretical assumption of full distribution at the end of each period. He indicates that:[97]

> …in order to analyse highly complex issues simplifying assumptions are used in theoretical models to gain a better understanding of the workings of financial markets.

7.23 This simplifying assumption results in an outcome that is too far an abstraction from reality. The alternative to making this assumption is to apply the market average which is readily observed in practice, and is widely applied by market practitioners. The debate continues to focus on assumption which does not predict 'real world' behaviour, which is the goal of any positive model.

Consistency with the Officer WACC framework

7.24 The main argument the AER makes with regard to the Officer WACC framework is that as Officer uses a perpetuity approach to examine the relationship between cost of capital, cash flows and value, the presumption is a payout is 100%. The perpetuity approach is a simplified approach based upon assumptions that enable users to explain events or to make predictions. The assumptions reduce the interaction of variables to make the model more manageable.

7.25 For the perpetuity model to be applied all that is required is that the payout ratio be constant. As stated about, the payout ratio has been reasonably constant since the introduction of dividend imputation. This satisfies the Officer WACC framework and it is not necessary for the payout to be treated 'as if' it were 100%.

7.3.2 What is a reasonable estimate for the distribution rate

7.26 In our opinion, the AER's assumption of a 100% distribution rate is not the most reasonable assumption that could be applied in the circumstances. We consider that the distribution rate should be based on the average distribution

[96] Australian Energy Regulator (2009b). Draft Decision, South Australia: Draft Distribution Determination 2010-2011 to 2014-15, November.

[97] Australian Energy Regulator (2009b). p.260.

rate that is observed in the market and is most commonly applied by practitioners, as estimated by Hathaway and Officer[98], which is 71%.

7.27 The AER has acknowledged that there is some uncertainty regarding the value of retained credits. Particularly given the asymmetric consequences of error, we do not consider that it is appropriate to set the distribution rate as if retained credits were fully valued. In our opinion, it is more reasonable and plausible to assume they have no value. This in turn supports an assumption for the distribution rate of 71%.

7.4 The value of franking credits (theta)

7.28 The AER's preferred value for theta is 0.65, which is mid-way between two points estimates it selected, being:

- 0.57, which is based on a 2006 dividend drop-off study by Beggs and Skeels[99];
- 0.74, which is based on a 2008 tax statistics analysis by Handley and Maheswaran.[100]

The AER reiterated this position in the 2010 decision for the Jemena gas networks.[101] Each of these studies will be examined in turn.

7.4.2 Beggs and Skeels study

7.29 A number of significant concerns were identified with the Beggs and Skeels study in two consultants' reports submitted to the AER as part of the development of its WACC Statements by the Joint Industry Associations (JIA).[102] The report by SFG Consulting (SFG) sought to simply extend Beggs and Skeels' sample period to September 2006, making no other changes to the methodology or assumptions they applied, and arrived at a very different estimate for the value of franking credits, being 0.37.

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

99 D. Beggs & C. Skeels (2006).

100 J. Handley and K. Maheswaran (2008). A Measure of the Efficacy of the Australian Imputation Tax System, The Economic Record, vol.84, no.264, March.

101 Australian Energy Regulator (2010a).

102 SFG Consulting (2009). The Value of Imputation Credits as Implied by the Methodology of Beggs and Skeels (2006), Report Prepared for ENA, APIA and Grid Australia, February; Synergies Economic Consulting (2009). Peer Review of SFG Consulting Reports on Gamma, A Report to the ENA, APIA and Grid Australia, January.

7.30 As part of its regulatory proposal lodged following the finalisation of the AER's Statements, ETSA Utilities also submitted a paper by one of the co-authors of the Beggs and Skeels study (Skeels).[103] Skeels was asked to review the extension of the Beggs and Skeels analysis that was conducted by SFG and submitted to the AER and the AER's review of the SFG study. Skeels also examined an updated version of the SFG study, which addressed a number of concerns that the AER had raised in relation to its dataset. This updated study arrived at a theta estimate of 0.23.

7.31 On reviewing the AER's dismissal of the SFG Consulting study, Skeels concluded that:[104]

> Many of the criticisms raised by the AER were little more than allusions to potential problems with the SFG analysis. In some cases I found that these allusions were ill-founded and readily dismissed. In other instances the appropriate response was to rework the model and to actually establish whether the concern was valid or not. This latter class of concerns was incorporated into the questions posed to SFG. I found their response to be convincing in as much as the potential problems were demonstrated to have little or no material impact on the results.

7.32 Skeels noted that some of the concerns that had been raised about the SFG study were more material. SFG responded to these issues and produced revised estimates. SFG arrived at a value of theta of 0.23. Skeels stated: [105]

> ...the SFG estimate of theta of 0.23 represents the most accurate estimate currently available.

Skeels concludes as follows: [106]

> It is clear that the more recent data used in the SFG results presented in Appendix I favour an estimate of theta that is lower than that of 0.57 which was obtained by Beggs and Skeels on the basis of less recent data. However, it might be argued that the minor methodological differences that remain between the methodology of Beggs and Skeels (2006) and that of SFG bias their estimate of theta downwards... Were such a position to be taken then, in my opinion, a compelling case can be made

[103] C. Skeels (2009). A Review of the SFG Dividend Drop-off Study, 28 August.

[104] C. Skeels (2009). p.4.

[105] C. Skeels (2009). p.4.

[106] C. Skeels (2009). p.4.

> that the empirical evidence overwhelmingly supports the notion that the true value of theta lies between the SFG estimate of 0.23 and the Beggs and Skeels (2006) estimate of 0.57, and that in all probability it lies closer to 0.23 than 0.57.[107]

7.33 The AER has strongly rejected the SFG analysis. Indeed, we note that much of the focus of the AER's discussion in decisions made following the release of the AER's final WACC Statements is the SFG study, rather than the Beggs and Skeels study.

7.34 For example, one of the reasons that it provides for not being able to rely on the SFG study is the problem of multicollinearity (which is a fundamental issue facing dividend drop-off studies). SFG had sought to address this problem by using joint confidence intervals, which is used as a means of *interpreting* the outcomes of its dividend drop-off study (that is, it is not purported that this eliminates or removes the multicollinearity problem).

7.35 SFG has applied the same dividend drop-off method used by Beggs and Skeels. However, the AER has not considered the extent to which the Beggs and Skeels study is affected by multicollinearity by anywhere near the same degree.

7.36 What the AER does observe is that Beggs and Skeels' estimate of theta is statistically different from zero.[108] However, this does not mean that the estimates do not suffer from multicollinearity. The problem of multicollinearity means that while the combined 'package' of dividends and franking credits can potentially be reliably estimated, the relationship between these two variables means that they cannot be independently valued. The fact that one or both of the variables is statistically significant does not mean that the value of one or both of those variables has not been affected by the other. SFG's use of joint confidence intervals is seen as a means of trying to meaningfully interpret the value of one of the variables (in this case, being the value of franking credits) by constraining the value of the other.

7.37 While we understand that the AER has accessed SFG's dataset and subject it to considerable scrutiny, the same level of scrutiny has not been applied to its own studies. Its own consultants, McKenzie and Partington, state:[109]

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[107] C. Skeels (2009). p.5.

[108] Australian Energy Regulator (2010a). p.216.

[109] M. McKenzie and G. Partington (2010). Report to AER: Evidence and Submissions on Gamma, 25 March, p.33.

> Due to their proprietary nature, we have not had access to the data used in either the Handley and Mahaswaran (2008) or Beggs and Skeels (2006) study and so therefore are unable to assess whether the data used in these studies is any more, or less, error prone. We suspect that, due to the nature of the data and the task at hand, if subject to the same level of scrutiny as the SFG study, the studies of Handley, Handley and Mahaswaran (2008) or Beggs and Skeels (2006) would yield a list of questions and clarifications.

7.38 While the AER has not explicitly referred to this it has justified its position on the following basis:[110]

> …both the Handley and Mahaswaran (2008) study and the Beggs and Skeels (2006) study are independent, published studies, which have been academically peer reviewed. The AER considers that the process of review before an academic journal article can be published is robust and therefore this study can be reasonably relied upon.

We note that the AER has previously dismissed evidence that has been published in journals, including the other studies submitted by the JIA to support their proposed value of gamma in the SoRI.

7.39 Overall, in our opinion, the AER should have required the same level of scrutiny of its own studies. We are not proposing that sole reliance should be placed on the SFG study, as we would not consider that sole reliance can be placed on any study, however we do consider that its estimates are reasonable and plausible and it should be include along with a number of studies that have sought to estimate the value of franking credits.

7.40 We note that the Economic Regulation Authority (ERA), which is currently the only Australian regulator to have adopted the AER's estimates apart from the ACCC, has recently reduced its 'lower bound' estimate for gamma to include the estimate from the original SFG consulting study that was submitted to the AER, which was 0.37.[111] As noted above, this estimate was subsequently updated to 0.23 in the more recent version of this study, which is the estimate that was endorsed by Skeels.

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[110] Australian Energy Regulator (2010d). Final Decision: Queensland Distribution Determination 2010-11 to 2014-15, p.227.

[111] Economic Regulation Authority (2010). Final Decision on GGT's Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline, Submitted by Goldfields Gas Transmission Pty Ltd, May.

7.4.3 Tax statistics analysis

7.41 The Handley and Maheswaran study that is also relied upon by the AER is based on an analysis of tax statistics. We had previously sought to replicate the results of this analysis in an attempt to understand what Handley and Maheswaran had sought to measure, not because we consider that such a method can be used to estimate the value of theta. Again, we note that the focus of the AER's subsequent analysis has been on criticisms of our study (which did not purport to value theta), rather than consideration of the fundamental problems associated with using this type of analysis for this purpose.

7.42 The main reason why we consider that tax statistics analysis cannot be used to value theta is because it is inconsistent with the definition of theta. The AER has stated that: [112]

> The generally accepted regulatory approach to date in Australia has been to define the value of imputation credits in accordance with the Monkhouse definition.

7.43 Under the Monkhouse definition for gamma: [113]

- the imputation payout ratio is the face value of imputation credits distributed by the firm as a proportion of the face value of imputation credits generated by the firm in the period; and
- the utilisation rate (theta) is defined as the value of distributed imputation credits to investors as a proportion of their face value.

7.44 What is important with the definition is the distinction between face value and value. Value (with reference to the calculation of theta) in itself would normally be interpreted as market value while face value is not market value. This distinction is important to the claim made by the AER in stating that: [114]

> ...the methodologies used in both studies were attempting to estimate the same value.

7.45 The Beggs and Skeels study attempts to use market data to estimate the effect on value of theta when dividends are paid. The second study referred to by the AER is the tax statistics study by Handley and Maheswaran. This study does

[112] Australian Energy Regulator (2009a). p. 393.

[113] P. Monkhouse (1997). Adapting the APV Valuation Methodology and the Beta Gearing Formula to the Dividend Imputation Tax System. Accounting and Finance, 37, vol. 1, pp. 69-88.

[114] Australian Energy Regulator (2009a). p. 204.

not attempt to estimate value and is therefore inconsistent with the Monkhouse definition. This study measures the extent to which imputation credits have reduced personal taxation liabilities. This is very different to the Beggs and Skeels study. Beggs and Skeels attempt to measure the market value of the ability to offset credits while the Handley and Maheswaran study measures the proportional offset of personal taxation liabilities given the credit.

7.46 In support of relying upon the taxation statistics study the AER states that:

> The AER acknowledges that tax statistics are based upon book values which may not reflect the market. That said, consistent with the AER's approach to gearing in the WACC review, the AER considers that book values can be used as a proxy for market values.[115]

7.47 The AER acknowledges that book values are a proxy for market values and are not market values themselves. As a proxy there is no consideration given to how close the proxy is to market values and how appropriate it is to use the proxy estimate as a market value estimate.

7.48 Where the AER normally uses book values as a proxy for market values is where either:

- market values are not obtainable (which they are in the case of theta); or
- the book value is a reasonable proxy for market value, as in say, the case of gearing.

7.49 The ratio based upon taxation statistics is not even a book value measure of theta. Theta is the value of distributed imputation credits to investors as a proportion of their face value as defined by Monkhouse. Handley and Masheswaran define their measure as:[116]

> We define this utilization value as the incremental reduction in personal tax, if any, which arises from the receipt of a franked dividend compared to the receipt of an otherwise equivalent unfranked dividend.

7.50 The obvious differences between the two are:

- the Monkhouse definition requires market value to be used; and

[115] Australian Energy Regulator (2009c). Draft Decision, Queensland, Draft Distribution Determination, 2010-11 to 2014-15, p. 209.

[116] J. Handley and K. Maheswaran (2008). p. 84

- the Monkhouse definition considers what companies have distributed as a proportion of their face value. What Handley and Masheswaran have measured is the credits received and the credits used.

7.51 The two issues with the taxation statistics approach are that book values are used instead of market values and there is an indirect link between book value and market value in this instance. Additionally, a further weakening in the relationship is that Handley and Masheswaran consider credits received by investors and credits used. They do not accurately capture the distributed credits that are lost.

7.52 The AER maintains that it is necessary to rely on this evidence because of the methodological problems associated with dividend drop-off studies. This is supported by advice from McKenzie and Partington, who indicated that: [117]

> In this respect the AER's approach of considering both ex-dividend and taxation statistics has merit, but we would recommend a broader range of studies to triangulate the evidence considered by the AER…Triangulation of the evidence relating to the value of dividends and credits distributed would suggest that the gamma value supplied by SFG is substantially on the low side while the gamma value determined by the AER to be on the high side, but much more evidence can be added to support the AER's gamma value. However, a precise estimate of gamma remains elusive both because of econometric problems and the fundamental problem of splitting the combined value of dividends and franking credits into its component parts.

7.53 The tax statistics approach is not a value-based approach. It is a ratio of the claimed imputation credit to the created and distributed imputation credit. It is not a proxy for market value as it does not attempt to be a measure of or reflective of this value. The relationship between market values and this value are indirect.

7.54 While we concur that a range of evidence should be submitted, this should be limited to evidence that seeks to estimate the value of theta. In our opinion, despite the recognised limitations of other methods it is misleading to include a method that does not value theta.

[117] M. McKenzie and G. Partington (2010).pp.4-5.

7.4.4 What is a reasonable estimate/range for the value of theta

7.55 Overall, we consider that it is important to consider a number of studies to value theta. One of the reasons the evidence the AER has considered is so limited is because it has concluded that a 'structural' break occurred with tax law changes implemented in 2000, which in turn means that it will only consider analysis that only includes post-2000 data. The evidence it relied upon in concluding that this structural break occurred was the Beggs and Skeels study.

7.56 Reports prepared by SFG and Synergies that have previously been submitted to the AER showed that the Beggs and Skeels results do not provide sufficiently reliable evidence to demonstrate that a structural break occurred.[118] We therefore do not accept that studies that have used data prior to 2000 should be excluded.

7.57 There are a number of reputable Australian studies that have sought to estimate the value of gamma using market data. These are summarised in the following table.

[118] SFG Consulting (2009). The Value of Imputation Credits as Implied by the Methodology of Beggs and Skeels (2006), Report Prepared for ENA, APIA and Grid Australia, February; Synergies Economic Consulting (2009). Peer Review of SFG Consulting Reports on Gamma, A Report to the ENA, APIA and Grid Australia, January.

Table 3 Summary of key studies

Study	Methodology	Time Period for Estimation	Value of franking credits (V)
Hathaway and Officer (2004)[a]	Dividend drop-off	1988-2002	0.5
Bellamy & Gray (2004)[b]	Dividend drop-off (adjusted)	1995-2002	0
Cannavan, Finn & Gray (2004)[c]	Analysis of futures and physical market (no arbitrage framework)	Pre- 45 day rule (1997)	Up to 0.5 (high-yielding stocks)
		Post- 45 day rule	0
Beggs & Skeels (2006)[d]	Dividend drop-off	1986-1988	0.75
		1989-1990	0.45
		1991	0.38
		1992-1997	0.2
		1998-1999	0.42
		2000	0.128
		2001-2004	0.57
SFG Consulting (2010)[e]	Dividend drop-off, based on Beggs & Skeels methodology	1 Jul 1997 – 30 Jun 1999	0.24
		1 Jul 1999 – 30 June 2000	0.36
		1 July 2000 – 20 June 2006	0.23
Feuerherdt, Gray and Hall (2010)[f]	Dividend drop-off, hybrid securities	Pre-1997 (45 day rule)	0
		Post-1997 to 2000	
		Post 2000	

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

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

c D. Cannavan, F. Finn and S. Gray (2004). The Valuation of Dividend Imputation Tax Credits in Australia. Journal of Financial Economics, 73, 167-197.

d D. Beggs & C. Skeels (2006). Market Arbitrage of Cash Dividends and Franking Credits. Economic Record, 82, 239–252.

e SFG Consulting (2010). Further Analysis in Response to AER Draft Determination in Relation to Gamma, Prepared for ETSA Utilities, February.

f C. Feuerherdt, S. Gray and J. Hall (2010). The Value of Imputation Tax Credits on Australian Hybrid Securities, International Review of Finance, 10:3, 365-401.

7.58 We concur with the AER's consultants, McKenzie and Partington, who advocate consideration of a range of studies. We consider that this is particularly important given the inherent uncertainty associated with valuing theta. All of the studies in the table above have sought to estimate the value of theta using market data. The table includes dividend drop-off studies, as well as:

1. A study by Cannavan, Finn and Gray, published in 2004, which does not use the dividend drop off method but has sought to infer the value of cash dividends and franking credits from the relative prices of share futures and the underlying shares on which these contracts are written, based on a no-arbitrage framework. This study was published in a

reputable journal (the Journal of Financial Economics) and hence has been 'academically peer reviewed'.

2. A study by Feuerherdt, Gray and Hall, published in 2010, which tests the value of imputation credits based on the prices of hybrid securities. A key reason for examining these securities is:
   - the signal-to-noise ratio is considered higher than for ordinary shares, reducing the multicollinearity problem associated with the dividend drop-off methodology; and
   - hybrid issues tend to be marketed exclusively to domestic investors. Hence, in order to address regulators' concerns regarding the relevance of foreign investors in setting the value of imputation credits, they have chosen an environment where trading is likely to be almost exclusively domestic-based.

   This study was published in a reputable journal (the International Review of Finance) and hence has been 'academically peer reviewed'.

7.59 Excluding Beggs and Skeels' 1986-1988 sub-period, the estimate for their post-2000 sub-period is the highest estimate for the value of theta (0.57), which is the estimate that has been adopted by the AER. While it has stated that this is not a 'lower bound', it is the lower of its two point estimates. A number of other studies have concluded that the value of theta is zero.

7.60 As outlined above, we do not consider that the AER has relied on sufficiently robust evidence to enable it to conclude that the analysis should be limited to post 2000 data. Indeed, this assumption by the AER is critical to its conclusions and given the asymmetric consequences of error, the evidence of a structural break must be robust and reliable. As we do not consider that evidence to be sufficiently robust and reliable, it is not appropriate to assume that a structural break has occurred and hence it is valid to include studies that have used data prior to 2000 in the scope of our review.

7.61 In our opinion, this evidence shows that a value of zero should at least be included within the bounds of a reasonable range. The upper bound for this range would be 0.57, based on the Beggs and Skeels study.

7.5 Conclusion: value of gamma

7.62 Based on a distribution rate of 71% and a range for theta of between zero and 0.57, an appropriate range for gamma is between zero and 0.4. In applying a point estimate based on this range it is considered appropriate to use the mid-point, which is 0.2.

8 Reasonableness check of the WACC estimate

8.1 As noted in this report, it is important to put the individual parameter estimates in context by comparing the reasonableness of the cost of debt and equity, having regard to the current market environment. We have therefore estimated a WACC for APT Allgas using the standard regulatory assumptions and approaches, as well as any recommendations we have made in this report (noting that the latter primarily influences the cashflows rather than the WACC estimate).

8.2 This is summarised in the following table. The risk-free rate and debt margin have been estimated over the twenty business days ending on 31 August 2010 for these indicative calculations, noting that the actual averaging period that is proposed for pricing purposes will be confidentially submitted to the AER for approval.

Table 4 WACC estimate

Parameter	Rationale	Estimate
Risk-free rate	Averaged over the 20 business days to 27 August 2010, annualised as per AER approach.	5.07%
Debt to value	Regulatory precedent.	60%
Debt margin	Average of ten year Bloomberg BBB yield and CBA Spectrum BBB+ yield. As per section 3 in this report, Bloomberg 7 year BBB yield rate has been extrapolated based on the difference between the 5 and 7 year yields. Averaged over the 20 business days to 27 August 2010, annualised as per AER approach.	3.85%
Debt raising costs	Based on ACG methodology updated by the AER, assuming that with a total debt of approximately $240 million, debt issuance costs would be in AER's category 1.	10.8 bp pa
MRP	Previous AER decisions	6.5%
Gamma	Refer section 7 of this report	0.2
Equity beta	Refer section 6 of this report	1.1
Cost of equity		12.22%
Cost of debt		9.03%
Post tax nominal vanilla WACC		**10.30%**

8.3 As outlined in section 4, if regard is given to the average cost of debt and equity prevailing prior to the global financial crisis, the difference between the cost of debt and equity should be between 4.5% and 6%. The difference implied by the above estimates is only 3.19%. As the cost of debt is estimated based on current market data, whereas the cost of equity is more reflective of a long term average (with the exception of the risk-free rate), our concern is that the return of equity will provide equity investors with inadequate compensation for the risks they bear in the current market environment. The AER has already made

it very clear that it will not consider any further increases in the MRP, having mooted a reduction back to 6%, which will lower the cost of equity even further.

8.4 Overall, the key issue that we have identified for APT Allgas is the beta estimate. In our opinion, there are a number of compelling reasons to maintain the estimate that was previously applied by the QCA, which reflect some fundamental differences in the systematic risk profile between the APT Allgas network and the gas distribution networks in the other states. The reasons for this were detailed in section 6.

8.5 Based on the parameter estimates applied above, if the AER applied an equity beta of 0.8 the difference between the cost of equity and the cost of debt would only be 1.24%. Such a significant contraction in the return required by equity holders relative to debt holders is neither reasonable nor plausible, especially in the current market environment. Apart from the fact that we do not consider that such a beta is appropriate given the systematic risk profile of the APT Allgas network, it risks materially under-compensating equity providers, which in turn will impact its ability to fund its investments.

Authors' statement

This report has been prepared by Mark Christensen, Euan Morton and Joanne Blades. Our qualifications are contained in Attachment A.

We confirm that in preparing this report, we have made all the inquiries that we believe are desirable and appropriate and that no matters of significance that we regard as relevant have, to our knowledge, been withheld from the report.

A list of the key source materials we have relied upon are contained in Attachment B. We have provided copies of our key source documents to the AER.

Signed

(Mark Christensen)

29 September 2010

Signed

(Euan Morton)

29 September 2010

Signed

(Joanne Blades)

29 September 2010

A Qualifications

Mark Christensen

Current position

Associate, Synergies Economic Consulting
Deputy Chairman, Queensland Competition Authority

Qualifications

Bachelor of Business
Master of Financial Management
Senior Fellow – FINSIA
CPA

Relevant experience

- estimated an asset beta for passenger rail services for Queensland Treasury;
- estimated the WACC of a coal port for the Queensland Government as part of a submission to the Queensland Competition Authority;
- developed an approach to estimate a long term WACC for the provision of port services with a fixed fee for 40 years;
- estimated divisional WACCs for Queensland Rail. Each major business unit derived a WACC to be used as a benchmark for project evaluation and performance review;
- reviewed the discount rate for Powerlink when pricing non-regulated services based on a WACC methodology;
- estimated asymmetric risk adjustments that are required for a regulated gas pipeline;
- using a WACC methodology, determined the discount rates to be applied for the generation of power by coal and alternative energy sources;
- estimated the WACC parameters for Queensland Rail as part of the second review of its access undertaking;
- provided comments on behalf of Queensland Rail to the QCA on a WACC discussion paper;

- provided comments and made representations to the Independent Pricing and Regulatory Tribunal and the Australian Competition and Consumer Commission on behalf of ARTC regarding WACC parameters and issues;
- provided WACC parameter estimates and comments for both Perth and Darwin airports, as part of pricing negotiations;
- calculated an appropriate discount rate for SEQWater to use for analysing bulk water storage;
- provided comments to Sunwater regarding the value of the asset beta and gamma;
- provided an analysis to Gladstone Area Water Board of systematic and non-systematic risk;
- developed a financial model to assess the impairment of water assets applying AASB136;
- estimated the cost of capital to apply to WestNet Rail as part of its review by the Economic Regulation Authority;
- estimated the cost of capital to apply to The Pilbara Infrastructure as part of its review by the Economic Regulation Authority;
- provided advice to overcome infrequency of trading issues when estimating beta;
- provided advice regarding WACC parameter estimates for ENERGEX and Ergon Energy as part of their submission to the Australian Energy Regulator;
- developed a discount rate to be used for analysing the social costs of crime, as part of a program to stop recividism by juveniles;
- estimated discount rates and reviewed valuation approaches for SME business valuations;
- provided advice regarding the appropriate discount rate to use to value impaired water assets, based on a WACC methodology;
- provided advice to the Queensland Audit Office regarding discount rates applicable for the valuation of water assets and forests;
- provided advice regarding discount rates applicable to Council business units, using a WACC methodology;
- acted as an expert witness or provided expert evidence on numerous occasions on WACC-related issues;

- provided advice regarding discount rates and non-systematic risks for setting a bid price for a power station;
- provide education courses across Australia for infrastructure businesses regarding discounted cash flows analysis, risk analysis and WACC;
- provided Brisbane Water with a valuation of a waste water plant to calculate lease payments to the end user. The model required calculation of the WACC, the effect of risk sharing and the calculation of the lease payment;
- conducted risk workshops where risks have been identified and quantified and included in the valuation analysis;
- reviewed a number of submissions received by the Queensland Competition Authority on WACC issues;
- provided a valuation to Brisbane Water of a stand-alone replication of water assets to supply a major end user;
- provided education courses via Queensland Treasury Corporation for Government Owned Corporations. One of the courses is 'Cost of Capital';
- reviewed the discount rate to be used in the gaming industry. The rate was estimated using a WACC methodology;
- written topics and chapters for education courses for FINSIA and CPA Australia. Topics have included valuation techniques, WACC and WACC-related issues;
- provided advice to Royal Dutch Shell. The advice was designed to improve the scoping of new explorations so that the final investment decision was undertaken with greater certainty and with a focus on the value added to the organisation. The two year contract focused of the final investment decision and included a number of assignments across the business;
- provided advice to the AGSM regarding the methodology for the estimation of beta;
- reviewed numerous journal and conference submissions. The topics have been corporate finance related.

Euan Morton

Current position
Principal, Synergies Economic Consulting

Qualifications
Bachelor of Commerce, University of Queensland, 1986
Bachelor of Law (with Honours), University of Queensland, 1988
Admission as a Solicitor, Supreme Court of Queensland, 1991
Bachelor of Economics, University of Queensland, 1992
Bachelor of Economics (1st Class Honours), University of Queensland, 1994

Relevant experience

- undertook a detailed quantitative review of the factors affecting an asset beta for Queensland Rail's below-rail coal network;
- evaluated the key issues associated with reviewing the WACC for Telstra's mobile termination services businesses as it approached a regulatory review and advised on the overall strategy that could be undertaken in the regulatory review;
- advised ARTC on the strategy that could be undertaken in approaching the review of its cost of capital as part of the review of its access undertaking by the ACCC. Detailed reviews were undertaken for ARTC's interstate and Hunter Valley coal networks;
- advised WestNet Rail on the cost of capital for regulatory purposes;
- advised Fortescue Metals Limited on the cost of capital and the inclusion of asymmetric risks for regulatory and valuation purposes;
- provided advice to Sunwater on the cost of capital to apply for rural water pricing, including the preparation of submissions to the QCA;
- advised Sunwater on the appropriate discount rate to use for analysing bulk water storage and wastewater using a WACC methodology;
- estimated the cost of capital for a coal terminal for the Dalrymple Bay Coal Terminal User Group. This work provided exposure to the perspective of a customer regarding WACC issues for a regulated entity;
- provided advice to Babcock and Brown regarding the WACC to be applied for due diligence purposes for the acquisition of the below rail assets of WestNet Rail;

- conducted an extensive review for the South East Queensland Water Corporation on the cost of capital in connection with its existing storage services and the additional risks associated with water treatment and recycling. Considerations included the appropriateness of using CAPM, the appropriate capital structure, developments in the estimation of beta and the value of the inputs;
- advised Brisbane Water on the WACC for its urban water and wastewater businesses;
- advised Queensland Treasury on the WACC to apply to urban water and wastewater providers to enable an assessment to be made as to whether certain infrastructure providers should be referred for prices oversight;
- advised Gladstone Area Water Board on the WACC associated with water storage and transmission;
- undertook an extensive review of the WACC for Sugar Terminal Limited;
- advised on the appropriate rate of return for a greenfields project (Alice Springs to Darwin railway), highlighting the circular nature of the rate of return for regulatory purposes in such a case;
- provided advice to the Queensland Office of Gaming Regulation regarding an appropriate cost of capital to apply to an entity operating in the gaming industry;
- undertook a detailed process to assess the cost of capital for Energy Australia, including the assessment of the form of WACC to be applied, the valuation of the key parameters and the preparation of submissions to IPART and the ACCC;
- estimated the appropriate cost of capital for ElectraNet SA, including preparation of a submission, to support ElectraNet's revenue reset application to the ACCC;
- estimated the appropriate cost of capital for Transend, including preparation of a submission, to support Transend's revenue reset application to the ACCC.

Joanne Blades

Current position
Director, Synergies Economic Consulting

Qualifications
Master of Applied Finance, Macquarie University, 2004
Bachelor of Commerce (Hons) – Economics, Griffith University, 1991
Bachelor of Business – Banking and Finance (with Distinction), University of Southern Queensland, 1989

Relevant experience

- prepared a cost of capital submission to the Economic Regulation Authority in relation to its review of the Goldfields Gas Pipeline;
- prepared a response to the Economic Regulation Authority's Draft Decision on the cost of capital to apply to the Goldfields Gas Pipe Pipeline;
- assisted ENERGEX and Ergon Energy as part of the industry response to the Australian Energy Regulator's review of the cost of capital parameters to apply to electricity network businesses;
- assisted ENERGEX and Ergon Energy in developing their cost of capital proposals to the Australian Energy Regulator. This included the provision of advice and the preparation of submissions;
- prepared a cost of capital submission for the Gladstone Area Water Board as part of its pricing review by the Queensland Competition Authority;
- prepared a cost of capital submission to the Queensland Competition Authority for QR Network as part of the second review of its access undertaking;
- prepared a submission to the Queensland Competition Authority reviewing the cost of equity that should apply to QR Network as part of the third review of its access undertaking. This included the preparation of an independent report and a further response to the QCA's Draft Decision;
- preparation of a cost of capital submission for GasNet as part of its regulatory review by the ACCC;
- prepared a cost of capital submission for Vector as part of its price control review by the Commerce Commission in New Zealand;

- undertook a review of the cost of capital to apply to Perth Airport based on regulatory principles;
- undertook a review of the cost of capital to apply to Darwin Airport based on regulatory principles;
- undertook an assessment of an appropriate beta for a regulated airport facility in New Zealand as part of a cost of capital review;
- reviewed the cost of capital to apply to The Pilbara Infrastructure as part of its review by the Economic Regulation Authority;
- undertook a cost of capital review for Cooperative Bulk Handling Limited;
- undertook a review of SEQWater Corporation's cost of capital, for both regulatory and commercial purposes;
- prepared two cost of capital submissions for ARTC as part of regulatory reviews, one for the Hunter Valley coal network and the other for its interstate rail network;
- prepared a response for ARTC in relation to IPART's Issues Paper on the proposed cost of capital to apply to the Hunter Valley coal network;
- prepared a response for ARTC in relation to IPART's Draft Decision on the proposed cost of capital to apply to the Hunter Valley coal network;
- undertook a review of the cost of capital for Sugar Terminals Limited to be used for pricing purposes.

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