Review of method for determining the WACC
Dealing with uncertainty and changing market conditions

Other Industries — Discussion Paper
December 2012
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Invitation for submissions

IPART invites written comment on this document and encourages all interested parties to provide submissions addressing the matters discussed.

Submissions are due by 15 March 2013.

We would prefer to receive them electronically via our online submission form <www.ipart.nsw.gov.au/Home/Consumer_Information/Lodge_a_submission>.

You can also send comments by fax to (02) 9290 2061, or by mail to:

Review of method for determining WACC
Independent Pricing and Regulatory Tribunal
PO Box Q290
QVB Post Office  NSW  1230

Our normal practice is to make submissions publicly available on our website <www.ipart.nsw.gov.au>. If you wish to view copies of submissions but do not have access to the website, you can make alternative arrangements by telephoning one of the staff members listed on the previous page.

We may choose not to publish a submission—for example, if it contains confidential or commercially sensitive information. If your submission contains information that you do not wish to be publicly disclosed, please indicate this clearly at the time of making the submission. IPART will then make every effort to protect that information, but it could be disclosed under the Government Information (Public Access) Act 2009 (NSW) or the Independent Pricing and Regulatory Tribunal Act 1992 (NSW), or where otherwise required by law.

If you would like further information on making a submission, IPART’s submission policy is available on our website.
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1 Executive summary

The Independent Pricing and Regulatory Tribunal of NSW (IPART) is currently reviewing our methodology for determining the weighted average cost of capital (WACC) we use in setting prices for regulated businesses. Our decision on the WACC has a major influence on the returns some of these businesses can earn from regulated services, and on the prices they can charge for those services. Thus it is in the interests of both the utilities and their customers that we get this decision ‘right’.

The main purpose of our review is to determine whether (and if so how) we should change our current WACC methodology to improve its robustness under changing market conditions, such as those since the global financial crisis (GFC). The purpose of this paper is to discuss the main issues we will consider, set out our preliminary views and analysis, and seek input from stakeholders.

1.1 What prompted this review?

Our current methodology aims to determine a real post-tax WACC for a ‘benchmark utility’, which is a hypothetical firm that is efficient, faces similar economic risks to the regulated business, and is a new entrant.\(^1\) It involves the following 3 steps:

1. Estimating a range for the expected cost of debt over the determination period using current data (based on a short-term average of 20 days) to calculate the risk free rate and the debt margin.

2. Estimating a range for the expected cost of equity using the Capital Asset Pricing Model (CAPM), long-term average data for the market risk premium (MRP), and current data (based on a short-term average of 20 days) for the risk free rate.

3. Adding these estimates together to establish the feasible range for the WACC, then using our judgement to select a point within this feasible range that reflects the efficient cost of capital for our benchmark utility.

\(^1\) Section 2.3 explains our objectives in setting the WACC in more detail, including what we mean by a benchmark utility.
This methodology worked well from early 2000 until 2008/09, as financial market conditions were fairly stable in Australia. However since the GFC, market conditions have been much more uncertain and volatile. For example, in the past 2 years, the midpoint of this range fell from 6.0% to 3.5%.

The gap between the expected costs of debt and equity also narrowed.

In recent determinations, we have addressed these changes in financial market conditions by selecting a WACC value at the upper end of the feasible range rather than the midpoint. While we are satisfied that this has resulted in appropriate rates of return for those determinations, we are concerned that the use of short-term average data (which reflects current market conditions) to estimate the expected cost of debt, and long-term average data (which reflects past market conditions) to estimate the expected cost of equity may be problematic in more uncertain and changeable market conditions. In extreme circumstances, this may lead to the estimate of the expected cost of debt being higher than that of the expected cost of equity. In addition, the current methodology does not incorporate a current estimate of the MRP. This may limit its ability to establish a WACC range which reflects current expectations of the forward-looking cost of equity.

In addition, the Australian Energy Markets Commission (AEMC) has recently highlighted the risks of excessive reliance on a single methodology. In a final position paper, the AEMC proposed that rather than use a single methodology, the Australian Energy Regulator estimate the rate of return consistent with an overall objective. This objective is focused on the rate of return required by a benchmark efficient service provider, with similar risk characteristics to the service provider subject to the decision. Under this approach, the regulator has the flexibility to adopt the method it considers appropriate to estimate the rate of return, provided it considers other relevant estimation methods, financial models, market data and other information. In particular, the AEMC believes that:

In this way, the regulator can better respond to changing financial market conditions, particularly where volatile market conditions impact on a service provider’s ability to attract sufficient capital.

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2 This is the midpoint estimate of the WACC at the end November 2012 using our standard assumptions of a MRP of 6%, 60% gearing and an equity beta midpoint of 0.7.
3 For example, IPART, 2012, Review of Prices for Sydney Water Corporation’s water, sewerage, stormwater and other services from 1 July 2012, 2012.
4 In choosing the WACC, we had regard to the midpoint of the WACC range derived using long-term average data to estimate both the cost of debt and the cost of equity (ie, for the debt margin and risk free rate as well as the MRP).
6 Ibid, iii.
Given the above, we are reviewing our WACC methodology to consider whether there is a clear case for change, and if so, what alternative approach will better enable us to determine a WACC that meets our overarching objective to set the WACC with reference to an efficient benchmark firm in a range of financial market conditions and industry circumstances.

1.2 What is the scope of the review?

This is not a comprehensive review of the WACC methodology. Rather, it will focus on the following main issues:

1. **To estimate the expected cost of debt**, should we use current (short-term average) or long-term data to estimate the risk free rate and the debt margin, or both? For current data, should we maintain the current 20-day averaging period or increase this period? And should we continue to use a 5-year term to maturity, or an alternative term?

2. **To estimate the expected cost of equity**, should we continue to use CAPM, or an alternative or additional model(s)? Should we use long-term historical data to estimate the MRP, or current data (short-term average) to provide a forward-looking estimate of this parameter, or both?

3. **To establish the feasible WACC range**, what combination of cost of debt and cost of equity models and methods should we use to establish this range?

4. **To select the appropriate WACC value**, what factors, information, processes and/or reference points (framework) should we use to guide us in exercising our discretion and reduce regulatory uncertainty?

1.3 What are our preliminary views?

We have conducted considerable analysis, and formed proposals and preliminary views on the above issues. Based on these views, we have identified 5 scenarios for establishing the feasible range for the WACC.

Broadly speaking, we are inclined to continue estimating the WACC range based on our existing methodology, but we consider that we should incorporate a current estimate of the MRP in some form. We are also inclined to use our judgement, having regard to our overarching objective, in deciding on the final WACC value from the feasible range. Finally, we are inclined to put in place a framework to guide us in making this decision and improve certainty for stakeholders.
1.3.1 Preliminary views on estimating the expected cost of debt

In relation to estimating the expected cost of debt, our preliminary view is that there may be merit in considering estimates derived by several different approaches – for example, one that uses current data to estimate the risk free rate and the debt margin, and another that uses long-term average data for these parameters. This is consistent with the approach we have taken in recent decisions.\(^7\)

We consider that using current data is most consistent with our objectives for the WACC, as this best reflects the financing costs of a new entrant or new investment, and thus provides efficient investment signals. However, we also recognise that there are advantages in using long-term average data. For example, this can provide greater stability, reduce re-financing risks for larger utilities, and may reflect decision-making on new entry and investment that has regard to longer term trends.

In relation to the averaging period for short-term data we propose to increase the averaging period for these data from the current 20 days to 40 days. We consider that this longer averaging period is sufficient to ensure that regulated businesses can lock-in the regulatory cost of debt, while still providing a marked-to-market cost of debt at the time of regulatory reset (consistent with the financing costs of a new entrant).

We also propose to continue using a term to maturity of 5 years.

1.3.2 Preliminary views on estimating the expected cost of equity

The cost of equity is the return required by investors to reward them for investing in the utility. This return comprises a MRP associated with the non-diversifiable (systematic) risk arising from a specific asset, firm or industry, plus the nominal risk free rate. As noted above, we currently estimate the cost of equity using the CAPM, under which the risk margins depend on the extent of exposure to systematic risk. In principle, there are other models we could use to estimate the cost of equity, either as the primary model or a cross check.

We have decided that we will continue to use the CAPM as the primary model for estimating the cost of equity. We have also formed a preliminary view that there may be merit in supplementing this model by also considering the results of other cost of equity models (where applicable) as well as additional market information.

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\(^7\) For example, in the review of prices for Sydney Water Corporation’s water, sewerage, stormwater and other services from 1 July 2012, we established the feasible WACC range using our current method. We also established a second WACC range using long-term average data for all parameters, and had regard to the midpoint of this second range in selecting the WACC value within the first range.
In relation to estimating the MRP and risk free rate (2 key inputs to the CAPM), our preliminary view is there are merits in considering estimates derived from both current and long-term average data. Our reasons for this view are similar to those outlined above in relation to estimating the expected cost of debt. In particular, we consider that we should incorporate a current estimate of the MRP – that is one based on current data – into our methodology in some way. However, we need consider the approaches we use to derive this estimate carefully, as there tends to be a considerable level of uncertainty and variability around estimates of the current MRP.

1.3.3 Preliminary views on establishing the feasible range for the WACC

Given our preliminary views on estimating the cost of debt and equity, we have put forward 5 scenarios for establishing the feasible WACC range. Under all scenarios, we would continue to use CAPM as the primary cost of equity model, and estimate a range for certain parameters. The scenarios are:

1. Long-term averages for the risk free rate, debt margin and MRP.
2. Short-term averages for the risk free rate, debt margin and estimate of the MRP using current market data.
3. A combination of Scenarios 1 and 2.
4. A combination of Scenarios 1 and 2 and our current methodology (short-term average data for the risk free rate and debt margin and long-term average for the MRP).
5. Our current methodology and selecting the WACC value with regard to the midpoint of the range established under Scenario 1.

Scenarios 3 and 4 include a forward-looking estimate of the MRP based on current market data. As noted above, we consider our methodology should incorporate such an estimate, as this would be consistent with (and enhance our ability to meet) our objective to determine a WACC that reflects the expected efficient cost of capital. However, it is likely to result in a wider feasible WACC range than our current methodology. This would create some tension between the possible decrease in certainty and predictability for stakeholders, and the greater scope for us to select a WACC that takes account of significant changes in market circumstances. This could be addressed by putting in place a framework to guide us in selecting the WACC from the feasible range (discussed below).

Scenario 5 does not incorporate a current estimate of the MRP. If we were to adopt this scenario, one option for including such an estimate would be by having regard to the midpoint of the range established under Scenario 2 (where all parameters are estimated using short-term average data) as well as under Scenario 1.
However before we decide how to incorporate a current MRP estimate, we need to do further work to examine and test the various approaches for calculating this estimate.

1.3.4 Preliminary views on framework for choosing the WACC

We recognise that stakeholders may be concerned about how we will select the appropriate WACC value in future decisions, especially if we adopt a scenario that may result in a wider feasible range for the WACC. In our view, any additional uncertainty that may arise if we change our WACC methodology can best be managed by establishing a framework that will guide this selection under the scenario we ultimately choose.

We are interested in stakeholders’ views on what this framework should include to reduce uncertainty and improve predictability in relation to this decision, while still enabling us to respond to changing financial market conditions. For example, it could include:

- specific objectives/criteria for setting the WACC, and a commitment to clearly reconciling our decision against these criteria
- transparent models and assumptions for estimating the range for the WACC
- a process that includes structured engagement with groups of investors and debt providers outside the context of specific WACC decisions to inform our views on market practice
- increased monitoring of analyst reports and investors presentations and other supporting information on debt and equity market conditions, and management and analyst practice in investment and valuation decision
- the use of draft reports to seek the views of stakeholders on the WACC value before proceeding to adopt it and the reasons for making this choice.

1.4 How can you provide input to the review?

All stakeholders and interested parties are invited to make submissions in response to this paper. These submissions are due on 15 March 2013. Details on how to make a submission can be found on page iii, at the front of this paper.

We will also hold a workshop on the scenarios presented in this paper in February 2013. We expect to complete this review in May 2013.

We have identified the issues on which we particularly seek stakeholder comment throughout this paper. For convenience, a full list of these issues is provided below:

1. Should we set the WACC for an efficient firm that faces similar economic risks to the regulated business and is a new entrant?
2 What is the appropriate averaging period for the cost of debt? 40
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9 Should we use a long-term average (for example 10 years) to estimate the risk free rate to be consistent with the long term averaging period used for the market risk premium estimate? 70
10 What model, or models, should be used in estimating the range for the WACC, and why? 90
11 Which of the Scenarios in Section 5.3 do you prefer and why? 90
12 If we continue using Scenario 5 (our current methodology, Section 5.3), should we also have regard to the midpoint of the WACC range estimated using current data for all parameters (including the market risk premium) as a reference point? 90
13 How can the exercise of discretion in selecting the WACC value from within the feasible range be structured to increase predictability and certainty while still ensuring that our primary objective for setting the WACC can be achieved? 91
14 If we establish a framework to guide the exercise of this discretion, what should be included? 92
15 What other information should be used in determining the WACC? How can this best be integrated into decision making? 92
16 Should we use the midpoint of the estimated cost of debt in calculating the tax expense? 92
1.5 What does the rest of this paper cover?

The rest of this paper discusses this review in more detail. It is structured as follows:

- Chapter 2 discusses the context and scope for the review, including more detail on our current methodology and objectives for determining the WACC.

- Chapters 3 and 4 focus on estimating the cost of debt and the cost of equity, and discuss the key issues we will consider, the options for estimating each cost, and our preliminary analysis and assessment of these options.

- Chapter 5 examines the various scenarios for establishing the WACC range and selecting the appropriate WACC value.
2 Context and scope of this review

Determining the weighted average cost of capital (WACC) is a critical step in our price setting process, and has a major influence on the resulting prices. If we set the WACC value too low it can discourage new investment and result in prices that are below efficient costs. Conversely, if we set it too high it can encourage overinvestment and result in prices that are too high. Thus, it is in the interests of both the utilities we regulate and their customers that we get this decision ‘right’.

In recent determinations, we have expressed concerns that in current market conditions our current methodology for determining the WACC may result in values that are too low. Our key concern was that the very low interest rates on Government bonds, which are an important part of our approach to estimating the WACC, had driven the estimated WACC to levels below their historical norms. This would not be a problem if it reflected revised expectations for returns on investments in utilities and similar industries. However, we were concerned that it may not. We responded to this by setting the WACC above the midpoint of the estimated range.

While we were satisfied that this approach resulted in a WACC that reflected current market conditions and the relative risks for these businesses, we have decided to review key components of our WACC methodology. We want to ensure that this method is robust and enables us to meet our regulatory objectives in a range of financial market conditions and industry circumstances.

To explain the context and scope of this review, the following sections:

- outline the concept of the WACC and how it is estimated
- discuss the role of the WACC in IPART’s price determinations
- explain our objectives in determining the WACC
- discuss the market and regulatory developments that prompted this review, including the Australian Energy Markets Commission’s (AEMC’s) review of the rules for determining the WACC for the energy utilities\(^8\)
- explain which aspects of the WACC methodology we are reviewing, and which are outside the scope of the review.

\(^8\) AEMC, Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services, Final Position Paper, 15 November 2012.
2.1 Concept of the WACC and how it is estimated

Like other businesses, utilities require capital to invest in their business. These funds are provided by the owners (through equity) or lenders (through debt).\textsuperscript{9} Both the owners and lenders require a return on the funds they provide. The sum of the return required by equity and debt investors – weighted by the proportions of equity and debt used by the business – is referred to as the weighted average cost of capital or WACC.

While the concept of the WACC is commonly accepted, there are a number of different models and formulae that can be used to estimate this cost. We use a real post-tax WACC for our regulatory determinations (as do all other regulators in Australia). In line with common market and regulatory practice, we use the CAPM for estimating the cost of equity. However, some Australian regulators use a real WACC,\textsuperscript{10} and others use a nominal WACC.\textsuperscript{11,12}

2.1.1 WACC parameters

To determine the feasible range for the WACC, we estimate 7 input parameters. Three of these parameters can be observed directly from financial market data:

\begin{itemize}
  \item the risk free rate (Rf)
  \item the debt margin (RD - Rf or return on debt minus the risk free rate)
  \item the adjustment for expected inflation (\(\Pi\)).
\end{itemize}

The other 4 require more complex estimation methods or assumptions:

\begin{itemize}
  \item the MRP (Rm - Rf)\textsuperscript{13}
  \item the degree of systematic risk (or \(\beta_e\), the equity beta)
  \item the level of gearing (D is debt and E is equity)
  \item the value of imputation credits or gamma (\(\gamma\)).\textsuperscript{14}
\end{itemize}

\textsuperscript{9} In practice, sources of funding are more complicated than this distinction allows, with various possible forms of debt and equity that take on different parts of the risk of the underlying asset.
\textsuperscript{10} For example, the Economic Regulation Authority of Western Australia (ERA) and the Essential Services Commission of South Australia (ESCOSA).
\textsuperscript{11} For example, the Australian Energy Regulator, the Australian Competition and Consumer Commission (ACCC), and Victoria’s Essential Services Commission (ESC).
\textsuperscript{12} The return on assets can be decomposed into components – an income sufficient to compensate for inflation and a real return above inflation. A real WACC excludes inflation from the calculated return and is applied to a regulatory asset base that is indexed by inflation. This is the return to the owner to compensate for inflation is provided by the indexation of the asset base. The ACCC and AER provide a nominal return on an asset base that is indexed for inflation. The allowance for depreciation is adjusted to avoid double counting of inflation.
\textsuperscript{13} The market risk premium is the excess return of the share market over the risk free rate.
\textsuperscript{14} In a post-tax framework gamma is accounted for in the tax model.
These parameters are related to each other. For instance, a higher level of gearing implies a higher debt margin and a higher equity beta than would otherwise be the case.

### 2.1.2 Real post-tax WACC formula

Once we have estimated these parameters, we combine them using the formula below, to give the real post-tax WACC.

\[
r_{\text{post}} = \left( 1 + \left( R_e \left( \frac{E}{D+E} \right) + R_d \left( \frac{D}{D+E} \right) \right) \right) \left( 1 + \Pi \right) - 1
\]

Where \( r_{\text{post}} \) is the real post-tax WACC, \( R_d \) is the nominal cost of debt, \( R_e \) is the nominal cost of equity, \( D \) is the level of debt and \( E \) is the level of equity.

### 2.2 The role of the WACC in price regulation

For most of our determinations we use a building block approach to set regulated prices. Under this approach we estimate the efficient costs for the quantity and level of services to be provided. Once the annual revenue requirement is determined we calculate the prices – or average price – needed to recover these costs over the regulatory period, given the expected volume of services to be provided.

We use an estimate of the WACC in determining the return on capital in our building block costs model. The return on capital (calculated as the Regulatory Asset Base (RAB) multiplied by the WACC) is often the largest proportion of the total costs because utilities are capital intensive businesses and have long-lived assets.

Hence, it is important for both utilities and their customers that we use the ‘right’ WACC in calculating the return of capital allowance is appropriate. For the utilities, if the WACC is too low it will reduce their revenues and may affect their financial sustainability. For customers, if the WACC is too high too high, they will be paying too much for the services and the utility may earn excess profits.

Using the right WACC is also important to encourage the efficient use of society’s resources. If it is too low, the utilities may be discouraged from undertaking efficient investment and customers will consume too much of the services and the resources required to provide them. Conversely, if the WACC is too high, the utility may be encouraged to over-invest and customers may under-use the services.
2.3 What is our objective in setting the WACC?

In determining the WACC used in our price setting process, we aim to set a value that reflects the efficient cost of capital for a ‘benchmark utility’. That is, we do not aim to set a WACC that reflects the actual financing decisions and cost of capital for a business under its existing structure and ownership. Rather our objective is to determine the WACC for a hypothetical benchmark utility with 3 main characteristics:

- **It is efficient.** This is consistent with the view that economic regulation should, as far as possible, seek to encourage greater efficiency by simulating the effects of competition. It is also consistent with the matters we have to consider in making price determinations, established by the Independent Pricing and Regulatory Tribunal Act (IPART Act) (see below).

- **It faces similar economic risks to the regulated business.** By this we mean similar market risks associated with general economic trends not risks that are specific to that business. The owners (equity holders) of a business can manage the business-specific risks through diversifying their investments across other businesses. In contrast, general economic risks that affect all businesses cannot be managed through diversification.

- **It is a new entrant.** This is also consistent with the view that regulation should, as far as possible, seek to encourage greater efficiency by simulating the effects of competition. In particular, determining the WACC that reflects the costs of a new entrant creates a strong incentive for regulated businesses to achieve the most efficient financing outcome overall. For example, setting such a WACC for monopoly businesses like the metropolitan water utilities has a similar effect on these businesses’ incentives as facing a new entrant in their market at each regulatory reset.

While the ownership of the benchmark utility is not specified, in practice the WACC is calculated from market data on the cost of debt and equity for privately-owned firms.

This objective for determining the WACC is consistent with the matters we must consider in making pricing decisions, set out under section 15 of the IPART Act (see Box 2.1).\(^\text{15}\) It is also consistent with a goal of enhancing the long-term interest of consumers through efficient investment in and the commercially sustainable provision of efficient services.

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\(^{15}\) Not all of IPART’s determinations are made under the IPART Act. For example, bus determinations are done under the *Passenger Transport Act 1990*. However, the requirements that affect the determination of the rate of return are similar.
We note that in establishing our methodology for setting a WACC in line with our objective, we also need to ensure the method is consistent with the broader principles of regulation. That is, the method should be:

- transparent
- predictable
- consistently applied over time and between utilities
- no more complex than necessary.

We seek stakeholder comments on the following issue:

1. Should we set the WACC for an efficient firm that faces similar economic risks to the regulated business and is a new entrant?

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**Box 2.1 The IPART Act**

Under section 15 of the IPART Act, we must have regard to, among others:

a) the cost of providing the services concerned

b) the protection of consumers from abuses of monopoly power

c) the appropriate return on public sector assets and associated dividends to the Government for the benefit of the people of New South Wales …

e) the need for greater efficiency in the supply of services so as to reduce the costs for the benefit of consumers and taxpayers …

g) the impact on borrowing, capital and dividend requirements of the government agency concerned and, in particular, the impact of any need to renew, or increase relevant assets.

The cost of capital is a component of the costs of providing the services and must be considered under (a) above, while the requirement to consider efficiency under (e) draws our attention to the efficient cost of capital rather than the actual debt and equity costs of the regulated business. Setting the WACC too high is arguably inconsistent with (e), while setting it too low may conflict with (c) and (g).

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**2.4 Why are we reviewing our WACC methodology?**

We have become concerned that our current methodology may not result in a WACC that fully reflects the expected cost of capital, due to changes in the financial market conditions since the GFC. The AEMC has also highlighted the need for regulators to ensure their approach for deciding on the rate of return takes account of changed market conditions.
2.4.1 IPART’s concerns about WACC method in post-GFC market conditions

Since the GFC, the WACC estimated using our current methodology has declined. As Figure 2.1 shows, the midpoint of the feasible range for the real post-tax WACC established by this method declined from more than 6.0% in early 2011 to less than 3.5% in November 2012. This is primarily due to a reduction in the estimated cost of equity.

Figure 2.1  Change in midpoint WACC since 2008

Data source: Bloomberg, IPART’s own analysis. Calculation based on a MRP of 5.5% to 6.5%, a gearing level of 60% and an equity beta range of 0.6 to 0.8.

In our report on our determination for Sydney Desalination Plant in 2011 (and in subsequent determination reports) we expressed concern that the actual cost of capital may not have declined by this much. To address this concern, we have set the WACC at or near the top of the estimated range rather than at the midpoint (after considering the midpoint of the WACC range established by using long-term average data for all parameters).

We consider that the reason our current method underestimates the WACC in post-GFC market conditions is that the data used to estimate the cost of debt reflects current market conditions, while the data used to estimate the cost of equity reflects historic market conditions. In particular, we:

- estimate the cost of debt using short-term average data for both the risk free rate and debt margin, but
- estimate the cost of equity using long-term average data for the MRP (and a short-term average data for the risk free rate).
The rationale for using long-term average data to estimate the MRP is that such an estimate provides a proxy for current expectations about this premium. This approach served well from early 2000 to 2008, when interest rates were fairly stable in Australia. But since the GFC we have witnessed substantial dislocations in financial markets that have affected interest rates and investor perceptions of risk and required returns on equity.

The initial effect of the GFC on debt markets was an increase in debt margins (the difference between the risk free interest rate and the interest rate on corporate bonds), and corporations found it difficult to access debt markets due to liquidity constraints. While debt margins have subsequently decreased, they remain higher than pre-GFC levels in Australia and liquidity in debt markets remains a concern.

In equity markets, there was a substantial reduction in share prices. Given forecast dividends and an assumption of a return to ‘normal’ growth in dividends in future years, this implied a substantial increase in the equity risk premium. It suggests that the GFC may have altered investors’ perceptions of the risk of equity investment, and hence they require a higher return on equity. Since its initial spike, the MRP has fallen but it does not appear to have returned to pre-GFC levels in Australia.  

There was also a substantial fall in yields on Government bonds, which we use as a measure of the risk free rate. There is no clear indication if and when yields will revert to more normal levels.

The market changes have had the following impacts on the WACC estimated using our current methodology:

- The estimated cost of equity has fallen substantially due to a decline in the risk free rate (estimated using current data). The MRP which is estimated using very long-term historical average data did not change.

- The estimated cost of debt rose by around 50% due to a rise in the debt margin during the GFC. Since then, the increase in the debt margin has been largely offset by the fall in the risk free rate (both estimated using current data). However, the difference between the spot cost of debt and the long-term cost of equity has decreased, because the debt margin has increased and the estimated MRP has not substantially changed. In extreme circumstances this could lead to the cost of debt being greater than the cost of equity.

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16 A 2010 Bank of England study found that estimates of the current MRP had fallen back to pre-GFC levels – Bank of England, Interpreting equity price movements since the start of the financial crisis, Quarterly Bulletin 2010 Q1, pp 24-33.
We recognise that for regulatory stability and investment certainty, regulators should not change their methodologies too frequently. Ideally, these methods should be stable through economic cycles and not be altered in response to possibly temporary unusual market circumstances. We set the WACC for periods of 4 to 5 years and we consider that the stresses the current changes in financial markets have placed on our current WACC methodology do require us to examine its ability to perform under volatile market conditions.

Concerns about estimating the WACC in post-GFC market conditions are not restricted to regulators and regulated businesses. Corporations, analysts and financial advisors have to form a view on the cost of capital when valuing businesses or investments. Hence, similar concerns have also been expressed in the context of company valuation and investment strategy. For example, Professor Damodaran, a Professor of Finance at the Stern School of Business at New York University and a frequent commentator on risk premia, recently identified 4 options on how low risk free rates can be addressed:

1. Use spot interest rates and the historical MRP. This option will overvalue assets.
2. Use historical interest rates and the spot MRP. This will lead to undervaluations.
3. Use historical averages for all inputs, interest rates and the MRP. This may be used by investors who believe that markets over-react and adjust back to norms over time.
4. Use spot interest rates and the spot MRP. The results of this option will be volatile and change as the macro environment changes.\(^{17}\)

It is important to note, that in our review of the WACC methodology, we are not seeking the theoretically best method. Theory might suggest we should use current market data to estimate the expected MRP and the cost of debt. However, as noted in section 2.2, our objectives are more practical. We are seeking a methodology that results in a WACC that reflects investor expectations in a range of market conditions over time, and provides regulatory stability, certainty and predictability. If relying on a single approach that uses current data to estimate the MRP creates additional risks and volatility, or if investors act on the basis of mean reversion to long-term averages, this may not be the best approach to adopt.

2.4.2 AEMC’s recent review on regulatory approaches to the WACC

The AEMC’s review of the rule changes submitted by the AER and the Energy Users Rule Change Committee (EURCC) included an extensive review of the regulatory approach to WACC. Importantly, the AEMC found that regulators should focus on an overall objective in determining the WACC and have regard to a wider range of approaches to estimating the WACC and sources of information. This finding recognises the uncertainty in estimating the WACC and the need for regulators to exercise discretion in setting the WACC. Recent developments in British regulation, such as a report by FTI Consulting\textsuperscript{18} for Ofgem, provide an example of the application of this kind of approach.

For its review, the AEMC commissioned reports from an expert consultant (SFG) and considered substantial submissions from utilities, regulators and users. While the proposed rule changes are not binding for IPART, we consider that we should have regard to the submissions, consultant reports, and findings of the AEMC.

In its final position on the rule change proposal, the AEMC proposed that a good rate of return framework would be one that:

- is based around estimating a rate of return for a benchmark efficient service provider
- allows methodologies for parameters to be driven by principles and to reflect current best practice
- allows flexibility to deal with changing market conditions and the availability of new evidence
- recognises the inter-relationships between parameter values
- creates a framework of accountability for both the regulator and the service provider in determining an appropriate rate of return
- provides certainty for service providers and their investors
- reacts to changes in market circumstances and allows to make decisions on an appropriate rate of return
- is based on a rate of return framework that allows for more effective consumer participation.\textsuperscript{19}

The AEMC recommended that the regulator make an estimate of the rate of return consistent with an overall objective. The objective should be focused on the rate of return required by a benchmark efficient service provider, with similar risk characteristics as the service provider subject to the decision. Under this approach, the regulator has the flexibility to adopt the approach it considers

\textsuperscript{18} FTI Consulting, \textit{Cost of capital study for the RIIO-T1 and GD1 price controls}, 24 July 2012.

appropriate to estimate the rate of return, provided it considers relevant estimation methods, financial models, market data and other information. The AEMC argued that:

In this way, the regulator can better respond to changing financial market conditions, particularly where volatile market conditions impact on a service provider’s ability to attract sufficient capital...20

In our view, our current WACC methodology is already broadly consistent with the AEMC’s recommended approach. However, the AEMC review raises the following questions for our review:

- Should there be a single benchmark WACC for the sector or multiple benchmarks that reflect characteristics of a benchmark firm that match the characteristics of the regulated firm more closely?
- Should we consider alternative methods for estimating certain parameters, such as using long-term average data for the risk free rate and debt margin?
- Should we consider models other than (or in addition to) the CAPM for estimating the cost for equity?
- What additional market information is available and how can this best be obtained and used in our decision-making on the WACC?

2.5 What aspects of the WACC methodology are we reviewing?

This is not a comprehensive review of our WACC methodology. To address the concerns and issues discussed in the sections above, we will focus on the following main issues:

1. To estimate the expected cost of debt, should we use current21 or long-term average data to estimate the risk free rate and the debt margin, or both? For current data, should we maintain the current 20-day averaging period or increase this period? And, should we continue to use a 5-year term to maturity, or an alternative term?

2. To estimate the expected cost of equity, should we continue to use the CAPM, or an alternative or additional model(s)? Should we use long-term historical data to estimate the market risk premium, or current data to provide a forward-looking estimate of this parameter, or both?

3. To establish the feasible WACC range, what combination of cost of debt and cost of equity models and methods should we use to establish this range?

4. To select the appropriate WACC value, what factors, information, processes and/or reference points (framework) should we use to guide us in exercising our discretion and reduce regulatory uncertainty?

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20 Ibid, p iii.
21 We currently use a 20-day average to smooth-out any short-term variability in current data estimates.
Several aspects of our current methodology are outside the scope of this review, as we consider they are relatively settled. These are:

- the use of yields on Commonwealth Government Bonds to estimate the risk free rate
- estimation of inflation using inflation swaps
- the assumed credit rating of BBB/BBB+
- the use of corporate bonds issued by Australian corporates locally and in the US and the Bloomberg Fair Value curve to estimate debt premium
- the assumption for gamma of 0.25.

In addition, the approach of estimating beta and debt gearing are outside the scope this review. These parameters are specific to each utility and price review, and are based on observable market data (where available) and first principles analysis of the risks and characteristics of the sector/activity.

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22 Except for the purpose of calculating the expected real WACC based on long term historical estimates of the risk free rate. For the purpose of calculating real WACC figures based on the long term historical risk free rate, we will use an estimate of the long-term inflation adjustment.
3 | Estimating the expected cost of debt

The cost of debt is the sum of the risk free rate and the debt margin. The debt margin represents the compensation above the risk free rate required by investors for credit, liquidity and maturity risks. To estimate this cost, we currently use the 20-day average of the 5-year nominal risk free rate and the median and the interquartile range of yields on our sample portfolio of bonds. Our sample bond portfolio is based on a 5-year term to maturity and a credit rating of BBB+ to BBB. We use Australian corporate bonds, the Australian 5-year Bloomberg Fair Value Curve and Australian corporate bonds issued in the US market swapped back into Australian Dollars.

As part of this review, we will consider whether we should change:

- the averaging period we use for the risk free rate and the debt margin
- the term-to-maturity we use.

The first sections below outline the key issues, the options, and current regulatory and commercial practice. The next sections examine the impact that using different averaging periods and terms-to-maturity have on cost of debt estimates, discuss our assessment of options and, lastly, consider the implementation and transition issues.

3.1 Key issues

Our current approach of determining the cost of debt has served us well over a number of years. It has generally provided an estimate of the cost of debt that was consistent with the debt financing costs of a new entrant.

However, current market conditions (particularly the relatively low risk free rate) have highlighted that a cost of debt estimate based on prevailing market conditions can sometimes vary significantly from financial market expectations. While this may sound counterintuitive, market expectations in a time of increased volatility may be based on longer term average conditions. This may be because it takes time for the expectation of how market participants respond to change conditions. We have recognised this in recent decisions by making reference to a long-term estimate of the cost of debt in our final choice of the WACC.
When setting the cost of debt, we are attempting to set a cost of debt with reference to a new entrant. This is why we use data on yields for the risk free rate and the debt margin from the financial markets at the time of a decision. Using current information from financial markets ensures that we set the efficient debt financing costs for a benchmark new entrant firm. This is also the efficient cost for new capital expenditure by the incumbent. We do not set the cost of debt with reference to the actual cost of debt of the utilities we regulate. Doing this would remove the very incentives that incentive regulation is intended to provide.

The key questions raised in regards to the use of current interest rates at the time of a WACC decision are:

- Does it create additional financing risk because it conflicts with optimal financing strategies?
- Do investors in long-term infrastructure assets take a longer term view of financing costs and look beyond current rates?

### 3.2 Options

There are a range of options for the benchmark cost of debt. In broad terms these benchmarks can be defined in terms of the form of debt (eg, bonds, bank debt, and project finance), the rating assumption, the period over which rates are averaged and the maturity period. Our review focuses on the last 2 of those characteristics – the averaging period and the maturity period.

For the averaging period, we considered 4 options:

1. Short-term averages of yields on BBB/BBB+ corporate bonds.
2. Long-term averages of yields on BBB/BBB+ corporate bonds.
3. Long-term averages with annual adjustments.
4. A hybrid approach based on the spot risk free rate and a 10-rear rolling average debt margin with a term equal to the length of the regulatory period where the risk free rate is based on a short-term average of swap rates with a term equal to the length of the regulatory period.\(^{23}\)

In relation to short-term averages, we also considered whether the number of days over which rates are averaged should be increased from the current 20 days, to allow utilities to lock-in the regulatory cost of debt.

\(^{23}\) ETSA Utilities, CitiPower and Powercor Australia, Joint Response to AER and EURCC Rule Change Proposals, 8 December 2011.
For the term to maturity, we considered 2 options:

1. Continue using our current approach of a 5-year term to maturity so that the term to maturity that approximates the regulatory period ensures NPV-neutrality of our regulatory model.

2. Switch to a 10-year term assumption.

### 3.3 Current regulatory and commercial practice

#### 3.3.1 Other regulators’ approaches

We surveyed the approaches other regulators in Australia and overseas take when estimating the cost of debt. Table 3.1 summaries the results, focusing on 2 questions:

- **What averaging period do they use for the risk free rate – short-term or a longer term?** A shorter averaging period is more likely to reflect current market conditions, whereas a longer averaging period is likely to show more normal conditions in the market.

- **What term-to-maturity do they use for the risk free rate?** A shorter term-to-maturity such as a 5-year term-to-maturity, more closely matches regulatory periods for which prices are set. A longer term bond more closely matches the lives of the assets funded by debt.
Table 3.1  Cost of debt approach by other regulators

<table>
<thead>
<tr>
<th>Regulator</th>
<th>Risk free rate averaging period</th>
<th>Term to maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPART</td>
<td>20-day average</td>
<td>5-year Commonwealth Government Bond (CGB)</td>
</tr>
<tr>
<td>AER</td>
<td>20-day average</td>
<td>10-year CGB</td>
</tr>
<tr>
<td>ERA</td>
<td>20-day average</td>
<td>5-year CGB for Dalrymple Natural Gas pipeline; 10-year CGB for 2008 freight/urban railway networks.</td>
</tr>
<tr>
<td>QCA</td>
<td>20-day average</td>
<td>5-year CGB</td>
</tr>
<tr>
<td>ESC</td>
<td>40-day average</td>
<td>10-year CGB</td>
</tr>
<tr>
<td>ESCOSA</td>
<td>20-day average</td>
<td>10-year CGB</td>
</tr>
<tr>
<td>Ofgem (GB)</td>
<td>10-year trailing average</td>
<td>10-year index-linked gilts</td>
</tr>
<tr>
<td>Ofwat (GB)</td>
<td>10-year trailing average</td>
<td>5&amp;10 year index-linked gilts</td>
</tr>
<tr>
<td>NZCC (New Zealand)</td>
<td>linearly interpolated annualised daily data by Bloomberg</td>
<td>5-year NZGB</td>
</tr>
<tr>
<td>NMa (Netherlands)</td>
<td>2 or 5-year trailing average</td>
<td>10-year government bonds</td>
</tr>
</tbody>
</table>


Our current approach of using a 20-day averaging period for the risk free rate is consistent with other Australian regulators. Regulators overseas mainly use longer term averaging periods, except for New Zealand.

Our approach of using a 5-year maturity period is consistent with some other Australian and overseas regulators. ERA and NMa use a 5-year term-to-maturity. The AER and Ofgem use a 10-year time-to-maturity. OfWat uses both.
3.3.2 AEMC’s final position on the cost of debt

In its final position, the AEMC noted that there had been broad support from stakeholders for consideration of return on debt methodologies other than the current prevailing market conditions approach. It concluded that:

- Historical trailing average approaches have sufficient merit to be an option for regulators to consider.
- The best methodology for estimating return on debt may not be the same for benchmark efficient service providers with different characteristics. Therefore, they proposed that the rules should provide some guidance as to how the best methodology should be determined but not dictate a fixed methodology.
- The benchmark for the cost of debt should not vary between privately-owned and state-owned service providers.
- The most appropriate benchmark to use in the regulatory framework for all service providers, regardless of ownership in general, is the efficient private sector service provider. If state-owned businesses issued their own bonds, without a government guarantee, they would face materially similar borrowing costs to privately-owned service providers. The most appropriate benchmark to use in the regulatory framework for all service providers, regardless of ownership in general, is the efficient private sector service provider.

3.3.3 Financial market practice

We also consulted a number of local banks on the benchmark for the cost of debt for utilities. These discussions provided useful insights into the financing strategies of utilities and the potential impact on financial markets of regulatory decisions on the benchmark cost of debt.

The banks advised us that a 10-year term to maturity would provide a better match to the financing strategies of utilities than a 5-year term to maturity. Utilities own long-lived assets and in their experience, utilities seek longer maturities where possible.

The banks also indicated a utility’s debt portfolio may include a variety of funding sources. They believe that our current approach to estimate the debt margin is better than relying solely on the Bloomberg Fair Value Curve or Australian Corporate bonds issued in Australia. Some thought the debt margin estimate could be improved by including indexed bonds and bonds with different maturities. For example in a recent report, NAB shows the funding mix of Australian network utilities (Figure 3.1).
Estimating the expected cost of debt

Review of method for determining the WACC

Figure 3.1  Funding mix of Australian network utilities

![Pie chart showing funding mix of Australian network utilities]


Figure 3.1 shows that only 9% of Australian network utilities’ debt is issued in the AUD bond market. One of the challenges for utilities in this market is the limited demand for bonds with long maturities. The USD private placement bond market (USPP) is more significant with 19% of funding. This market offers longer maturities that are not available locally at cost effective pricing.

We also asked the banks about the impact of using a short-term average or a long-term average in their cost of debt estimate. Some banks believe that a long-term average would be a better match to utilities’ debt portfolios. There was agreement that the timing of debt-raising and the maturity of bonds are not linked to the regulatory cycle.

The banks also noted that utilities may use interest swaps to lock-in interest rates at the time of regulatory decisions. This enables them to match the risk free rate component of the cost of debt to a short-term average. But they cannot hedge the debt margin in this way. This could mean that a short-term average is appropriate, because utilities lock-in the base interest rate at the time of the regulatory reset.

As noted below, New South Wales Treasury Corporation (TCorp) had raised the concern that this strategy may not be feasible for a large utility such as Sydney Water. The banks provided some support for this view. While some of the privately-owned utilities in Victoria may be able to access the swap market without shifting the market, some of the larger utilities or Treasury Corporations may shift swap market prices due to the size of their swap transaction. However, they also considered that an increase in the short-term regulatory averaging period from 20 to 40-days may be sufficient to address this problem for a debt-hedging task equivalent to Sydney Water Corporation’s and the Sydney
Catchment Authority’s RABs. The effect on the market would be diluted by spreading the purchases of swaps over a longer period.

### 3.3.4 Debt management practice in NSW

Many of the utilities we regulate are owned by the NSW Government. TCorp manages the debt for State-owned utilities in NSW. In the past, TCorp\(^{24}\) has put forward the view that the cost of debt should be estimated using a term to maturity of 10 years and a 10-year moving average of the risk free rate and debt risk premium.

Generally, debt fund managers attempt to manage 2 key risks:

- **Funding or refinancing risk** – prudent debt management practice requires long life assets to be funded by long-term loans to minimise refinancing risk over the life of the assets. This risk was highlighted during the GFC for both government and corporate borrowers where withdrawal of support by debt providers and the limited availability of long-term funding exposed borrowers to default and bankruptcy.

- **Interest rate reset risk** – the cost of debt is reset as part of regulatory determinations every 4-5 years. Debt fund managers need to re-price the interest rate of their loan portfolio in line with the regulatory determination period. Doing this during a 20-day period consistent with the regulatory averaging period could potentially drive up prices on swaps used to lock-in the regulatory interest rate.

TCorp argues that in practice it would not be possible to refinance a utility’s debt portfolio at each regulatory reset based on a 5-year term assumption and the use of a short average period (20-day average) adds significant re-pricing risks for both the utilities and consumers. It concludes that a prudent debt management strategy is consistent with 10-year term to maturity for both the risk free rate and the debt margin based on a 10-year trailing average.

In its report to the AEMC, SFG argued that government-owned businesses financed through treasury corporations, adopt an ‘issue and park’ approach. Treasury Corporations issue fixed rate bonds well before regulatory determinations and ‘park’ the proceeds until the determination and use swap contracts to lock-in the regulatory interest rates over a much longer period rather than during the 20-day to 40-day averaging period.\(^{25}\)

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\(^{24}\) See for example T-Corp’s submission to our 2012 review of prices for Sydney Water Corporation’s water, sewerage, drainage and other services – March 2012.

3.4 The impact of using different averaging periods and terms to maturity

We have analysed the impact that the choice of the averaging period has on the estimates of the risk free rate and cost of debt, using data for the last 20 and 10 years, respectively. The results illustrate that longer term averages provide greater stability but can also result in estimates of the cost of debt that are at times substantially different from the current cost of debt. We have also considered the effect of the choice of the averaging period and debt maturity on the financing risks for the utilities.

3.4.1 Impact of averaging periods

In November 2009, we completed a review of the way we estimate the return on capital as part our regulatory decision.26 As part of the review, we considered alternative averaging periods that can be used to determine the WACC input parameters. The figures below update our previous analysis of the nominal risk free rate and the debt margin using the most recent available data and our current methodology.

Nominal risk free rate

We estimate the nominal risk free rate using the 5-year Commonwealth nominal bond index. Figure 3.2 shows the trends in the 5-year Commonwealth nominal bond index over the last 20 years for a number of averaging periods27.

![Figure 3.2 Trend in the 5-year nominal risk free rate (to 5 November 2012)](image)

Data source: Bloomberg.

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26 IPART, Averaging the WACC parameters for the cost of capital - Discussion Paper, November 2009.
27 All averaging periods are measured in trading-days.
Estimating the expected cost of debt

Not surprisingly, Figure 3.2 shows that the shorter the averaging period, the more volatile the estimates will be. The 20-day average is the most volatile estimate among all the estimates. The 40-day average is more volatile than the 5-year and 10-year averages. There is very little difference between the 20-day and 40-day averages.

Table 3.2 contains the summary statistics of the nominal risk free with different averaging periods over the period from 1 January 1992 to 5 November 2012.

Table 3.2 Nominal risk free rate statistics

<table>
<thead>
<tr>
<th>Averaging period (trading days)</th>
<th>20-day</th>
<th>40-day</th>
<th>5-year</th>
<th>10-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of observations</td>
<td>5422</td>
<td>5402</td>
<td>4399</td>
<td>2833</td>
</tr>
<tr>
<td>Average</td>
<td>6.3%</td>
<td>6.3%</td>
<td>6.2%</td>
<td>6.1%</td>
</tr>
<tr>
<td>Median</td>
<td>5.8%</td>
<td>5.8%</td>
<td>5.7%</td>
<td>5.8%</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1.5%</td>
<td>1.5%</td>
<td>1.1%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>3.3</td>
<td>3.4</td>
<td>3.1</td>
<td>2.1</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.8</td>
<td>0.8</td>
<td>1.2</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Note: The kurtosis of the normal distribution is 3. If the kurtosis exceeds 3, the distribution is peaked (leptokurtic) relative to the normal distribution; if the kurtosis is less than 3, the distribution is flat (platykurtic) relative to the normal distribution. Skewness characterizes the degree of asymmetry of a distribution around its mean. Positive skewness indicates a distribution with an asymmetric tail extending toward more positive values. Negative skewness indicates a distribution with an asymmetric tail extending toward more negative values.

Table 3.2 indicates that the standard deviation of the 20-day average is more than twice that of the 10-year average. A change from a 20-day to a 10-year average would significantly decrease volatility and result in a substantial reduction in the range of the estimate. Over the period as a whole there is little difference in the averages but there can be sustained periods (e.g., 2 years) when there is a significances difference between the 5-year average and the short-term averages.

Debt margin

Our current debt margin approach is based on 20-day averages of the Bloomberg fair value yield curve for BBB rated Australian corporate bonds with a maturity of 5 years, as well as actual bond yields for BBB and BBB+ rated securities issued by Australian firms in both Australian and US markets. We also include an allowance of 20 basis points (bps) per annum on the debt margin for debt raising costs. The composition of our proxy bond portfolio differs for different time periods. For this trend analysis, we have used the Bloomberg 5-year BBB fair value curve as a proxy. Figure 3.3 shows the trends in our measure of the debt margin over the last 10 years for a number of different averaging periods.

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28 IPART, Developing the approach to estimating the debt margin - Final Decision, April 2011, p 9.
29 Debt margin is calculated as the difference between the Bloomberg 5-year BBB fair value curve and the 5-year nominal risk free rate.
Figure 3.3  Debt margin trend (to 5 November 2012)

![Graph showing debt margin trend (to 5 November 2012)]

**Note:** The debt margin trend is constructed for the period from the 5 December 2001 to 5 November 2012. There is not enough data to create the full 5 and 10-year debt margin trends.

**Data source:** Bloomberg.

Figure 3.3 shows that the 20 and 40-day averages are more volatile than the longer term averages. The longer term averages are smoother than the 20 and 40-day averages. There is no predictable bias among the different averaging periods before mid-2007. The longer term averages are more stable over time. The 5-year average is not very responsive to medium term changes in yields (period after mid-2007).

Table 3.3 contains statistical measures of variability of the different debt margin averages over the period from 1 January 2002 to 5 November 2012.

<table>
<thead>
<tr>
<th>Averaging period (trading days)</th>
<th>20-day</th>
<th>40-day</th>
<th>5-year</th>
<th>10-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of observations</td>
<td>2831</td>
<td>2811</td>
<td>1527</td>
<td>222</td>
</tr>
<tr>
<td>Average</td>
<td>2.0%</td>
<td>2.0%</td>
<td>1.9%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Median</td>
<td>1.4%</td>
<td>1.3%</td>
<td>1.8%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1.1%</td>
<td>1.1%</td>
<td>0.7%</td>
<td>0.06%</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>1.6</td>
<td>1.2</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.31</td>
<td>0.30</td>
<td>0.29</td>
<td>-0.13</td>
</tr>
</tbody>
</table>

**Note:** The kurtosis of the normal distribution is 3. If the kurtosis exceeds 3, the distribution is peaked (leptokurtic) relative to the normal distribution; if the kurtosis is less than 3, the distribution is flat (platykurtic) relative to the normal distribution.

**Skewness** characterizes the degree of asymmetry of a distribution around its mean. Positive skewness indicates a distribution with an asymmetric tail extending toward more positive values. Negative skewness indicates a distribution with an asymmetric tail extending toward more negative values.

Table 3.3 indicates that increasing the averaging period from 20-days to 5-years would result in a significant reduction in volatility (as measured by the standard deviation). The reduction in volatility is even more pronounced when the averaging period is changed to 10 years.
A longer term average of the debt margin provides a more stable estimate over time, but this needs to be balanced against the danger of missing substantial changes in current rates, as experienced after June 2008.

Overall, our analysis indicates that for the risk free rate and the debt margin:
- a longer term averaging period means a more stable WACC over time, but
- the longer the averaging period, the less reflective the WACC is compared to prevalent market conditions.

**What is the new evidence on averaging periods?**

We currently use a 20-day averaging period for the risk free rate and the debt margin. This is consistent with our objective to set the cost of debt with reference to a new entrant, if they base their entry/investment decisions on current rates. In principle this means that we mark-to-market utility assets at the time of the regulatory reset.

Between the beginning of 2000 until mid-2008, interest rates in Australia were fairly stable (Figure 3.2), and our 20-day average assumption was not contested by utilities or their debt managers. Stable interest rates meant that the timing of debt raisings did not impact much on the average cost of debt and there was no significant difference between the interest cost of existing debt and new debt. It also meant that the timing of regulatory decisions did not have a great effect on outcomes.

Since mid-2008 this has changed dramatically. Risk free rates and liquidity have decreased and debt margins have increased significantly. This means that:
- interest costs of existing and new debt started to diverge
- debt managers have become more concerned with managing refinancing risk.

For economic regulators this means that with the onset of the GFC, a gap between the regulatory benchmark for the cost of debt, actual financing strategies and risk management practice emerged for at least some utilities. This has also been recognised by the AEMC in its recent final position on the economic regulation of network service providers.\(^{30}\) The AEMC recognises that different business models may require different benchmarks.

TCorp’s view is that the averaging period should be consistent with prudent debt management and stable prices. It favours a 10-year averaging period with annual indexing. Our views on using long-term averages or short-term averages rates are discussed below.

We note that in its final position the AEMC has identified a number of key factors the regulator should consider when setting the cost of debt:

- whether the benchmark debt costs for utilities in the same sector should differ because of different benchmark debt management strategies
- the effect on the cost of equity of different methodologies for estimating the return on debt
- the effect on incentives for efficient capex during the regulatory period of the methodology used to estimate the return on debt
- consideration of whether transition arrangements are required if there is a change in the methodology used to estimate the return on debt.\textsuperscript{31}

**What is the impact of using different averaging periods on the cost of debt?**

Figure 3.4 shows:

- the cost of debt generated using our current methodology (cost of debt–S-S) of using a 20-day averaging period for the risk free rate and the debt margin
- the cost of debt generated using a 10-year average for the risk free rate and an estimated long-term debt margin of 2.2% (Cost of debt–L-L)
- the cost of debt generated using the spot risk free rate and an estimated long-term debt margin of 2.2% (20-day average RF+LT debt margin).

### Figure 3.4 Averaging the real cost of debt

*Note:* Short-term average cost of debt generated using 5-year term to maturity risk free rate and debt margin based on the 5-year Bloomberg Fair Value curve. Long-term average cost of debt generated using the 5-year term to maturity risk free rate, a long-term debt margin of 2.2%. All scenarios use an inflation adjustment of 2.5%.

*Data source:* Bloomberg, IPART’s analysis.

\textsuperscript{31} Ibid.
Figure 3.4 shows how volatile the short-term average cost of debt estimate was during the GFC. The long-term average cost of debt has been fairly stable during the GFC. There are relatively long periods where the long-term average is either significantly below or significantly above the short-term average:

- From a utility’s point of view, this means that there may be long periods where the regulatory long-term cost of debt may be significantly below the spot cost of debt in financial markets. At such times the cost of funding new investment may exceed the return allowed by the regulator.

- From a consumer’s point of view, it means that there may be long periods where the regulatory long-term cost of debt is significantly above the observable spot cost of debt in financial markets.

**How do different averaging periods impact on the WACC?**

Figure 3.5 shows how different averaging periods impact on the WACC.

**Figure 3.5 Averaging periods and the real post-tax WACC**

![Graph showing the impact of different averaging periods on the WACC]

**Data source:** Bloomberg, IPART’s analysis. Based on 60% gearing. 20 and 40-day averages use the 5-year Bloomberg Fair Value curve for the debt margin. Long-term estimates based on a 10-year average debt margin of 2.2% (IPART’s own calculations). Cost of equity calculated using a MRP of 6% in all scenarios and an equity beta 0.9. All scenarios use an inflation adjustment of 2.5%.

Over the observation period:

- the 20-day average had a maximum of 7.8% and a minimum of 3.9%
- the 40-day average had a maximum of 7.7% and a minimum of 4.0%
- the 10-year average had a maximum of 7.7% and a minimum of 5.9%
Figure 3.5 also shows that for much of the last 20 years the longer term averages results in a higher WACC estimate than the shorter averaging periods. In the first half of the period inflation expectations were declining with a relatively stable monetary policy framework and explicit inflation targeting. It is important to note that Figure 3.5 uses our current methodology with the historical MRP in all scenarios. An analysis of the same scenarios using current market implied MRP estimates can be found in chapter 5.

**Mean-reversion of interest rates**

The merits of using long-term averages are strengthened if, in practice, investors take a longer term view of interest rates and there is strong mean reversion of interest rates. If this is true then the current low interest rates are just a temporary condition and interest rates will eventually revert to a longer term average. If so investment decisions may reflect longer term views of the cost of capital rather than current rates. This argument is stronger for shorter periods of for mean reversion.

Economic theory suggests that interest rates should have a long-run term equilibrium value based on long run rate of output growth, population growth, consumer time preferences and risk aversion. Historical interest rate data indicates that interest rates generally remain within a narrow band over centuries. Empirical research finds that there is a stable relationship between the real interest rate and economic growth and real interest rates stay closer to their equilibrium value than nominal interest rates.

While economic theory assumes nominal interest rates are in the long run mean reverting, empirical evidence is inconclusive. Recent research on long-term bond yields in a range of countries indicates that they can persistently deviate from their average values and statistical evidence of mean reversion is not strong.

Other research suggests short-term interest rates revert to their long run mean when levels of volatility are high, but behave like a random walk process during periods when the interest rate level and volatility are low.

Therefore empirical evidence on mean reversion is largely inconclusive.

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3.4.2 Term to maturity

We changed to using a 5-year term to maturity in 2010. In making this change we took into account advice provided to us by Professor Kevin Davis. In his advice, Kevin Davis argued that the term to maturity used in the WACC should match the length of the regulatory period. This ensures that the regulatory model is NPV-neutral. The QCA also uses a 5-year maturity period based on similar advice from Professor Martin Lally.

There are theoretical arguments both for and against matching the term to maturity of the risk free rate to the life of the assets or matching the cashflows generated by the regulated assets.

Utilities, their debt managers and the banks argue that that long lived assets are usually financed using long-term debt. The 10-year term to maturity risk free rate is the longest available liquid rate in Australia and would seem consistent with funding arrangements of infrastructure utilities. If other rates are used, they argue, utilities or their debt managers will face increased funding risks relating to refinancing risk and interest rate risk.

On the other hand, Prof Davis and Prof Lally argued that the term to maturity assumption should match the regulatory period (for example 5 years) such that the rate of return on the regulated assets generates expected future cashflows with a net present value equal to the initial investment. Conceptually, the only term assumption (for risk free rate and debt risk premium) that satisfies this net present value principle is one that matches the regulatory period.

In its final position, the AEMC does not prescribe a benchmark, including the term to maturity, for the cost of debt. It states that it believes that it should remain open to the regulator and service providers to consider that different sectors and different kinds of service providers have different risk characteristics that lead to different characteristics for efficient debt financing. The AEMC therefore agrees that that a one-size-fits-all approach to setting a benchmark should not be considered a default position. However, the benefits of benchmarking for incentivising efficient financing practices must be retained.

Refinancing risk

Refinancing risk (or roll-over risk) is an important concern for regulated utilities with long life assets. Typically, utilities with long life assets are best managed by having longer term debt to provide certainty of funding and minimise refinancing risk. However, long dated bonds are generally more expensive than short dated bonds. Therefore, there is a trade-off between raising long-term debt which reduces refinancing risk and the price of the debt. Equally, a diversified

---

portfolio of debt instruments with a range of maturities is typically used to minimise risks of refinancing too much debt maturing in any one year. Using a 10-year term to maturity assumption for establishing the cost of capital for regulated utilities may be more consistent with utilities’ funding practice.

Apart from locking-in longer term borrowings, regulated utilities also attempt to secure a diversified portfolio of bonds with different terms to maturity raised in different markets. Evidence shows that a prudent treasury policy will seek to limit the amount of debt maturing in any given year to no more than 15% to 25% of the total debt portfolio.

**Interest rate reset risk**

Interest rate risk arises when a utility’s interest rate differs from the regulatory interest rate. This risk can be managed by using base rate swaps where a utility swaps a floating rate against a fixed rate. The fixed rate will be as closely related to the regulatory risk free rate as possible. This type of transaction is only available for the risk free component of the cost of debt and not for the debt margin.

The issues of refinancing and interest rate risks are also highlighted by the ACCC which in a recent report on the cost of debt surveyed market participants and found that either or both of the following factors influence a regulated businesses view on the ideal maturity of their debt:

- the incentive to match maturity to the length of the regulatory cycle
- the incentive to reduce refinancing risk.

According to the ACCC while the incentive to match the regulatory cycle is a factor that may encourage a business to issue shorter maturity debt, the incentive to avoid refinancing risk may provide businesses with a reason to prefer longer maturity debt. This can be achieved by issuing debt with a relatively long maturity in order to minimise refinancing risk and use interest rate swaps to ensure that the risk free rate is only locked in for five years.

**Bonds issued by Australian gas and electricity utilities**

This section shows recent bond issues by Australian utilities and their term to maturity. Table 3.4 shows bond issues by the Australian energy utilities in recent years. The majority of the bonds have term of 10 years or longer. Only 5 out of 27 bonds were issued for less than 10 years (ranging from 5 to 9 years). The longest bonds have a term-to-maturity of 20 years.

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37 ACCC, Report by ACCC staff to ICC on the debt market, and the consequences of the Global Financial Crisis, February 2012.
Table 3.4  Bonds issued by Australian gas and electricity utilities

<table>
<thead>
<tr>
<th>Issuer</th>
<th>Issue date</th>
<th>Maturity</th>
<th>Currency</th>
<th>Credit rating</th>
<th>Term of bond (yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citipower</td>
<td>2003</td>
<td>2013</td>
<td>AUD</td>
<td>BBB+</td>
<td>10</td>
</tr>
<tr>
<td>Citipower</td>
<td>2007</td>
<td>2017</td>
<td>AUD</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Citipower</td>
<td>2007</td>
<td>2017</td>
<td>AUD</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>ETSA</td>
<td>2005</td>
<td>2015</td>
<td>AUD</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>ETSA</td>
<td>2007</td>
<td>2019</td>
<td>AUD</td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td>Powercor</td>
<td>2005</td>
<td>2015</td>
<td>AUD</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Powercor</td>
<td>2007</td>
<td>2021</td>
<td>AUD</td>
<td>-</td>
<td>14</td>
</tr>
<tr>
<td>Powercor</td>
<td>2007</td>
<td>2022</td>
<td>AUD</td>
<td>A-</td>
<td>15</td>
</tr>
<tr>
<td>SPI Aus</td>
<td>2011</td>
<td>2021</td>
<td>GBP</td>
<td>A-</td>
<td>10</td>
</tr>
<tr>
<td>SPI Aus</td>
<td>2010</td>
<td>2016</td>
<td>CHF</td>
<td>A-</td>
<td>6</td>
</tr>
<tr>
<td>SPI Aus</td>
<td>2010</td>
<td>2015</td>
<td>AUD</td>
<td>A-</td>
<td>5</td>
</tr>
<tr>
<td>SPI Elect &amp; Gas</td>
<td>2003</td>
<td>2013</td>
<td>USD</td>
<td>A</td>
<td>10</td>
</tr>
<tr>
<td>SPI Elect &amp; Gas</td>
<td>2004</td>
<td>2014</td>
<td>USD</td>
<td>A-</td>
<td>10</td>
</tr>
<tr>
<td>SPI Elect &amp; Gas</td>
<td>2006</td>
<td>2016</td>
<td>USD</td>
<td>A-</td>
<td>10</td>
</tr>
<tr>
<td>SPI Elect &amp; Gas</td>
<td>2008</td>
<td>2018</td>
<td>GBP</td>
<td>A-</td>
<td>10</td>
</tr>
<tr>
<td>SPI Elect &amp; Gas</td>
<td>2010</td>
<td>2017</td>
<td>AUD</td>
<td>A-</td>
<td>7</td>
</tr>
<tr>
<td>SPI Elect &amp; Gas</td>
<td>2010</td>
<td>2015</td>
<td>CHF</td>
<td>A-</td>
<td>5</td>
</tr>
<tr>
<td>SPI Elect &amp; Gas</td>
<td>2010</td>
<td>2020</td>
<td>HKD</td>
<td>A-</td>
<td>10</td>
</tr>
<tr>
<td>SPI Elect &amp; Gas</td>
<td>2011</td>
<td>2021</td>
<td>AUD</td>
<td>A</td>
<td>10</td>
</tr>
<tr>
<td>Jemena Ltd</td>
<td>1998</td>
<td>2018</td>
<td>USD</td>
<td>A-</td>
<td>20</td>
</tr>
<tr>
<td>Jemena Ltd</td>
<td>1998</td>
<td>2018</td>
<td>USD</td>
<td>A-</td>
<td>20</td>
</tr>
<tr>
<td>Jemena Ltd</td>
<td>2003</td>
<td>2015</td>
<td>USD</td>
<td>A-</td>
<td>12</td>
</tr>
<tr>
<td>Jemena Ltd</td>
<td>2003</td>
<td>2015</td>
<td>USD</td>
<td>A-</td>
<td>12</td>
</tr>
<tr>
<td>United Energy</td>
<td>2003</td>
<td>2016</td>
<td>USD</td>
<td>BBB</td>
<td>13</td>
</tr>
<tr>
<td>United Energy</td>
<td>2003</td>
<td>2016</td>
<td>USD</td>
<td>BBB</td>
<td>13</td>
</tr>
<tr>
<td>United Energy</td>
<td>2005</td>
<td>2014</td>
<td>AUD</td>
<td>BBB</td>
<td>9</td>
</tr>
<tr>
<td>Electranet</td>
<td>2000</td>
<td>2015</td>
<td>AUD</td>
<td>AA</td>
<td>15</td>
</tr>
</tbody>
</table>


3.5  Assessment of options for averaging periods

We assessed the 4 options for the averaging period listed in section 3.2 against criteria implied by the objectives discussed in Chapter 2 as well as the discussion above. Table 3.5 lists these criteria and summarises our view on whether the options meet them. It shows that, overall, using a short-term averaging period meets the most important criterion – providing incentives for efficient investment – while the long-term averaging options better match actual benchmark debt management practice in NSW, at least for the larger utilities.
Table 3.5  
**Assessment of cost of debt options**

<table>
<thead>
<tr>
<th></th>
<th>Short-term average</th>
<th>Long-term average</th>
<th>Long-term average with annual indexing</th>
<th>Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficient investment incentives</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Maybe</td>
</tr>
<tr>
<td>Continuity in approach</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Stability in prices</td>
<td>No</td>
<td>Yes</td>
<td>Maybe</td>
<td>No</td>
</tr>
<tr>
<td>Consistency with banks feedback</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Consistency with benchmark debt management practice</td>
<td>No</td>
<td>Maybe</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

The sections below sets out our preliminary view on our preferred options, and then discuss our analysis of each option in more detail.

### 3.5.1 Preliminary view on averaging period

Our preliminary view is that a short-term averaging period may better reflect our main objective to set the cost of debt with reference to the financing costs of a new entrant and new investment. In doing so, it provides efficient investment signals. If we use a short-term averaging period, we propose to increase the averaging period from 20 to 40 days. We consider this slightly longer period will allow utilities to lock-in the regulatory cost of debt.

However, we also recognise that there are advantages in using long-term averages. This can provide greater stability, lower financing risks for larger utilities and may reflect decision-making on new entry and investment that has regard to longer term trends.

If we were to use a long-term averaging period, we are inclined to use a 10-year period. This is likely to reduce refinancing risk. It also ensures relatively stable prices over regulatory periods. Using a 10-year averaging period also means that the inputs of the cost of equity calculation would be consistent, that is, long-term averages are used for the equity risk premium and the interest rate.

### 3.5.2 Short-term averages

We currently use a 20-day average to estimate the cost of debt. This means that our cost of debt estimate is consistent with prevailing market conditions at the time of a regulatory reset.
The 20-day average ensures that utility assets are marked-to-market at the regulatory reset. In principle, the financial market estimate of interest rates for a 5 or a 10-year term to maturity should be the best forecast of interest rates over this period. Otherwise there would be arbitrage opportunities. Using the spot rate or a short-term average is also consistent with the benchmark cost of a new entrant. It also means that:

- when interest rates are falling, savings are passed through to consumers
- when interest rates are rising, a higher rate of return ensures financial sustainability.

While this approach provides the efficient benchmark for a new entrant, it introduces refinancing risk for the incumbent. Furthermore, investors and utilities may not base interest rate assumptions on spot rates only. If they take a long-term view they may have some regard to longer term average interest cost in the base assumptions or sensitivity tests. This ensures that the business remains viable in the future should rates return to longer term averages.

In its final position, the AEMC considers that this short-term averages may be well suited for some of the smaller service providers who appear to be able to hedge their interest rate very well, but it may be less suited to the larger service providers who may find it more difficult to access financial markets for the amount of funds or hedges required.38

Our discussions with banks confirmed that smaller or single asset utilities should not have any problems accessing the swap market at the time of a regulatory determination to lock-in the regulatory cost of debt. However, larger utilities may encounter problems if they attempt to enter into sufficient swaps within a 20-day window. Liquidity conditions in swap markets have changed since the GFC and given this reduced liquidity it would be appropriate to increase the averaging period from 20 to 40 days.

On balance, there is a good case to use the short-term average debt cost at the time of the regulatory reset. An increase of the averaging period from 20 to 40 days may be sufficient to allow utilities to lock-in interest rates at the time of a regulatory determination. Using a short-term approach would provide a marked-to-market cost of debt at the time of each regulatory reset. This is consistent with the financing cost of a new entrant and the financing cost required by the incumbent for new investment.

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3.5.3 Long-term averages (with or without annual adjustments)

The use of long-term averages has received significant attention recently, not only by us but also by the AEMC as part of its review of economic regulation of network service providers. TCorp and Queensland Treasury (QTC) have also argued for the use of a 10-year averaging period. In addition to the issues mentioned above, TCorp and QTC argued that given the amount of debt they manage on behalf of network service providers, it would be imprudent and inefficient to raise debt or even lock-in the regulatory cost of debt using swaps at the regulatory reset. While the technical implementation of their proposed models differs, both argue that for large debt portfolios the efficient benchmark is a 10-year average. This allows the debt manager to raise debt and lock-in interest rates using swaps on a 10-year average basis.

In our view, the 10-year average with or without annual adjustments has a number of advantages:

- it is consistent with the preferred benchmark debt management strategy
- it would result in relatively stable prices over time
- it is consistent with our current approach of estimating the cost of equity.

However, we consider it also has a number of disadvantages:

- it may not reflect the cost of debt of a new entrant or new investment and may distort the incentive to invest
- it does not accommodate current inflation expectations
- it does not reflect the efficient debt costs at the time of the decision
- annual adjustments may not provide enough benefits to justify the additional administrative costs involved.

Current market conditions and their impact on the cost of debt are important considerations. Utilities have a portfolio of debt consisting of different funding sources. The interest rate on the existing debt will depend on the source of funds, the term to maturity and the timing of the borrowing. When interest rates are stable over time, this is not of much concern.

The use of a long-term average for the cost of debt is consistent with our market risk premium assumption in the cost of equity. If we were to use a 10-year average for the cost of debt, we would also use a 10-year average risk free rate for our cost of equity estimate and a 10-year inflation estimate. This brings the averaging assumptions used in the cost of debt and cost of equity more in line with each other. The key concern with this approach is that it does not reflect the

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39 Ibid
40 If we use longer term averages there may not be a regulatory incentive to enter into swaps to lock-in interest rates at the time of the determination.
efficient cost of debt at the time of the decision and may not reflect the cost of debt for a new entrant or new investment.

We are not convinced annual indexing of the 10-year average will provide sufficient benefits to outweigh the additional administrative costs involved.

### 3.5.4 Hybrid approach

A hybrid approach has been proposed by utilities as part of the AEMC’s review of economic regulation of network service providers. They propose to estimate the risk free rate by using the current bank bill swap rate with a term equal to the length of the regulatory period. The debt margin would be estimated using a 10-year rolling average debt margin with a term equal to the length of the regulatory period.41

The hybrid approach has some of the features of both the short and long-term averages. Hence, it also has some of their advantages and disadvantages. The risk free rate component may reflect the new entrant cost and the cost for new investment, whereas the debt premium component may be a better proxy for the cost of the incumbent.

IPART seeks comments on the following issues:

2 What is the appropriate averaging period for the cost of debt?

3 If a long-term average is used for the cost of debt, should it be adjusted annually?

4 If a short-term averaging period is used, are 40 days sufficient to address the practicality concern in regard to risk management strategies?

5 Are there merits in the hybrid approach (Section 3.5.4)?

### 3.6 Assessment of options for the maturity term

For the term-to-maturity we considered:

- continuing our current approach of a 5-year term to maturity so that the term to maturity matches the regulatory period and ensures NPV-neutrality of our regulatory model, and
- switching to a 10-year term assumption.

The sections below sets out our preliminary view and discuss our analysis.

---

3.6.1 Preliminary view on maturity term

We are inclined to maintain our current assumption of a 5-year term-to-maturity. In our view the advantage of ensuring NPV-neutrality of our regulatory model is an important consideration. While a 10-year term-to-maturity may replicate what some utilities are doing, the 5-year term to maturity reflects the fact that utilities use the swap market to lock-in the regulatory risk free rate for the term of the regulatory period. We also note that the hybrid model proposed by privately-owned utilities uses a 5-year term-to-maturity.42

3.6.2 Analysis on maturity term

The primary objective for setting a regulated return for a regulated is business to ensure that the utility, whether privately owned or state-owned is compensated for the efficient cost of capital on a competitively neutral basis. This is achieved by estimating a benchmark cost of capital under market conditions prevailing at the time of decision.

We recognise that the evidence indicates that using a 10-year term to maturity reflects actual financing practices. The key advantage of a 10-year term is that it is more consistent with the funding practices of the capital market for long life regulated infrastructure assets. It also seems to be the most efficient option considering that it gives utilities an incentive to manage refinancing risk.

But, as argued by some finance experts, shortening the term to 5 years to match the regulatory period is consistent with the principle of NPV-neutrality because it matches the investment horizon and risk profile of investors. This option, if implemented by utilities, would expose them to refinancing risk. Against this matching the maturity period to the regulatory period reduces interest rate risk. If the maturity assumption matches the regulatory period the utility can, in principle, enter into swaps to lock-in that interest rate.

It is our view that using a term to maturity that matches the regulatory period and ensures NPV-neutrality of our regulatory model remains the preferred option. While a 10-year term to maturity may replicate what some utilities are doing, the 5-year term to maturity reflects the fact that utilities use the swap market to lock-in the regulatory risk free rate for the term of the regulatory period. Hence, achieving NPV-neutrality over the regulatory period is relevant for the regulatory model and the utility’s hedged cost of debt. By changing to a 10-year term to maturity we would place more weight on the incentive to reduce refinancing risk than on the incentive to deliver an NPV-neutral regulated cash flow. If we decide to continue using a 5-year term to maturity, we will consider the relationship between the term of the risk free rate and the MRP.

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42 ETSA Utilities, CitiPower and Powercor Australia, Joint Response to AER and EURCC Rule Change Proposals, 8 December 2011.
IPART seeks comments on the following issue:

6 What is the appropriate term to maturity to use for the cost of debt calculation?

### 3.7 Implementation issues and cross checks

This section outlines the key implementation issues associated with the new methodologies we are considering to estimate the cost of debt, and some possible cross checks.

#### 3.7.1 How long should the short-term average period be?

As noted above, if we use short-term averages, we propose to change the averaging period from 20 to 40 days. This would make it easier for larger utilities to hedge their debt costs during the regulatory reset period and not materially affect market prices.

#### 3.7.2 What index should we use for long-term averages?

The use of a long-term average would affect the way we estimate the cost of debt and the inflation rate.

**Debt margin**

If long-term averages are used, it would be impractical to use a portfolio of actual bonds to determine the debt margin. This is because the composition of the portfolio has to be determined on every single day of the estimate.

We propose to use fair value curves to determine the debt margin for a long-term average approach. In principle, fair value curves include all of the relevant bonds. The disadvantages are that:

- the relevant term to maturity may not be available and
- it is not possible to include USD bonds issued by Australian companies.

**Inflation**

If long-term averages are used inflation expectations will also be based on long-term averages. We propose to use the average break-even inflation rate between nominal and indexed Commonwealth Government bond yields.
Annual adjustments

Information we have obtained from financial markets indicates that there does not seem to be enough benefits to outweigh the additional administrative costs of implementing an annual indexing mechanisms. Therefore we do not propose to adjust the cost of debt on an annual basis.

Sampling

We propose to estimate the 10-year long-term average based on daily observations. If no annual indexing mechanism is used, the 10-year average needs to be update only at each regulatory reset.

3.7.3 What cross checks should we use?

We believe it is important that we ensure that the regulatory cost of debt allows the ongoing financeability of a utility and that consumers do not pay more than what is required by financial markets.

Regardless of the methodology we use in setting the cost of debt, we believe it is important to have a number of cross checks in place. We propose to cross check our cost of debt with a number of methodologies:

1. External peer reviews from banks, corporate treasuries or consultants
2. Cost of debt estimates obtained from the use of alternative models

We will release the results of these cross checks as part of our WACC analysis and explain how we used them, how much weight we gave them and what other considerations influenced our decision.
4 Estimating the expected cost of equity

The cost of equity is the return required by investors to reward them for investing in the business. This return comprises a risk premium associated with the non-diversifiable (systematic) risk associated with a specific asset, firm or industry, plus the nominal risk free rate. We calculate the cost of equity using the CAPM under which the risk margins depend on the extent of exposure to systematic risk. However, there are other models which could, in principle, be used to estimate the cost of equity, either as the primary model or as a cross check.

This chapter outlines our current thinking on the applicability of these models to the businesses we regulate. In particular it assesses the following options against a set of relevant decision criteria:

- whether we should use different cost of equity models, either in place of or in addition to the CAPM
- which MRP model(s) we should use to estimate the MRP, especially whether we should use short or long-term averaging periods
- the different combinations of MRP and risk free rate estimation methodologies within the CAPM.

We propose to continue to use the CAPM as the primary cost of equity model, but are considering supplementing this with results of other models – where applicable – and additional market information.

The sections below outline our current approach in more detail, then discuss the key issues, the options, current regulatory practice, academic views, and the evidence on the risk free rate and MRP. The final section summarises our analysis of the options against criteria implied by our primary objective for setting the WACC and our preliminary views on the preferred options.
4.1 Current Approach

We calculate the cost of equity using the CAPM under which the risk margins depend on the extent of exposure to systematic risk. The risk allowance is calculated as a proportion of the average risk premium for all investments. Algebraically it is:

\[ E(R_i) = r_f + \beta_i \times [E(R_m) - r_f] \]

where:
- \( E(R_i) \) = expected return on equity
- \( r_f \) = risk free rate
- \( \beta_i \) = stock’s sensitivity to the market (i.e., equity beta)
- \( E(R_m) - r_f \) is the MRP.

The systematic risk for a business is the extent to which the returns to equity holders in the business rise and fall in line with the average returns to equity investors. For businesses with shares traded on the stock market, \( \beta_e \) is a measure of systematic risk calculated as the correlation of returns on the firm’s stock and the return on the market overall, divided by the variance of returns on the market. The risk premium for the stock (the return required in excess of the risk free rate) is given by \( \beta_e (E[R_m] - R_f) \). If it is less volatile than the market average \( \beta_e \) will be less than 1 and the risk premium will be less than the market average.

In implementing the CAPM, we assess the risk free rate, equity beta and MRP. We currently use a 20-day average of the risk free rate, a long-term historical MRP of 5.5% to 6.5% and an industry-specific equity beta.

4.2 Key issues

Our current approach of using a 20-day average risk free rate and a long-term historic MRP has served us well over a number of years. For most of that time it has probably provided a reasonable proxy for expected returns. Our approach of using a range for the WACC has also provided the flexibility to reflect specific factors and market circumstances. However, recent market conditions have highlighted that it can result in estimates of the WACC that may vary significantly from current market expectations for a sustained period.
A further concern is that in some instances, the relative size of the range for the cost of equity may not reflect the underlying level of uncertainty. There is evidence that the volatility in the implied MRP\(^{43}\) has increased significantly since the GFC, but our estimate of the expected MRP has been based on the same range since well before the GFC.

The current cost of debt can be measured more directly and with greater confidence than the current expectations for the return on equity. When estimating the cost of equity using the CAPM, we have to make assumptions about 2 key parameters:

- the MRP
- the equity beta.

In this review, we do not propose to review the way we estimate the equity beta.

Our cost of capital estimate is forward-looking and hence we are estimating an expected return on equity required by investors. Since the MRP is not directly measurable, we use past observations as a guide to expected returns. But, expectations can be volatile and can move in opposite directions to recently observed actual returns. For example, during the GFC the expected MRP based on historical observations was around 6% while the market implied MRP was over 18% and fell back below 10% within a few months.

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

### 4.3 Options

This discussion paper presents a number of options on how we can arrive at the best possible estimate of the expected cost of equity. In particular, we will look at the model we use to estimate the cost of equity and the MRP.

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\(^{43}\) The implied MRP is based on current market conditions as opposed to historic data and can be measured by a number of models including the dividend growth model or the implied volatility model.
4.3.1 Cost of equity model

As noted above, we currently use the CAPM to estimate the cost of equity. There are a number of other models which can be used including:

- the Fama and French 3 factor model
- the arbitrage pricing theory model (APT)
- the dividend growth model (DGM).

These options are set out in detail in section 4.4.2 below.

4.3.2 MRP methodology

The paper considers the following options for estimating the MRP:

- long-term historic averages
- estimates of the current MRP using the dividend growth model or implied volatility in options
- MRP estimates based on surveys.

In assessing these options we consider:

- the stability of MRP over time
- the stability of the risk free rate over time
- the relationship between the risk free rate and the MRP.

4.4 Regulatory practice and academic literature

4.4.1 Approach taken by other regulators

Table 4.1 shows what approaches are taken by other regulators when considering the cost of equity. The issues we are interested are:

- Which cost of equity model has been used to estimate the costs of capital? Typically, the Capital Asset Pricing Model (CAPM) is the standard approach used to estimate the return on equity required by an investor given the risk characteristics of the business. However, the CAPM has shortcomings and other equity valuation models have been proposed, such as the Fama-French 3-factor model and the dividend growth model (DGM).

- Does the averaging period for the risk free rate match the period used to estimate the MRP?
Table 4.1 Cost of equity approach by other regulators

<table>
<thead>
<tr>
<th>Regulator</th>
<th>Averaging periods</th>
<th>Model selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPART</td>
<td>20-day average risk free rate with long-term historical estimate of the MRP</td>
<td>CAPM</td>
</tr>
<tr>
<td>AER</td>
<td>20-day average risk free rate with long-term historical estimate of the MRP</td>
<td>CAPM</td>
</tr>
<tr>
<td>ERA (WA)</td>
<td>20-day average risk free rate with long-term historical estimate of the MRP for Western Power determination and 2008 determination for freight and urban railways.</td>
<td>CAPM</td>
</tr>
<tr>
<td>QCA</td>
<td>20-day average risk free rate with MRP estimate based on 4 methodologies including historical data and current data methodologies.</td>
<td>CAPM</td>
</tr>
<tr>
<td>ESC</td>
<td>20-day average risk free rate and historical MRP.</td>
<td>CAPM</td>
</tr>
<tr>
<td>ESCOSA</td>
<td>20-day average risk free rate and historical estimates of the MRP. ESCOSA’s use of historic MRP is consistent with a study by Bishop, Fitzsimmons and Officer.</td>
<td>CAPM</td>
</tr>
<tr>
<td>Ofgem (GB)</td>
<td>Ofgem base its MRP range on long-term historical estimates (Dimson, Marsh and Staunton, 2011) and short-term forward looking implied estimates (Bank of England).</td>
<td>CAPM but sense-check against alternative approaches, information from transactions and regulatory precedent.</td>
</tr>
<tr>
<td>Ofwat (GB)</td>
<td>Long-term averaging period and long-term ERP based on Dimson et al.</td>
<td>CAPM but other model could be used as cross checks such as, Fama-French, DGM, market-to-asset ratios and reality checking.</td>
</tr>
<tr>
<td>NZCC New Zealand</td>
<td>Ex post techniques adjusted for trends in price/dividend ratios is the starting point. Ex ante (forward looking) estimates are used as cross checks, but the NZCC uses its judgement on this matter.</td>
<td>Simplified Brennan-Lally CAPM</td>
</tr>
<tr>
<td>NMa (Netherlands)</td>
<td>NMa uses historically realised (ex post), as well as expectations of the ex ante market risk premium and the risk free rate.</td>
<td>CAPM</td>
</tr>
</tbody>
</table>

Note: Dimson et al. (2009, 2011), has not been directly sourced for this paper. This study has been referred to by other regulators (eg, Ofgem and Ofwat). The references are Dimson, Marsh and Staunton, 2009, Credit Suisse Global Investment Yearbook 2009, and Dimson, Marsh and Staunton, 2011, Equity premia around the world - 9 October 2011 update. The acronym BoE in the Ofgem example means Bank of England.

In general, Australian regulators uniformly use a MRP consistent with the long-term historic average and the current estimate risk free rate for the CAPM.

The CAPM is the approach most commonly used by regulators outside the United States. Ofwat, in its position paper for the 2010-2015 price setting process, refers to an earlier joint regulators’ study which concluded that although the CAPM approach had its drawbacks, it was the most robust methodology available. Further, Ofwat states that since that study other regulators (for example Ofgem and the CAA) continue to recommend and use the CAPM approach at least as a general framework. British regulators also have regard to alternative specifications of the CAPM and other data in coming to a view on the cost of equity and the WACC. The potential use of alternative cost of equity models to provide a ‘cross check’ for CAPM model results was used by Europe Economics for research undertaken for Ofwat to advise on the cost of capital and financeability for PR09. As Table 4.1 shows, Ofgem also makes use of other information to sense-check the results from its CAPM estimates.

Similarly, the AEMC considers that estimates are more robust and reliable if they are based on a range of estimation methods, financial models, market data and other evidence.

In the United States, it appears that cost of equity decisions are made on a case-by-case basis although attempts were made in the 1980s to move to a common return on equity approach. The methods used by different regulators include dividend growth model (DGM), equity/historical risk premium (HRP) and the capital asset price model (CAPM). However, the DGM model is the most commonly used of these three approaches among US regulatory commissions according to a 2008 study by NERA. Another study suggests that commissions consider the results of multiple methods, and ultimately use their judgment to determine a “fair” rate of return on common equity. It appears that this second approach was used recently for an annual adjustment rate case before the California Public utilities Commission.

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45 Europe Economics, Cost of Capital and Financeability at PR09, Updated Report, 22 October 2009, p 1.
46 FTI Consulting, Cost of Capital study for the RIIO-T1 and GD1 price controls, 24 July 2012.
50 Ibid, p 44.
4.4.2 Academic literature on cost of equity

CAPM is the most commonly model to estimate the cost of equity

A number of academic surveys in the US, the UK and Australia show that the CAPM is the most commonly used model to estimate the cost of equity. Graham and Harvey (2001)\textsuperscript{52} surveyed 4,400 executives who were members of the Financial Executives Institute and held positions at 8,000 companies in the US and Canada. Their results showed that 73\% of the respondents used mainly the CAPM to estimate the cost of equity. The CAPM is also the most commonly used model also in the UK, though to a lesser degree compared to the US survey. McLaney et al. (2004)\textsuperscript{53} found that in the UK 47\% of the companies in their sample used the CAPM for the cost of equity. Truong et al. (2008)\textsuperscript{54} surveyed 356 Australian companies included in the All Ordinaries Index as of August 2004. They showed that 72\% of the respondents used the CAPM to estimate the cost of equity.

Alternative cost of equity models

Other cost of equity models include multi-factor asset pricing models such as the arbitrage pricing theory\textsuperscript{55}, the Fama-French 3-factor model\textsuperscript{56} and the dividend growth model.\textsuperscript{57} Below we summarise these models and discuss their applications to the cost of equity estimation in the US, the UK and Australia.

Arbitrage Pricing Theory (APT)

The APT postulates that a security’s expected return must equal the risk free rate plus the cumulative sum of its exposure to each factor ($\beta_i$) times the factor’s risk premium ($\lambda_i$) for $k$ number of factors.

$$E(R_i) = r_f + \sum_{i=1}^{k} \beta_i \lambda_i$$

If a security is mispriced, arbitrage will bring the price back to the equilibrium price. Implementation of the APT is not straightforward since the model does not specify the number and types of risk factors to explain a security’s expected return.

**Fama-French 3-factor model**

The Fama-French 3-factor model is similar to the APT in that it postulates that multiple risk factors explain an expected return of a security. However, unlike the APT, the Fama-French 3-factor model identifies specific risk factors as shown below.

\[
E(R_i) - r_f = \alpha_i + \beta_i [E(R_m) - r_f] + \gamma_i SMB + \delta_i HML
\]

where:
- \( E(R_i) \) = expected return of a security
- \( r_f \) = risk free rate
- \( \beta_i \) = stock’s sensitivity to the market
- \( E(R_m) \) = expected return of the market
- \( SMB \) (Small minus Big) is the size premium, the excess returns of small stocks over big stocks
- \( HML \) (High minus Low) is the value premium, the excess returns of high book-to-market stocks (ie, value stocks) over low book-to-market stocks (ie, growth stocks).

Fama and French (1993) view both size and value as risk factors in addition to the market risk factor in the CAPM (ie, \( E(R_m) - r_f \), \( SMB \) and \( HML \) factors). They provide evidence that including the additional risk factors significantly improves the explanatory power in describing the common variation in stock returns. In their model, \( SMB \) and \( HML \) capture the risks associated with investing in small stocks and value stocks, respectively. Hence a stock is expected to receive a risk premium if its return is positively correlated with those of small stocks or value stocks.
Dividend growth model

In the dividend growth model (DGM), the value of equity equals the present value of expected dividends from the investment. If we assume that dividends will grow at a constant rate forever, we have the following dividend growth model, where the value of equity equals the present value of dividends which grow at a constant rate.

\[ P_0 = \frac{E(D_1)}{r - g} \]

where:

- \( P_0 \) = equity price in time 0
- \( E(D_1) \) = expected dividend in time 1
- \( r \) = required rate of return or cost of equity
- \( g \) = expected growth rate.

This model requires data on the current stock price (ie, \( P_0 \)), the expected dividends in the next period (ie, \( E(D_1) \)) and the expected long-term growth rate in earnings or dividends (ie, \( g \)). Then, by solving for the unknown \( r \) in the above equation, we can estimate the cost of equity, which is shown below.

\[ r = \frac{E(D_1)}{P_0} + g \]

In principle, the DGM can be applied at a sector or utility level to derive an estimate of the cost of equity or it can be applied to the overall market to provide a forward looking estimate of the cost of capital for the market as a whole.

How widely are the alternative models used to estimate the cost of equity?

In their survey for the US and Canadian firm executives, Graham and Harvey (2001) showed that 34% considered additional risk factors when using the CAPM, and that 16% used the dividend growth model. In the UK, 28% of the sample firms used the dividend growth model (McLaney et al., 2004). In Australia, only 1% of the respondents used multi-factor asset pricing models and 9% used the dividend growth model (Truong et al., 2008).

IPART seeks comment on the following issue:

- 7 What alternative models, if any, should we use to estimate the cost of equity as a cross check for an industry sector or the overall market?
4.5 Evidence on the risk free rate and MRP

4.5.1 Relationship between risk free rate and expected MRP

The MRP represents the risk premium that investors can expect to earn over and above the risk free rate for bearing non-diversifiable (ie, systematic) risk and it is scaled up or down by the equity beta (of a particular asset or business) to reflect the risk premium of the particular asset or business as part of the investor’s well-diversifiable portfolio.

In estimating the cost of equity using the CAPM, it has been common practice in regulatory decisions to combine an estimate of the expected market risk premium (MRP) based on long-term historic data and a current-day estimate of the expected risk free rate typically based on the observed yields on Commonwealth Government bonds over the 20 trading days immediately prior to a decision.

The risk free rate appears twice in the CAPM equation, once by itself and once as part of the MRP:

\[ E(R_i) = r_f + \beta_i \times [E(R_m) - r_f] \]

where:
- \( E(R_i) \) = expected return on equity
- \( r_f \) = risk free rate
- \( \beta_i \) = stock’s sensitivity to the market (ie, equity beta)
- \( E(R_m) - r_f \) is the MRP.

Typically, Australian regulators have used a long-term historical average expected MRP of 6% and 10-year Commonwealth Government securities to estimate equity return for regulated businesses. Rather than using a point estimate for the MRP, we currently use a MRP (long-term historical average) range of 5.5% to 6.5% (midpoint 6%) and a 5-year term to maturity risk free rate as a proxy for the risk free rate.

We have considered 2 consistency issues in the application of the CAPM:
- the consistency in the term of the risk free rate and MRP, and
- the implications of using a historic long-term MRP as a proxy for the current MRP in conjunction with a short-term estimate of the risk free rate.
Consistency of maturity assumptions between MRP and risk free rate

The CAPM is a single period model which can be applied to any time period. Internal consistency of the model would imply that when a time horizon (whether short-term or long-term) is applied to one parameter such as the risk free rate the same time horizon is used for all parameters. Historical MRP studies generally adopt a 10-year term risk free rate yield as the risk free rate proxy.

The Australian Competition Tribunal considered this issue in the matter of Application by GasNet. It took the view that the mathematical logic underlying the CAPM formula requires a consistent use of the value of risk free rate in both parts of equation so that either a 5-year or a 10-year term to maturity risk free rate is applied in the cost of debt and equity. ⁵⁸

The AER noted in its 2009 review of the WACC parameters that 5-year risk free rate yields were available since 1969 and historical estimates of MRP (from 1969) relative to 5-year risk free rate were not statistically significantly different from estimates using the 10-year risk free rate as the base. AER did not consider it was a viable option to use a 5-year term risk free rate for estimating historical excess returns. The AER noted that there was a difference of 18 bps between 10-year and 5-year risk free rate suggesting that the MRP relative to a 5-year risk free rate might be 20 bps higher than for a 10-year risk free rate. ⁵⁹

Implications of using a short-term average for the risk free rate and a long-term average for the MRP

Using a short-term average for the risk free rate and a long-term average for the MRP has a range of implications. In considering these implications, we have looked at:

- current market conditions
- evidence on mean reversion of MRP
- stability of the risk free rate
- relationship between risk free rate and MRP
- British regulators’ practice
- US regulators’ practice.

Current market conditions

In relatively stable market conditions, there may be a little difference between long-term historic and current market implied estimates of the expected MRP. Since the GFC, market conditions have become significantly more volatile. Estimates of the market implied expected MRP are currently above the historic long-term average of 6%.

Figure 4.1 Implied MRP and risk free rate (RF)

Data source: Bloomberg, IPART’s analysis. From 2 January 2009 to 15 November 2012.

The application of the CAPM using a stable historic MRP (of 6%) and a prevailing market rate for the risk free rate means that the cost of equity will move in synchronicity with the risk free rate for a given level of equity beta. If the risk free rate fluctuates significantly so will the cost of equity.

In late 2008/early 2009, and then again from late 2011, the risk free rate fell to a 50-year low. The overall effect is that the regulatory cost of equity has fallen and may underestimate the cost of equity for regulated businesses when the risk free rate is low. Conversely, it may overestimate the cost of equity when the risk free rate is high.

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Calculated by Bloomberg as an implied MRP based on the Dividend Growth Model.
Evidence on mean reversion of MRP

There is strong evidence showing that stock prices are partially mean reverting. Fama and French (1988)\textsuperscript{61} and Poterba and Summers (1988)\textsuperscript{62} reported that price movements for market portfolios of common stocks tend to be at least partially offset over long horizons. That is, they partially revert to their mean over the long-term. According to Fama and French (1988) 25% to 40% of the variation of stock returns over 3 to 5 years is predictable from past returns.

Morley (1999)\textsuperscript{63} questioned the strength of long-term mean reversion reported by Fama and French (1988). He showed that the evidence for mean reversion is significantly diminished for risk-adjusted returns, with the timing of changes in the estimated risk premium corresponding directly to the changes in price behaviour implied by time sensitive coefficients in his model.

Subsequently Kim, Morley and Melson (2004)\textsuperscript{64} showed that an intertemporal trade-off between risk and return (volatility) for the stock market as a whole explains the evidence of mean reversion in Fama and French (1988) and Poterba and Summers (1988). In particular, the timing of large changes in stock market volatility produced changes in expected returns, responsible for the tendency of price movements to be offset over the long term.

In a separate publication Kim, Morley and Melson (2001)\textsuperscript{65} showed that the empirical evidence supports a significant positive relationship between stock market volatility and the equity premium (when effects of volatility feedback are fully taken into account). That is, the MRP will increase when there is increased volatility in stock prices, such as a sudden fall followed by a period of instability. If the trade-off between risk and return (volatility) for the stock market as a whole explains the evidence of mean reversion in stock prices, it follows that the market risk premium (MRP) is also mean reverting.

Stability of risk free rate

The fall in the risk free rate since the second half of 2011 was due to strong demand for relatively safe assets in the uncertain global investment climate, particularly from offshore investors. At the end of September 2011, non-residents held an estimated 75% of Commonwealth Government securities on issue.

\textsuperscript{63} Morley, J.C., 1999, Essays in empirical finance, PhD dissertation, University of Washington.
The fall in the risk free rate does not seem to be only due to the flight to security from riskier equities markets. The downgrade of Eurozone government debts followed by US government debt in 2011 had reduced the availability of AAA rated government debts for investors. As a result, Australia has become one of the few providers of AAA rated government securities. Furthermore, despite the fall in Australian interest rates, yields on Australian Government bonds were high compared to other OECD countries with similar sovereign risk.

In addition, the recent regulatory changes in Australia associated with Basel III banking regulation which require banks to increase their holdings of low risk liquid assets, primarily Commonwealth Government securities, have further increased the demand for these securities. This in turn has pushed down the yields on Commonwealth Government securities to their lowest level in 50 years.

Figure 4.2  Historical trends of 5-year and 10-year government bonds in Australia, the UK and the US

Source: Bloomberg. IPART’s own analysis.

Relationship between risk free rate yields and MRP

As indicated in Figure 4.1, estimated risk premiums are not stable through time. Risk premiums tend to move in the opposite direction to the risk free rate. As investors may respond to recent losses on riskier assets by shifting to safer assets, prices of those assets are likely to fall, increasing the expected rate of return for a given flow of future dividends. In periods of high risk aversion there is a flight from risky assets to safe assets (such as the risk free rate). This tends to push up the price of safe assets, thereby pushing down their yields. Thus, in these circumstances, a falling risk free rate tends to be associated with rising equity risk premiums (and vice versa).
To the extent there is a negative relationship between the risk free rate and the risk premiums on listed equities, the required return of the equity market (being the sum of risk free rate and the market risk premium) is relatively more stable than its individual components.\footnote{Wright, S., Mason, R., and Miles, D., 2003, \textit{A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK}, A report commissioned by the U.K. economic regulators and the Office of Fair Trading, pp 4 and 49.}

Figure 4.3 shows AMP’s estimate of the cost of equity in Australia. Prior to the GFC the cost of equity was within the range of 10\% to 11\%. There was a spike in 2009, but the cost of equity seems to have come back close to pre-GFC levels.\footnote{CEG, \textit{Internal consistency of risk free rate and MRP in the CAPM}, Report prepared for Envestra, SP AusNet, MultiNet and APA, March 2012, p 27.} This is despite the risk free rate being far lower than historical risk free rate levels.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure4.3.png}
\caption{Cost of equity in Australia (1996-2012, nominal)}
\end{figure}

If there is a negative relationship between risk premiums and risk free rates, the application of the CAPM in conjunction with a constant historical MRP (of 6\%) and current interest rates, is likely to produce a considerably lower estimate of the expected return on equity than the market return during periods of low risk free rates. Conversely, when risk free rates are high it may overestimate the return on equity.

Most Australian regulators currently use a WACC model that uses short-term estimates of the cost of debt and long-term estimates of the expected MRP in the cost of equity. This varies from the practice in Great Britain and the US.
British regulators’ practice

British regulators have considered the problems associated with using the historical MRP and the current risk free rate in estimating equity returns. Their consultant Wright et al (2003) in the Smithers report advised that generally movements in the equity premium are offset by changes in the risk free rate. As a result, the cost of equity estimated by using the CAPM is more stable than its components (the MRP and risk free rates).

British regulators have accepted the above advice and applied a longer term average instead of a prevailing estimate of risk free rate when applying the CAPM:

- Ofgem used a range for risk free rates that included a 10-year average yield on 10-year Indexed Linked Gilts (ILG) (as a lower bound) and regulatory precedent in Great Britain (as upper bound) to estimate the cost of equity.68
- Ofcom has used the nominal rate for 5-year gilts.69
- Ofwat has used a risk free rate estimate based on an average level of yields on UK government medium-term index-linked gilts.70

US regulators’ practice

US regulators estimate total return on equity using the DGM and do not decompose it into a risk free rate component and a premium above the risk free rate. Returns allowed by regulators are relatively stable and unaffected by movements in the risk free rate.

4.5.2 Methodologies to estimate the expected MRP

The MRP is the additional return over the risk free rate of return that an investor requires for the risk of investing in a diversified equity portfolio. The MRP is used in the cost of equity calculation. Mathematically, the MRP is expressed as follows.

\[ MRP = E(r_m) - r_f \]

where:

- \( E(r_m) \) = the expected return on the market portfolio of all risky assets
- \( r_f \) = the risk free rate.

68 Ofgem GB, Decision on strategy for the next transmission and gas distribution price controls - RIIO-T1 and GD1 Financial issues, March 2011.
69 Office of Communications, Ofcom’s approach to risk in the assessment of the cost of capital, 23 June 2005, p 15.
MRP estimation methods

The expected MRP is a forward-looking parameter and not directly observable from market data. There are 3 ways to estimate the MRP.

Survey MRP

In this approach, investors, analysts, and professors are asked for their opinions on the MRP. For example, Fernandez, Aguirreamalloa and Avedano (2012) conducted a survey on the MRPs used by professors, analysts, financial institutions, and company managers in 82 countries including Australia. They estimated a MRP of 6% for Australia.

Historical MRP

The historical MRP is the most commonly used means of estimating the expected MRP. The premium is computed as the difference between the average return on the market portfolio and the average return on a risk-free asset based on historical data. In determining the WACC we have used the historical long-term average of the MRP as a proxy for the expected MRP. This approach assumes that the MRPs have not changed in any material fashion over a long-time period and that they will mean-revert. The most recent historic average MRP for Australia is 6.1% which is in our current range of 5.5% to 6.5%.

McKenzie and Partington (2011) recommended in a recent paper that for regulatory purposes, the general view seems to be that a stable long run MRP should be used.

Implied MRP

The estimation of the historical MRP assumes mean reversion in stock market prices and uses historical market returns. According to Damodaran (2012), if one believes that market is efficient or at least one cannot forecast how the overall market would move, the objective should be to estimate a current and forward-looking MRP. There are 2 main approaches for estimating the forward-looking MRP, often referred to as an implied MRP.

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72 There were 73 responses in Australia. Professors, analysts and financial institutions responded to have used an MRP of 5.8-5.9%, while company managers said to have used an MRP of 6.8%. 6% was the median MRP. The mean MRP was 5.9%.
1. Dividend growth model (DGM) based MRP

The following is the simplest example of the DGM-based MRP estimation approach as documented in Harrison and Marston (2001)\(^{77}\).

\[
P_0 = \frac{E(D_1)}{r - g}
\]

Harrison and Marston’s MRP approach is founded on the DGM with a stable growth in dividends, and estimates a forward-looking MRP based on the following steps.

---

**Box 4.1 Implied MRP estimation using DGM with a stable growth (Harrison and Marston, 2001)**

**Step 1:** For each stock, estimate the expected dividend in the next period \((E(D_1))\) and dividend growth rate \((g)\) based on the analysts’ consensus earnings forecasts over 5 years, where the growth rate is applied in perpetuity.

**Step 2:** Solve for \(r\), given the current price \((P_0)\), the next period dividend \((E(D_1))\) and the estimated growth rate \((g)\) for an individual stock. Therefore, \(r\) is interpreted as the internal rate of return (IRR) implicit in the stock price.

**Step 3:** Each stock’ \(r\) is aggregated to form a value-weighted expected market return.

**Step 4:** Subtract a risk free rate from the value-weighted expected market return to obtain an implied MRP.

---

An extension of the above model is the 2-stage DGM, where dividends grow faster for the first few years at a different rate, \(g_1\), then slow down or stabilise to a constant long-term rate \(g_2\). This explicitly takes into account current market conditions forecasts. This model can be expressed as follows:

\[
P_0 = \sum_{t=1}^{t=N} \frac{D_0(1 + g_1)^t}{(1 + r)^t} + \frac{D_0(1 + g_1)^N (1 + g_2)}{(1 + r)^N (r - g_2)}
\]

where

- \(D_0\) is dividend at time 0
- \(g_1\) is the higher growth rate over \(N\) years, and \(g_2\) is the stable growth rate after year \(N\), where \(g_1 > g_2\)
- \(r\) is the required rate of return.

---

Bloomberg calculates daily implied MRPs for a number of countries based on an extension of this model. In particular, Bloomberg assumes 3 growth stages and calculates the required rate of return, closely following Harrison and Marston’s approach (2001). For example, to estimate the MRP for Australia, Bloomberg first derives the required rate of return (or IRR) which equates the present value of the expected future dividends with the current stock price for each of the stocks constituting the S&P/ASX 200 index. Each stock’s IRR is then weighted by its market capitalisation to determine the value-weighted internal rate of return for the S&P/ASX 200 index. Bloomberg subtracts the daily yield on the 10-year Australian Government bond from this market rate to obtain daily implied MRPs. The Bank of England recently published a paper on the estimation of the MRP using a dividend growth model.78

Use of DGM-based MRP models have been used for a considerable amount of time. For example, Professor Kevin Davies recommended a DGM-based model in a 1998 report for the Office of the Regulator-General in Victoria:

Historical measures of the risk premium may not be particularly appropriate since the risk premium in the CAPM is a forward-looking concept – the return investors expect to receive from a current investment in the market over that received on risk free securities. An alternative approach is to apply a valuation technique such as the dividend growth model to the market as a whole to derive the implied required rate of return.79

More recently, Associate Professor Martin Lally has done extensive work for Australian regulators on the issue of estimating the MRP using the DGM. In 2012, he advised the AER that:

…whilst the AER gives primary weight to historical averaging of excess returns and survey results in estimating the forward-looking MRP, I consider that the AER should give consideration or additional weight to a number of other methods including the Siegel approach, the DGM and results from a range of other markets.80

2. Option pricing model based MRP

Another way of estimating the MRP is to use option market information. In particular, using current option prices, one can derive implied volatility in the equity market.81 The implied volatility is a forward-looking measure of risk as it is not based on historical stock prices. Instead, it is a measure of risk implied by the market based on the current option prices. To the extent that the MRP quantifies a reward for bearing risk associated with investing in stock market, a greater level of risk as measured by a higher implied volatility should increase the MRP.

79 Professor Kevin Davis, The weighted average cost of capital for the Gas industry, a report prepared at the request of the ACCC and the Office of the Regulator-General, 18 March 1998, p 14.
81 As per the Black-Scholes option pricing model.
In the US market, the volatility index (VIX) is the simplest measure of the implied volatility (Damodaran, 2012). The VIX is a measure of 30-day volatility and is constructed using the implied volatilities of S&P 500 index options. In the Australian market, the implied volatility is based on S&P/ASX 200 index options.

Bishop, Fizsimmons and Officer (2011)\textsuperscript{82} derive a one-year implied MRP, assuming a constant required rate of return per unit of risk. They first estimate the average excess market return over a risk free rate per unit of risk. This is the Sharpe ratio for the market portfolio in the CAPM. The calculation can be expressed as follows.

\[
S_m = \frac{E(R_m - R_f)}{\sqrt{var(R_m - R_f)}}
\]

where \(S_m\) is the Sharpe ratio, \(R_m\) is market return and \(R_f\) is risk free rate.

Bishop et al. (2011) divide the excess market return (ie, 6\%\textsuperscript{83}) by the annualised standard deviation (ie, 14\%\textsuperscript{84}), and obtain 43 bps as the average MRP per unit of risk. Given that the implied volatility of the 12-month call option is 22.5\%\textsuperscript{85}, they obtain an implied MRP of 9.7\% by multiplying the implied volatility (ie, 22.5\%) to the MRP per unit of risk (ie, 43 bps).

The one-year implied MRP can be converted to a longer term forward-looking MRP with further assumptions (Bishop et al., 2011). For example, Value Advisor Associates (VAA) assumes that the one-year implied MRP will converge to equilibrium MRP (ie, the historical MRP) over 3 years. JCP Investment Partners assumes step reversion after 2 years.

**MRP Comparison**

Table 4.2 shows the MRP values based on the 3 different estimation methods. We have not included the option pricing model MRP here as an explicit source as we prefer to use publicly available data as our estimates. This does not mean that we will not consider it in an estimate of the implied MRP.

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\textsuperscript{82} Bishop, S., Fizsimmons, M., and Officer, B., 2011, Adjusting the market risk premium to reflect the global financial crisis, JASSA, Issue 1, pp 8-14.

\textsuperscript{83} 6\% is the historical MRP (ie, excess market return over risk free rate) based on historical stock prices.

\textsuperscript{84} Bishop et al. (2011) note that the 14\% is the annualised average historical volatility calculated using a moving average of daily data from January 1980 to end-November 2009.

\textsuperscript{85} Estimates of the implied volatilities are available from Bloomberg.
Table 4.2  MRP values using 3 MRP estimation methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Source</th>
<th>Averaging method</th>
<th>MRP values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey MRP</td>
<td>Fernandez et al. (2012)a</td>
<td>n/a</td>
<td>6%^</td>
</tr>
<tr>
<td>Historical MRP</td>
<td>Brailsford et al.(2012)</td>
<td>Arithmetic</td>
<td>6.1%</td>
</tr>
<tr>
<td>Implied MRP</td>
<td>Bloomberg</td>
<td>n/a</td>
<td>8.7%</td>
</tr>
</tbody>
</table>

Note: There were 73 responses in Australia. Professors, analysts and financial institutions responded to have used an MRP of 5.8-5.9%, while company managers said to have used an MRP of 6.8%. 6% was the median MRP. The mean MRP was 5.9%.


Table 4.2 shows that the survey-based MRP and the historical arithmetic average MRP are consistent with our MRP range of 5.5% to 6.5%. The historical geometric average is below our range. The implied MRP is above our range.

Figure 4.4 compares the expected MRP from different methodologies since July 2008.

**Figure 4.4  MRP estimates comparison to 4 September 2012**

Data source: Geometric and arithmetic historical MRPs are from Brailsford et al. (2012). Daily implied MRP is available from Bloomberg.

Figure 4.4 shows that since the GFC the implied MRP has been above the historical estimates except for the 6-months leading up to the beginning of 2010.
The various MRP methodologies have their merits and disadvantages. It is important to consider them as part of the overall WACC model methodology. For example, the Queensland Competition Authority (QCA) uses more than one methodology to estimate the MRP (Box 4.2). They also need to be tested against current market expectations. This highlights the importance of including peer reviews from financial market participants and corporate treasuries as part of the WACC decision process.

Box 4.2 The QCA’s approach to estimate the MRP

The Authority has consistently set a market risk premium of 6.0% for the regulated firms in its jurisdiction. The Authority’s estimation procedure principally involves four estimation methodologies, specifically:

1. **Ibbotson historical averaging** – an historical averaging method that measures the historical (excess) return above the risk free rate that investors could have earned by investing in a diversified ‘market’ portfolio, including applicable adjustments for any dividend imputation credits. The Ibbotson average is taken over *ex post* market outcomes, where the annual premium is calculated as the simple difference between the nominal equity return and the nominal risk free rate.

2. **Siegel historical averaging** – an historical averaging method where the (annual) market risk premium estimated from the Ibbotson method is adjusted for the effects of unanticipated inflation. The Siegel method is based on the premise (based on empirical evidence) that historically, unexpected inflation has artificially reduced the real returns on bonds but not the real returns on equities.

3. **Cornell method** – a forward-looking method and an advanced application of the dividend growth model where expected growth rates in dividends (proxied by the earnings per share growth rate) converge over time to the forecast, long-run GDP growth rate and once convergence occurs, the growth rate of dividends is assumed to occur at the same nominal rate as the economy.

4. **survey evidence** – forward-looking approach that attempts to ascertain investors’ expectations of the market risk premium by seeking an estimate directly from market participants and/or experts, including academics, financial analysts, and company managers. The objective is to find out what they require as a premium for investing in equity as a class relative to the risk free rate.

In arriving at a mean estimate, the Authority has attributed each method equal weight to date. The Authority then rounds the mean estimate to the nearest whole percent. The Authority’s approach to both weighting and rounding are important aspects of its methodology and accordingly, are discussed further.\(^{86}\)

4.6  Assessment of options for cost of equity model

4.6.1  Preliminary views

The CAPM is the most widely used and best understood model to estimate the cost of equity. While the estimation of its inputs involves significant levels of uncertainty, we believe the CAPM still provides the best estimate of the expected cost of equity. Other models such as the Fama and French 3-factor model require their own inputs which involve similar and potentially more uncertainty than the CAPM model.

While we intend to continue to use the CAPM as the primary model, we believe that we could improve our estimate by using other models as a cross check of the CAPM cost of equity. However, it may be difficult to implement the arbitrage pricing model in general or the dividend growth model for the businesses we regulate.

Use of the CAPM requires us to estimate the MRP, the risk free rate and the equity beta. As Chapter 3 discusses, we propose to use a short-term estimate of the risk free rate which we will base on a 40-day average of the yields on Commonwealth Government bonds. We may also use long-term average risk free rates as an additional estimate of the expected cost of debt. The same risk free rates will also be applied in the CAPM. We do not propose to review the equity beta.

4.6.2  Analysis

Table 4.3 summarises our assessment on how the different methodologies to estimate the cost of equity meet our assessment criteria.

<table>
<thead>
<tr>
<th></th>
<th>CAPM</th>
<th>Fama and French</th>
<th>APT</th>
<th>DGM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficient investment incentives</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Continuity in approach</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Applicable to businesses IPART regulates</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Widely used in financial markets?</td>
<td>Yes</td>
<td>Maybe</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

All the models we considered meet our most important criterion, which is providing incentives for efficient investment. The CAPM provides continuity in our approach and (like the Fama and French 3-factor model) it applicable to individual industry sectors. The APT and the DGM would be difficult to apply for the businesses we regulate. Most are government-owned and it is difficult to find comparable businesses here or overseas whose shares are publicly traded.
4.7 Assessment of options for estimating MRP and risk free rate in CAPM

4.7.1 Preliminary views

Given that we propose to continue using the CAPM as the primary cost of equity model we will need to estimate a MRP. We propose to continue:

a) using our current methodology of estimating the MRP based on historic data with a risk free rate based on a short-term average\(^87\)

b) including consideration of the cost of equity using long-term averages for both the risk free rate and the MRP.

However, we consider that we should also have regard to an estimate of the cost of equity based on current estimates of the MRP. We could use these additional estimates when constructing our feasible WACC range or selecting the WACC within the range established using our present approach.

We believe that given the level of uncertainty involved in estimating the MRP, it is important that more than one cost of equity model is considered. For example, while it may be true that the historical MRP is the best estimate of the expected MRP over the long-term it may be the case that the current MRP is significantly higher than the historical average. In such a case it will be important to consider the current MRP and its impact on investors, the new entrant, the incumbent and consumers.

Evidence and common sense suggest that the MRP can vary significantly from the long-term historic MRP, sometimes for extended periods. While we understand that estimation methods of the implied MRP require a number of assumptions such as dividend growth rates, we believe that they can be used as a cross check on our long-term historic based MRP. We also found evidence that the source of increased uncertainty may stem from volatility and material changes in the risk free rate. Therefore we believe that we should also consider the impact of changes in the risk free rate. This can be done by using a cost of equity estimate generated using a long-term risk free rate and MRP.

\(^87\) For example, McKenzie and Partington (2011) recommended in a recent paper that for regualtory purposes, the general view seems to be that a stable long run MRP should be used. McKenzie M.D. and Partington, G, 2011, Equity Market Risk Premium, Report to Corrs, Chambers and Westgarth, December 21.
4.7.2 Analysis

Table 4.4 summarises our assessment on how the different methodologies for estimating the MRP meet our assessment criteria. All methods except for the surveys meet the most important criterion, which is providing incentives for efficient financing. The long-term historic MRP provides consistency in our approach. To the extent that the MRP is mean reverting over time it can be used as a guide to expected returns in the future. The long-term historic MRP and possibly the survey MRP would provide greater stability in prices over time. We found evidence that the long-term historic and the implied MRP methods are used in financial markets.

We consider that long-term historic and the implied MRP based on a DGM methodology would best meet our objective to estimate the cost of equity for an efficient benchmark firm. It would be desirable to investigate further the use of alternative methods to estimating the current MRP.

Table 4.4 Summary of assessment of MRP estimation method options

<table>
<thead>
<tr>
<th></th>
<th>Long-term historic MRP</th>
<th>Implied MRP (DGM-based)</th>
<th>Implied MRP (Implied volatility-based)</th>
<th>Survey MRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficient investment incentives</td>
<td>Maybe</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Continuity in approach</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Stability of prices</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Maybe</td>
</tr>
<tr>
<td>Widely used in financial markets?</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Maybe</td>
</tr>
</tbody>
</table>

Table 4.5 shows our assessment of using different MRP estimates with different risk free rate estimates. It indicates that in principle, Option 3 (implied MRP and short-term risk rate) provides incentives for efficient financing. However, in practice decisions on entry and new investment may be made using assumptions that have regard to long run values because of the time horizon of the evaluation. If this is the case, Option 1 (long-term MRP and short-term risk free rate) and Option 2 (long-term MRP and risk free rate) may be a better match with the investment criteria in practice. Option 1 also provides stability in our approach to estimate the cost of equity using the CAPM.
Table 4.5  Assessment of MRP options within the CAPM

<table>
<thead>
<tr>
<th></th>
<th>(Option 1) Current methodology historic long-term MRP and short-term risk free rate</th>
<th>(Option 2) Long-term historic MRP and long-term risk free rate</th>
<th>(Option 3) Implied MRP and short-term risk free rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficient investment incentives</td>
<td>Maybe</td>
<td>Maybe</td>
<td>Yes</td>
</tr>
<tr>
<td>Continuity in approach</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Widely used in financial markets?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Option 1 is consistent with different assumptions on mean reversion – that is, the risk free rate may not be mean reverting but the MRP is. To the extent that both the risk free rate and the MRP are mean reverting, Option 2 may be a good predictor of the cost of equity over the long-term. Option 3 assumes current rates are the best predictor of future rates because they include all current and relevant information over the relevant maturity. Options 1 and 3 are unlikely to provide the same stability in prices as Option 2. Price stability for customers also translates to revenue stability for the regulated business. Lastly, there is evidence that Options 1, 2 and 3 are all used in financial markets.

Figure 4.5 shows 3 different approaches to the cost of equity estimate:

- our current approach (Cost of equity – current) using a 20-day average risk free rate, an equity beta from Bloomberg proxy company analysis and a long-term historical MRP
- an approach consistent with prevailing market conditions (Cost of equity- S-S)
- an approach using long-term averages (Cost of equity- L-L).
Estimating the expected cost of equity

Figure 4.5  Estimating the cost of equity (real)

Note: Cost of equity-Current based on a 20-day average 5-year risk free rate, a constant long-term historical MRP of 6% and an equity beta of 1.
Cost of equity-S-S based on 20-day average 5-year risk free rates, the Bloomberg implied MRP and an equity beta of 1.
Cost of equity-L-L based on a 10-year trailing average of the 5-year risk free rate a constant historical MRP of 6% and an equity beta of 1. All scenarios use an inflation adjustment of 2.5%.
Data source: Bloomberg, IPART’s own analysis.

This figure indicates that the cost of equity based on long-term averages is very stable over time. The expected cost of equity generated based on our current model is also fairly stable. It uses a short-term average risk free rate and a constant expected MRP of 6% based on the long-term historical average. However, it is significantly lower than both the other estimates in the current market conditions. Movements in this estimate can be explained by movements in the risk free rate. The expected cost of equity based on the prevailing spot rates in the financial markets displays a significant degree of volatility. This volatility can be explained by changes in the risk free rate and Bloomberg’s implied MRP and in particular its inputs:

- changes in share prices
- expected dividends
- growth rates.

IPART seeks comments on the following issues:

8 How should we estimate a current market-implied measure of the expected market risk premium?
9 Should we use a long-term average (for example 10 years) to estimate the risk free rate to be consistent with the long term averaging period used for the market risk premium estimate?
4.8 Using cross checks on the cost of equity

We propose to use a series of cross checks on our cost of equity estimate. These may include:

- external peer reviews from banks, corporate treasuries or consultants
- monitoring of market reports
- cost of equity estimates obtained from the use of alternative models
- sensitivity analyses.

We would release the results of these cross checks as part of our WACC analysis and explain how we used them, how much weight we gave them and what other considerations influenced our decision.
5 Establishing the range and choosing the appropriate WACC value

Once we have estimated the expected costs of debt and equity, we use these estimates to decide on the appropriate WACC value for the relevant determination period. Given the uncertainties around some of the input parameters for these estimates, there will be uncertainty about the appropriate WACC value. For this reason, we first establish a feasible range for the WACC, and then choose the appropriate WACC from this range.

Through this review, we seek to establish a standard approach for establishing the WACC range for future determinations. Should we wish to adopt an alternative approach or consider additional or alternative factors for a particular price review, our intention is to indicate this during the review (for example, in the issues paper or draft report) and provide opportunities for stakeholders to submit comments on our proposed variation to the standard approach.

In our view, establishing the range and choosing the appropriate value for the WACC requires the exercise of carefully considered judgement within a framework of clear reference points and guiding objectives and principles. There are several valid models and methods for estimating the WACC and its parameters and these yield different results. But there are also tensions between these approaches.

For example, using long-term average data to estimate some parameters, such as the MRP, means that the estimate does not necessarily reflect current market conditions. During the GFC, the long-term MRP was around 6% while implied MRP estimates were as high as 18%. In these cases, the regulator may have to exercise its judgement to ensure that the WACC does not underestimate the cost of capital for the regulated business. On the other hand, using forward-looking estimates of the MRP based on current market data may lead to volatility in the WACC and therefore prices. Thus, this method may be difficult to reconcile with revenues and the common-sense view that pricing outcomes should not depend too heavily on the date of the pricing decision.
The sections below discuss our analysis and preliminary views in relation to estimating the range and choosing the appropriate value for the WACC. Specifically, they:

- outline the approaches for determining the appropriate WACC taken by other regulators
- discuss the key issues to be considered in deciding on IPART’s approach for determining the WACC for future determinations
- set out 5 broad scenarios for establishing the feasible WACC range and choosing the WACC value for future determinations, and assess these scenarios against the objectives and issues discussed in section 2.3
- outline the main areas where further information and analysis are required to inform our final decisions on our methodology for determining the WACC.

## 5.1 Approaches taken by other regulators

We surveyed other regulators in Australia, the Great Britain, New Zealand and the Netherlands to identify the approaches they use to address uncertainty in estimating the WACC and choose the appropriate WACC value. We focused on 2 main questions:

- Do they use a range for the input parameters in the WACC formula, or point estimates?
- If they use a range, how do they choose the final WACC value? For example, do they exercise discretion to set the WACC above or below the midpoint to meet a particular objective (eg, to reflect the prevailing economic conditions)?

Table 5.1 summarises the results. It shows that there are significant differences in regulatory approaches. Like IPART, all overseas regulators surveyed use a range for the input parameters. The main reason for using a range appears to be the uncertainty that surrounds the individual parameters, especially the MRP.
Establishing the range and choosing the appropriate WACC value

Table 5.1 Summary of regulatory approaches for setting WACC

<table>
<thead>
<tr>
<th>Regulator</th>
<th>Approach for WACC inputs</th>
<th>Midpoint or other</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPART</td>
<td>Range</td>
<td>Discretion exercised. Recent determinations - upper end of range to reflect market conditions.</td>
</tr>
<tr>
<td>AER</td>
<td>Point estimate</td>
<td>n/a</td>
</tr>
<tr>
<td>ERA</td>
<td>Point estimate</td>
<td>n/a</td>
</tr>
<tr>
<td>QCA</td>
<td>Point estimate</td>
<td>n/a</td>
</tr>
<tr>
<td>ESC</td>
<td>Range</td>
<td>Discretion exercised. Latest decision - upper end of range to reflect market conditions so businesses can recover actual borrowing costs and likely future borrowing costs.</td>
</tr>
<tr>
<td>ESCOSA</td>
<td>Point estimate</td>
<td>n/a</td>
</tr>
<tr>
<td>Ofgem (GB)</td>
<td>Range for cost of equity (CoE) inputs</td>
<td>Discretion exercised. Latest decision - CoE parameters at upper end of the range. Focusses on longer-term estimates, which it considers prudent given it sets controls for 8-year period.</td>
</tr>
<tr>
<td>Ofwat (GB)</td>
<td>Range</td>
<td>Discretion exercised. Latest decision - set WACC above the midpoint of range presented by consultant in view of financial market conditions and uncertainties.</td>
</tr>
<tr>
<td>NZCC (New Zealand)</td>
<td>Range is used to recognise that many uncertainties surround the WACC’s individual component parts</td>
<td>Discretion not exercised. Uses 75th percentile for the WACC in setting prices for price-quality regulation. Guidelines on cost of capital state it often sets WACC value above the midpoint due to social cost of setting a rate that is too low. Reports on midpoint annually.</td>
</tr>
<tr>
<td>NMa (Netherlands)</td>
<td>Range is used due to uncertainty with respect to the equity risk premium and the risk free rate.</td>
<td>In principle, midpoint used unless there are reasons otherwise.</td>
</tr>
</tbody>
</table>

Establishing the range and choosing the appropriate WACC value

Ofgem focuses on the uncertainty surrounding the cost of equity. This uncertainty exists at 2 levels—model uncertainty and parameter uncertainty within each model. It generates alternative estimates for the cost of equity using different models, such as the CAPM with different averaging periods for the parameters, and the DGM. Within each model there is still uncertainty, which is reflected in the ranges for the parameter values.

Most overseas regulators surveyed have used discretion in selecting the WACC from within the estimated range. In their decisions since the GFC, both Ofwat and Ofgem have selected a WACC above the midpoint in response to financial market uncertainties.

The exception among the overseas regulators is New Zealand’s Commerce Commission (NZCC), which uses a more formal statistical approach to establish the range and set the WACC. NZCC specifies the uncertainty surrounding the parameters in statistical terms by estimating a standard deviation. This allows it to construct a probability distribution for the parameters and the overall WACC.

NZCC sets the WACC using the 75th percentile estimate for input variables for default price-quality paths. It uses this approach because it considers that the social costs of setting allowed rates of return too low probably outweigh the costs of returns set too high.

Of the Australian regulators surveyed, all but Victoria’s Essential Services Commission (ESC) (and IPART) use point estimates for the input parameters and hence for the WACC value. In the case of determinations under the current National Electricity Rules, the AER and ERA do not have the option of using ranges for the parameters. This may change following the AEMC’s recent review of the rule changes. As Chapter 2 discussed, AEMC’s final position paper on this review emphasised the uncertainty in estimating the WACC and the desirability of using a range of models and data sources to obtain a better appreciation of this uncertainty.

5.2 Key issues in relation to our approach for determining the WACC

In considering our approach for determining the WACC for future determinations, we need to consider whether it will enable us to meet our primary objective in setting the WACC. As Chapter 2 discussed, this objective is to determine a value that reflects the expected cost of capital over the determination period for a ‘benchmark utility’ that is efficient, faces similar risks to the regulated business, and is a new entrant. This is consistent with the

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establishing the range and choosing the appropriate WACC value

As Chapter 2 also discussed, we need to ensure our approach leads to a WACC decision that is consistent with our broad objectives and the matters we must consider under the IPART Act, and is consistent with the principles of good regulation.

In addition, we also need to consider the following key issues in deciding on our approach for establishing the WACC range and choosing the appropriate WACC value:

- Is the approach robust under changing financial market conditions?
- Is the approach consistent with market practice?
- How much discretion does the approach provide us in choosing the WACC value, and how should this discretion be exercised?

5.2.1 Is the approach robust under changing market conditions?

As noted above, we aim to establish a standard approach for establishing the range for the WACC that can be consistently applied over time and across sectors. Therefore, this approach must be robust under changing market conditions. It must be capable of generating a WACC that meets our primary objective in setting the WACC under the wide range of different market conditions that may exist. A number of factors make this particularly challenging.

First, some of the key input parameters are not easily observed, particularly those used to estimate the cost of equity. This cost is the expected return required by investors to compensate them for the systematic risks they face by holding equity in the business. These expectations are difficult to observe directly and we need to rely on proxies (such as past returns) and a range of models from which an implied expected return can be derived, as well as other data such as surveys of analysts and managers. Estimating the cost of debt is less challenging, as there are alternative benchmarks for the input parameters, and these benchmarks (such as yields on BBB/BBB+ corporate bonds) are generally directly observable. Even so, there are substantial variations in observed yields.

Second, the input parameters of the WACC can be stable for extended periods but can also change quickly and substantially. The changes in the inputs are interrelated and depend strongly on events in financial and equity markets and general economic trends. However, these relationships are also complex and may not be uniform over time. For example, the initial effects of the GFC in 2008 started with a crisis in access to debt markets for financial corporations that spread to non-financial corporations. More recently, concerns have focused on public sector debt in some countries in the EU and the sluggish recovery of many developed economies. These different phases have had quite different effects on 3 key WACC parameters – the debt margins, the MRP and the risk free rate.
We do not consider that our current WACC methodology is ‘broken’. It has been subject to considerable stress during the period since the GFC and we have been concerned that the midpoint estimate has understated the cost of capital for the benchmark firm. However, we have been able to use our discretion to set the WACC at the top end of the range, having strong regard to the long-term averages for all parameters. Nevertheless, it would be a concern if, through the economic cycle, we always had to choose a WACC value at or near the top of the estimated range. It would also be a concern if we were no longer confident that the returns expected by investors fell within the range of our estimated WACC.

5.2.2 Is the approach consistent with market practice and customer expectations?

It is important that the approach we use to determine the WACC for regulatory purposes reflects market practice and expectations that drive the cost of debt and equity. In relation to this issue, one of the choices we face is whether to give greater weight to:

- estimates based on the long-term average of historical data for all parameters,
- forward-looking estimates based on market data for all parameters.

The choice we make could supplement or replace our current hybrid approach, which uses current estimates of the risk free rate and debt margin and long-term average data for the MRP.

In making this choice, we consider that the practice of debt managers and analysts is highly relevant. While we use theoretical models to estimate the WACC, our purpose is to estimate the expected cost of capital for the benchmark firm. This suggests we should take account of practice in valuation and investment decision-making, as well as economic and finance theory.

Other relevant factors include the expectations of customers and regulated businesses in relation to price and revenue stability. Do customers (or business managers/owners) expect that prices (or revenues) for the next 4 to 5 years will depend significantly on the month in which the price decision is made?
5.2.3 How much discretion does the approach provide IPART, and how should this discretion be exercised?

The final key issue in considering our approach for establishing the WACC range and choosing the WACC value is how much discretion the approach provides us and how that discretion should be exercised. That is, we need to consider:

1. How does the approach account for uncertainty in estimating the WACC?
2. If it does so by establishing a range for the WACC, how do we choose a WACC value within the range? What arguments and evidence are needed to support a decision other than the midpoint?

As the AEMC has noted there are several credible models that can be used to estimate the WACC. Within each model there is a level of uncertainty around key parameters. Hence, there is a level of uncertainty within each model and between competing models.

This level of uncertainty – that is, the spread between the various reasonable estimates of the WACC – will not be constant over time. For example, under some of the scenarios discussed in section 5.3 below, there has been a significant increase in the estimated range for the WACC since the GFC. While that may reduce the certainty and predictability of the WACC decision, it may reflect an increase in market uncertainty since the GFC.

In its final position paper the AEMC stated that:

Estimating the rate of return ultimately requires a regulator to exercise judgement about the analytical techniques and evidence to use to make an estimate that is commensurate with efficient financing costs. The new framework does not prescribe methodologies or lock-in specific benchmark characteristics other than providing high-level principles that should be taken into account when estimating various components, such as return on equity and debt. While the judgement as to the best approach is left to the regulator, the preferred methods must be developed to meet the overall allowed rate of objective.90

One option to increase certainty and predictability may be to constrain the WACC range by narrowing the range for parameters or relying on a smaller set of models. However, this may make it more difficult to achieve our primary objective of setting a WACC that reflects the efficient cost of capital for a benchmark utility that faces similar economic risks to the regulated business and is a new entrant.

Another option is to better define how the discretion will be exercised and what additional data and information will be considered in exercising this discretion. Again the challenge is to balance the desire for certainty with the need for flexibility to reflect changing market circumstances.

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5.3 Scenarios for establishing feasible WACC range

Based on the analysis discussed in the previous chapters and sections, we have identified 5 broad scenarios for establishing a feasible WACC range and choosing an appropriate WACC value. Under all scenarios, we would continue to use the CAPM as the primary cost of equity model, and estimate a range for certain parameters (resulting in a range for the WACC). In addition, we would continue to exercise our judgement in choosing the appropriate WACC value with reference to our primary objective and specified reference points.

These scenarios estimate the costs of debt and equity using:

1. Long-term averages for the risk free rate, debt margin and MRP.
2. Short-term average for the risk free rate, debt margin and estimate of the MRP using current market data.
3. A combination of Scenarios 1 and 2.
4. A combination of Scenarios 1 and 2 and our current methodology (short-term data for the risk free rate and debt margin and long-term average for the MRP).
5. Our current methodology and selecting the WACC value with regard to the midpoint of the range established under Scenario 1.

Attachment A describes each scenario in detail. The sections below provide an overview of our preliminary view on the scenarios, and then assess each scenario against the objectives and issues discussed in section 5.2 above.

5.3.1 Overview of our analysis and preliminary view on these scenarios

Our analysis indicates that the current feasible WACC ranges generated using these 5 scenarios vary considerably in terms of their width and midpoints (Table 5.2). Scenario 4 generates the widest feasible range. Not surprisingly, Scenario 1 currently yields higher estimates of the WACC than the other scenarios. However, this depends on market conditions. Unless there is systematic bias in expectations, Scenarios 1 and 2 should yield the same average WACC over the long term. Scenario 2 may provide a more volatile range depending on changes in the implied MRP.
Establishing the range and choosing the appropriate WACC value

Table 5.2  Real post-tax WACC ranges over 2012 (%) (as at 15 November 2012)a

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Lower</th>
<th>Midpoint</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (long/long)</td>
<td>6.1</td>
<td>6.5</td>
<td>6.9</td>
</tr>
<tr>
<td>2 (short/short)</td>
<td>4.2</td>
<td>4.7</td>
<td>5.3</td>
</tr>
<tr>
<td>3 (scenarios 1 &amp; 2)</td>
<td>4.2</td>
<td>5.6</td>
<td>6.9</td>
</tr>
<tr>
<td>4 (current &amp; scenarios 1&amp;2)</td>
<td>3.2</td>
<td>5.1</td>
<td>6.9</td>
</tr>
<tr>
<td>5 (current &amp; scenario 1 as a reference)</td>
<td>3.2</td>
<td>3.9</td>
<td>4.6</td>
</tr>
</tbody>
</table>

a  Scenarios generated using an equity beta range of 0.8 to 1.0 for demonstration purposes only. The actual equity beta will depend on risk characteristics of the activity being regulated.

Our preliminary view is that Scenarios 3, 4 and 5 have most merit and most warrant further consideration. We agree with the AEMC that given the uncertainties in estimating the WACC, it is not appropriate to rely on a single model or approach to estimate the WACC (as in Scenarios 1 and 2). We consider that it is better to focus on overall objectives in setting the WACC and have regard to several valid models and sources of information (as in Scenarios 3, 4 and 5).

Scenario 5 is our current methodology, and in line our past practice in considering WACC issues, we prefer to continue using this current approach unless it can be clearly shown that an alternative approach is superior. This cautious approach to change helps achieve the objectives of certainty and consistency in our decision-making.

However, Scenario 5 does not include a current estimate of the MRP. As Chapter 4 discussed, we consider the WACC methodology should incorporate such an estimate, as this is consistent with (and would enhance our ability to meet) our objective to determine a WACC that reflects the expected efficient cost of capital. If we were to continue using this scenario, one option for including a current MRP estimate would be by having regard to the midpoint of the range established under Scenario 2 (where all parameters are estimated using short-term average data) as well as the midpoint under Scenario 1.

Both Scenarios 3 and 4 include a current estimate of the MRP but Scenario 4 represents less change from our current methodology. However, it results in a wider feasible WACC range than the other scenarios. While this may decrease in certainty and predictability for stakeholders, it means the approach to determining the WACC is more robust in changing market circumstances. We consider this could provide:

- an increased level of certainty to investors that assets remain financeable
- greater ability to reflect the efficient financing costs of a privately-owned new entrant or new investment
- increased confidence for businesses and consumers that revenue and price volatility can be minimised without affecting quality and service standards.
The decrease in uncertainty and predictability for stakeholders may be addressed by putting in place a transparent framework to guide us in selecting the WACC from the feasible range. (This framework is discussed in section 5.4 below).

5.3.2 Scenario 1 - Long-term average data for risk free rate, debt margin and MRP

This scenario assumes that in the long term, the expected cost of capital will revert to an average. In our recent water and retail electricity determinations, we have published our estimate of the WACC using long-term averages for the parameters. However, if we adopted this scenario, we would analyse the estimated parameter values further.

Scenario 1 would produce a relatively narrow range for the WACC (as illustrated in Figure 5.1), and this range would be stable over time.

**Figure 5.1 Real post-tax WACC range using Scenario 1 (long/long)**

![Real post-tax WACC range using Scenario 1 (long/long)](image)

**Data source:** Bloomberg, IPART’s own analysis. Range generated using the Bloomberg Fair Value curve for debt, an equity beta range of 0.8 to 1.0 and a MRP range from 5.5% to 6.5%.
Establishing the range and choosing the appropriate WACC value

If there is a strong reversion to long-term means, using Scenario 1 would be consistent with an efficient cost of capital in the long term. However, we have not found strong evidence of a return to such means in bonds with long maturities. Given the narrow WACC range generated under this scenario, and the variability in current estimates of the cost of capital, there is a strong possibility that at any single determination it will not generate an estimate of the WACC that is consistent with the expected efficient cost of capital over the determination period. Hence, it may not provide a sound basis for efficient investment and pricing.

On the other hand, it is a transparent approach that yields predictable and stable outcomes. Hence, it can provide a sound basis for long-term planning and decision-making by the utilities and customers.

The approach may not produce a WACC that reflects the expected efficient cost of capital for a new entrant, as it may not reflect the cost of capital at the time an investment decision is made. For the incumbent, it would recognise that a large part of its capital has been raised at historical (average) financing costs. For Treasury Corporations, the approach minimises refinancing risk.

This approach is more likely to produce an estimate of the WACC that is inconsistent with the current costs of debt and equity. Hence, it is less robust in its ability to reflect changing market conditions.

Surveys of management and analysts indicate that, in practice, relatively stable long-term estimates are often used in investment and valuation decisions. However we understand that these are not entirely fixed. We are seeking further information on this.

This approach provides significantly less scope for the exercise of discretion in choosing the appropriate WACC value than Scenarios 3, 4 and 5.

5.3.3 Scenario 2 – Short-term average data for risk free rate, debt margin and MRP

This scenario assumes that current market values incorporate relevant information and are the best guide to the cost of debt and equity for the regulatory period or assumed debt maturity. It also provides a marked-to-market valuation of assets at the time of the regulatory reset, consistent with economic theory.

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We have not previously estimated the MRP using short-term average data. As Chapter 4 discussed, such current MRP estimates vary depending on the methodology and assumptions used. We have used Bloomberg’s implied MRP data to provide estimates of the WACC in 2012 under this scenario (Figure 5.2). If we adopted this scenario, we would need to further consider the methodology and assumptions we use.

**Figure 5.2  Real post-tax WACC range using Scenario 2 (short/short)**

As Figure 5.2 shows, Scenario 2 results in a relatively more volatile WACC range over time than Scenario 1. Over the past year, this range has been relatively wide at times. It has also trended down over the year and the range has narrowed.

In principle, this scenario best matches the theory of the efficient cost of capital. It uses current market data to estimate the expected cost of debt over the determination period, and the cost of equity based on current expectations. Hence, it should be consistent with efficient investment decisions and commercial sustainability for an efficient operator. However, as noted above, in practice, investment decisions and valuations may give more weight to historic averages for the parameters.

One concern is the possible sensitivity of the calculation of the MRP to the methodology chosen. We could use more than one methodology to estimate the MRP. This would better reflect the uncertainties in estimating the forward-looking MRP, but it would also broaden the feasible WACC range.
Establishing the range and choosing the appropriate WACC value

If the Bloomberg estimates of the implied MRP are used, this scenario is as transparent as Scenario 1 but less predictable and stable. Inclusion of alternative methods of estimating the MRP would make it more complex and less transparent.

This scenario should reflect the cost of capital for the new entrant and for new investment. From the point of view of the incumbent, the scenario assumes that it can lock-in the cost of debt at the time of the regulatory reset using the swap market. This should be possible for smaller utilities. Larger diversified utilities should be able to manage this rate resetting risk internally. For Treasury Corporations this may introduce a refinancing risk.

This approach should result in a WACC that is consistent with the financial conditions and the cost of debt and equity at the time of the decision. Hence, it is robust in changing financial market conditions. Compared to Scenario 1, it would lead to greater variability in the prices and revenues between decisions and greater sensitivity to the timing of decisions. This may conflict with consumers’ expectations of more stable prices and the businesses’ preference for more stable and predictable incomes.

For the period shown in the figure above, the range for the estimated WACC is wider than the range generated under Scenario 1 but narrower than those generated under Scenarios 3, 4 and 5. It is not clear that the range will always be wider than that for Scenario 1.

5.3.4 Scenario 3 – Combination of Scenarios 1 and 2

Scenario 3 recognises that the actual financing strategies of utilities may differ depending on the nature of assets and size. It allows us to treat the regulated business as if it was an efficient benchmark firm while taking into account the impact of current market conditions on financeability and price movements. The concerns in regard estimating the MRP under Scenario 2 noted above also apply to this scenario. However, their impact is lessened because the scenario does not rely on only that approach.

Figure 5.3 shows the WACC range in 2012 generated using Scenario 3. The upper bound was set by Scenario 2 until April 2012 and by Scenario 1 thereafter. The lower bound was briefly set by Scenario 2 in early 2012 and by Scenario 1 at other times.
Establishing the range and choosing the appropriate WACC value

Review of method for determining the WACC

Figure 5.3 Real post-tax WACC range using Scenario 3 (short/short and long/long)

<table>
<thead>
<tr>
<th>Date</th>
<th>Upper bound</th>
<th>Midpoint</th>
<th>Lower bound</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>01-Oct'12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>01-Nov'12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data source: Bloomberg, IPART’s own analysis. Long-term range generated using the Bloomberg Fair Value curve for debt, an equity beta range of 0.8 to 1.0 and a MRP range from 5.5% to 6.5%. Short-term range generated using the current proxy bond portfolio for debt, an equity beta range of 0.8 to 1.0 and the implied MRP. The range is set by the following rule: upper bound: max(scenario 1, scenario 2) and lower bound: min(scenario 1, scenario 2).

This figure indicates that Scenario 3 would provide a relatively wide WACC range compared to Scenarios 1 and 2. The midpoint is more stable than under Scenario 2, but less stable than under Scenario 1.

Because the scenario combines both Scenarios 1 and 2, it has the strengths and weaknesses of each to some degree. But the balance between these would depend crucially on how we exercised our discretion if the midpoint was not deemed appropriate. The midpoint may be seen as a form of adaptive expectations: it partially responds to market variations with a lag. It does not assume reversion to the mean nor does it follow market variations in full.

The range includes estimates of:

- a forward-looking WACC based on current market conditions
- a forward-looking WACC based on long-term average costs that would be consistent with the long-term efficient cost of capital if there is mean reversion.

Overall we believe that it is likely to deliver outcomes consistent with the primary objective – depending on how the discretion in selecting the WACC within the range is exercised.
The midpoint represents a mixed approach in terms of incentives for investment. It will not fully reflect the cost of capital for new investment – or a new entrant – during the regulatory period. If decisions are evaluated on the assumptions of more stable longer term ‘norms’ it may better reflect these decision processes.

From the point to view of the incumbent, this scenario would recognise financing costs for existing capital and that of new capital. On the downside it may be difficult for the incumbent to hedge the base rate. The incumbent may question the increased scope for regulatory discretion under this scenario, but at the same time recognise that it provides a greater scope for resulting in a rate of return that ensures financeability.

This scenario is likely to lead to relatively stable revenues and prices. Compared to Scenario 1, it gives the regulator greater scope to choose a WACC with reference to current market conditions should financing cost continue to fall.

The approach is transparent in the calculation of the ranges for the WACC. As it results in a wider range for the WACC, it may result in a less predictable, consistent and stable WACC than either Scenario 1 or 2. However, this will depend on how we exercise discretion in selecting the WACC value from within that wider range – for example, the extent to which we select a WACC above or below the midpoint.

This means that under this scenario, it would be more important to put in place a transparent framework that sets out (for example) the objectives, rules, reference points and information we will consider to guide us in exercising that discretion than under Scenario 1 or 2. For instance, one option for reducing uncertainty would be to establish a rule or expectation that the chosen WACC value would be between the midpoint of the ranges under Scenario 1 and 2 (except in extreme circumstances). Another option would be to improve and make more transparent the ‘market intelligence’ considered in choosing the value (ie, the information we obtain from surveys and consultation with market participants).

5.3.5 Scenario 4 – Combination of Scenarios 1 and 2 and current methodology

This scenario involves less change from our current methodology than Scenarios 1, 2 and 3. We would continue to estimate the expected costs of debt and equity using a long-term average for the MRP and current estimates for the risk free rate and debt premium. We would also estimate these costs under Scenarios 1 and 2 in the range. The resulting estimates would be given the same priority or weight, and would be used to create a single range for the WACC.

Figure 5.4 shows the WACC range in 2012 generated using this scenario.
5. Establishing the range and choosing the appropriate WACC value

Review of method for determining the WACC

Figure 5.4  Real post-tax WACC range using Scenario 4 (current methodology and short/short and long/long)

<table>
<thead>
<tr>
<th>Date</th>
<th>Upper bound</th>
<th>Midpoint</th>
<th>Lower bound</th>
</tr>
</thead>
<tbody>
<tr>
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<td>9.5%</td>
<td>8.0%</td>
<td>6.5%</td>
</tr>
<tr>
<td>01-Feb-12</td>
<td>9.0%</td>
<td>7.5%</td>
<td>6.0%</td>
</tr>
<tr>
<td>01-Mar-12</td>
<td>8.5%</td>
<td>7.0%</td>
<td>5.5%</td>
</tr>
<tr>
<td>01-Apr-12</td>
<td>8.0%</td>
<td>6.5%</td>
<td>5.0%</td>
</tr>
<tr>
<td>01-May-12</td>
<td>7.5%</td>
<td>6.0%</td>
<td>4.5%</td>
</tr>
<tr>
<td>01-Jun-12</td>
<td>7.0%</td>
<td>5.5%</td>
<td>4.0%</td>
</tr>
<tr>
<td>01-Jul-12</td>
<td>6.5%</td>
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<td>3.5%</td>
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<td>01-Aug-12</td>
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<td>01-Sep-12</td>
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<tr>
<td>01-Oct-12</td>
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<td>3.5%</td>
<td>2.0%</td>
</tr>
<tr>
<td>01-Nov-12</td>
<td>4.5%</td>
<td>3.0%</td>
<td>1.5%</td>
</tr>
</tbody>
</table>

**Data source:** Bloomberg, IPART’s own analysis. Long-term range generated using the Bloomberg Fair Value curve for debt, an equity beta range of 0.8 to 1.0 and a MRP range from 5.5% to 6.5%. Short-term range generated using the current proxy bond portfolio for debt, an equity beta range of 0.8 to 1.0 and the implied MRP. Current methodology generated using current proxy bond portfolio for debt, an equity beta range of 0.8 to 1.0 and a MRP range from 5.5% to 6.5%. The range is set by the following rule: upper bound: max(scenario 1, scenario 2, current) and lower bound: min(scenario 1, scenario 2, current).

This figure shows that in 2012, this scenario generated a considerably wider WACC range than Scenarios 1, 2 or 3. Throughout the year, the bottom of the range was set by the current methodology. The midpoint was no less stable over this period than the midpoint of Scenario 3, but it was below this midpoint.

Like Scenario 3, because the range produced using Scenario 4 encompasses estimates generated using Scenarios 1 and 2, it can have the same pros and cons as those scenarios, depending on how we exercise discretion in choosing the WACC value. However, because it also includes estimates generated using our current methodology it can provide greater consistency with our past decisions.

The key point of difference between Scenarios 3 and 4 is that Scenario 4 results in an even wider range for the WACC and hence greater scope for us to exercise discretion in choosing the appropriate WACC value. This creates the possibility that using this scenario will lead to a less predictable, consistent and stable WACC. However, this will depend on how we exercise this discretion - for example, the extent to which we select a WACC value above or below the midpoint of the range.

Like Scenario 3, this means that under this scenario, it would be more important to put in place a transparent framework that sets out (for example) the objectives, rules, reference points and information we will consider to guide use in exercising that discretion than under Scenario 1 or 2. One option to reduce
uncertainty would be to establish a rule that the chosen WACC would normally
be between the midpoints of the methods that produce the highest and lowest
ranges. This could significantly reduce the level of discretion when the ranges
for the different methods widen as they have over the last 2 years. It would also
be consistent with an approach that has a balanced consideration of the results
under all 3 methods. Another option would be to improve and make more
transparent the ‘market intelligence’ considered in choosing the value, as
suggested in relation to Scenario 3.

5.3.6 Scenario 5 – Continue using our current methodology

This scenario involves continuing to establish the feasible WACC range using our
current methodology and to select the WACC value from this range with regard
to the midpoint of a range estimated using long-term averages for the risk free
rate, debt margin and MRP (Scenario 1). Consistent with our practice in making
recent decisions, we would not select a WACC outside the range established
using our current methodology (ie, current risk free rate debt margins and long-
term MRP).

Figure 5.5 shows the WACC range in 2012 generated using Scenario 5.

Figure 5.5 Real post-tax WACC range using Scenario 5 (current
methodology plus midpoint of long/long WACC range as a
reference point)

Data source: Bloomberg, IPART’s analysis. Long-term range generated using the Bloomberg Fair Value curve
for debt, an equity beta range of 0.8 to 1.0 and a MRP range from 5.5% to 6.5%. Current estimate derived
using our current sample of proxy bonds. The range is set by the following rule: upper bound: max(current) and
lower bound: min(current).
This figure shows that midpoint of the WACC range derived using our current methodology declined significantly over 2012. It is currently below the midpoint under the 4 other scenarios.

Of course, for extended periods the WACC range under this scenario may well overlap with the ranges under all the other scenarios. But the trends in the last year have raised questions whether the approach is robust in periods of unusual market conditions.

In contrast to Scenarios 3 and 4, there is not the same level of certainty that the range will encompass the long-term or short-term efficient cost of capital for the benchmark firm. As indicated above, it would not currently be possible to set a WACC within the range generated using Scenario 5 that was consistent with long-term estimates. While it could reflect the current estimate based on short-term averages this is not assured and depends on financial market conditions. Hence it is not as robust to changing market conditions. That said, we consider that this approach has worked well in the past.

The midpoint of the Scenario 5 range will not necessarily reflect the cost of capital for new investment or a new entrant. As discussed previously adding the long-term MRP to the current risk free rate may not reflect either the current or historic cost of equity unless the long-term average for the MRP approximates current expectations.

Scenario 5 would recognise financing costs for existing capital and that of new capital. On the downside, it may be difficult for the incumbent to hedge the risk free rate. As for Scenario 3, the incumbent may question the increased scope for regulatory discretion under this scenario, but at the same time recognise that it provides a greater scope for resulting in a rate of return that ensures financeability.

From the point of view of debt providers, this scenario would provide the benefit of reflecting actual debt management practice of the larger utilities and the financing cost of a new entrant on the debt side.

This scenario is likely to lead to relatively stable revenues and prices and there is likely to be little difference between this scenario and Scenarios 3 and 4.

If we continued using this scenario, it would be more important to put in place a transparent framework to guide use in exercising that discretion than if we used Scenario 1 or 2. However, the issue of how we exercise discretion, and the transparency and predictability of this, would probably be less important than if we used Scenario 4 because the feasible WACC range is reduced.

If we decided to include a current estimate of the MRP in this scenario by having regard to the midpoint of the range established under Scenario 2 (as discussed in section 5.3.3) as well as the midpoint under Scenario 1, this could enhance the scope for the discretion to be exercised.
Establishing the range and choosing the appropriate WACC value

IPART seeks comment on the following issues:

10 What model, or models, should be used in estimating the range for the WACC, and why?
11 Which of the Scenarios in Section 5.3 do you prefer and why?
12 If we continue using Scenario 5 (our current methodology, Section 5.3), should we also have regard to the midpoint of the WACC range estimated using current data for all parameters (including the market risk premium) as a reference point?

5.4 Issues for further analysis and consideration

In addition to considering stakeholder comments, we need to further analyse and consider 3 important issues or areas before making our final decisions. These are:

▼ which models and assumptions we should use in estimating the current MRP
▼ what framework we should put in place to guide us in exercising discretion in selecting the WACC value from within the feasible range
▼ the impact of our decisions on estimating the cost of debt on our approach to calculating the allowance for tax expense.

5.4.1 Models and assumptions for estimating the current MRP

For the analysis in this paper, we have used Bloomberg estimates of the implied MRP as a proxy for the current MRP. However, given our preliminary view that we should incorporate a current MRP estimate in our method for determining the WACC in some way, we need to undertake further research on the methodologies to derive these estimates and their stability and robustness.

Chapter 4 discusses the issues related to estimating an implied MRP from current market data in detail. It also identifies the questions on which we particularly seek stakeholder comment.

5.4.2 Framework for exercising discretion

We understand that stakeholders may be concerned about the way we will choose a WACC in future decisions, especially if the scope for discretion is increased. We consider that any additional uncertainty that may arise if we change our WACC methodology can best be managed by providing a transparent framework that outlines how we will decide on the WACC value from the range provided by whatever scenario we choose. By providing such a framework, we will be able to provide the right balance between choosing the highest quality WACC estimate and reducing uncertainty.
We agree with the AEMC that it is important to structure the way we exercise discretion by clearly specifying the objectives and other relevant information that will guide our decision. We propose to give further consideration to how best this can be done.

For example, our consultation with financial and equity market practitioners has been very helpful. One option is to formalise this process and undertake such consultation more regularly. We can also seek to increase and improve the market information we collect and its use. This may include market data from recent debt raising transactions and independent expert reports for equity transactions.

Another option is structured engagement with groups of investors and debt providers, outside the context of any particular WACC decision. The purpose would be to help us form views on how investors are dealing with uncertainty in periods where rates depart markedly from historical ranges. Protocols would be needed to ensure that neither the timing nor the composition of the discussion group compromises us in any decision-making.

Closer monitoring of analyst reports and investor presentations by firms could also play an important role. This will help us form insights on how investors are seeing WACC related assumptions.

We are interested in stakeholder views on what should be included in the framework for guiding our decisions on the WACC value. For example, should the framework include:

- transparent information on the models and assumptions used to estimate the range for the WACC
- structured engagement with groups of investors and debt providers outside the context of specific WACC decisions to inform our views on market practice
- increased monitoring of analyst reports and investors presentations and other supporting information on debt and equity market conditions, and management and analyst practice in investment and valuation decision
- specific objectives/criteria for setting the WACC and clear reconciliation of the decision against these criteria
- the use of draft reports to seek the views of stakeholders on the WACC value before proceeding to adopt it and the reasons for making this choice.

IPART seeks comment on the following issues:

13 How can the exercise of discretion in selecting the WACC value from within the feasible range be structured to increase predictability and certainty while still ensuring that our primary objective for setting the WACC can be achieved?
If we establish a framework to guide the exercise of this discretion, what should be included?

What other information should be used in determining the WACC? How can this best be integrated into decision making?

### 5.4.3 Impact on our approach to calculating the allowance for tax expense

Under a post-tax WACC model, the cost of debt is used to build up the estimate of the WACC and is also an input to the estimation of the tax expense. When only one model is used and there is only a single point estimate of the cost of debt it is easy to infer the cost of debt underpinning the WACC.

However, if more than one model is used in selecting the WACC there is not necessarily a single value for the cost of debt that could be consistent with the decision. Even if only one model is used, unless the WACC chosen is at the extreme end of the range, several values for the cost of debt could be consistent with the WACC.

In our recent decisions where we have adopted a WACC at the top end of the range with regard to long-term averages we have used the top of the range for the cost of debt in estimating the tax expense. This has the merit of consistency with a set of WACC parameters that yield the determined WACC under our normal model. However, it resulted in a lower estimate of tax expense than if we had used the midpoint for the cost of debt, which was our best estimate of the benchmark cost of debt. It should be noted that in these cases we went to the top-end of the range because of a concern about the capacity of the model to reflect the market values for the cost of equity. We did not have reason to believe the cost of debt was biased.

The alternative would be to recognise that the choice of the WACC is not based on a single model and use the midpoint estimate of the cost of debt for the calculation of tax expense as the best available estimate of the benchmark cost of debt.

IPART seeks comment on the following issue:

Should we use the midpoint of the estimated cost of debt in calculating the tax expense?
Appendix A provides a summary of the inputs used to generate the WACC ranges for scenarios 1 to 5 in Chapter 5.

A.1 Scenario 1

Table A.1 Parameters for real post-tax WACC range for Scenario 1 (long/long)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimation method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk free rate</td>
<td>10-year average of 5-year Commonwealth Government Bond yield</td>
</tr>
<tr>
<td>Inflation</td>
<td>Breakeven inflation from bond markets using 10-year term to maturities</td>
</tr>
<tr>
<td>Debt margin</td>
<td>10-year average of 5-year Bloomberg Fair Value curve</td>
</tr>
<tr>
<td>MRP</td>
<td>100 years historical MRP estimate of 5.5 to 6.5%</td>
</tr>
<tr>
<td>Gearing</td>
<td>60%</td>
</tr>
<tr>
<td>Equity beta</td>
<td>Range of 0.8 to 1.0</td>
</tr>
</tbody>
</table>

We note that this scenario differs from our recent water decision in that it uses an equity beta range of 0.8 to 1.0. Our 2012 water decisions used an equity beta range of 0.6 to 0.8.
A. Scenario specifications

Figure A.1  Real post-tax WACC range for Scenario 1 (long/long)

![Graph showing real post-tax WACC range for Scenario 1 (long/long)]

Data source: Bloomberg, IPART's own analysis.

A.2  Scenario 2

Table A.2  Parameters for real post-tax WACC range for Scenario 2 (short/short)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimation method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk free rate</td>
<td>20-day average of 5-year Commonwealth Government Bond yield</td>
</tr>
<tr>
<td>Inflation</td>
<td>20-day average of swap market implied inflation with a 5-year term to maturity</td>
</tr>
<tr>
<td>Debt margin</td>
<td>Our current bond portfolio and the 5-year Bloomberg Fair Value Curve</td>
</tr>
<tr>
<td>MRP</td>
<td>Implied MRP from Bloomberg</td>
</tr>
<tr>
<td>Gearing</td>
<td>60%</td>
</tr>
<tr>
<td>Equity beta</td>
<td>Range of 0.8 to 1.0</td>
</tr>
</tbody>
</table>

We note that this scenario differs from our recent water decision in that it uses an equity beta range of 0.8 to 1.0. Our 2012 water decisions used an equity beta range of 0.6 to 0.8.
A.3 Scenario 3

Table A.3  Parameters for real post-tax WACC range for Scenario 3
(short/short and long/long)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimation method (long/long)</th>
<th>Estimation method (short/short)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk free rate</td>
<td>10-year average of 5-year Commonwealth Government Bond yield</td>
<td>20-day average of 5-year Commonwealth Government Bond yield</td>
</tr>
<tr>
<td>Inflation</td>
<td>Breakeven inflation from bond markets using 10-year term to maturities</td>
<td>20-day average of swap market implied inflation with a 5-year term to maturity</td>
</tr>
<tr>
<td>Debt margin</td>
<td>10-year average of 5-year Bloomberg Fair Value curve</td>
<td>Our current bond portfolio and the 5-year Bloomberg Fair Value Curve</td>
</tr>
<tr>
<td>MRP</td>
<td>100 years historical MRP estimate of 5.5% to 6.5%</td>
<td>Implied MRP from Bloomberg</td>
</tr>
<tr>
<td>Gearing</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Equity beta</td>
<td>Range of 0.8 to 1.0</td>
<td>Range of 0.8 to 1.0</td>
</tr>
</tbody>
</table>

We note that this scenario differs from our recent water decision in that it uses an equity beta range of 0.8 to 1.0. Our 2012 water decisions used an equity beta range of 0.6 to 0.8.
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Figure A.3 Real post-tax WACC range for Scenario 3 (short/short and long/long)

Data source: Bloomberg, IPART’s own analysis.

A.4 Scenario 4

Table A.4 Parameters for real post-tax WACC range for Scenario 4 (current methodology and short/short and long/long)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimation method (current)</th>
<th>Estimation method (long/long)</th>
<th>Estimation method (short/short)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk free rate</td>
<td>20-day average of 5-year Commonwealth Government Bond yield</td>
<td>10-year average of 5-year Commonwealth Government Bond yield</td>
<td>20-day average of 5-year Commonwealth Government Bond yield</td>
</tr>
<tr>
<td>Inflation</td>
<td>20-day average of swap market implied inflation with a 5-year term to maturity</td>
<td>Breakeven inflation from bond markets using 10-year term to maturities</td>
<td>20-day average of swap market implied inflation with a 5-year term to maturity</td>
</tr>
<tr>
<td>Debt margin</td>
<td>Our current bond portfolio and the 5-year Bloomberg Fair Value Curve</td>
<td>10-year average of 5-year Bloomberg Fair Value curve</td>
<td>Our current bond portfolio and the 5-year Bloomberg Fair Value Curve</td>
</tr>
<tr>
<td>MRP</td>
<td>100 years historical MRP estimate of 5.5% to 6.5%</td>
<td>100 years historical MRP estimate of 5.5% to 6.5%</td>
<td>Implied MRP from Bloomberg</td>
</tr>
<tr>
<td>Gearing</td>
<td>60%</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Equity beta</td>
<td>Range of 0.8 to 1.0</td>
<td>Range of 0.8 to 1.0</td>
<td>Range of 0.8 to 1.0</td>
</tr>
</tbody>
</table>

We note that this scenario differs from our recent water decision in that it uses an equity beta range of 0.8 to 1.0. Our 2012 water decisions used an equity beta range of 0.6 to 0.8.
Figure A.4  Real post-tax WACC range for Scenario 4 (current methodology and short/short and long/long)

Data source: Bloomberg, IPART’s own analysis.

A.5  Scenario 5

Table A.5  Parameters for real post-tax WACC range for Scenario 5 (current methodology midpoint of long/long WACC range as a reference point)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimation method (current)</th>
<th>Estimation method (long/long)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk free</td>
<td>20-day average of 5-year Commonwealth Government Bond yield</td>
<td>10-year average of 5-year Commonwealth Government Bond yield</td>
</tr>
<tr>
<td>rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflation</td>
<td>20-day average of swap market implied inflation with a 5-year term to maturity</td>
<td>Breakeven inflation from bond markets using 10-year term to maturities</td>
</tr>
<tr>
<td>Debt margin</td>
<td>Our current bond portfolio and the 5-year Bloomberg Fair Value Curve</td>
<td>10-year average of 5-year Bloomberg Fair Value curve</td>
</tr>
<tr>
<td>MRP</td>
<td>100 years historical MRP estimate of 5.5% to 6.5%</td>
<td>100 years historical MRP estimate of 5.5% to 6.5%</td>
</tr>
<tr>
<td>Gearing</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Equity beta</td>
<td>Range of 0.8 to 1.0</td>
<td>Range of 0.8 to 1.0</td>
</tr>
</tbody>
</table>

We note that this scenario differs from our recent water decision in that it uses an equity beta range of 0.8 to 1.0. Our 2012 water decisions used an equity beta range of 0.6 to 0.8.
A Scenario specifications

Figure A.5  Real post-tax WACC range for Scenario 5 (current methodology midpoint of long/long WACC range as a reference point)

Data source: Bloomberg, IPART’s own analysis.