



Independent Pricing and Regulatory Tribunal

WACC methodology

Research — Draft Report
September 2013



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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 1 November 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 mail to:

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1 Executive summary

1.1 Introduction

This is a Draft Report of our review of the weighted average cost of capital (WACC) methodology. Determining the 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 over-investment and result in prices that are too high.

We consider that our previous WACC methodology worked well in estimating the efficient cost of capital from early 2000 until 2008/09 as financial market conditions were fairly stable in Australia. But, relying exclusively on current market data meant that the estimated cost of capital would fluctuate with market conditions. Since the global financial crisis (GFC), market conditions have become much more uncertain and volatile. Interest rates decreased to a record low, significantly reducing the estimated cost of capital. We temporarily addressed this issue by selecting a WACC value above the midpoint of the WACC range in several past price reviews.¹ At the same time, we questioned whether we should consider changing our approach to setting the WACC to improve its robustness under changing market conditions such as those since the GFC. This prompted us to initiate the review of the WACC methodology, focusing on the following 4 aspects:

1. **To estimate the expected cost of debt** – should we use current or long-term data to estimate the risk-free rate and the debt margin, or both? If we continue to use current data, should we maintain the current 20-day averaging period or increase this period?
2. **To estimate the expected cost of equity** – should we use long-term historical data or current data to estimate the market risk premium (MRP) and risk-free rate?
3. **To estimate the feasible WACC range** – what combination of cost of debt and cost of equity methods should we use to establish this range?
4. **To select the appropriate WACC value** – what factors, information, models, processes and reference points should we use to guide us in exercising our discretion and to reduce regulatory uncertainty?

¹ For example, IPART, *Review of prices for Sydney Water Corporation's water, sewerage, stormwater and other services from 1 July 2012 – Final Report*, June 2012.

We released a Discussion Paper in December 2012.² We received submissions to the Discussion Paper and held a workshop in March 2013. Based on comments received and evidence presented by stakeholders, and our own research, we released our interim decision on the review of WACC methodology in June 2013.³ This decision was applied to:

- ▼ the review of prices for Hunter Water Corporation (HWC) from 1 July 2013
- ▼ the review of developer charges for Gosford City Council and Wyong Shire Council from 1 July 2013
- ▼ the review of regulated electricity retail prices from 2013 to 2016.

This report sets out our draft decisions. Submissions on this Draft Report are due by **1 November 2013**. We will release our final decision in December 2013.

1.2 Overview of our draft decision

1.2.1 Objectives for setting the WACC (Chapter 3)

We propose to continue to set the cost of capital based on a benchmark firm rather than the actual cost of capital of a regulated entity. This maintains the current efficiency incentives. The benchmark will be the efficient cost of capital for a firm operating in a competitive market and facing similar risks. We consider that, in practice, the cost of capital and expected return on investment for this benchmark are likely to reflect a mix of current market rates and long-term averages.

1.2.2 Cost of debt estimation (Chapter 4)

Term-to-maturity

We propose to continue using a maturity assumption of 5 years for all industries except gas and electricity. When we set the WACC for regulated entities, the regulatory model should be consistent with net present value (NPV) neutrality over the life of an asset in our regulatory model.

² IPART, *Review of method for determining the WACC – Discussion Paper*, 21 December 2012.

³ IPART, *WACC methodology – Interim Report*, June 2013.

Professor Kevin Davis argued that the real asset is the future cash flow resulting from each price reset, not the physical asset.⁴ He demonstrated that matching the regulatory period and the term-to-maturity would result in NPV neutrality. While our regulatory period is typically 1 to 4 years, we decided to adopt 5 years as the term-to-maturity as an approximation.

This is consistent with the principle of NPV neutrality under which the NPV of a regulated firm's revenues and costs is equal for the regulatory period. It is also consistent with our objective of setting the WACC based on the efficient cost of capital for a benchmark firm operating in a competitive market and facing similar risks.

In the case of electricity and gas, since we seek to estimate the costs of competitive and unregulated businesses, the question of NPV neutrality does not arise. Hence, in our electricity and gas decisions, we are not bound to an assumed maturity of 5 years.

Averaging period

We propose to estimate the cost of debt based on the on-the-day rate (approximated using a 40-day average) and long-term averages (approximated using a 10-year average). This is consistent with our competitive market objective. However, this does not assume that we attempt to replicate actual financing practice. The previous approach, which relied on the on-the-day rate, (approximated using a 20-day average) was not consistent with business practice and resulted in excessive volatility in the cost of debt estimates. Stakeholders had raised concerns that it was difficult to hedge their debt costs during the 20-day averaging period. Increasing the averaging period to 40 days for the cost of debt using current market data and reducing its weight on the estimation of the overall cost of debt will reduce these concerns.

We do not propose to introduce an annual adjustment in prices for changes in the cost of debt during the regulatory period.

1.2.3 Estimating market risk premium (Chapter 5)

We propose to estimate the WACC using current market data and long-term averages. This is consistent with our interim methodology.

For the WACC using current market data, our draft decision is to use 6 different models to determine a range and a point estimate for the implied MRP.

⁴ Professor Kevin Davis, *Determining debt costs in access pricing*, December 2010. This report can be found at Appendix A of IPART, *Developing the approach to estimating the debt margin – Draft Decision*, February 2011.

For the WACC using long-term averages, our draft decision is to continue using the MRP range of 5.5% to 6.5% based on the historical arithmetic average.

1.2.4 Use of alternative models to the cost of equity estimation (Chapter 6)

Our draft decision is to use the capital asset pricing model (CAPM) as the main model for estimating the cost of equity, but to consider supplementing it by considering the results of other cost of equity models (where applicable) and other financial market information.

Our new WACC methodology estimates the cost of equity using current market data (ie, 40-day average) and long-term averages (ie, 10-year average). Using 2 different averaging periods does not mean that there should be 2 equity betas. Our draft decision is to apply a common equity beta in estimating the cost of equity using current market data and long-term averages.

1.2.5 WACC determination process (Chapter 7)

Our draft decision establishes 3 stages for the WACC determination process:

- ▼ In Stage 1, we establish a WACC range and midpoint. Our default position is to choose the midpoint WACC as a point estimate.
- ▼ In Stage 2, we conduct an internal consistency test to ensure that the regulatory cost of debt is lower than the regulatory cost of equity, and assess the appropriateness of the midpoint WACC based on the degree of economic uncertainty.
- ▼ In Stage 3, we specify our point estimates for the cost of debt and cost of equity and the information considered in reaching our WACC decision.

Our WACC determination framework has been peer reviewed by an expert consultant, Ian Alexander, from Cambridge Economics Policy Associates (CEPA).

Also, our draft decision is that we will release a 6-monthly market update on WACC estimates for the major industries that we regulate.

1.2.6 Internal consistency test (Chapter 8)

We propose to continue conducting the internal consistency test on the cost of capital parameters. The purpose is to ensure that the regulatory cost of debt is lower than the regulatory cost of equity.

1.2.7 Other implementation issues (Chapter 9)

As part of our draft decision, we also considered whether we should use:

- ▼ a different proxy for the risk-free rate used to estimate the WACC with current market data
- ▼ an alternative way to estimate inflation expectation for the WACC using long-term averages.

We propose to:

- ▼ continue using the Commonwealth Government Securities (CGS) as the risk-free rate for the WACC using current market data
- ▼ use a hybrid approach to estimate the inflation expectation for the WACC using long-term averages, which combines:
 - all available swap market implied inflation expectations from 2 January 2009 to date
 - breakeven inflation expectations for the period over which the swap market implied inflation is not available (ie, prior to 31 December 2008).

1.3 How this report is structured

The rest of this report explains our review and draft decisions in more detail:

- ▼ Chapter 2 provides background information on the context for this review.
- ▼ Chapter 3 discusses the objective for setting the WACC.
- ▼ Chapter 4 considers the cost of debt estimation.
- ▼ Chapter 5 explains our decision on the methodologies to estimate implied MRPs to be used in estimating the WACC with current market data.
- ▼ Chapter 6 considers the use of alternative models or approaches to the cost of equity estimation.
- ▼ Chapter 7 presents further analysis on the WACC determination process.
- ▼ Chapter 8 discusses the internal consistency test.
- ▼ Chapter 9 considers other issues regarding implementation of the new WACC methodology.
- ▼ Appendix A explains how we measure economic uncertainty.

2 Context

2.1 Summary of the interim decision on WACC methodology

In the Discussion Paper released in December 2012, we indicated that we would release a final decision after considering comments from stakeholders. However, due to the complexity of this review, we released an Interim Report in June 2013.

Our interim decision proposed to set the WACC based on the efficient cost of capital for a benchmark firm operating in a competitive market and facing similar risks. We concluded that, in practice, the cost of capital for this benchmark firm is likely to reflect a mix of current market rates and long-term averages.

Our interim decision was to establish a WACC range using the midpoints of the WACC ranges estimated using current market data and long-term averages. Under the interim decision, establishing a WACC range involves the following 3 steps:

1. Estimate a WACC range using current market data with an averaging period of 40 days.
2. Estimate a WACC range using long-term averages with an averaging period of 10 years.
3. Establish a WACC range using the midpoints of the 2 WACC ranges obtained in Steps 1 and 2, and select a point estimate for the WACC within the range, having regard to relevant market data. Unless there is strong contrary evidence, we will choose the midpoint WACC as a default WACC.

2.2 Issues analysed in this report

In the Interim Report, we indicated that we would do further work on:

- ▼ estimating the implied MRPs to be used in estimating the WACC with current market data
- ▼ clearly defining how we would use additional market information in assessing the appropriateness of the midpoint WACC
- ▼ describing how we would deal with potential uncertainty in our WACC determination.

This report documents our analysis of the above issues and our responses to stakeholders' submissions on the interim decision. In particular, to improve the robustness of our WACC determination framework, we have sought advice from an expert consultant, Ian Alexander, from CEPA on the decision-making process in our framework.

2.3 Submissions and stakeholder consultation

All stakeholders and interested parties are invited to make submissions on this Draft Report. These submissions are due by **1 November 2013**. Details on how to make a submission can be found on page iii of this report. We will take stakeholders' submissions into account in our final decision. Late submissions will be assessed on a case-by-case basis and may not be accepted. We expect to release our final decision in December 2013.

3 Objectives for setting the WACC

We propose to maintain the objectives for setting the WACC and the definition for a benchmark entity for the WACC set out in our interim decision.

This chapter presents our draft decision, summarises submissions we received on the objective we set in the interim decision, analyses the issues raised in submissions, and explains our draft decision.

3.1 Draft decision

Our draft decision is to maintain the objective for setting the WACC and the definition for a benchmark entity as set out in our interim decision. That is:

- ▼ The objective for setting the WACC is to establish a value that reflects the efficient cost of capital for a benchmark entity. This is consistent with incentive regulation.
- ▼ The benchmark entity in determining the WACC is a firm that operates in a competitive market and faces similar risks to the regulated business that is subject to our decision.

3.2 Stakeholders' views

Overall, stakeholders supported the changes made under the interim decision, although they proposed further changes. Stakeholders commented that a mix of current market data and long-term averages is a significant improvement on our previous approach to setting the WACC.

HWC submitted that the removal of the new entrant test from our regulatory objective is a clear improvement on the regulatory objective stated in the WACC Discussion Paper. However, it considers the interim methodology as temporary, and argues that a more robust, transparent and predictable long-term approach should be developed.

3.3 Our analysis

In the Interim Report, we considered that the WACC should be set with reference to the efficient cost of capital for a benchmark entity. We consider that our objective is consistent with incentive regulation designed to ensure that prices reflect efficient costs and that the regulated businesses have strong incentives to improve efficiency.

We have based the benchmark on the efficient cost of capital for a firm in a competitive market rather than a regulated market. There are 3 reasons for this. Firstly, it is not possible to observe the efficient financing strategies for regulated businesses independently of the way in which the regulated WACC is set. For example, how a regulator sets the cost of debt will affect the optimal debt strategy of the regulated business. Secondly, there are more competitive than regulated businesses, giving a larger set of observations of the cost of capital and financing strategies. Finally, efficient utilisation of resources across the economy is enhanced if distortions between the regulated and competitive sectors are reduced. Basing the cost of capital for regulated firms on the benchmark of a competitive firm otherwise facing similar risks avoids creating possible distortions.

We consider setting the WACC based on this objective ensures that the returns determined for a hypothetical benchmark firm are reasonable given the risks and opportunity costs faced by potential investors in the actual business.

These objectives are largely consistent with submissions from stakeholders. However, we do not consider that the benchmark for the cost of debt should necessarily reflect the preferred or actual financing strategy of a regulated entity (Section 4 has more detailed discussion). We consider that setting a WACC which reflects achievable efficient costs is consistent with the overall approach to incentive regulation.

4 Cost of debt estimation

In the Interim Report, we decided to estimate the WACCs using current market data with an averaging period of 40 days, and long-term averages with an averaging period of 10 years. This meant that the cost of debt would be set with reference to both current market data and long-term averages. This is a change from our previous methodology. We did not review issues regarding the target term-to-maturity for the cost of debt. We currently assume a target term-to-maturity of 5 years.

This chapter presents our draft decision, summarises submissions we received on the cost of debt, and analyses the issues raised in submissions.

4.1 Draft decision

We propose to:

- ▼ estimate the cost of debt with reference to current market data (ie, a 40-day average) and long-term averages (ie, a 10-year average)
- ▼ use a 5-year term-to-maturity for all industries except for electricity generation, electricity retail, coal mining and gas businesses⁵
- ▼ not adjust prices for changes in the cost of debt during the regulatory period.

4.2 Stakeholders' views

ActewAGL submitted that using a 7-year fair value curve is likely to underestimate the cost of debt with a target term-to-maturity of 10 years assuming an upward sloping yield curve,⁶ and hence proposed to extrapolate to 10 years.⁷

HWC suggested using a 10-year term-to-maturity as it:

- ▼ reflects the expected life of the assets and financing practices of businesses with long-lived assets operating in a competitive market
- ▼ better enables utilities to hedge debt costs
- ▼ is consistent with the broader principles of regulation being 'transparent, predictable, consistently applied over time and between utilities and no more complex than necessary'.⁸

Further, HWC supported use of the long-term trailing average approach to estimating the cost of debt. It considered that, under this approach, the regulatory cost of debt and actual cost of debt would be better aligned, avoiding potential over- or under-compensation issues. HWC noted that, in our recent price review, we reduced the assumed gearing ratio to address concerns raised by electricity stakeholders regarding a possible inconsistency between assumed

⁵ For electricity generation, electricity retail, coal mining and gas businesses, we adopt a target term-to-maturity of 10 years. The 10-year term-to-maturity for these businesses reflects the expected life of the assets and financing practices of competitive businesses with long-lived assets. Given that we estimate the WACC for competitive businesses, the regulatory period is not a relevant consideration. Note that, although electricity retail businesses are not capital-intensive and do not have long-lived assets, we apply the same target term-to-maturity of 10 years for consistency across industry sectors involved in the electricity and gas retail price review. IPART, *Review of regulated retail prices and charges for electricity – Final Report, Appendix B*, June 2013.

⁶ Yield curves are theoretically upward sloping, which means the longer the maturity, the greater the yield, with diminishing marginal increases.

⁷ ActewAGL submission in response to IPART's Interim Report of the review of method for determining the WACC, 26 July 2013, p 2.

⁸ Hunter Water Corporation submission on Interim Report on WACC methodology, 26 July 2013, p 2.

gearing ratio and credit rating. HWC argued that we should equally address concerns raised by water utilities regarding the assumed gearing ratio. HWC added that based on its own modelling, it would not be able to maintain the BBB/BBB+ credit rating with the currently assumed gearing ratio of 60%.⁹

Sydney Catchment Authority (SCA) submitted that we should apply a consistent term-to-maturity (ie, 10 years) to both electricity and water industries. SCA explained that using a shorter term-to-maturity than 10 years for water businesses:

- ▼ does not reflect the fact that water infrastructure assets generally have a longer expected life than 60 years
- ▼ would imply that the expected asset life of water utilities is shorter than that of electricity generators
- ▼ would ignore the fact that financing practices for firms with long-lived assets are the same regardless of industry.

Further, SCA supported the use of the long-term trailing average approach in the cost of debt estimation.¹⁰

Sydney Desalination Plant (SDP) welcomed our proposal to move to a 40-day averaging period for regulated firms to hedge their debt portfolios. It considered that it would help reduce movement in the swap market by reducing the daily volume of swaps required. To improve our new WACC methodology, SDP proposed using a longer term-to-maturity such as 10 years. SDP argued that this would encourage utilities to take on longer-term debt, which better aligns their debt portfolio to the asset life and long-term asset owners.

SDP submitted that it is aware of other stakeholders advocating the use of trailing averages with annual adjustments, but considered that, given the complexity of such an approach, SDP and we may need to further examine its implications.¹¹

⁹ Hunter Water Corporation submission on Interim Report on WACC methodology, 26 July 2013, p 3.

¹⁰ Sydney Catchment Authority submission on Interim Report on WACC methodology, 26 July 2013, p 1.

¹¹ Sydney Desalination Plant submission on Interim Report on WACC methodology, 2 August 2013, pp 2-4.

Sydney Water Corporation (SWC) welcomed our new objective of setting the WACC. However, SWC claimed that our new objective implies that there should be no marked difference in the financing strategies of a benchmark firm among water, electricity and gas industries. Irrespective of industry, the relevant benchmark entity would be:

- ▼ investing in long-lived assets
- ▼ accessing Australian debt and equity markets to finance these long-lived assets
- ▼ serving similar customers.

SWC acknowledged differences in systematic risks among water, electricity and gas industries, but did not consider that there is any reason to adopt different term-to-maturities. SWC argued that, in selecting the term-to-maturity, we should consider empirical evidence on the actual debt financing strategies of infrastructure businesses operating in a competitive market, which clearly indicate that the average maturity of debt at issuance by regulated infrastructure entities is around 10 years. SWC concluded that using a 10-year term-to-maturity would therefore be consistent with our objective of setting the WACC.¹²

SWC made 2 recommendations to improve our approach to the cost of debt estimation.

1. Calculate the long-term average over a period that matches the term of the benchmark debt (ie, use a 10-year term-to-maturity and average over 10 years). If the term of benchmark debt is longer or shorter than the averaging period, the long-term average would no longer reflect the benchmark entity's average cost of debt at the start of the regulatory period. SWC added that a 10-year term-to-maturity is consistent with our new objective, the 'competitive market', and a 5-year term-to-maturity is consistent with the 'new entrant' objective, which was previously adopted by us.
2. Undertake analysis directed at assessing whether a 50/50 split between prevailing and long-term average best reflects the likely effective debt costs of a benchmark entity operating in a competitive market. While SWC considered that our new methodology is a significant improvement on the past approach, which relied solely on spot rate, it considered that an even better methodology could be developed. It suggested that we should at least consider the use of the long-term trailing average approach, with or without annual adjustment.¹³

¹² Sydney Water Corporation submission on Interim Report on WACC methodology, 29 July 2013, pp 2-3.

¹³ Sydney Water Corporation submission on Interim Report on WACC methodology, 29 July 2013, pp 4-6.

4.3 Our analysis

The 2 key issues raised in the submissions relate to the term-to-maturity and the use of the long-term trailing average approach. This section explains our views on these issues.

4.3.1 Term-to-maturity

We decreased a target term-to-maturity for the cost of capital estimation from 10 years to 5 years in April 2011 based on advice from Professor Kevin Davis.¹⁴ Professor Davis recommended matching the term-to-maturity to a regulatory period, because this is consistent with the NPV neutrality of regulated cash flows under a building block model. NPV neutrality means that the present value of the future cash flows of a firm equals the initial investment.

Professor Davis argued that the real asset is the future cash flow resulting from each price reset, not the physical asset. He demonstrated that matching the regulatory period and the term-to-maturity would result in NPV neutrality. While our regulatory period is typically 1 to 4 years, we decided to adopt 5 years as the term-to-maturity as an approximation.

Associate Professor Martin Lally also suggested matching the term-to-maturity to the regulatory period. He demonstrated that, if the risk-free rate were revised at the end of each regulatory cycle at the prevailing rate, then the appropriate term would be that matching the regulatory period.¹⁵

We acknowledge that there is evidence that the actual debt raising practice of firms in a competitive market involves raising debt with longer maturity periods such as 10 years. For example, recent survey results on financing practices in estimating the cost of capital show that firms and financial advisers use Treasury bond yields with maturities of 10 years or longer. Many firms said they matched the term of the risk-free rate to the tenor of the investment.¹⁶

If we were to estimate the cost of capital for unregulated firms, using the 10-year term-to-maturity would be more appropriate. In fact, we adopted the 10-year term-to-maturity in the recent review of regulated retail prices for electricity and gas. We considered that there was no issue of NPV neutrality, since the activities for which a WACC was being estimated were not regulated under a building block model.¹⁷

¹⁴ Professor Kevin Davis, *Determining debt costs in access pricing*, December 2010. This report can be found at Appendix A of IPART, *Developing the approach to estimating the debt margin – Draft Decision*, February 2011.

¹⁵ Lally, M., *Regulation and the choice of the risk free rate*, December 2004.

¹⁶ Brotherson, W. T., Eades, K. M., Harris, R. S., and Higgins, R. C., 2013, “Best practices in estimating the cost of capital: an update”, *Journal of Applied Finance* 23, pp 15-33.

¹⁷ IPART, *Review of regulated retail prices and charges for electricity – Final Report*, Appendix B, June 2013.

However, except for the electricity and gas sectors, we set the WACC for regulated entities. For these utilities, we consider that the relevant asset is the regulated cash flow, which we reset periodically. In our building block model, we assume that all economic costs, including a rate of return, are recovered by the owner of the asset. Achieving NPV neutrality within our regulatory model means that owners will not be under- or over-compensated. As demonstrated by Professor Davis, a term-to-maturity matching the regulatory period results in NPV neutrality. For this reason, and since the 5-year term-to-maturity reflects the nearest term with a relatively deep market, we consider that the 5-year term-to-maturity remains appropriate for our new WACC methodology.

We also note that, in recent years, other regulators in Australia and New Zealand (eg, Economic Regulation Authority of Western Australia, New Zealand Commerce Commission and Queensland Competition Authority) have adopted a term-to-maturity of 5 year¹⁸ and the Australian Energy Regulator (AER) proposes to adopt a term-to-maturity of 7 years.¹⁹

4.3.2 Averaging period

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

In our Interim Report, we decided to estimate the cost of debt based on the on-the-day rate (approximated using a 40-day average) and long-term averages (approximated using a 10-year average). This is consistent with the competitive market objective, but does not assume that we attempt to replicate actual financing practice.

¹⁸ Economic Regulation Authority of Western Australia, *Explanatory statement for the draft rate of return guidelines – Meeting the requirements of the National Gas Rules*, 6 August 2013, p 225; New Zealand Commerce Commission, *Draft TSO cost calculation determination for TSO instrument for local residential telephone service for period between 1 July 2008 and 30 June 2009*, 4 December 2009, p 21; Queensland Competition Authority, *QR Network's 2010 DAU - Tariffs and Schedule F*, June 2010, p 36.

¹⁹ Australian Energy Regulator, *Better regulation: Explanatory statement – Draft rate of return guideline*, August 2013, p 98.

Under the previous approach, if a utility wished to reduce their interest rate risks, they could enter into swaps for their entire debt in the 20-day averaging period. However, NSW Treasury Corporation expressed concern that this was not practical as the value of swaps required would increase the cost of swaps.²⁰ Our discussion with a number of local banks suggested that these concerns may be overstated. However, increasing the averaging period to 40 days and reducing the weight placed on the overall estimation of the cost of debt will reduce this risk.

HWC argued that the long-term trailing average approach would minimise any distortions in efficient financing practice, avoiding over/under-investment issues. We consider that this statement overstates our role, which is to set maximum prices and oversee licence compliance. We do not dictate utilities' expenditure programs, nor do we aim to determine their financing or hedging practices. We have created a strong presumption that we will use an equal weighting of the current interest rate and long-term averages. The utilities can, if they wish, largely replicate this by using a similar mix of historical unhedged debt and swaps to lock-in current rates at the time of the decision.

Overall, compared to our previous approach, our new WACC methodology gives more weight to long-term averages. We also do not consider that indexing the cost of debt on an annual basis in our new methodology provides sufficient benefits to outweigh the increased administrative costs.

Submissions argue that we should use a 10-year maturity assumption if we average interest rates over 10 years. There is merit in this argument if:

- ▼ Our objective is to estimate the cost of a utility's debt portfolio at the time of the decision.
- ▼ We assume that the utility has borrowed equal amounts over the previous 10 years using a term-to-maturity of 10 years and not engaged in any risk management strategies.

However, we seek to estimate the cost of debt for investment decisions rather than the cost of a utility's current debt portfolio.

²⁰ NSW Treasury Corporation, *Response to Sydney Water and Sydney Catchment draft determinations*, 17 April 2012, pp 1-2.

5 Estimating market risk premium

In the interim decision, the cost of equity is set with reference to both current market data and long-term averages. In particular:

- ▼ For the cost of equity using current market data, we use the 40-day average risk-free rate and a MRP estimated with current market data (ie, implied MRP).
- ▼ For the cost of equity using long-term averages, we use the 10-year average risk-free rate and a MRP range of 5.5% to 6.5% given by the historical arithmetic average MRP.

For the reviews to which we applied the interim WACC methodology, we used the 40-day average of daily implied MRPs obtained from Bloomberg. As part of the Interim Report, we published a report by SFG which developed 2 models to estimate implied MRPs: one based on the use of market-wide indicators, and the other based on a dividend discount model (DDM) using analyst forecasts. We considered that the latter approach was more theoretically sound than the former. We considered using other versions of the DDM to estimate implied MRPs.

The Interim Report indicated that we would consider further implied MRP estimates derived from other models. This section presents our draft decision, summarises submissions we received on the MRP, analyses the issues raised in submissions, and explains our draft decision.

5.1 Draft decision

Our draft decision is that we will use all 6 models presented in Table 5.2 to determine a point estimate and range for the implied MRPs to estimate the WACC using current market data. We consider that SFG's MRP methodologies based on market-wide indicators and analyst forecasts, Bloomberg's methodology and the 3 additional models presented in this report provide valuable information regarding the implied MRP. As of June 2013, our implied MRP range is 6.5% to 7.7% with a midpoint of 7.1%.

We acknowledge that our draft decision to use 6 models to estimate the implied MRP increases complexity in estimating the cost of equity with current market data, compared to our interim approach of using only Bloomberg's implied MRP estimate. However, we consider that it is important to obtain a robust estimate of the implied MRP, given its impact on the WACC using current market data and hence our final WACC estimation. An implied MRP estimate is likely to be sensitive to the specific model chosen by us, since each model makes certain underlying assumptions. We consider that employing a number of models to estimate the implied MRP reduces these concerns and enhances the robustness of our implied MRP estimate, leading to a better and more robust estimate of the cost of equity using current market data.

We note that, in the interim decision, we considered that SFG's MRP estimates based on 4 economic indicators were not a direct estimate of the discount rate incorporating current share prices. For the purpose of this draft decision, we have included this model to broaden the number of estimates that can be used to reach our view on an appropriate point estimate and range for the implied MRPs. This is consistent with our decision to consider alternative financial models in our WACC determination framework (discussed in Section 7).

In estimating the WACC using long-term averages, our draft decision is to continue using the MRP range of 5.5% to 6.5% based on the historical arithmetic average.

5.2 Stakeholders' views

ActewAGL proposed adopting a range for the implied MRP rather than a point estimate. Also, it suggested that we should use various methodologies to estimate the implied MRP.²¹

HWC proposed that long-term averages should be used to estimate the cost of debt and the cost of equity. Hence, it recommended using the long-term average of the historical MRPs.²²

SDP submitted that the blending of short-term and long-term parameters may have the potential to establish a more representative cost of equity. It suggested conducting further analysis and research on the methodology to estimate the implied MRP to better understand the implications of its use. Also, it recommended using a 10-year risk-free rate, consistent with its view on the method to estimate the cost of debt.²³

5.3 Our analysis

This chapter explains further work we have undertaken since releasing our interim decision. In particular, we have further analysed:

- ▼ the DDMs available to estimate the implied MRPs (Section 5.3.1)
- ▼ how these models can be applied (Section 5.3.2)
- ▼ the difference between the implied MRPs derived from various models (Section 5.3.3)
- ▼ how we select a range and point estimate for the implied MRP using current market data (Section 5.3.4)

²¹ ActewAGL submission on Interim Report on WACC methodology, 26 July 2013, pp 1-2.

²² Hunter Water Corporation submission on Interim Report on WACC methodology, 26 July 2013, p 3.

²³ Sydney Desalination Plant submission on Interim Report on WACC methodology, 2 August 2013, pp 4-5.

- ▼ whether our implied MRP estimates are robust to a different terminal growth rate assumption for dividends (Section 5.3.5)

5.3.1 The DDMs available to estimate the implied MRPs

As part of our draft decision, we researched various methodologies to estimate the implied MRPs. Using a DDM to estimate the implied MRPs assumes that current cash flows are proxied by dividends. Also, the ratio of dividends to earnings (ie, payout ratio) is assumed to be constant going forward. That is, dividends are assumed to increase at the same rate as earnings. This makes it possible to use analysts' earnings forecasts to capture changes in the expected future income stream derived from holding equities.

A simple example of how an implied MRP can be estimated is shown below, assuming that dividends grow at a constant rate forever.

$$\text{Value of index } (P_0) = \frac{\text{Expected dividends next period } (E(D_1))}{\text{Required return on index } (MRP + r_f) - \text{Expected growth rate } (g)}$$

We can obtain or estimate the current value of index (P_0), expected dividends next period ($E(D_1)$), and risk-free rate (r_f). The only unknown variable is MRP . We can solve for MRP to find the 'implied' MRP.

While there are various versions of the DDM, we adopt the specifications of the following DDMs to estimate the implied MRPs:

- ▼ Damodaran (2013)
- ▼ Bank of England (2002)
- ▼ Bank of England (2010).

In all 3 models:

- ▼ The S&P/ASX 200 Index represents the Australian stock market.
- ▼ P_0 is the current level of the index.
- ▼ D_0 is the current level of dividends on the index.
- ▼ The 10-year CGS is used as a risk-free rate, r_f .
- ▼ We use a long-term constant growth rate, g , of 5.5%.

Damodaran (2013)²⁴

Professor Damodaran annually publishes implied MRP estimates for the US market using the S&P 500 Index. Following Damodaran (2013), we assume that:

- ▼ The expected dividends over the next 5 years are estimated using the geometric average of the expected growth rates over the next 5 years (ie, $g_{GA} = [\prod_{t=1}^5 (1 + g_t)]^{\frac{1}{5}}$, where g_t is an expected growth rate for t -year ahead.).
- ▼ In estimating g_{GA}
 - g_1 and g_2 are estimated using analysts' earnings per share (EPS) forecasts for the companies in the index for 1 and 2 years ahead
 - g_3 and g_4 are estimated assuming a linear decrease (or increase) in the growth rate from a rate of g_2 to the constant growth rate of g in the 5th year (ie, $g_5 = g$).
- ▼ After 5 years, the growth rate reverts to the long-term constant growth rate, g .

The DDM of Damodaran (2013) is as follows. Our aim is to find MRP given other parameters.

$$P_0 = \sum_{t=1}^{t=5} \frac{E(D_t)}{(1 + MRP + r_f)^t} + \frac{E(D_6)}{(MRP + r_f - g)} \frac{1}{(1 + MRP + r_f)^5} \quad (1)$$

Bank of England (BoE, 2002)²⁵

The purpose of BoE (2002) was not to derive implied MRPs, but to value the FTSE 100 Index using a DDM. BoE (2002) assumes that the FTSE 100 Index grows at a different rate from the long-term constant growth rate for the first 12 years. Specifically, BoE (2002) illustrates that their model consists of 3 phases:

1. In Phase 1, dividends are expected to grow at a constant rate given by analysts' forecast for long-term growth (g_{LTG}) for the first 4 years.
2. During Phase 2, the dividend growth rate declines (or increases) in a linear fashion to a constant growth rate (g), which is assumed to persist from year 12 onward.
3. Phase 3 is the constant growth stage which starts from year 12.

²⁴ Damodaran, A., *Equity risk premiums (ERP): Determinants, estimation and implications – The 2013 edition*, 2013, pp 63-73. Damodaran is Professor of Finance at the Stern School of Business at New York University. He is best known as the author of several widely used academic and practitioner texts on valuation, corporate finance and investment management.

²⁵ Bank of England, *Analysts' earnings forecasts and equity valuations*, 2002, pp 59-66.

BoE (2002) applies the following simplified formula, which is given by Fuller and Hsia (1984).²⁶

$$P_0 = \frac{D_0}{(MRP + r_f) - g} [(1 + g) + 8(g_{LTG} - g)] \quad (2)$$

Bank of England (BoE, 2010)²⁷

In their quarterly bulletin in spring 2010, BoE extends their previous work on the implied MRPs. Following BoE (2010):

- ▼ g_1, g_2 and g_3 are estimated using analysts' EPS forecasts on the index for 1 year, 2 years and 3 years ahead.
- ▼ g_4 is given by the analysts' long-term growth rate forecast.
- ▼ After 4 years, the growth rate reverts to the long-run constant growth rate of g .

The DDM of BoE (2010) is similar to Damodaran (2013) in the sense that dividends grow for a certain number of years at a different rate to a long-term constant growth rate and then reach a constant growth stage.

$$P_0 = \sum_{t=1}^4 \frac{E(D_t)}{(1 + MRP + r_f)^t} + \frac{E(D_5)}{(MRP + r_f - g)} \frac{1}{(1 + MRP + r_f)^4} \quad (3)$$

Assumption regarding the choice of the long-term constant growth rate, g

The choice of the long-term constant growth rate has a significant impact on the terminal value within a DDM. The impact becomes larger as the terminal growth rate approaches the required rate of return. In our MRP estimation, we assume that the long-term nominal constant growth rate of dividends is equal to the expected long-term nominal growth rate of the Australian economy, which is approximately 5.5%. Our assumption regarding the constant growth rate is based on Associate Professor Lally's estimate of the average real GDP growth rate in Australia.²⁸ Based on real GDP growth rates over 100 years, he estimated that the historical average of the real growth rates in Australia is 3%. Assuming the long-term inflation rate of 2.5%, we obtain the nominal GDP growth rate as follows.

$$g = (1 + 0.03)(1 + 0.025) - 1 \cong 0.056^{29}$$

²⁶ Fuller, R. J., and Hsia, C., 1984, "A simplified common stock valuation model", *Financial Analyst Journal* 40, pp 49-56.

²⁷ Bank of England, *Interpreting equity price movements since the start of the financial crisis*, 2010, pp 24-33.

²⁸ Lally, M., *The dividend growth model*, 4 March 2013, p 17.

²⁹ For simplicity, we have used a constant growth rate of 5.5%.

Implicit in our approach to choosing the long-term constant growth rate is that the constant dividend growth rate is directly related to the economy's growth rate. This is based on Rozeff (1984), who assumed that the real growth rate of dividends is directly related to the economy's real growth rate of output.³⁰

To check whether our choice of the long-term constant growth rate is reasonable, we have estimated the terminal growth rate as the long-term nominal risk-free rate based on theoretical arguments put forward by several academic studies. According to the Golden Rule of accumulation, if the economy maximises consumption per capita, then the rate of growth of output equals the physical marginal productivity of capital, which in turn equals the rate of interest. Rozeff (1984) argues that, provided that this is true of an economy, in equilibrium the real growth rate of output equals the real rate of interest. He assumed that the real growth rate of dividends is directly related to the economy's real growth rate of output and set the real dividend growth rate equal to the real rate of interest. He then added expected inflation to both rates, yielding the nominal dividend growth rate as equal to the nominal interest rate.

Professor Damodaran also argues that, since no firm can grow forever at a rate higher than the growth rate of the economy in which it operates, the constant growth rate cannot be greater than the overall growth rate of the economy. Further, he states that, in the long term, the real risk-free rate will converge on the real growth rate of the economy and the nominal risk-free rate will approach the nominal growth rate of the economy. In fact, a simple rule of thumb on the stable growth rate is that it should not exceed the risk-free rate used in the valuation.³¹ As of June 2013, the long-term average (ie, 10-year average) of the 10-year CGS yields is 5.1%. This shows that our choice of the long-term nominal growth rate is closely aligned with the terminal growth rate estimated using the long-term nominal risk-free rate.

BoE (2010) considered using a long-term forward interest rate, such as overnight index swap (OIS) rates, as the long-term constant growth rate. BoE notes that OIS rates will contain expectations of future interest rates, so they may be closely linked to the expected long-term growth rate of the economy. But, long-term sterling OIS rates were relatively illiquid before mid-2008 and so may have provided a poor guide to expected future interest rates. For this reason, BoE preferred using an 'estimate' of the potential growth of the economy, but did not specify what they actually used as a proxy for the potential growth of the economy.

³⁰ Rozeff, M. S., 1984, "Dividend yields are equity risk premiums", *Journal of Portfolio Management* 11, pp 68-75.

³¹ Professor Damodaran uses the monthly 10-year US Government bond yields as a proxy for the terminal growth rate, g. http://pages.stern.nyu.edu/~adamodar/New_Home_Page/littlebook/terminalvalue.htm.

Instead, BoE (2002) calculated the long-term constant growth rate as:

$$g = ROE(1 - \text{payout ratio}) = (MRP + r_f) \left(1 - \frac{\text{Dividends}}{\text{Earnings}}\right)$$

The intuition behind estimating the long-term growth rate, g , as $ROE(1 - \text{payout ratio})$ is that the higher the current payout ratio, the lower the fraction of earnings used for investment and the lower for future growth of a company. By assuming that the stocks in the market do not earn excess returns in the long term, ROE is set equal to the required return on the market portfolio, and hence ROE is given by $MRP + r_f$. BoE (2002) assumed an MRP of 4% in estimating g . However, this approach is problematic when deriving implied MRPs. This is because g is a function of ROE , a function of MRP . This results in the long-term growth rate being endogenously determined.

While the choice of the long-term growth rate is arbitrary, we consider that using the historical real GDP growth rates provides a reasonable estimate of the expected growth rate of the economy and hence perpetual dividends.

5.3.2 How these models can be applied

To estimate the implied MRPs based on Damodaran (2013), BoE (2002) and BoE (2010), we obtain monthly S&P/ASX 200 index prices, daily yields on the 10-year CGS and daily dividend yields from Thomson Reuters Datastream. We also download monthly analysts' consensus EPS forecasts and the long-term EPS growth forecast from the Institutional Brokers' Estimate System (I/B/E/S) via Thomson Reuters Datastream. Daily data are averaged to yield monthly averages. Since I/B/E/S analysts' forecast data are available from November 2000, implied MRPs are estimated from November 2000 to June 2013 based on a monthly frequency.

In this section, we illustrate the BoE (2010) methodology as an example. On 30 June 2013, the S&P/ASX 200 index was at 4802.6, the dividend yield on the index was 4.3%, and the risk-free rate was 3.5%. The growth rates are given by the consensus estimate of the growth in earnings for companies in the index over the next 4 years, and revert to the long-term constant growth rate thereafter.

Table 5.1 Estimated dividends on the S&P/ASX 200 Index as of June 2013

Year	Expected dividends on S&P/ASX 200 Index
1	201.9
2	222.0
3	245.1
4	263.0
5	277.4
∶a	∶
∞a	

^a From year 6 to infinity.

Source: IPART calculation.

If we assume that these are reasonable estimates of the expected dividends and that the index is correctly priced, the value can be written as follows:

$$4802.6 = \frac{201.9}{(1 + MRP + r_f)} + \frac{222.0}{(1 + MRP + r_f)^2} + \frac{245.1}{(1 + MRP + r_f)^3} + \frac{263.0}{(1 + MRP + r_f)^4} + \frac{277.4}{(MRP + r_f - g)} \frac{1}{(1 + MRP + r_f)^4}$$

The last term in the equation is the terminal value of the index based on the constant growth rate of 5.5%, discounted back to the present. Solving for the unknown, *MRP*, yields an implied *MRP* of 6.6%.

5.3.3 The difference between the implied MRPs derived from various models

In Table 5.2, we summarise the average *MRP* estimates for 2 periods – July 2002 to June 2008, and July 2008 to June 2012. We chose these periods so we can compare the *MRP* estimates of SFG and Bloomberg, which were presented in the Appendix A of the Interim Report.

Table 5.2 Average implied *MRP* estimates

	July 2002 to June 2008	July 2008 to June 2012	Difference
Damodaran (2013) ^a	4.4%	6.4%	-2.0%
BoE (2002) ^a	4.8%	7.3%	-2.5%
BoE (2010) ^a	4.4%	6.5%	-2.1%
SFG analyst-implied ^b	4.7%	6.4%	-1.7%
SFG market-wide indicators ^b	6.6%	7.9%	-1.3%
Bloomberg ^b	Not available	9.0%	n/a

^a Using a terminal growth rate of 5.5%.

^b SFG, *Market risk premium*, 18 May 2013, p 14. The SFG's report is the Appendix A of the following report: IPART, *WACC methodology – Interim Report*, June 2013.

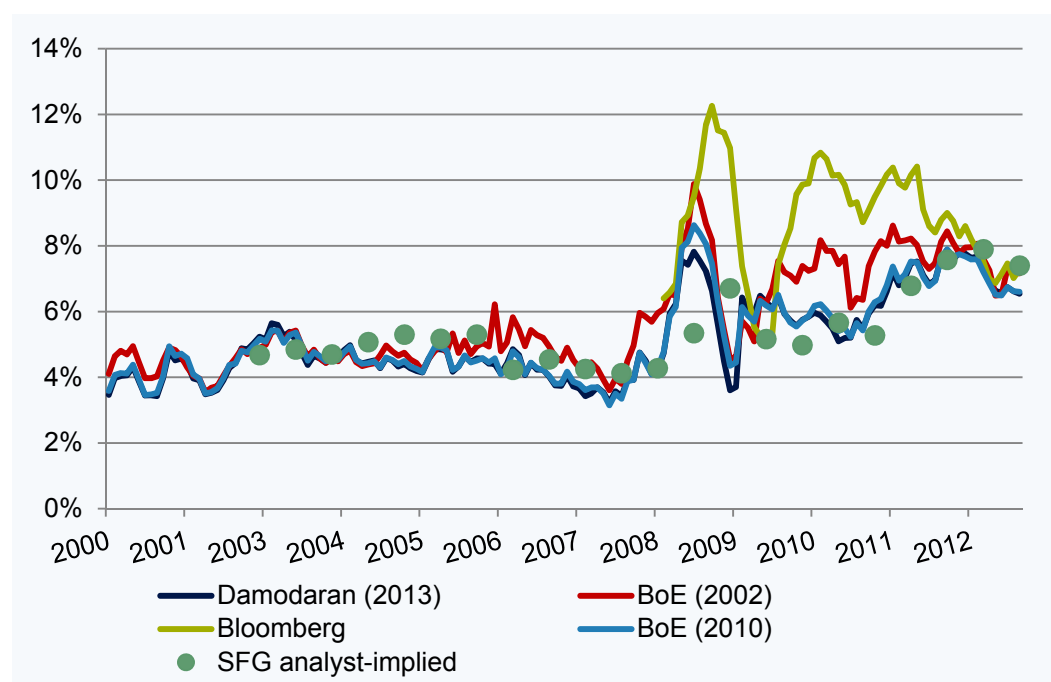
Source: Thomson Reuters Datastream, Bloomberg, and SFG and IPART analysis.

Consistent with our expectation, we find that the implied MRP estimates in the post-crisis period are higher than those in the pre-crisis period. The average differences between the 2 periods are within a range of 130 to 250 basis points (bps).

Another interesting observation is that, in the pre-crisis period, the implied MRP estimates (except for those based on market-wide indicators) are below the widely accepted MRP of 6% based on historical arithmetic averages in Australia. On the contrary, in the post-crisis period, all implied MRPs exceed the historical MRP of 6%.³²

Figure 5.1 shows monthly implied MRPs estimated using the 3 models. For comparison, the graph also includes Bloomberg’s and SFG’s implied MRP estimates. The sample period is from November 2000 to June 2013.

Figure 5.1 Monthly implied MRPs using different DDMs^a



^a SFG analyst-implied MRPs are half-yearly estimates.

Data source: Thomson Reuters Datastream, Bloomberg and IPART analysis.

³² Note that the monthly implied MRPs are obtained as the internal rate of return of a discount factor model, implying that they are geometric rates. Hence, the implied MRPs derived from our DDMs would be better compared with the geometric average of the historical MRPs. The geometric average of the historical MRP in Australia is 4.7% over the period from 1883 to 2010, according to Brailsford et al. (2012). Brailsford, T., Handley, J. C., and Maheswaran, K., 2012, “The historical equity risk premium in Australia: post-GFC and 128 years of data”, *Accounting and Finance* 52, pp 237-247.

The main differences between our models and SFG's analyst-implied model and Bloomberg's model are that:

- ▼ We estimate the implied MRPs directly using the S&P/ASX 200 Index.
- ▼ SFG and Bloomberg
 - first estimate the implied required rate of returns on individual stocks in the S&P/ASX 200 Index
 - calculate the implied MRP as a market capitalisation weighted average of the implied required rate of returns on the individual stocks in the S&P/ASX 200 Index.

In addition, our models are different from SFG's analyst-implied MRP methodology in that:

- ▼ In each DDM, we solve for the implied MRP, given risk-free rate, growth rate, expected dividends and current index price.
- ▼ SFG finds a combination of the cost of equity, growth rate and *ROE*, which provides the closest match between the stock valuation based on the DDM and individual analyst price target, and which allows a smooth transition from near-term growth to long-term growth.

5.3.4 How we select a range and point estimate for the implied MRP using current market data

We will construct a range for the implied MRP using the maximum and minimum of the implied MRPs estimated using the 6 models presented in Table 5.2. The midpoint implied MRP is given by the average of the upper and lower bound of the implied MRP range. As of 30 June 2013, the implied MRP range is 6.5% to 7.7% with a midpoint of 7.1%.³³

A potential concern regarding the methodology of constructing the MRP range and midpoint is that it effectively uses only 2 implied MRP estimates, the maximum and minimum of the 6 implied MRP estimates. As a result, our implied MRP range and midpoint become sensitive to outliers. Alternatively, we could consider other options, such as:

- ▼ using an average of the implied MRP estimates from the 6 models as our point estimate for the implied MRP
- ▼ establishing a range using the 25th and 75th percentiles of the implied MRP estimates from the 6 models, and calculating the midpoint as the average of the 2 percentile values.

We will consider this issue further for our final decision.

³³ The lower bound of 6.5% is the implied MRP based on Damodaran (2013) and the upper bound of 7.7% is the implied MRP based on SFG's MRP methodology using market-wide indicators.

Table 5.3 shows the WACC used in determining prices for HWC from 1 July 2013 which used Bloomberg's implied MRPs, and WACC calculated using the new implied MRP estimate. The implied MRP estimate based on our new MRP methodology is 0.4% lower than the 40-day average of Bloomberg's implied MRPs. This reduces the midpoint of the WACC range using current market data (ie, lower bound of our WACC range) to 4.5%. Had we applied our new implied MRP methodology to the review of prices for HWC, the final WACC would have been 4.5% instead of 4.6%.

Table 5.3 Effect of the change in the implied MRP estimation

	2013 HWC Final decision^a	Water WACC under the draft WACC methodology
Implied MRP	7.6%	7.2% ^b
Lower bound	3.8%	3.7%
Upper bound	5.3%	5.3%
Midpoint WACC	4.6%	4.5%

^a As of 16 April 2013.

^b The range for the implied MRP is 6.5% to 7.9%. The range is constructed based on the MRP estimates as of March 2013 except for SFG's analyst-implied MRP. SFG's analyst-implied MRP is estimated half-yearly, so we used a MRP estimate as of December 2012 in constructing the range.

Source: IPART, *Hunter Water Corporation's water, sewerage, stormwater drainage and other services – Final Report*, June 2013, p 182; IPART analysis.

5.3.5 Sensitivity test of implied MRP estimates

Since the choice of a long-term terminal growth rate has a significant impact on the terminal value and hence our implied MRP estimates, we conducted a sensitivity test of our implied MRP estimates using a different long-term constant growth rate of 4.6%. Associate Professor Lally estimated the real GDP growth rate of 3% and proposed deducting 1% from the real GDP growth rate to account for new share issues and new companies. After adjusting for the long-term inflation of 2.5%, the real dividend growth rate of 2% is equivalent to a nominal dividend growth rate of 4.6%.³⁴

Table 5.4 shows the average implied MRP estimates for 2 periods (ie, pre-/post-crisis periods) and Figure 5.2 shows monthly implied MRPs since November 2000, using the alternative terminal growth rate of 4.6%.

³⁴ Associate Professor Lally suggested deducting 0.5%, 1% and 1.5% from the expected GDP growth rate to account for new share issues and new companies. The 1% is the midpoint of the suggested range for deduction. Lally, M., *The dividend growth model*, 4 March 2013, p 17.

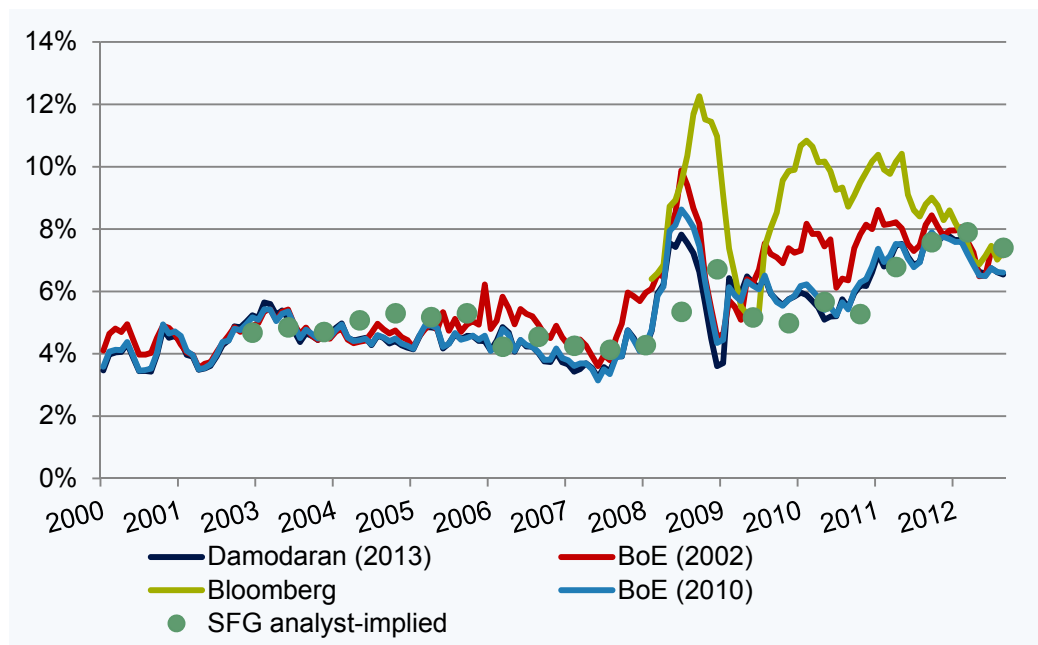
Table 5.4 Average implied MRP estimates using a terminal growth rate of 4.6%

	July 2002 to June 2008	July 2008 to June 2012	Difference
Damodaran (2013)	3.6%	5.6%	-2.0%
BoE (2002)	4.2%	6.7%	-2.6%
BoE (2010)	3.6%	5.8%	-2.1%

Source: Thomson Reuters Datastream, Bloomberg, and SFG and IPART analysis.

The implied MRPs based on Damodaran (2013), BoE (2002) and BoE (2010) in Table 5.2, which used the terminal growth rate of 5.5%, are on average higher than those shown below. Differences in the implied MRP estimates are less than 1%, ranging from 0.6% to 0.8%.

Figure 5.2 Monthly implied MRPs using a terminal growth rate of 4.6%.



Data source: Thomson Reuters Datastream, Bloomberg and IPART analysis.

6 Use of alternative models to the cost of equity estimation

In our interim decision, we used the Sharpe-Lintner CAPM (ie, standard CAPM) to estimate the cost of equity. This is consistent with our previous approach. We also noted that we may consider alternative models to estimate the cost of equity as part of our overall decision-making framework.

This chapter presents our draft decision, summarises submissions we received on the cost of equity, analyses the issues raised in submissions, and explains our draft decision.

6.1 Draft decision

Our draft decision regarding the cost of equity estimation is to:

- ▼ Continue using the standard CAPM as the primary model for estimating the cost of equity.
- ▼ Use the same equity beta for an industry in estimating the cost of equity using current market data and long-term averages. However, the equity beta will vary between industries, depending on the level of systematic risk.

6.2 Stakeholders' views

ActewAGL submitted that we should consider using alternative cost of equity models, such as the Fama-French 3-factor model, in estimating the cost of equity.³⁵

SWC submitted that our interim methodology could result in a relatively narrow range of the cost of equity estimates and suggested:

- ▼ determining a range by reference to the range of plausible CAPM parameter values using the model as specified with current market data and long-term averages
- ▼ having regard to other cost of equity models such as DDMs, the Black CAPM or the Fama-French 3-factor model.³⁶

6.3 Our analysis

This section presents our further work on the cost of equity estimation.

³⁵ ActewAGL submission on Interim Report on WACC methodology, 26 July 2013, p 3.

³⁶ Sydney Water Corporation submission on Interim Report on WACC methodology, 29 July 2013, p 9.

6.3.1 Alternative cost of equity models

The cost of equity is the return required by investors for investing in equity. We currently estimate the cost of equity using the standard CAPM. The standard CAPM is a relatively simple model, having only 3 inputs: the risk-free rate, equity beta and MRP.

We acknowledge that there are other models we could use to estimate the cost of equity, either as a primary model or a crosscheck. In fact, we considered several alternative cost of equity models in the 2010 review of alternative approaches to the determination of the cost of equity.³⁷ These included the Fama-French 3-factor model, constant growth DDM, arbitrage pricing theory (APT) and other extensions of the CAPM, such as zero-beta CAPM (Black, 1972),³⁸ intertemporal CAPM (Merton, 1973)³⁹ and consumption CAPM (Breedon, 1979).⁴⁰ Our views regarding the alternative cost of equity models are summarised below:

- ▼ The Fama-French 3-factor model introduces 2 additional terms, *SML* (excess return of small stocks over large stocks) and *HML* (excess return of value stocks over growth stocks). These increase the complexity in estimating the cost of equity.
- ▼ Estimating the cost of equity using the constant growth DDM highly depends on assumptions regarding dividend payout ratio and dividend growth rate. The constant growth DDM could be used as a cross-check for our cost of equity and WACC estimate but is less transparent than the CAPM as a stand-alone cost of equity model. It is difficult to apply at the sector level in Australia as very few comparable stocks are listed.
- ▼ The arbitrage pricing theory (APT) is not easily implementable and not transparent in the choice of inputs. We considered that the APT is not a suitable alternative to the CAPM in the regulatory context.

³⁷ IPART, *Alternative approaches to the determination of the cost of equity – Discussion Paper*, November 2009.

³⁸ Black, F., 1972, “Capital market equilibrium with restricted borrowing”, *Journal of Business* 45, pp 444-455.

³⁹ Merton, R., 1973, “An intertemporal capital asset pricing model”, *Econometrica* 41, pp 867-887.

⁴⁰ Breedon, D. T., 1979, “An intertemporal asset pricing model with stochastic consumption and investment opportunities”, *Journal of Financial Economics* 7, pp 265-296.

- ▼ Empirical evidence suggests that the security market line in the standard CAPM is too flat. That is, the expected returns for stocks with beta less than 1 are underestimated and the expected returns for stocks with beta greater than 1 are overestimated. The zero-beta CAPM addresses this bias by introducing a 'zero-beta' portfolio in place of the risk-free asset, where the returns of the zero-beta portfolio are uncorrelated with the market returns, like the risk-free asset, but are higher than the return on the risk-free asset. Given the difficulty in estimating the zero-beta CAPM, a pragmatic approach is to have regard to the potential bias in the cost of equity estimates under the standard CAPM in selecting the value for equity beta. That is, we could consider selecting a point estimate for the cost of equity above (below) the midpoint cost of equity estimated based on the standard CAPM for stocks with beta less (greater) than 1.⁴¹

Overall, we concluded that the standard CAPM is still the best model to estimate the cost of equity in the regulatory context.

6.3.2 Estimating equity beta

Clarifying beta under the interim WACC methodology

Our interim methodology estimates the cost of equity using current market data and long-term averages. In the recent price reviews where the interim methodology was applied, we used:

- ▼ a 40-day average risk-free rate and a 40-day average implied MRP obtained from Bloomberg
- ▼ a 10-year average risk-free rate and a MRP range of 5.5% to 6.5% based on the historical arithmetic average.

Using 2 different averaging periods does not mean that there should be 2 equity betas in estimating the WACCs using current market data and long-term averages. There is no short-term beta or long-term beta for a stock, but rather 1 beta estimate that accurately measures the covariance between stock and market returns.

⁴¹ Similarly, in its draft decision, the AER decided to consider adjusting their equity beta estimate. Australian Energy Regulator, *Better regulation: Explanatory statement – Draft rate of return guideline*, August 2013, p 196.

How can we accurately measure equity beta?

While beta can be estimated from fundamentals or using accounting data, it is commonly estimated as the slope of the following market model using the ordinary least square (OLS) regression.

$$R_i = \alpha + \beta R_m + \varepsilon \quad (1)$$

where α is the intercept from the regression, β is the slope of the regression, R_i is stock i 's return and R_m is the return on market portfolio. Since the slope of the above OLS regression is a statistical estimate, it comes with a standard error, which measures how noisy the estimate is, and can be used to arrive at the confidence intervals for the true beta value.

There are 3 decisions that an analyst must make in setting up the OLS regression.

1. Measurement period: There is a trade-off in choosing an appropriate measurement period. That is, a longer estimation period reduces the standard errors or sampling error in beta estimation, but it increases the extent of staleness or redundancy of the information content of the estimated beta as the firm might have changed in its risk characteristics over time.
2. Return interval: Returns on stocks are available on an annual, monthly, weekly, daily and intraday basis. Using a higher frequency data such as daily or intraday will increase the number of observations in the regression. But beta will be biased downward (upward) for an illiquid stock that trades less (more) frequently than the market index used in the regression.
3. Market portfolio: In the CAPM, the market portfolio is the value-weighted portfolio of all assets both traded (such as stocks and bonds) and untraded (such as private companies and human capital). Since the true market portfolio is unobservable, a proxy is necessary. For US stocks, the most commonly used proxy is the S&P 500, a value-weighted index of large US companies.

Given the results of a variety of empirical and academic studies, McKinsey & Company (2010) concludes that:

- ▼ The measurement period for raw regressions should include at least 60 data points (eg, monthly returns over 5 years). Beta estimate providers such as Morningstar Ibbotson and several academic studies such as Black et al (1972)⁴² and Fama and French (1992)⁴³ use 5 years. Alexander and Chervany tested the accuracy of estimation periods from 1 to 9 years and found that 4- and 6-year estimation periods performed the best.⁴⁴

⁴² Black, F., Jensen, M. and Scholes, M., 1972, "The capital asset pricing model: some empirical tests" in *Studies in theory of capital markets*, Praeger Publishers Inc.

⁴³ Fama, E. F, and French, K. R., 1992, "The cross-section of expected stock returns", *Journal of Finance* 47, pp 427-465.

⁴⁴ Alexander, G., and Chervany, N., 1980, "On the estimation and stability of beta", *Journal of Financial and Quantitative Analysis* 15, pp 123-137.

- ▼ Raw regressions should be based on monthly returns. Using more frequent return periods, such as daily and weekly returns, leads to systematic biases.
- ▼ Company stock returns should be regressed against a value-weighted and well-diversified market portfolio.⁴⁵

Our practice

While we do not have a predefined methodology to estimate equity beta, we have used a methodology which is generally consistent with that described above. For example, in the recent review of regulated retail prices for electricity and gas, we estimated betas using monthly returns with an estimation period longer than 5 years and market indices that were value-weighted and well-diversified. For each industry considered, we estimated a common beta and used it for the cost of equity using both current market data and long-term averages.⁴⁶

7 WACC determination process

By taking into account both current market data and long-term averages, the new WACC methodology results in a relatively wide WACC range. This is more noticeable in recent times as we observe a greater discrepancy between current and long-term average risk-free rates. This increases the need for a transparent and robust framework for choosing our WACC point estimate within the range.

In our Interim Report, we suggested a decision-making framework to explain to our stakeholders:

- ▼ how we check if the midpoint of the WACC range is the best estimate available at a given point in time
- ▼ why in some circumstances we may be inclined to move away from the midpoint.

This chapter presents our draft decision, summarises submissions we received on the WACC determination process, analyses the issues raised in submissions, and explains our draft decision.

⁴⁵ McKinsey & Company, *Valuation*, Fifth edition, 2010, p 250.

⁴⁶ IPART, *Review of regulated retail prices and charges for electricity – Final Report*, Appendix B, June 2013.

7.1 Draft decision

Our draft decision is:

- ▼ To construct a measure of economic uncertainty (ie, an uncertainty index) to guide us in selecting a WACC point estimate within the range. The uncertainty index is constructed using the S&P/ASX 200 VIX Index, dispersion in analysts' forecasts for companies in the S&P/ASX 200 Index and credit spreads as a proxy for economic uncertainty in Australia.⁴⁷
- ▼ To establish a 3-stage process to determine the WACC:
 - In Stage 1, we will establish a WACC range and midpoint. Our default position is to choose the midpoint of the resulting WACC range as our point estimate.
 - In Stage 2, we will conduct an internal consistency test to ensure that the regulatory cost of debt is lower than the regulatory cost of equity, and assess the appropriateness of the midpoint WACC based on the level of economic uncertainty. If economic uncertainty is neutral, we will choose the midpoint WACC as our point estimate. If economic uncertainty is unusually high or low, we will consider moving away from the midpoint WACC. The extent of the movement above or below the midpoint WACC will depend on our interpretation of financial market information. The information that will be analysed in this process includes independent expert reports, equity research reports, actual corporation transaction data, and the market-to-asset ratio (MAR) for traded entities and recent acquisitions.
 - In Stage 3, we will specify our point estimates for the cost of debt and cost of equity and evidence considered in reaching our WACC decision.
- ▼ To release half-yearly updates on market developments and the implication for the WACC. This will provide greater certainty on our approach to incorporating the financial market information in our decision-making.

While our WACC decision framework is largely predefined, we acknowledge that its implementation still involves a degree of judgement, especially with respect to finding the right subset of financial market information, and interpreting the information when assessing the appropriateness of the midpoint WACC.

7.2 Stakeholders' views

ActewAGL noted that in the Interim Report we stated:

...unless there is strong contrary evidence, we will allocate equal weights to the information obtained from current market data and long-term averages.

⁴⁷ Our uncertainty index is constructed using Principal Component Analysis (PCA). The details are discussed in Section 7.3.1 and Appendix A.

ActewAGL suggested that we should clarify what level of evidence would be considered sufficiently 'strong' to justify a move away from the 'default' midpoint position in determining the WACC. Also, it commented that it was unclear how we would deal with the potential shortage of relevant transactions and expert reports.⁴⁸

HWC submitted that our interim methodology does not remove the impact of financial market variability, nor does it necessarily make the forecasting of a WACC any more predictable. It further argued that, only if a WACC range estimated under the interim methodology is narrow, choosing the midpoint may be acceptable. Overall, it did not support application of the interim methodology in the long term. It suggested that we should clarify the criteria that we will use to justify deviating from the midpoint WACC if we intend to continue using the interim approach.⁴⁹

Although **SCA** generally supported our interim methodology, it was concerned that the interim methodology would not be plausible in volatile market conditions. In **SCA's** view, taking the midpoint WACC as our default position implies that the final WACC outcome would still be heavily influenced by short-term market volatility. Under the interim methodology, utilities receiving price determinations during market contraction (expansion) would be under-compensated (over-compensated) for their actual cost of capital. This would distort utilities' investment decisions, having a detrimental effect on consumers. Further, **SCA** considered that we should clearly develop criteria on when we would decide to deviate from the midpoint WACC.⁵⁰

SDP welcomed our proposal to check the resulting WACC against market expectations. It suggested that this market sounding process should:

- ▼ be structured, transparent and implemented in a systematic manner to ensure that temporary market volatility does not unnecessarily affect utility valuations
- ▼ involve discussions with Australian utility investors and financiers.⁵¹

SWC submitted that the interim methodology provides us with greater discretion to determine the weights assigned to current market data and long-term averages in estimating the cost of debt. It considered that, to promote regulatory certainty, this methodology must be further revised to provide greater transparency and predictability. **SWC** considered that the assessment framework set out in the Interim Report generally provides a solid foundation for assessing

⁴⁸ ActewAGL submission on Interim Report on WACC methodology, 26 July 2013, p 3.

⁴⁹ Hunter Water Corporation submission on Interim Report on WACC methodology, 26 July 2013, pp 2-3.

⁵⁰ Sydney Catchment Authority submission on Interim Report on WACC methodology, 26 July 2013, p 2.

⁵¹ Sydney Desalination Plant submission on Interim Report on WACC methodology, 2 August 2013, p 5.

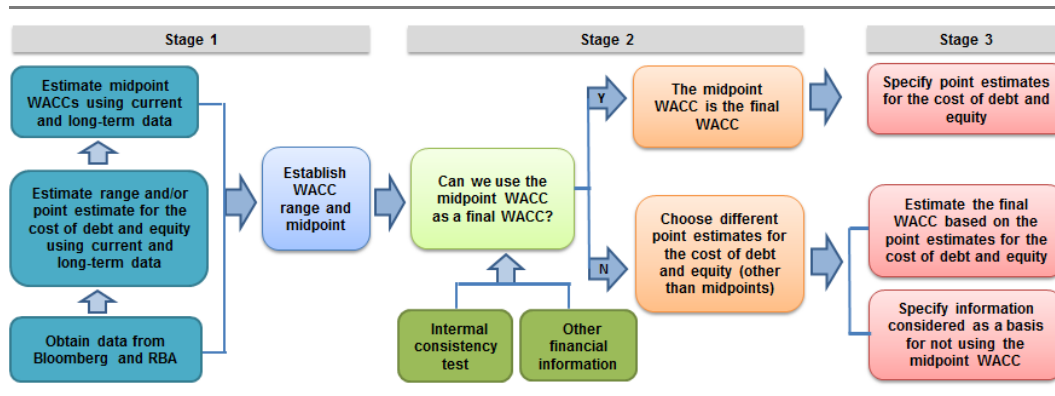
the cost of equity, but that we may be able to further refine the methodology to estimate the cost of equity.⁵²

7.3 Our analysis

In the Interim Report, we decided to establish 3 stages for WACC determination process as shown in Figure 7.1:

- ▼ In Stage 1, we establish a WACC range and midpoint. Our default position is to choose the midpoint WACC as a point estimate.
- ▼ In Stage 2, we conduct an internal consistency test to ensure that the regulatory cost of debt is lower than the regulatory cost of equity. We also assess the appropriateness of the midpoint WACC using evidence from financial markets.
- ▼ In Stage 3, we specify our point estimates for the cost of debt and cost of equity and the market evidence considered in reaching our WACC decision.

Figure 7.1 Our WACC determination process



Source: IPART, WACC methodology – Interim Report, June 2013.

Stakeholders commented that, in the Interim Report, it was unclear what level of evidence would be considered sufficiently strong to warrant a move away from the default midpoint WACC. They added that specifying when we will deviate from the midpoint would increase the transparency and predictability of our WACC decision.

We have carefully considered these comments and conducted further research to reinforce our WACC framework, especially with regard to Stage 2. Our draft decision is that we will assess the appropriateness of the midpoint WACC based on the level of economic uncertainty. If the level of economic uncertainty is neutral, we will select the midpoint WACC as our point estimate. If the level of economic uncertainty is unusually high or low, we will consider deviating from

⁵² Sydney Water Corporation submission on Interim Report on WACC methodology, 29 July 2013, pp 7-9.

the midpoint WACC. We will use other financial market information to determine the extent to which we move away from the midpoint WACC.

In the remainder of this section, we:

- ▼ discuss the use of an index of economic uncertainty in assessing the midpoint WACC (Section 7.3.1)
- ▼ list the type of information which will be used to determine the extent to which we will deviate from the midpoint WACC, if the midpoint WACC is deemed inappropriate given the level of economic uncertainty (Section 7.3.2).

7.3.1 Economic uncertainty and the WACC

We consider that an indicator of economic uncertainty may be useful in our WACC determination process. The level of uncertainty in the economy may be relevant to the estimation of the WACC in that:

- ▼ Like other economic models, our WACC models may perform less well and be subject to greater volatility when there are higher levels of uncertainty, such as in unusual economic conditions or at economic turning points.
- ▼ Other things being equal, a higher level of uncertainty surrounding the economic outlook may be associated with a higher risk premium on investment and hence a higher cost of capital.

The difficulty is that there is no single indicator of the degree of uncertainty available. Furthermore, the level of uncertainty can only inform directional movements in the WACC, given the assessment of the full range of available information, rather than providing a specific estimate of the WACC.

We have sought to address this information gap by developing an index of economic uncertainty that draws on research by the Bank of England. We propose to use this to inform our judgements in regard to the WACC. That is, in periods when the index is neutral, we would choose the midpoint WACC as our point estimate. Conversely, in periods when the index indicated a higher or lower level of uncertainty than usual, we would move away from the midpoint WACC. To decide the extent to which we will deviate from the midpoint WACC, we will consider other financial market information specified in the section below (Section 7.3.2). In an unlikely event that the index of economic uncertainty is neutral but other financial market information suggests that the midpoint WACC underestimates or overestimates market expectations for the cost of capital, we will choose a point estimate above or below the midpoint WACC.

Appendix A explains how we construct the uncertainty index and its information content. We also discuss why the level of economic uncertainty is relevant to our WACC decision and how we intend to use the index of economic uncertainty.

7.3.2 Using other financial information

In addition to the index of economic uncertainty discussed above, we consider that the following 4 sources of information may be useful in assessing the WACC point estimate:

1. independent expert reports
2. equity research reports
3. actual corporate transaction data on bond issuance for refinancing
4. MAR for traded entities and recent acquisitions.

Independent expert reports

Independent expert reports are provided by experienced corporate advisers in the context of market transactions, such as mergers and acquisitions. These reports provide valuable information on the cost of equity since their valuation is conducted in the event of substantial market transactions. Independent experts may value assets or shares using multiples or discounted cash flow (DCF) methodology. If the DCF methodology is used, we can obtain the individual parameter values used to estimate the cost of capital.

The main benefit is that independent expert reports provide impartial assessment of the market-side parameters in the cost of capital estimation, since experts engaged in the preparation of such reports should not have any conflict of interest with parties associated with the transactions. The major drawback is that these reports may not be readily available at the time of our price reviews as they are produced for mergers and acquisitions which occur relatively infrequently. Figure 7.2 presents WACC parameters used in a recent independent expert report which can be relevant to the assessment of the midpoint WACC in Stage 2 in our framework.

Figure 7.2 A sample WACC used in an independent expert report

WACC

On the basis of the above, we have adopted the following inputs in our calculation of a real, post-tax WACC:

	Low	High
Risk free rate	3.4%	3.4%
Equity market risk premium	6.0%	6.0%
Asset beta	1.4	1.6
Specific risk premium	2.8%	4.0%
Cost of equity	14.6%	17.0%
Gearing (D/D+E)	0%	0%
Nominal cost of capital	14.6%	17.0%
Inflation factor	2.5%	2.5%
Real cost of capital	11.8%	14.1%
WACC, real, midpoint		13.0%

Source: CapitalIQ, EY research

Based on the above analysis, we have assessed the real, post-tax discount rate to apply in the discounted cash flow valuation of MDS as 13%.

Data source: Endocoal, *Scheme Booklet – Attachment F prepared by Ernst & Young*, 29 January 2013.

Equity research reports

In-house research departments in brokerage firms or investment banks produce research reports focusing on a specific stock, industry sector, currency, commodity or fixed income instrument. Such information is usually disseminated to institutional and retail clients with analysts' recommendations. We may use equity research reports as additional financial market information. In an equity valuation, analysts usually use the DCF methodology where the present values of all future cash flows are summed to yield the NPV, which is taken as the value or price of the equity. The discount rate applied in this estimation is usually the WACC that reflects the risk of the cash flows. We propose to obtain individual WACC parameters from these reports and use them in assessing the appropriateness of the midpoint WACC. Figure 7.3 presents WACC parameters used in a recent equity research report which can be relevant to the assessment of the midpoint WACC in Stage 2 in our framework.

Figure 7.3 WACC used in an equity research report

		Neutral
Price (at 09:36, 16 Aug 2013 GMT)		A\$2.11
Valuation	A\$	2.30
<small>- DCF (WACC 9.3%, beta 0.9, ERP 5.0%, RFR 5.0%)</small>		
12-month target	A\$	2.31
12-month TSR	%	+17.5
Volatility Index		Low
GICS sector		Utilities

Data source: Anonymous equity research report issued on 16 August 2013.

Actual corporate transaction on new bond issuance for refinancing

We propose to use evidence from actual capital market transactions. We will focus on new bonds issued for refinancing. The set of information we expect to obtain includes:

- ▼ issue size
- ▼ tenor
- ▼ prices
- ▼ use of proceeds (ie, purpose of new debt issuance).

Provided that the above information is available, we will be able to check bond yields of BBB-rated corporations in case of refinancing.

In Figure 7.4, we provide a sample of a recent corporate transaction on new bond issuance. In July 2013, SP AusNet raised \$707 million by issuing a EUR 500 million, 7-year Euro bond. The proceeds were to be used to refinance existing debt and fund capital expenditure.

Figure 7.4 A recent bond issuance by SP AusNet

SP AusNet successfully prices EUR 500M offer

SP AusNet has successfully priced a EUR 500 million, 7-year Euro ("EUR") bond issue to raise approximately A\$707 million.

Adam Newman, SP AusNet's Chief Financial Officer, said that: "The proceeds will be used to refinance existing debt and to fund capital expenditure. This is our first Euro bond issue and despite the current volatile conditions in debt markets, we were very pleased to see such strong demand resulting in the offer being more than four times oversubscribed."

Terms of the issue

	Amount	Maturity
EUR500M	A\$707M	24 July 20

Data source: ASX & SGX-ST Release, 12 July 2013, accessed via [http://www.sp-ausnet.com.au/CA2575630006F222/Lookup/ASX2013/\\$file/EurBond%2012%20July%202013.pdf](http://www.sp-ausnet.com.au/CA2575630006F222/Lookup/ASX2013/$file/EurBond%2012%20July%202013.pdf).

Market-to-asset ratios

Subject to data availability, we may use the MAR for traded entities and recent acquisitions. The MAR is calculated as the ratio of the market value of core regulated assets to the regulatory capital value of the business. The MAR will be equal to 1 if market expectations of regulated returns are identical to the actual cost of capital of the business. Assuming that firms are fairly valued by the market, a MAR of less (greater) than 1 may suggest that the regulator may have set returns that are too low (high) relative to the true cost of capital. Using the MAR was also suggested by SCA in their submission to our Discussion Paper.

Figure 7.5 shows a sample of available information on the MAR ratio from a recent transaction of SDP. In May 2012, New South Wales signed a \$2.3 billion deal for a 50-year lease of the desalination plant. The actual transaction value was higher than the plant's regulated asset base, indicating a MAR of greater than 1.

Figure 7.5 MAR ratio from the 2012 Sydney Desalination Plant deal

New South Wales has signed a \$2.3 billion deal with a consortium of Hastings Funds Management and Ontario Teachers Pension Plan for the long-term lease of a desalination plant in Sydney, a source with direct knowledge of the deal said on Friday.

Morgan Stanley and RBC Capital Markets advised the international consortium which will pay \$300 million more than the plant's regulated asset base.

Under the agreement, Sydney Water is locked into a 50-year water supply agreement with the owners of the new plant. The 50-year lease will include the desalination plant, the pipeline and the site.

Data source: Sydney Morning Herald, *NSW signs \$2.3b desalination plant deal*, 11 May 2012, accessed via <http://www.smh.com.au/business/nsw-signs-23b-desalination-plant-deal-20120511-1ygk5.html>.

Limitation

While the additional financial market information may be a useful in our WACC determination, there are some limitations to this approach. Some of the limitations include:

- ▼ Different types of financial market participants may have different views in valuing asset prices.
- ▼ There may be limited data availability at any point in time. For example, we may not be able to find new private market debt transactions or independent expert reports at each determination.
- ▼ There is a trade-off between having a systematic WACC methodology that is not subject to any discretion and allowing a certain level of discretion in the choice of WACC by accounting for other financial information. We consider that the latter may provide a better estimate of the WACC but acknowledge that it may reduce the predictability of our WACC decision.

7.4 Regular financial market updates

As part of our draft decision, we propose to release a regular update on market conditions and their implication for the WACC. The purpose of the update is to provide stakeholders with:

- ▼ a brief outline of our WACC estimates at a given point in time for the main industries that we regulate
- ▼ a summary and our assessment of financial market conditions
- ▼ a directional view on estimated WACCs.

The market update will be released on our website.

Table 7.1 sets out the planned release dates of the market updates.

Table 7.1 Expected release dates of IPART’s market update

	Release date
First market update	End of February each year
Second market update	End of August each year

We consider that releasing a 6-monthly update would further reduce potential uncertainty around our WACC decision under the new WACC methodology and framework.

8 Internal consistency test

We propose to continue conducting the internal consistency test on the cost of capital parameters. The purpose is to ensure that the regulatory cost of debt is lower than the regulatory cost of equity. This is consistent with finance theory that the cost of equity should always be higher than the cost of debt since investment in equity is riskier than debt.

One of our stakeholders submitted that we should consider additional internal consistency tests on the cost of equity estimate using different estimation models.

This chapter presents our draft decision, summarises submissions we received on the internal consistency tests, analyses the issues raised in submissions, and explains our draft decision.

8.1 Draft decision

Our draft decision is to conduct the internal consistency test to ensure that the cost of equity and the cost of debt estimates are economically sensible. Also, we may consider checking the consistency and reasonableness of the CAPM parameters using other market evidence in Stage 2 of our WACC determination process (See Section 7).

8.2 Stakeholders’ views

ActewAGL noted that, in the Interim Report, we proposed to continue conducting an internal consistency test of whether the regulatory cost of debt is lower than the regulatory cost of equity in determining the WACC. ActewAGL suggested that we should also consider other internal consistency tests, such as checking the consistency of parameters and data in applying the CAPM by looking at other cost of equity models and economic and financial market conditions.⁵³

⁵³ ActewAGL submission on Interim Report on WACC methodology, 26 July 2013, p 3.

8.3 Our analysis

We consider it important to ensure that the benchmark cost of debt is lower than the cost of equity. The underlying rationale is that the components of the WACC should make economic sense when considered in the context of all other components.

Since investing in bond markets is less risky than in equity markets, the cost of debt should always be lower than the cost of equity. Using the same methods to estimate the costs of debt and equity (ie, either prevailing rates or long-term averages) reduces the risk that the estimated cost of debt exceeds the cost of equity. However, there is a risk that this will not be the case if, for example, the cost of equity estimated using current market data is combined with the cost of debt estimated using long-term averages.

9 Other issues regarding the new WACC methodology

Since the release of the Interim Report, we have examined 2 additional issues related to the WACC methodology which we did not separately consider as part of the interim decision. These include estimating the:

- ▼ risk-free rate for the WACC using current market data
- ▼ inflation expectation for the WACC using long-term averages.

This chapter summarises further work we have undertaken on these issues and discusses our draft decisions.

9.1 Risk-free rate for the WACC using current market data

In the interim WACC decision, we decided to use:

- ▼ the 40-day average of the yields on the 5-year CGS as the risk-free rate for the WACC using current market data
- ▼ the 10-year average of the yields on the 5-year CGS as the risk-free rate for the WACC using long-term averages.⁵⁴

By using current market data, we mean to reflect on-the-day cost of equity and cost of debt in determining the overall expected WACC. We have considered this issue and undertaken further work on what proxy we could use as a risk-free rate for the WACC using current market data. Overall, we consider that the 40-day average of the 5-year CGS is still the best proxy.

⁵⁴ Note that discussion in this section assumed a term-to-maturity of 5 years. For electricity, we currently use a term-to-maturity of 10 years.

9.1.1 Draft decision

Our draft decision is to use the CGS as the risk-free rate in estimating the WACCs using current market data and long-term averages. This is the most widely used benchmark for the risk-free rate.

Australia has consistently maintained the highest credit rating of AAA. Therefore, we consider that the CGS is a reasonable proxy for the risk-free rate that is free from default risk.⁵⁵

9.1.2 Analysis

We have considered the 3-month bank bill swap rate (BBSW) and 5-year swap rate as possible alternative proxies for the risk-free rate for the WACC using current market data.

The **BBSW** is the interest rate used by banks in lending transactions with other banks. This is Australia's equivalent of the more widely used London Interbank Offered Rate (LIBOR).

When companies issue floating rate bonds, the bonds have a variable coupon equal to a money market reference rate, BBSW plus a quoted spread, which is determined by the credit profile of a bond issuer. For utilities regulated by us, floating rate bonds have quarterly coupons which are typically 3-month BBSW plus a fixed credit spread based on the issuer's credit profile, the term-to-maturity of the issue and market liquidity.

The advantage of using the 3-month BBSW as the risk-free rate is that:

- ▼ It reflects the actual practice in the fixed income securities market.
- ▼ Utilities wishing to match the regulatory WACC component based on current rates will be able to do so without having to hedge that part of their interest rate exposure relating to the short-term cost of debt.

We also considered the **5-year swap rate** with a reference rate being the 3-month BBSW, given that we use a maturity of 5 years. Swap rates are borrowing rates between financial institutions, usually with credit ratings of A/AA equivalent.

For example, a 5-year swap rate of 6% means that one party pays a fixed rate of 6% (ie, the swap rate), and receives the 3-month BBSW for the next 5 years. This is equivalent to locking in the 3-month BBSW for 5 years rolled over on a quarterly basis.

In general, the advantages of using the swap rate as a risk-free rate are that:

⁵⁵ To be precise, the 5-year CGS is not free from reinvestment risk as it is not a zero coupon bond. However, given that the 5-year CGS is a long-term bond, it contains much less reinvestment risk than short-term bonds.

- ▼ There are more maturity points available to construct a swap curve than a government bond yield. Currently, in Australia swap rates are quoted for maturities of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 20, 25 and 30 years.
- ▼ The supply of swaps depends only on the number of counterparties seeking or willing to enter a swap transaction at any given time. Since there is no underlying government bond, there can be no effect of market technical factor that may result in the yield for a government bond issued being less than its true yield.
- ▼ There is almost no government regulation of the swap market. The lack of government regulation makes the swap rates in different markets more comparable.

We consider that neither the 3-month BBSW nor 5-year swap rate is an appropriate proxy for the risk-free rate for the following reasons.

- ▼ The 3-month BBSW and 5-year swap rate do not meet 2 risk-free rate criteria. A risk-free asset is one where an investor knows the expected return with certainty. Consequently, for an investment to be risk-free, it should be *free* from *default risk* and *reinvestment risk*.
 - First and foremost, the BBSW and swap rate are not default-free since they reflect the credit risk of the banking sector, which usually has an AA credit rating. ‘No default risk’ generally implies that the security has to be issued by a government.⁵⁶
 - Using the 3-month BBSW will incur reinvestment risk. If we are trying to estimate the expected return over a 5-year period using a risk-free rate, we cannot use a short-term rate such as 3 months, because there is the reinvestment risk of not knowing what the rate will be in 3 months.
- ▼ The 3-month BBSW cannot be used as a risk-free rate, since:
 - The short-term interbank lending rate, such as the LIBOR and the BBSW, reflects changing liquidity conditions or credit worthiness in the market. During the global financial crisis (GFC), banks became increasingly reluctant to lend to each other. Consequently, the TED spread (ie, difference between the 3-month LIBOR and the US Treasury bill) was very high during the crisis, reaching over 300 basis points in October 2008.

⁵⁶ Not all governments are default-free. However, this is not the case for Australia since it has been maintaining the highest credit rating of AAA for a prolonged period.

- It directly captures variation in expected MRPs required by investors. For example, during the GFC, both the LIBOR and implied MRPs were at the highest level. Using the 3-month BBSW and implied MRPs to estimate the cost of equity with current market data would result in double-counting changing market conditions.
- ▼ It may be possible to remove the credit risk premium associated with the AA credit rating from the 5-year swap rate by using credit default swaps (CDS). However, the CDS premiums have risen to a substantially higher level and have been relatively volatile since the GFC. Consequently, this methodology would introduce more volatility and uncertainty in the WACC using current market data.

9.2 Inflation expectation for the WACC using long-term averages

In May 2009, we decided that we would use swap market data to estimate the inflation adjustment. This decision was based on advice by Professor Erik Schlogl.⁵⁷ In our interim decision, we used the 40-day average of the daily swap market implied inflation rates.

Unlike our previous WACC methodology, the interim WACC methodology requires 40-day and 10-year averages of market-based WACC parameters. Since swap market implied inflation rates are available only from January 2009, we cannot calculate the 10-year average of inflation expectation using swap market data. Therefore, in our recent price reviews where the interim WACC methodology was applied, we used the swap market implied inflation expectation for the WACC using current market data, and the breakeven inflation rate based on bond market data on real and nominal 10-year CGS yields for the WACC using long-term averages.⁵⁸

We consider that using swap market data is the most appropriate methodology to estimate inflation expectation, but that maintaining this approach may potentially raise concerns that inflation expectations estimated using swap and bond market data are fundamentally different. Swap market based inflation expectations include the price for inflation hedging and compensation required by swap holders for not being able to easily terminate the swap contract prior to the agreed date. Also, the inflation expectation estimated using bond market data is based on a maturity of 10 years due to the unavailability of a 5-year indexed bond. This is not consistent with our term-to-maturity assumption of 5 years for all industries except for gas and electricity. For this reason, we have sought an alternative way to estimate the inflation expectation for the WACC

⁵⁷ IPART, *Adjusting for expected inflation in deriving the cost of capital – Final Decision*, May 2009.

⁵⁸ The breakeven inflation is derived based on the Fisher equation where inflation rate = $(1 + \text{nominal rate}) / (1 + \text{real rate}) - 1$. For this estimation, we used the 10-year Australian Government bond (Mnemonic: FCMYGBAG10D) and indexed bond (FCMYGBAGID), sourced from the RBA website: www.rba.gov.au/statistics/tables/xls/f02dhist.xls.

using long-term data that is more closely aligned with swap market implied inflation expectation used for the WACC using current market data.

9.2.1 Draft decision

Our draft decision is to adopt a hybrid approach to estimate the inflation expectation for the WACC using long-term averages. We consider that:

- ▼ The hybrid approach reflects our position, which is that using swap market data is the most appropriate method to estimate inflation expectation.
- ▼ The breakeven inflation expectation component in the hybrid approach will phase out as time passes, resulting in the inflation expectation for the WACC using long-term averages entirely based on swap market data.

9.2.2 Analysis

We consider that using swap market implied inflation for the WACC using long-term averages is consistent with our decision in 2009. Swap market data is only available from January 2009. This means that our time-series on swap market implied inflation is less than 10 years. To circumvent this problem, we considered using a hybrid approach, which combines swap market implied inflation and breakeven inflation. Specifically, we have considered using:

- ▼ all available swap market implied inflation expectations (2 January 2009 to the date of a decision)
- ▼ breakeven inflation expectations for the period over which the swap market implied inflation is not available (prior to 2 January 2009).

We present the inflation expectation for the WACC using long-term averages based on the hybrid approach in Table 9.1 as of 1 July 2013. For comparison, we have also calculated the breakeven inflation expectation averaged over 10 years.

Table 9.1 Inflation expectations for the WACC using long-term averages

Methodology	long-term averages (10-year averages)
Breakeven inflation	2.66% ^a
Hybrid approach	2.78% ^b

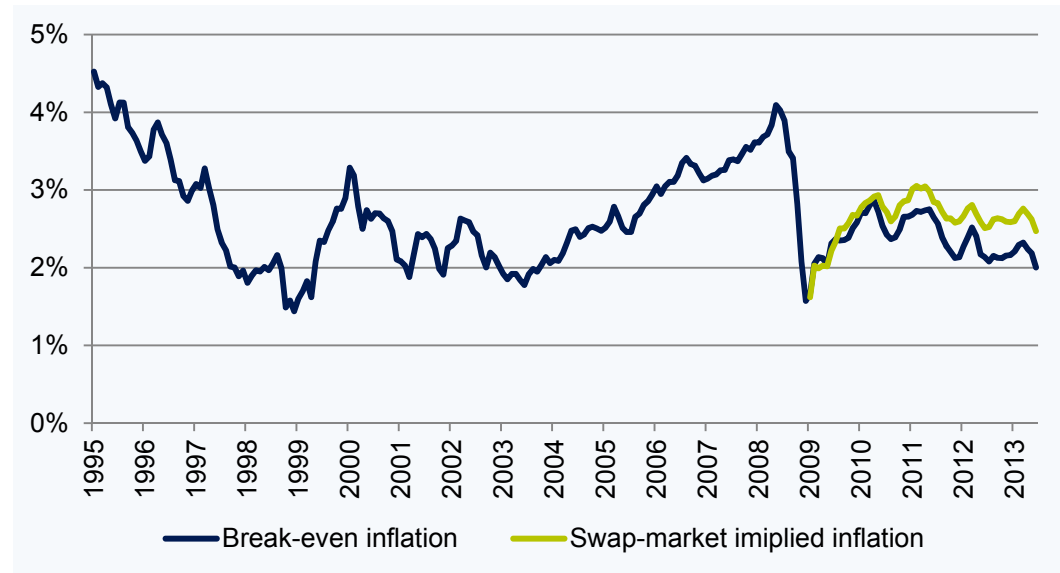
^a The breakeven inflation was used for the WACC using long-term averages in the final price decisions for Gosford City Council, Wyong Shire Council, HWC and the regulated retail prices for electricity. The breakeven inflation is averaged over the period from 2 July 2003 to 1 July 2013.

^b This is estimated using breakeven inflation expectations over the period from 2 July 2003 to 31 December 2008 and swap market implied inflation expectations over the period from 2 January 2009 to 1 July 2013.

Source: Bloomberg, Reserve Bank of Australia (RBA) and IPART analysis.

The inflation expectation based on the hybrid approach is slightly higher than the breakeven inflation expectation.

Figure 9.1 Monthly average breakeven inflation expectations and swap market implied inflation expectations



Note: The sample period is from 2 January 1995 to 1 July 2013. The swap market implied inflation is calculated based on a 5-year term-to-maturity from 2 January 2009. For the breakeven inflation expectations, we use the 10-year CGS and indexed bond sourced from the RBA website: www.rba.gov.au/statistics/tables/xls/f02dhist.xls.

Data source: Bloomberg, RBA and IPART analysis.

A How we measure economic uncertainty

In its second quarterly bulletin of 2013, BoE published an article which shows that uncertainty has a negative impact on economic activity.⁵⁹ BoE constructed an indicator of uncertainty using FTSE option-implied volatility, sterling option-implied volatility, dispersion of analysts' earnings forecasts, dispersion of annual GDP growth forecasts, GfK unemployment expectations balance, CBI 'demand uncertainty limiting investment' score and a number of press articles citing 'economic uncertainty'.

We have identified 3 variables that could proxy for economic uncertainty in Australia. These variables are described below.⁶⁰

Constructing an index of economic uncertainty

1. S&P/ASX 200 VIX

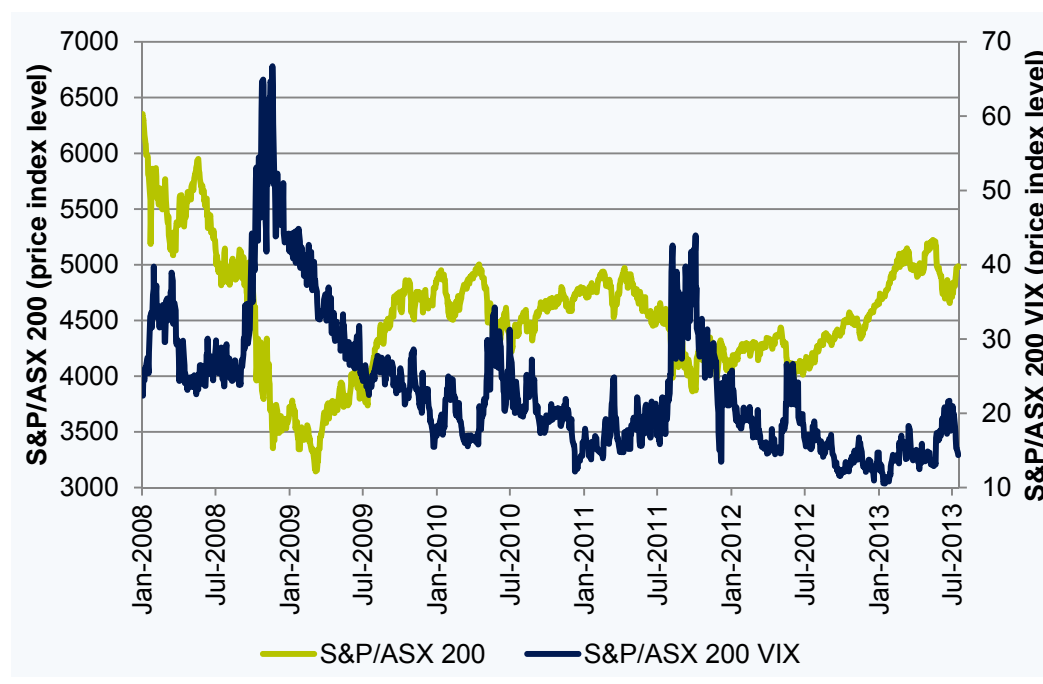
The S&P/ASX 200 VIX is a volatility index that reflects the market's expected volatility in the S&P/ASX 200. The S&P/ASX 200 VIX is used to monitor the expected level of short-term volatility in the Australian stock market. The level of the volatility index implies market expectations of volatility in the S&P/ASX 200 over the next 30 days and provides an indicator of investor sentiment.

A high (low) volatility index generally indicates that the market expects large (little) changes in the S&P/ASX 200 Index over the next 30 days. The level of the volatility index is negatively related to investor sentiment. Hence, when the level of the volatility index is high and the market expects a high volatility, it signals that investor sentiment is pessimistic, and vice versa. Figure A.1 plots the S&P/ASX 200 VIX and the S&P/ASX 200 Index over the period from January 2008 to July 2013, and shows an inverse relationship between the 2 indices.

⁵⁹ BoE (2013) explains how macroeconomic uncertainty matters for the UK economy. It outlines the different ways in which uncertainty can affect real economic activity. It describes the level of uncertainty in the UK and other countries and its evolution during the recent recession. It also explores the extent to which elevated levels of uncertainty can explain the recent weakness in UK activity. It suggests that a better understanding of how uncertainty shocks have affected the UK economy in the recent past is likely to help policymakers assess how future shocks to uncertainty might affect demand and supply prospects. Bank of England, 2013, *Macroeconomic uncertainty: what is it, how can we measure it and why does it matter?* pp 100-109.

⁶⁰ Due to data availability or accessibility, we could not obtain the same set of proxy variables as in BoE (2013).

Figure A.1 S&P/ASX 200 VIX



Data source: Thomson Reuters Datastream.

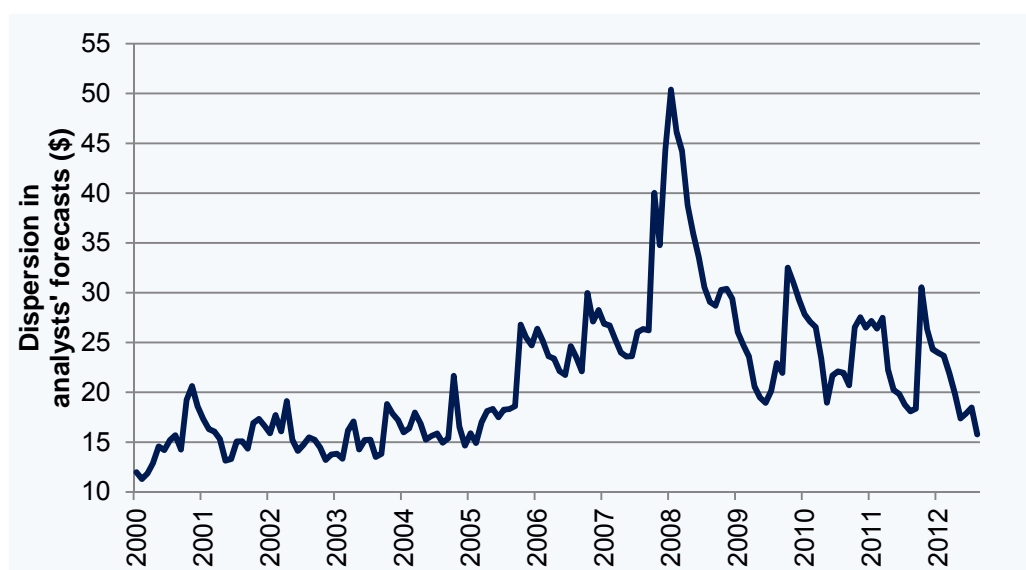
2. Dispersion in analysts' forecasts for companies in the S&P/ASX200 Index

In academic studies, dispersion in analysts' earnings forecasts is widely used as a proxy for the uncertainty about future earnings or the degree of consensus among analysts or market participants (Zhang, 2006; Ramnath et al., 2008).⁶¹ We can obtain dispersion in analysts' earnings forecasts for the companies in the S&P/ASX Index from Thomson Reuters Datastream. Figure A.2 plots the weighted average dispersion in the analysts' EPS forecasts for the next fiscal year for companies in the S&P/ASX 200 Index.⁶²

⁶¹ Zhang, X. F., 2006, "Information uncertainty and stock returns", *Journal of Finance* 61, pp 105-137; Ramnath, S., Rock, S., and Shane, P., 2008, "The financial analyst forecasting literature: A taxonomy with suggestions for further research", *International Journal of Forecasting* 24, pp 34-75.

⁶² We acknowledge that some studies challenge the risk or uncertainty interpretation of analyst forecast dispersion. For example, Trueman (1994) argues that uncertainty could lead to herding behaviour amongst analysts, resulting in a low dispersion in their forecasts. Diether et al. (2002) show that firms with greater dispersion in analysts' earnings forecasts earn lower future returns, inconsistent with dispersion capturing meaningful differences in uncertainty or firm risk. Additionally, Johnson (2004) points out that because an earnings forecast is just a mean expectation, it is possible for all analysts to agree on the mean of the distribution while each is completely uncertain about the future or, alternatively, each analyst could be extremely confident in their estimates (ie, low uncertainty) while differing significantly from each other because of different access to information. Trueman, B., 1994, "Analyst forecast and herding behaviour", *Review of Financial Studies* 7, pp 97-124; Diether, K., Malloy, C., and Scherbina, A., 2002, "Differences of opinion and the cross section of stock returns", *Journal of Finance* 57, pp 2113-2141; Johnson, T., 2004, "Forecast dispersion and the cross section of expected returns", *Journal of Finance* 59, pp 1957-1978.

Figure A.2 Dispersion in analysts' forecasts



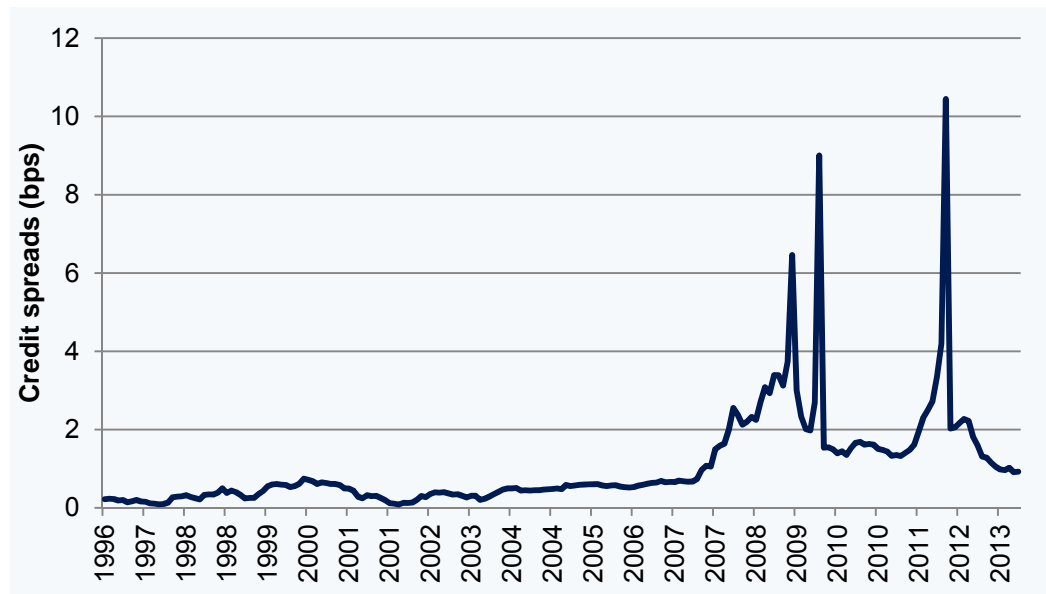
Data source: Thomson Reuters Datastream.

3. Credit spreads

Credit spreads refer to a difference in yields between different securities due to different credit quality. When investors are more risk averse, they require a higher risk premium for holding risky assets. Hence changing risk aversion will change the MRP and also affect credit spreads. Tang and Yan (2010) demonstrate that credit spreads decrease with investor sentiment as measured by the Conference Board Consumer Confidence Index.⁶³ Because consumer/investor sentiment is usually negatively correlated with the market-wide risk aversion and uncertainty about future economic growth, this implies that the credit spreads depend on investors' risk attitude and uncertainty about future economic prospects. In the Australian context, the credit spreads can be calculated as the difference between the UBS Australian all maturities credit yield and UBS Australian Treasury all maturities yield on a monthly basis. Figure A.3 shows monthly average credit spreads from August 1996 to June 2013.

⁶³ Tang, D. Y., and Yan, H., 2010, "Market conditions, default risk and credit spreads", *Journal of Banking and Finance* 34, pp 743-753.

Figure A.3 Credit spreads



Note: The sample period is from August 1996 to June 2013.

Data source: Thomson Reuters Datastream and IPART analysis.

Information content of the 3 proxies

Table A.1 summarises the information content of the 3 proxies for economic uncertainty.

Table A.1 Information content of the 3 proxies

	High value	Low value
S&P/ASX 200 VIX	High uncertainty	Low uncertainty
Dispersion in analysts' forecasts	High uncertainty	Low uncertainty
Credit spreads	High uncertainty	Low uncertainty

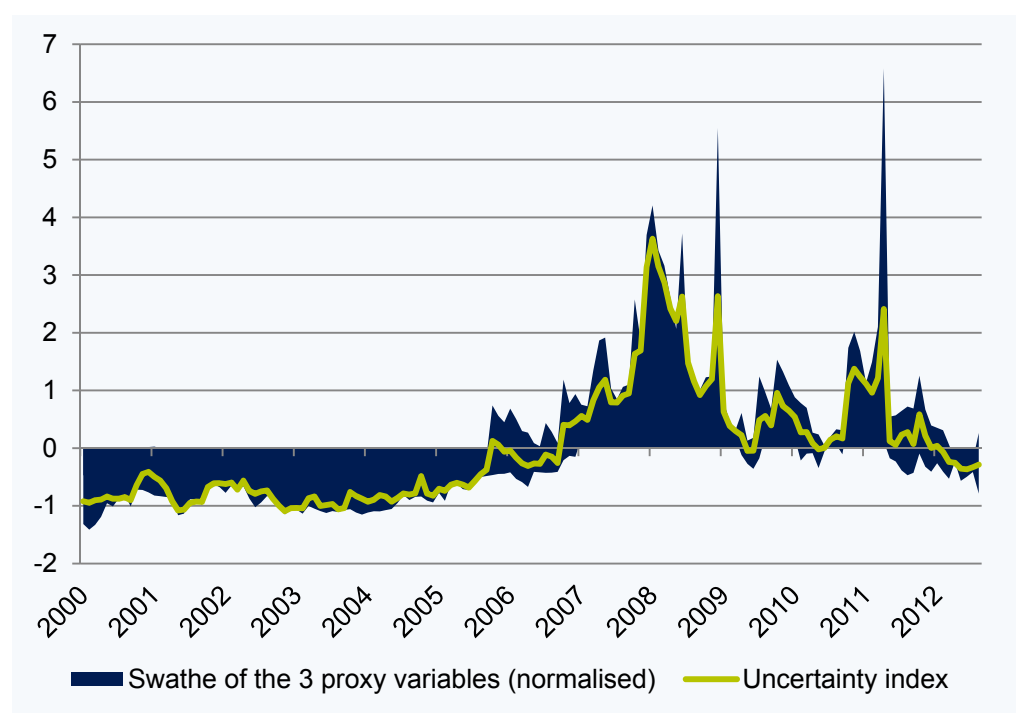
Constructing an indicator of economic uncertainty

Following BoE (2013), we construct our uncertainty indicator using a statistical technique called principal component analysis (PCA). The PCA is a way of identifying patterns in data and expressing the data in a way which highlights their similarities and differences. Using this method, we combine the 3 uncertainty proxy variables and extract a single variable, called a principal component, which explains most of the variation in the original set of the 3 uncertainty proxy variables.

The uncertainty index resulting from the PCA analysis is shown in Figure A.4, represented by a green-coloured line. Each of the 3 uncertainty proxy variables is strongly correlated with the newly constructed uncertainty index (Table A.2). The uncertainty index has a mean of 0 and the standard deviation of 1.

Figure A.4 shows that, prior to the GFC, the level of Australian economic uncertainty was close to or below its average for a prolonged period. However, consistent with our expectation, the Australian economy seemed to have received a number of uncertainty shocks during the GFC and recent Eurozone crisis.

Figure A.4 A time-series of the uncertainty indicator



Data source: Thomson Reuters Datastream and IPART analysis.

Table A.2 Correlation with first principal component excluding confidence indices

Uncertainty measure	Correlation with first principal component (November 2000 to June 2013)
S&P/ASX 200 VIX	0.93
Dispersion in analysts' forecasts	0.92
Credit spreads	0.81

Source: Thomson Reuters Datastream and IPART analysis.

Why economic uncertainty is relevant to our WACC decision

This section explains how we intend to use the uncertainty index in Stage 2 of our WACC decision framework (Figure 7.1). In the interim decision, we decided that we would choose the midpoint WACC by default unless there was strong contrary evidence suggesting otherwise. In our draft decision, we use the uncertainty index as a factor in assessing the appropriateness of our default position (ie, midpoint WACC).

In general, we would expect that overall cost of capital increases with economic uncertainty. Several studies provide evidence which shows that a high degree of economic uncertainty indeed increases the cost of capital. Gilchrist et al. (2010) show that fluctuations in macroeconomic uncertainty are associated with a significant movement in corporate credit spreads, and this subsequently affects corporate investment dynamics.⁶⁴ Further, the OECD report (2013) shows that the GFC increased the vulnerability of the entire financial system and, as a result, corporate bond yields spiked and the equity risk premium rose. The rise in the cost of capital and extreme uncertainty caused delays in and cancellation of investment projects.⁶⁵

We have constructed the index to provide a theoretically sound and quantitative proxy for economic uncertainty. Including this index in the information we consider will help improve the robustness and transparency of our decision-making.

How we intend to use the uncertainty index

We will apply the index of economic uncertainty to our WACC determination as follows. If the index:

- ▼ exhibits a sharp spike above zero, we will consider selecting a point estimate above the midpoint WACC
- ▼ is at or around the mean of zero, we will use our default position of the midpoint WACC
- ▼ exhibits a sharp spike below zero, we will consider selecting a point estimate below the midpoint WACC.

We will take into account additional financial market information to decide the extent to which we move away from the midpoint WACC. We will consider any value within the WACC range as a possible choice for a point estimate.

⁶⁴ Gilchrist, S., Sim, J., and Zakrajsek, E., 2010, "Uncertainty, financial frictions, and investment dynamics", Working paper, *Boston University and Federal Reserve Board*, p 11.

⁶⁵ OECD, *The role of banks, equity markets and institutional investors in long-term financing for growth and development – report for G20 leaders*, February 2013, p 10.

