IPART
New South Wales

Independent Pricing and Regulatory Tribunal

WACC methodology

Research — Interim Report
June 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 26 July 2013.

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

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

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

If you would like further information on making a submission, IPART's submission policy is available on our website.

Contents

1 Executive summary

1.1 Introduction

This is an interim report of our review of the Weighted Average Cost of Capital (WACC) methodology. We have applied the interim views outlined in this report in the final price decisions for Gosford City Council, Wyong Shire Council and Hunter Water Corporation, and regulated retail supply of gas and electricity.

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 overinvestment and result in prices that are too high.

Our WACC methodology worked well from early 2000 until 2008/09, as financial market conditions were fairly stable in Australia. However, since the GFC, market conditions have been much more uncertain and volatile. For example, in the past 2 years, the midpoint of this range fell from 6.0% to 3.5%.[1] The gap between the expected costs of debt and equity also narrowed. This has prompted us to initiate a review of our WACC methodology and we released a discussion paper in December 2012.[2] Our review focused on 4 aspects of our approach:

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 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 reduce regulatory uncertainty?

Our discussion paper indicated that we would release a final decision after considering comments from stakeholders. Due to the complexity of this review, we have decided to release this interim report to coincide with our current round of energy and water reviews. Submissions on this interim report are due on 26 July 2013. We will release a draft decision on the WACC methodology in September 2013 and provide stakeholders with the opportunity to provide us

1 This is the midpoint estimate of our WACC at the end of November 2012 using our standard assumptions of a MRP of 6%, 60% gearing and an equity beta midpoint of 0.7.

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

with additional submissions. We will release our final decision in December 2013.

1.2 Summary of interim decision

Objective for setting the WACC

Under our interim decision, our objective for setting the WACC is to set an efficient product price for a benchmark firm operating in a competitive market and facing similar risks. We conclude 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.

WACC methodology

Our interim WACC methodology is summarised in Box 1.1. We used this interim methodology in the recent price decisions for water supply in the Hunter and Central Coast and the final electricity and gas retail prices decision.

Box 1.1 Interim decision on WACC methodology

1. Estimate a WACC range based on current market data with a 40-day averaging period.
2. Estimate a WACC range based on long-term averages with a 10-year averaging period.
3. Establish a WACC range using the midpoints of these 2 WACC ranges (in Steps 1 and 2). The midpoint WACC, the average of the upper and lower bound of the WACC range, is the default WACC point estimate.
4. Having regard to relevant financial market information, assess the appropriateness of the default WACC point estimate (ie, whether a WACC point estimate should be above, below or at the midpoint WACC within the range).

Section 3.3.2 explains how we estimate the market-based parameters (Steps 1 and 2 in Box 1.1) under our interim approach.

Internal consistency test of WACC parameters

Our interim decision is to continue to conduct the internal consistency test of cost of capital parameter estimates. The purpose is to ensure that the regulatory cost of debt is lower than the regulatory cost of equity.

Managing uncertainty in WACC decision

Our interim decision is that we will use additional financial market information in assessing the appropriateness of the midpoint WACC. While we consider that allowing a certain level of discretion in the choice of the WACC would yield a better WACC estimate, it could potentially increase uncertainty in our WACC decision. To address this concern, we have specified:

1. that the midpoint of the range will be the default value for the WACC
2. that strong evidence will be needed to support an alternative value for the WACC
3. the financial market information and evidence we will consider in determining the WACC.

In this report we have presented our current view on how we will use financial market information as part of our WACC determination framework. Further, we also consider that it may be valuable to release periodic updates on our view on the WACC.

The remainder of this report:

- provides context to this report (Section 2)
- explains our interim decision (Section 3)
- summarises submissions we received from stakeholders and our responses (Section 4)
- describes our WACC determination framework (Section 5)
- provides details on what further work we intend to do before we release our draft decision in September 2013 (Section 6).

2 Context

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 overinvestment and result in prices that are too high.

Our WACC methodology worked well from early 2000 until 2008/09, as financial market conditions were fairly stable in Australia. However since the GFC, market conditions have been much more uncertain and volatile. For example, in the past 2 years, the midpoint of this range fell from 6.0% to 3.5%.[3] The gap between the expected costs of debt and equity also narrowed. This has prompted us to initiate a review of our WACC methodology and we released a discussion paper in December 2012.[4]

We received 6 submissions in response to this paper, and held a workshop to discuss the issues and way forward for the review of the WACC methodology. After the workshop, we received 3 additional submissions.

The submissions and the workshop identified a number of areas where further work is required before we can make a final decision on our WACC methodology. We agree with our stakeholders that it is not feasible to move to a final decision on the review at this point in time.

At the same time, we acknowledged that it is important to ensure that we set the WACC in our current water and electricity retail prices based on our best view of the WACC at that point in time. Therefore, we have decided to release this report which sets out the approach adopted in our recent water and energy decisions. This interim report also updates stakeholders on the progress of the review so far.

2.1 Previous WACC methodology

The WACC methodology that we used prior to this review involved the following 3 steps:

1. Estimating a range for the expected cost of debt using current market data with a 20-day averaging period to calculate the risk-free rate and the debt margin.
2. Estimating a range for the expected cost of equity based on the Capital Asset Pricing Model (CAPM). We used a market risk premium (MRP) estimate based on historical data as a proxy for the expected MRP and current market data with a 20-day averaging period to calculate the risk-free rate.
3. Establishing a feasible range for the WACC using the ranges for the cost of equity and the cost of debt given a chosen level of gearing. In recent decisions, we have selected a point within this range having regard to the long-term averages for the costs of debt and equity.

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3 This is the midpoint estimate of our WACC at the end of November 2012 using our standard assumptions of a MRP of 6%, 60% gearing and an equity beta midpoint of 0.7.

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

2.2 This report

This report documents our interim decisions on the review of our WACC methodology. In coming to our interim decision, we considered the comments and evidence presented by stakeholders, and conducted our own analyses on the issues identified in submissions and at the workshop. We also sought advice from SFG Consulting on the alternative methods for estimating the MRP. Their advice to us is attached at Appendix A.

2.3 Submissions and stakeholder consultation

All stakeholders and interested parties are invited to make submissions in response to this interim report and the attached report by SFG. These submissions are due on 26 July 2013. Details on how to make a submission can be found on page iii, at the front of this paper. We will take stakeholders' submissions into account in our draft decision. We will also allow enough time between our draft report and the submissions due date to conduct another workshop.

2.4 Next steps

Our discussion paper indicated that we would release a final decision after considering comments from stakeholders. However, submissions and the workshop identified a number of areas where further work is required before we can make a final decision on our WACC methodology. We changed the timetable for this review to allow additional time for further research and analysis of stakeholders' submissions.

Table 2.1 outlines our revised timetable for completing the review.

Table 2.1 Timetable for review

Milestone	Timeframe
Release discussion paper	21 December 2012
Submissions on discussion paper due	15 March 2013
Workshop	25 March 2013
Release interim report	17 June 2013
Submissions on interim report due	26 July 2013
Release draft decision	September 2013
Submission on draft report due	October 2013
Release final decision	December 2013

3 Interim decision

3.1 Objective for setting the WACC

Our objective for setting the WACC is to set a value that reflects the efficient cost of capital for a 'benchmark entity'.

Our regulatory framework is one of incentive regulation to promote efficient service provision and efficient pricing. Consistent with this, in determining the WACC used in our price setting process, we aim to set a value that reflects the efficient cost of capital for a **'benchmark entity'**. That is, the WACC needs not reflect the actual financing decisions for a business under its existing structure and ownership. As with other costs, our objective is to determine an efficient benchmark cost. We discuss our interim decision on the characteristics of our benchmark entity in Section 3.2.

This objective for determining the WACC is consistent with the matters we must consider in making pricing decisions, set out under section 15 of the IPART Act.[5] It is also consistent with a goal of enhancing the long-term interest of consumers through efficient investment in and the commercially sustainable provision of efficient services.

We note that in establishing our methodology for setting a WACC in line with our objective, we also need to ensure the method is consistent with the broader principles of regulation. That is, the method should be:

- transparent
- predictable
- consistently applied over time and between utilities
- as simple as possible.

3.2 Benchmark entity

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.

Our interim decision is that, in determining the WACC used in our price setting process, our objective should be to reflect the efficient cost of capital for a benchmark firm that operates in a competitive market and faces similar risks to the regulated business subject to our decision.

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5 Not all of IPART's determinations are made under the IPART Act. For example, bus determinations are made under the *Passenger Transport Act 1990*. However, the requirements that affect the determination of the rate of return are similar.

There are 2 components to the benchmark definition. The first is that a firm operates in a competitive market and the second is that it faces similar risks to the regulated business. The competitive benchmark guides our thinking on the relevant financing strategies and how we consider current market rates and longer term averages. The benchmark of similar risks is particularly important in estimating the beta and gearing ratio from observations of comparable businesses. We understand that in practice, many of the businesses that have similar systematic risks are regulated businesses, but using this data is not inconsistent with our benchmark.

This is a change from our discussion paper where we proposed to use the test of the cost of capital for a new entrant in a competitive market. We found that the benchmark cost of debt for an efficient firm operating in a competitive market is consistent with the objective of efficient pricing and is more readily observable and independent of the specific form of regulation chosen. Being based on the efficient cost of capital for a broad pool of firms, we consider that it is also consistent with the reasonable expectations of the asset owners and the long-term interests of consumers. As set out below, we consider that the use of this benchmark is consistent with a WACC that is set with regard to both current market data and long-term averages

3.3 WACC methodology

3.3.1 Establishing a WACC range

IPART's interim decision is 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 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.

Section 3.3.2 provides more detail on how we estimate the market-based parameters in Steps 1 and 2 under the interim approach.

Step 1 is similar to our previous WACC methodology in that the estimated cost of capital reflects current market data. But, there are 2 major differences:

1. Under our interim approach, the proxy for the expected MRP used to estimate the expected cost of capital using current market data is Bloomberg's daily estimate of the implied MRP averaged over 40 days. The implied MRP estimate changes over time. Under our previous approach, we used a fixed MRP range of 5.5% and 6.5% based on the historical arithmetic average as a proxy for the expected MRP to estimate the expected cost of capital using current market data.
2. The market-based WACC parameters (ie, risk-free rate, inflation rate, debt margin and Bloomberg's daily estimate of the implied MRP) are averaged over 40 days. Our previous methodology used an averaging period of 20 days. We decided to increase the averaging period from 20 days to 40 days based on our consultation with local banks. The banks commented that an increase in the short-term regulatory averaging period from 20 to 40 days may be sufficient to address the potential concerns that the utilities we regulate are not able to access the swap market without shifting the market within the 20-day period. This advice was conditional on the total size of the debt of utilities subject to a single determination.

We have applied the interim WACC methodology outlined in this report in the final price decisions for Gosford City Council, Wyong Shire Council and Hunter Water Corporation and regulated retail supply of gas and electricity.

3.3.2 Market-based WACC parameter estimation

Table 3.1 sets out how we estimated the market-based parameters in the 2013 water price reviews. We used a target term-to-maturity of 5 years to estimate the cost of debt based on advice by Professor Kevin Davis[6] Professor Davis suggested that, for regulatory price reviews using a building block approach, a target term-to-maturity should match a regulatory period of 5 years in order to achieve NPV-neutrality over the regulatory period.[7]

Table 3.2 presents how we estimated the market-based parameters in the 2013 electricity an gas retail prices review. We used a target term-to-maturity of 10 years. This reflects the expected life of the assets and financing practices of competitive businesses with long-lived assets. Given that we were estimating the WACC for competitive businesses, the regulatory period was not a relevant consideration. Adopting the 10-year term-to-maturity is consistent with previous electricity price review in 2010 and the subsequent annual updates.

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6 Professor Kevin Davis, *Determining debt costs in access pricing*, December 2010.

7 We note that the 5-year term-to-maturity was also used for the CityRail and Sydney Ferries price reviews in 2012.

Table 3.1 Parameter estimation for water industry decision

Parameter	Expected cost of capital using current market data	Expected cost of capital using long-term averages
Risk-free rate	▾ 40-day average of 5-year Commonwealth Government bond yield	▾ 10-year average of 5-year Commonwealth Government bond yield
Inflation	▾ 40-day average of swap market implied inflation with a 5-year term-to-maturity	▾ Breakeven inflation[a] from bond markets using 10-year term-to-maturities averaged over 10 years
Debt margin	▾ Our current bond portfolio and the 5-year Bloomberg fair value curve	▾ 10-year average of 5-year Bloomberg fair value curve
MRP	▾ 40-day average of the implied MRP from Bloomberg	▾ Historical arithmetic average MRP of 5.5-6.5%

[a] The breakeven inflation is derived based on the Fisher equation where inflation rate = (1+nominal rate)/(1+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.

Table 3.2 Parameter estimation for regulated retail supply of gas and electricity

Parameter	Expected cost of capital using current market data	Expected cost of capital using long-term averages
Risk-free rate	▾ 40-day average of 10-year Commonwealth Government bond yield	▾ 10-year average of 10-year Commonwealth Government bond yield
Inflation	▾ 40-day average of swap market implied inflation with a 10-year term-to-maturity	▾ Breakeven inflation from bond markets using 10-year term-to-maturities averaged over 10 years
Debt margin	▾ Our current bond portfolio and the 7-year Bloomberg fair value curve	▾ 10-year average of 7-year Bloomberg fair value curve
MRP	▾ 40-day average of the implied MRP from Bloomberg	▾ Historical arithmetic average MRP of 5.5-6.5%

3.3.3 Default WACC

IPART's interim decision is to use the midpoint WACC as a default and assess the appropriateness against a set of different financial market information.

When we choose a point estimate for the expected WACC within the feasible range, we will have regard to current market conditions and long-term averages. Our interim decision is that unless there is strong contrary evidence, we will allocate equal weights to the information obtained from current market data and long-term averages, and hence select a midpoint of the WACC range as a default WACC point estimate.

We will test the appropriateness of this point estimate against relevant financial market data and other information. The use of transparent financial market information may provide evidence to justify use of the midpoint or a move above or below the midpoint in volatile or unusual market conditions. We discuss the use of financial market information in more detail in Section 6.2.

3.3.4 Internal consistency of cost of capital parameter estimates

IPART's interim decision is to test if the regulatory cost of debt is lower than the regulatory cost of equity in our WACC determination.

We will continue to conduct the internal consistency test of cost of capital estimates. The purpose is to verify whether 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.

In the event of bankruptcy, bondholders are paid before shareholders, and therefore 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 longer 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, an estimate of the expected return on equity based on current data is combined with a longer term average for debt costs. Our interim decision is that we will conduct the internal consistency test to ensure that the cost of equity and the cost of debt estimates are economically sensible.

3.4 Analysis of the interim WACC methodology

3.4.1 Why do we consider both current market data and long-term averages in determining the WACC?

The use of the benchmark of an efficient entity operating in a competitive market and facing similar risks focuses our attention on the following questions:

- How are target rates of return used in investment decisions formed and adjusted over time?
- What are the financing strategies of such firms?

Based on the consultations we have conducted for our WACC review to date, we have formed a view that an efficient financing strategy is likely to be based on a mix of current market rates and historical averages:

- Expectations about the target rates of return that are used in investment decisions are likely to be influenced by historical rates, but prevailing rates will be used to finance investments. When making investment decisions, firms would evaluate how much they expect to earn from a new investment relative to how much they expect to pay for servicing debt and equity. We consider that firms considering investment in long-lived assets would form these expectations based on their experience of historical returns, particularly when there is a large discrepancy between currently available rates and historical rates. Firms may compare the historical rates with the prevailing rates and decide to engage in market-timing to obtain more attractive rates by deferring or advancing their investments. When firms decide to go ahead with their investments, they will be financed at the prevailing rates.
- Using a cost of debt that has regard to both current rates and longer term averages is consistent with the outcome of financing strategies of unregulated businesses. Business financing strategies need to be sufficiently flexible to adjust to changing conditions in financing markets and product markets while also seeking to minimise financing costs over time. In practice, the resulting financing strategies employ a mix of different instruments: floating rate debt, fixed rate debt, locally issued debt, offshore debt, currency swaps, interest rate swaps and hybrid debt/equity securities. This conclusion is supported by the observation that there are active markets in all these forms of securities that are accessed by a wide range of companies. As a result, the effective interest cost of an unregulated business is likely to be a mix of current and past interest rates. However, the weighting of each and the maturity structure of debt will not be constant over time. Financing strategies and the composition of debt portfolios will vary as businesses respond to opportunities offered by current interest rates, expectations of future rates, and current and future financing needs.
- Using a cost of equity that is based on both current market data and long-term averages is consistent with estimates of the cost of equity by independent experts. Currently, many independent expert reports incorporate adjustments to partially offset the current low risk-free rates or alternatively use an estimate of the market risk premium based on current market data.[8]

[8] Focus Minerals Ltd, *Notice of Annual General Meeting*, 23 October 2012; Regis Resources, Meeting Booklet, 9 November 2012; Talison Lithium, *Scheme Booklet – Part 1*, 26 October 2012; Endocoal, *Scheme Booklet – Attachment F*, 29 January 2013; Grant Thornton, *Norton Gold Fields Limited – Independent Expert's Report and Financial Services Guide*, 13 July 2012; Grant Thornton, *Republic Gold Limited – Independent Expert's Report and Financial Services Guide*, 13 September 2012.

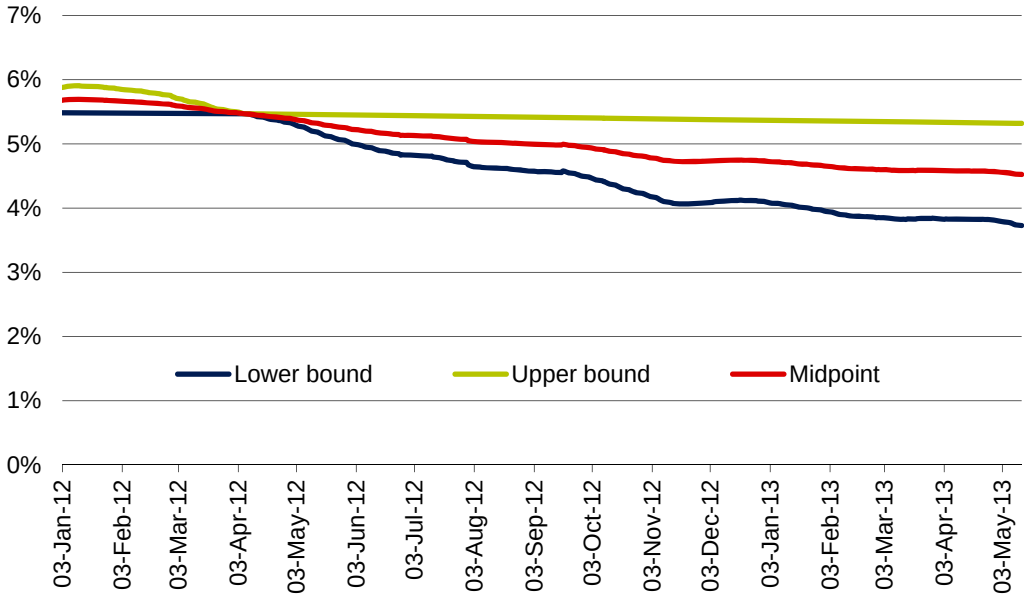
- Market analysts often adopt a similar approach. The assumptions they use in assessing companies commonly reflect long-term views but are adjusted when there are more sustained variations from current rates. Similarly, we understand that target rates of return that firms typically use in evaluating investment decision are relatively stable. While they may be adjusted from time to time in response to current rates, they are strongly influenced by long-term averages and expectations.

3.4.2 Comparison: IPART's previous WACC methodology versus interim decision

Figure 3.1 shows the historical WACC range and midpoint under our interim WACC approach. We note that the width of the WACC range under the interim decision changes over the period. From January 2012 to March 2012, we observe a narrow WACC range. In April 2012, we do not have a WACC range as the midpoints of the WACCs using the 40-day averages and long-term averages temporarily converge. The WACC range becomes wider in the more recent period.

We do not consider that the variation in the WACC range is a problem per se as it may reflect changing degrees of market uncertainty.

Figure 3.1 WACC range and midpoint under the interim decision

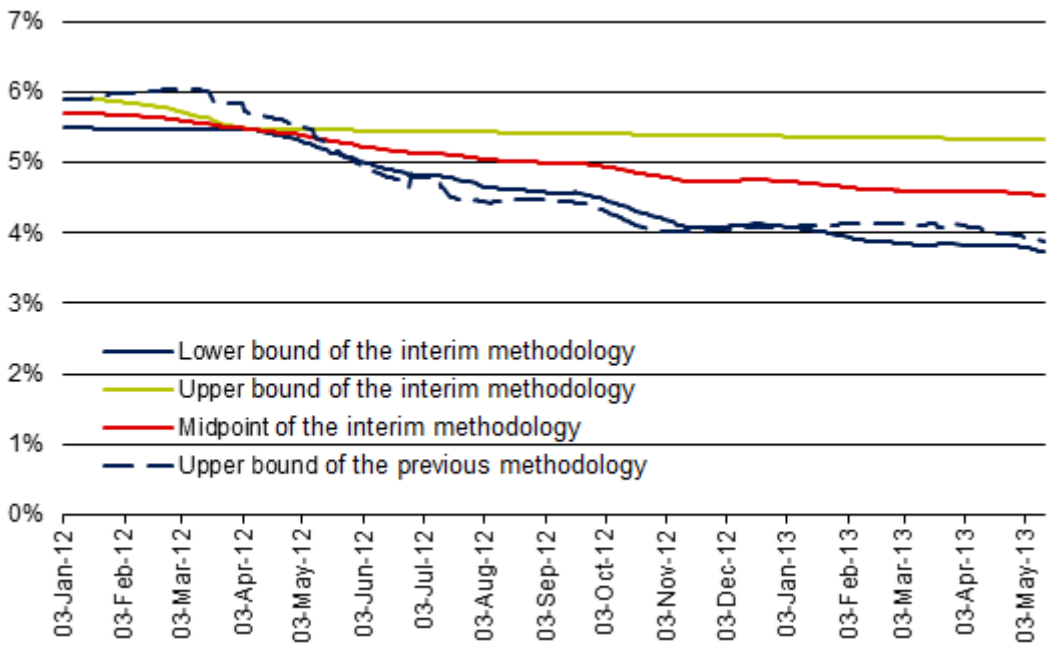


Note: WACCs are based on the gearing assumption and equity beta for water industry (ie, gearing = 60% and equity beta 0.6-0.8)

Data source: Bloomberg, IPART. From 3 January 2012 to 13 May 2013.

In the pricing decisions made before the release of our discussion paper in December 2012, IPART recognised the material difference between the WACCs using the current market data and long-term averages by choosing the upper bound of the WACC range (eg, 2012 Sydney Water Corporation and Sydney Catchment Authority, CityRail and Sydney Ferries decisions). Figure 3.2 compares the upper bound of the WACC range under our previous approach and the WACC range and midpoint under our interim approach. The upper bound of the WACC range under the previous methodology remains below midpoint WACC under the interim decision since May 2012.

Figure 3.2 Interim decision compared to previous methodology



Note: WACCs are based on the gearing assumption and equity beta for water industry (ie, gearing = 60% and equity beta 0.6-0.8)

Data source: Bloomberg, IPART. From 3 January 2012 to 13 May 2013.

3.4.3 Regulatory precedent in having regard to current and historical data

In this section, we document a recent UK regulatory precedent in having regard to current market data and long-term averages in determining the WACC.

Box 3.1 Cost of capital for UK designated airports[9]

PricewaterhouseCoopers's (PwC) were commissioned by the Civil Aviation Authority (CAA), of the United Kingdom (UK) to estimate the WACC for UK airports, as part of the 2013 (Q6) price review. In its draft determination, *'Economic regulation at Heathrow from April 2014: initial proposals'*, the CAA did not adopt all the recommendation of the PwC report.

PwC recommended different approaches to estimate the cost of debt and the cost of equity. For the cost of debt, PwC recommended adopting a notional debt financing structure which is partly based on company specific financing arrangements and partly on benchmark debt. The notional cost of debt is calculated using the cost of new debt and embedded debt, where embedded debt is the cost of existing fixed rate debt raised in prior regulatory periods and new debt is the debt which will be raised in the next regulatory period.

PwC proposed determining overall cost of equity using the historical approach (ie, analysing historical equity returns over 100 years) and forward-looking approaches (ie, analysing equity returns based on Gordon Growth Model, which is a subset of the dividend discount model, DDM). PwC's analysis indicated that both approaches indicated a reduction in total equity market returns. PwC considered the market risk premium (MRP) to be a forward-looking concept (ie, 'expected' MRP). However, they noted that while in practice both historical and forward-looking approaches are used to estimate a proxy for the expected MRP, an estimate based on the historical approach is often used as a proxy for the expected MRP estimate.

The CAA noted PwC's analysis regarding the risk-free rate and the MRP and concluded that current market rates were not significantly different from long-run market rates. The CAA further noted PwC's estimated range for the current cost of debt. The CAA took the top end of this range and revised it after considering a blended cost of debt arising from a notional debt portfolio comprising current and embedded debt. The CAA compared PwC's cost of debt estimate with that determined by other UK regulators between 2008 to 2013 and reached a view that PwC's cost of debt estimate was consistent with the general decline in the cost of debt. The CAA noted that the cost of debt determined by UK regulators did not reflect the actual debt financing practices of utilities, but rather a notional financing structure composed of both company specific and general market data.

9 PWC, *Estimating the cost of capital in Q6 for Heathrow, Gatwick and Stansted – A report prepared for the Civil Aviation Authority (CAA),* April 2013.

4 Submissions from stakeholders and our response

In this section, we summarise submissions that we received on the review of the WACC methodology discussion paper and discuss how our interim decision addresses the submissions.

We received submissions from the following stakeholders:

- Australian Rail Track Corporation (ARTC)
- EnergyAustralia
- Hunter Water Corporation (HWC, 2 submissions)
- Origin Energy (Origin)
- Sydney Catchment Authority (SCA, 2 submissions)
- Sydney Water Corporation (SWC, 2 submissions).

4.1 Objectives of setting the WACC

4.1.1 Submissions

Stakeholders submitted their views on what should be the objectives of setting the WACC:

- HWC commented that to provide a fair outcome to consumers, the allowed cost of debt must be approximately equal to the actual cost of debt within the regulatory period with the actual cost of debt being that which results from prudent, proven and efficient debt management practices. They argued that a NPV neutral principle (ie, setting the WACC that exactly matches the expected capital costs of a benchmark entity) is necessary but not sufficient to meet the regulatory objectives of consumers.
- SCA stated that adopting an efficient benchmark approach is consistent with an incentive-based regulatory system. But, they commented that we need to ensure the allowed returns for a hypothetical benchmark firm are reasonable for actual firms making real investment. In this regard, they suggested several methodologies[10]. They also noted that we should aim to achieve 'internal consistency' in that approaches to estimating WACC parameters are consistent with one another and based on sound economic principles.

[10] These include: i) cross-checking estimates using different methods, estimation techniques and market data, ii) engagement with key stakeholders to seek view on the reasonableness of regulatory determinations, and iii) financeability tests.

4.1.2 IPART's response

As discussed in Section 3.2, we consider 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 limit a firm's ability to exercise market power, while maintaining the productive efficiency of a natural monopoly.

Our interim WACC determination process includes assessing the appropriateness of our WACC estimate against a set of additional financial market information. This process is expected to ensure the returns determined for a hypothetical benchmark firm are reasonable given the risks and opportunity costs faced by potential investors in the actual business (refer to Section 5 for more details).

Our interim WACC methodology also ensures internal consistency of WACC parameter estimates since:

- We adopt the same methods to estimate the costs of debt and equity by using either prevailing rates or long-term averages.
- We conduct an 'internal consistency test' of the cost of capital parameters estimates, which is designed to verify whether the regulatory cost of debt is lower than the regulatory cost of equity.

These objectives are largely consistent with those proposed in submissions except that we do not consider that the benchmark for the cost of debt should necessarily reflect the preferred financing strategy of the regulated entity. We consider that consistent with the overall approach to incentive regulation, we should set a WACC that reflects achievable efficient costs.

4.2 Benchmark entity

4.2.1 Submissions

Stakeholders commented on the appropriateness of our view that in setting the WACC, we would use the benchmark cost of capital for an efficient firm that faces similar economic risks to the regulated business and is a new entrant. SWC submitted that it did not consider the new entrant to be an appropriate benchmark and argued that the objective should be to minimise any distortions in efficient financing practices.

In their subsequent submission after the workshop on 25 March 2013, SWC again argued that setting the WACC for a new entrant means that firms refinance all debt within a very short time period at each regulatory reset, which is inconsistent with efficient hedging practices and potentially distorts efficiency of utilities' capital raising practices.

At the workshop, stakeholders raised the question as to whether our benchmark is a regulated firm or a firm operating in a competitive market. The latter is consistent with the view that in pursuing economic efficiency, regulators should seek to mimic outcomes of competitive markets.

4.2.2 IPART's response

We note stakeholders' comments that setting the WACC for a firm in a competitive market may not reflect utilities' actual financing practices or an efficient financing strategy, especially with respect to the cost of debt. As noted above, we do not consider that the objective in setting the WACC is to mimic the preferred debt strategy of the entity being regulated. Our concerns are to set a benchmark cost of capital that is consistent with our overall objectives in setting regulated prices. These objectives include:

- efficiency including promotion of efficient investment
- protecting long-term interests of consumers through avoidance of monopoly rents, commercially sustainable revenue streams that facilitate the provision of adequate, safe and reliable services and price stability
- providing revenue streams that allow for reasonable dividends, sustainable financing strategies, and adequate revenue stability.

In coming to our position, we considered 3 potential benchmarks: an efficient regulated utility, a new entrant, and a benchmark utility operating in a competitive market.

Efficient regulated utility

Stakeholders submitted that the benchmark should be the cost of capital for an efficient regulated entity. They further submitted that the costs of financing for a regulated entity can be minimised by raising funds through long-term fixed rate bonds and not entering into swaps to manage potential interest rate variations. This avoids the transaction costs associated with swaps. Utilities argued that an average of historical debt costs updated annually would allow the recovery of these costs and align the debt component of the cost of new investment to current rates. Submissions also argued that if the cost of debt is based on a long-term average, the cost of equity should be calculated with reference to a forward-looking MRP based on a long-term historical time-series.

Firstly, we consider that the lowest cost financing strategy is not necessarily the most efficient. An efficient financing strategy will reflect an optimisation, for example, of cash flow risks and interest costs.

Secondly, the optimal financing strategy for a regulated utility depends on the benchmark WACC assumptions used by the regulator. For example, the efficient, or optimal, debt strategy for a regulated utility will depend on the benchmark used by the regulator for the cost of debt. Hence privately owned energy utilities use swaps to lock in the current risk-free rate at a determination to match the risk-free rate used by the regulator.

New entrant

Submissions expressed concern that the new entrant test was a hypothetical test that was not relevant to a regulated utility. Furthermore, SWC's consultant NERA argued that, to the extent it resulted in using current rates to determine the WACC, it was inconsistent with the fact that the existing assets were not re-valued to the cost of new assets and requirements for new entrants.

In theory, the cost of capital for a new entrant would be based on the current cost of debt and equity as the benchmark and in turn prices in competitive markets would be determined by the costs of the new entrant. In our discussion paper, we considered that in practice, hurdle rates of return and investors' return expectations may reflect a mix of current rates and longer term averages of the cost of debt. This may reflect a degree of rigidity in the formation of expectations and the consideration of future financing costs, given that the asset lives are significantly longer than the maturity of debt. Similarly, for the cost of equity, the new entrant raises equity at current market prices.

However, we agree that because new entry is rare in practice it is difficult to infer the efficient financing strategy for a new entrant from observed behaviour.

A benchmark utility operating in a competitive market

Having a benchmark utility operating in a competitive market should aim to produce an efficient price, which is the outcome of a competitive product market. This recognises that:

- There is a strong information asymmetry between regulators and utilities, and thus the best reference to efficiency is a competitive market.
- If the benchmark cost of capital for firms facing similar risks differs between competitive and regulated markets, it can distort relative prices in product markets and hence allocative efficiency.
- While utilities' product markets may not be competitive, the markets for their inputs usually are, including capital markets.

- Outcomes in competitive markets do not lead to automatic or smooth matching of costs and revenues. For firms in competitive markets, there are periods of prosperity (over-recovery) and periods of poor performance (under-recovery). Rather, competitive markets create incentives to strive for lower costs and to capitalise upon opportunities to reset costs (including the cost of capital) to lower levels. In doing so, firms would engage in market-timing when making financing decisions by comparing the current rates with historical levels and decide whether or not to issue new debt and equity at the prevailing rates. A number of studies document evidence of market-timing. On the debt side, Graham and Harvey (2001) show that managers attempt to time interest rates by issuing debt when they feel that market interest rates are particularly low.[11] Barry et al. (2008) show that historical interest rates have significant impact on debt issuance.[12] When current interest rates are low relative to past levels, firms tend to issue more debt. On the equity side, evidence shows that firms are likely to issue equity in lieu of debt when market value of equity is high relative to book value and past market values, and repurchase equity when market value is low (for example, see Baker and Wurgler, 2002)[13].

Conclusion

Overall, we consider that the best approach would be to reflect how an efficient firm in practice would finance its operations in a competitive product market. While we do not consider the new entrant or the efficient regulated utility to be an appropriate objective, we acknowledge that they do have a role in capital market decisions.

We consider that the benchmark of the efficient competitive firm facing similar risks meets the regulatory objectives set out above of efficiency, the long-term interests of consumers and the reasonable commercial interests of the service provider. At the margin, it may meet the objectives of efficiency better than the alternatives because it reduces the possible distortions in relative pricing in the product markets. This benchmark is also more practical than the alternatives considered. It avoids the circularity in using the regulated firm as the benchmark where the efficient financing strategy depends on the benchmarks actually used for the cost of debt. It is more readily observable than the cost of capital for the new entrant, since the new entrant may be relatively rare or hypothetical.

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11 Graham, J., and Harvey, C., 2001, *The theory and practice of corporate finance: Evidence from the field,* Journal of Financial Economics 60, pp 187-243.

12 Barry, C., Mann, S., Mihov, V., and Rodriguez, M., 2008, *Corporate debt issuance and the historical level of interest rates,* Financial Management 37, pp 413-430.

13 Baker, M., and Wurgler, J., 2002, *Market timing and capital structure*, Journal of Finance 57, pp 1-32.

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

4.3.1 Submissions

SWC, SCA and HWC suggested use of the long-term trailing average methodology and Origin and ARTC supported the use of long-term averages. Their main arguments included:

- Utilities are typically capital intensive with long-lived assets, contracts and business models (Origin).
- Utilities with long-lived assets would finance using long-term debts with staggered maturities to minimise refinancing risk (SWC and SCA).

In addition, ARTC, EnergyAustralia, Origin and HWC argued that the term-to-maturity for the cost of debt estimation should be 10 years.

4.3.2 IPART's response

Our interim decision is 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. Our interim decision gives more weight to long-term averages, which approximate the trailing average preferred by most submissions, compared to our previous approach. However, it continues to give some weight to current market rates.

In coming to this view, we have considered stakeholders' submissions on our role in:

- minimising any distortions in efficient financing practice
- reflecting actual debt management practices of NSW utilities.

Our views in response to the submissions are summarised below:

1. **Setting the WACC irrespective of utilities' hedging strategies.** Utilities have argued that using the current cost of debt leads to inefficient hedging practice. This statement overstates our role in management of utilities. Our role is to set maximum prices and to oversee license compliance. We do not dictate utilities' expenditure programmes, nor do we 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 un-hedged debt and swaps to lock-in current rates at the time of the decision.

2. **Evidence of privately owned utilities' hedging practices.** The arguments for a trailing average do not appear to take account of evidence that private firms in regulated sectors have been able to match their debt costs to on-the-day costs of debt. There is evidence that Victorian energy network businesses have been successful in hedging the base risk-free borrowing costs to on-the-day rates to coincide with regulatory resets, without confronting unmanageable risks of refinancing.
3. **Options to match costs and revenues.** The arguments for a trailing average also overstate the extent to which unregulated firms in competitive markets are able to match costs and revenues. Unregulated firms are required to borrow and invest in conditions of uncertainty and many invest in long-term fixed assets. They can adjust operations and capital expenditure as conditions change, as can regulated utilities. Therefore, they typically adopt a more flexible, adaptive financing strategy using various instruments.

4.4 How should we estimate the MRP?

4.4.1 Submissions

We also asked stakeholders to comment on the estimate of the forward-looking MRP. Origin, HWC and SCA submitted that we should continue using the MRP based on historical data and that this will ensure consistency when used together with the long-term trailing average approach. ARTC submitted that, to obtain a meaningful/stable MRP, we need to use at least 30 years of data and this will usually yield a MRP of 6% and 7%. EnergyAustralia argued that we should consider estimates of the MRP using current market data as well as historical averages, and that an appropriate MRP is 7%.

4.4.2 IPART's response

As per our interim decision, we will estimate the cost of equity based on current market data and historical averages:

- To estimate the cost of equity using long-term averages, we will use the historical MRP as a proxy for the expected MRP. We will continue to use a range of 5.5% to 6.5% and a midpoint of 6% as the historical MRP. This is consistent with Brailsford et al. (2012) which shows that the historical MRP in Australia is 6.1%.[14]

[14] Brailsford, T., Handley, J.C., an Maheswaran, K., 2012, *The historical equity risk premium in Australia: post-GFC and 128 years of data,* Accounting and Finance 52, pp 237-247.

- To estimate the cost of equity using current market data, we will use the implied MRP as a proxy for the expected MRP. Our interim decision is that we will use Bloomberg's daily implied MRP estimate averaged over 40 days as our implied MRP. We engaged SFG consulting to provide advice on alternative methods for estimating the implied MRP (ie, an estimate of the expected MRP based on current market data). SFG's final report can be found in Appendix A.
- We are currently reviewing the methodologies put forward by SFG in this report and will release our final decision on methods for estimating the implied MRP in our final report. In the interim, we will continue to use a 40-day average of the daily implied MRP published by Bloomberg.

4.5 What alternative models should we use to estimate the cost of equity?

4.5.1 Submissions

ARTC, EnergyAustralia, HWC, SCA, and Origin generally supported the continued use of the CAPM as a main model to estimate the cost of equity:

- HWC submitted that we may use alternative models as a cross-check but did not specify preference as to which alternative models could be used.
- SCA submitted that we may use the Dividend Discount Model (DDM) and the Fama-French 3-factor model as a cross-check, but these models need to be applied and interpreted carefully. They suggested using other models and/or evidence including residual income model, market-to-asset ratios, bond yields and discount rates from market valuations. They noted that if we choose the cost of equity based on other models, we need to publish all workings and reasonings in the interest of transparency.
- Origin submitted that we should conduct a "reasonableness test", for example, using broad market survey on the appropriateness of the cost of capital.

SWC submitted that we should avoid relying wholly on the CAPM to estimate the cost of equity and that all relevant information should form part of an evidence-based approach to estimating the cost of equity. They suggested alternative models such as the Black CAPM or the Fama-French 3-factor model, evidence from DDM estimates, independent expert reports and actual business transactions such as the sale of the Sydney Desalination Plant.

4.5.2 IPART's response

In 2010, we conducted the review of alternative approaches to the determination of the cost of equity and concluded that we will continue to use the CAPM to estimate the cost of equity. Consistent with the majority of the submissions, our view is also that the CAPM is an appropriate model to use for the cost of equity estimation. Currently, we use the DDM to obtain one of the CAPM parameters, that is, the expected MRP. The implied MRPs obtained from Bloomberg, which we use as a proxy for the expected MRP using current market data, are calculated using the DDM with several growth stages[15]. As for the cost of equity estimate, we may use the DDM as a cross-check, subject to data availability. Since most utilities we regulate are not listed on the Australian Securities Exchange, the cross-check for the cost of equity estimate would involve identifying a set of proxy firms listed on overseas stock exchanges and estimating the cost of equity for each firm using the DDM.

Our interim decision is that we will continue to use the Sharpe-Lintner CAPM (Sharpe, 1964; Lintner, 1965)[16] to estimate the cost of equity as our main model. We may consider other financial market information in assessing the reasonableness of the cost of equity estimate, for example:

- other models such as the Fama-French 3-factor model
- actual corporate transaction data on bond issuance for refinancing
- independent expert reports
- equity research reports.

4.6 How should we exercise discretion in choosing the appropriate WACC value?

4.6.1 Submissions

Stakeholders commented on how we should exercise discretion in choosing the appropriate WACC value within the feasible range. HWC, SCA, SWC and Origin submitted that we need to establish a consistent and transparent framework in exercising discretion as an unbiased/independent decision maker. HWC added that there is no need to choose a WACC from the feasible range if the trailing average is selected. EnergyAustralia argued that, where a range is selected for a given parameter, the range should be selected such that the

15 SFG's report on the MRP methodology, which is attached to this interim report, describes how Bloomberg estimates the implied MRPs using the DDM.

16 The Sharpe-Lintner CAPM is often referred to as the standard CAPM. Sharpe, W.F., 1964, *Capital asset prices: A theory of market equilibrium under conditions of risk*, Journal of Finance 19, pp 425-442; Lintner, J., 1965, *The valuation of risk assets and the selection of risk investment in stock portfolios and capital budgets*, Review of Economics and Statistics 47, pp 13-37.

likelihood of any point within the range is equal, in which case, IPART will be indifferent to selecting any WACC point estimate from the range.

4.6.2 IPART's response

We consider that while there is uncertainty at both the model and parameter level in estimating the WACC, this does not mean that all values are equally likely. The approach that we have set out is in our view the best means of estimating the WACC, but due to these uncertainties there is at least conceptually, a probability distribution for the likely true WACC around the central value in the range. Our interim decision is to use the midpoint of the WACC range, which in turn is set by the midpoints of the WACC ranges estimated using current market data and long-term averages. This implies that we will allocate equal weights to the information obtained from current market data and long-term averages.

We will then consider relevant financial market data and other information to assess the appropriateness of the default WACC, and we may or may not adjust the default WACC within the range.[17] We acknowledge stakeholders' concerns that this process could potentially increase uncertainty about our WACC decision. To address these concerns, we will establish a transparent and consistent framework to guide us in determining the weights to be given to relevant financial market information. This will be part of our further work. Refer to Section 6.2 for more details.

We will also consider releasing quarterly market updates of our WACC estimates for different industries to increase the transparency of our WACC decisions.

5 WACC determination framework

By taking into account both current market data and long-term averages, our interim decision 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 interest rates. This increases the need for a transparent and robust framework on how we will choose our WACC point estimate within the range. Having such a framework would lead to a WACC estimate that best reflects current and long-term market conditions and provide greater certainty to the manner in which discretion will be exercised.

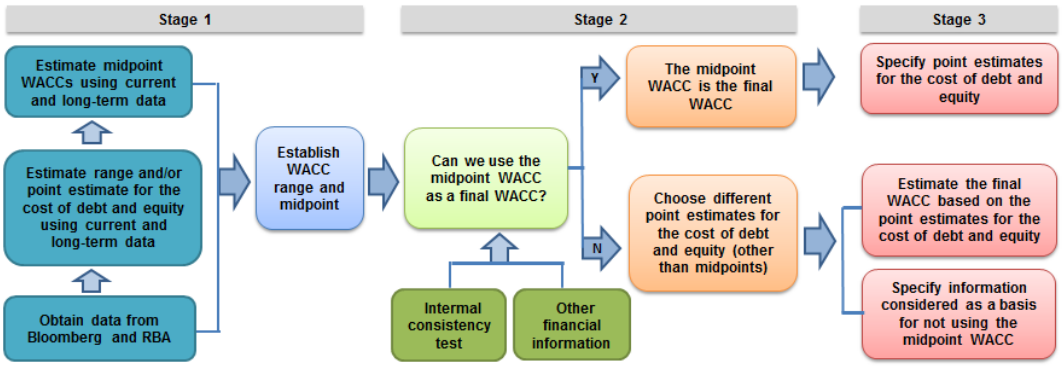
[17] This can be likened to a Bayesian approach to decision-making where the decision-making starts with an initial view of the outcome or estimate and its likelihood and adjusts this taking into account other information to reconsider the likelihood of the initial estimate and adjust it if necessary.

Figure 5.1 describes our current view on how we will use financial market information. We consider that there are 3 broad stages in our WACC estimation:

- establishing the WACC range and midpoint
- assessing midpoint WACC against a set of financial market information
- choosing our WACC point estimate.

These 3 stages are described in more detail below.

Figure 5.1 Our proposed WACC determination process



Stage 1 - Establishing the WACC range

In Stage 1, we establish the WACC range and midpoint by estimating the midpoint WACCs using current market data and long-term averages as defined in our interim WACC methodology in Section 3.3. This involves the following:

1. Obtain market data from Bloomberg and RBA.
   a) The market data from Bloomberg includes daily yields of Australian Government bonds with a maturity of 5 and 10 years, daily yields of Australian corporate bonds issued in Australia and US with BBB/BBB+ rating with a minimum of 2-year remaining term-to-maturity, Bloomberg fair value curves with maturity of 5 and 7 years, daily implied MRPs and daily swap market data with maturity of 1 to 10 years.
   b) The market data from RBA includes daily yields of the 10-year Australian Commonwealth Government bond and inflation-linked bond for the purpose of estimating the long-term CPI.
2. Estimate WACC parameters based on the methodologies as set out in Table 3.1 (or Table 3.2 depending on industries).

3. Calculate a range and point estimate for the cost of equity and the cost of debt, and estimate the WACC midpoints based on current market data and long-term averages given an appropriate level of gearing. The WACC range under the interim WACC methodology is given by the 2 midpoint WACCs based on the current market data and long-term averages. At this stage, we consider the midpoint WACC of the range as the best estimate of the expected WACC and use it as our default position.

Stage 2 - Assessing midpoint WACC

In Stage 2, we assess the appropriateness of the midpoint WACC estimated in Stage 1. This involves the following:

1. Conduct an internal consistency test to ensure that the cost of debt estimate is lower than the cost of equity.
2. Provided that the internal consistency test is met, we decide whether to take the midpoint WACC as a final WACC by reviewing a set of additional financial market information. Section 6.2.1 presents the list of potential financial market information that can be used in this process:
   a) We will use the midpoint WACC as the final WACC unless we find significant evidence suggesting otherwise. Using the midpoint WACC means that we give an equal weight to current market data and long-term averages.
   b) If financial market evidence warrants departure from the midpoint WACC, we will decide whether to give more or less weight to current market data relative to long-term market data and then estimate point estimates for the cost of debt and the cost of equity. The point estimate for the cost of debt (equity) will be determined by the relative weights that we assign to current market data and long-term averages.

For example, in our recent water and energy price decisions, we used information obtained from independent expert reports. The independent experts generally agreed that the current risk-free rate is unusually low when compared to the historical average. They added a specific risk premium, ranging from 2% to 4%, to increase the cost of equity given current market conditions. On balance, we considered that choosing the midpoint WACC, which gives an equal weight to the current market data and historical data, is consistent with the evidence obtained from the independent expert reports.

Stage 3 – Finalising WACC decision

In Stage 3 we will take different actions depending on our decision in Stage 2:

- If we decide to take the midpoint WACC
  - We will report the point estimate for the cost of debt and equity. The point estimates for the cost of debt and equity will be the midpoints of the costs of debt and equity estimated in Stage 1 using current market data and long-term averages.
- If we decide not to take the midpoint WACC and determine the point estimates for the cost of debt and the cost of equity other than the midpoint
  - We will report these point estimates and specify a set of information considered as a basis for not using the midpoint WACC of the cost of debt and/or equity, and the WACC. We will specify the information that was most persuasive in our decision-making.

6 Further work

This section outlines the major areas of work we intend to address in our draft report.

6.1 Estimating the expected MRP using current market data

6.1.1 Motivation

Under our previous WACC framework, we considered that the 'on-the-day' cost of capital was the best estimate for the efficient cost of capital for a new entrant. On this ground, we used current market data to estimate individual parameters for the cost of debt and the cost of equity, except for the expected MRP. Our view regarding the expected MRP was that it could not be reliably estimated using market data 'on the day'. We used the historical arithmetic average MRP as a proxy for the expected MRP with a range of 5.5% and 6.5% and a midpoint of 6%. This is consistent with Brailsford et al. (2012) which shows that the historical MRP in Australia is 6.1%.

However, our investigation to date suggests that it may be possible to estimate the expected MRP using current market data. We consider that there is a greater need to estimate the expected MRP using current market data than previously thought, as we have found that:

- There is evidence from a number of sources that the MRP is not constant over time and that at times it may be inversely related to the risk-free rate.[18]
- Using the long-term average MRP together with the current risk-free rate could be problematic when the risk-free rate and the MRP move in an opposite direction.

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

Use of the expected MRP estimate based on current market data is likely to introduce a greater volatility in prices/revenue for customers of utilities. However, we consider that it is more consistent with competitive market outcomes.

6.1.2 Work in progress

SFG report on MRP

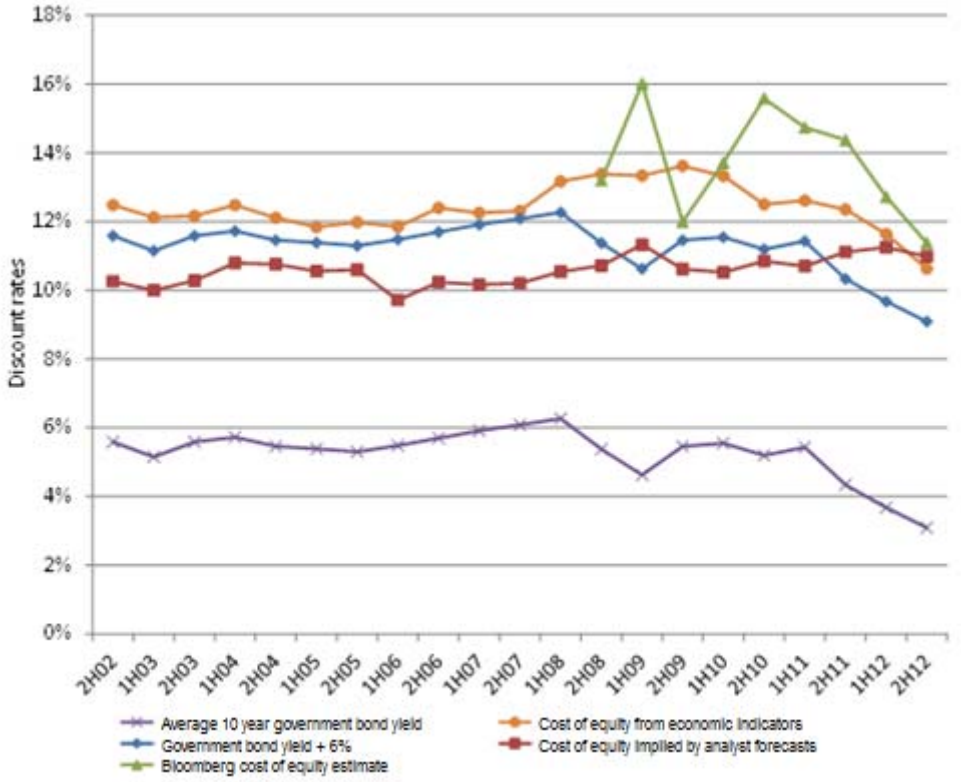
IPART engaged SFG consulting to provide advice on methods for estimating the expected MRP. SFG's full report can be found in appendix A.

SGF recommends that the MRP should be estimated with reference to:

- economic indicators (dividend yield, corporate spread, term spread, risk-free rate and volatility implied by option prices)
- the cost of equity capital derived from analyst forecasts based on the DDM.

18 CEG, *Internal consistency of risk-free rate and MRP in the CAPM,* A report prepared for Envestra, SP AusNet, MultiNet and APA, March 2012, p iv.

Figure 6.1 Cost of equity estimates based on various MRP methodologies



Data source: SFG, *Market risk premium*, 18 May 2013, p 13.

Figure 6.1 shows the cost of equity estimates based on different MRPs, where an expected MRP is estimated by:

- 10-year Australian government bond yield + 6%
- Bloomberg
- SFG using economic indicators
- SFG using analyst forecasts.

Over the period for which Bloomberg's MRP estimates are available, the cost of equity estimates using SFG's MRPs (using economic indicators and analyst forecasts) are more stable than those using Bloomberg's MRPs. The cost of equity estimate given by the risk-free rate plus an MRP of 6% is also stable over time, but in the most recent period, it is noticeably below other cost of equity estimates.

IPART's preliminary view on SFG's work

MRP estimates based on 4 economic indicators

In our view, the advantage of this technique is that it is transparent and can be easily implemented. Its disadvantage is that it is not a direct estimate of the discount rate which incorporates current share prices, and does not have an underlying theoretical model. We consider that we need to better understand the basis for and impact of the choice of model specifications.

Analyst-implied MRP estimates

In our view, the methodology used by SFG yields MRP estimates that are more stable over time than Bloomberg's implied MRPs. Also, the estimates are determined by a large sample of data, and are not dependent on a growth rate assumption that reflects the views of an analyst involved in the estimation. However, it is computationally-intensive and it may not be easy for stakeholders to replicate the MRP estimates.

Both the SFG and Bloomberg models are based on a more broadly accepted model (DDM) than the approach using the economic indicators.

We are still weighing up the merits of using SFG's application of the DDM relative to using Bloomberg's implied MRP estimates. We are also considering estimating MRPs based on other applications of the DDM, including that suggested by the Bank of England.[19]

6.2 Improving the framework for using other market information

Our default position is to choose the midpoint of the WACC range as our best estimate of the expected WACC. We will use additional financial market information in deciding whether the WACC should be below, above or at the midpoint WACC. In this section, we discuss potential sources of financial market information that are currently under consideration (Section 6.2.1) and how we propose to deal with potential uncertainty in our WACC decision (Section 6.2.2).

[19] Bank of England, *Interpreting equity price movements since the start of the financial crisis,* Quarterly Bulletin 2010 Q1, pp 24-33.

6.2.1 Use of additional financial market information in assessing the default WACC

Source of financial market information

We may consider financial market information obtained from the following 4 sources:

1. independent expert reports
2. equity research reports
3. actual corporate transaction data on bond issuance for refinancing
4. market-to-asset ratios (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. As noted in the NERA report in SWC's submission to our discussion paper, independent expert reports provide valuable information on the cost of equity since their valuation is conducted in the events of substantial market transactions. Independent experts may conduct valuation of assets or shares, using multiples or discounted cash flow (DCF) methodology. If the DCF methodology is used, we can obtain 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 the report 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.

Equity research reports

In-house research department in brokerage firms or investment banks produce research reports focusing on a specific stock, industry sector, a currency, commodity or fixed income instruments. 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 net present value, 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.

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. A 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. Based on this information, we will be able to form a view on the relative weights given to market estimates and long-term historical rates.

Market-to-asset ratios (MAR)

Subject to data availability, we may use the Market-to-Asset Ratios (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 (RCV) 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 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.

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 of this approach 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.

6.2.2 Managing uncertainty

We understand that the proposed increase in inputs into our WACC decisions may create uncertainty. We will consider ways to manage this increase in uncertainty. For example, one way to reduce uncertainty is by increasing transparency. This could be achieved by releasing periodic updates on our view of the WACC.

A SFG report on the methods to estimate the MRP

Market risk premium

18 May 2013

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Contents

1. Introduction

1.1 The question

SFG Consulting has been engaged to advise the Independent Pricing and Regulatory Tribunal ("IPART" or "the Tribunal") on methods for estimating the forward-looking market risk premium ("MRP"). This is an estimate of the difference in the expected return on the market portfolio of all risky assets and the risk free rate of interest. In almost all practical contexts, the market is considered to be the equity market because this is the type of liquid security for which market and accounting data is readily available. So for the purposes of this report we treat the market as the listed Australian equity market. The question of whether the market should be considered an international equity market or limited to Australian-listed securities does not form part of our analysis.

IPART estimates the regulated rate of return as the prevailing cost of funds at the time of each determination. It is an estimate of the return investors require at each point in time before they are prepared to commit capital. There are separate estimates for the cost of debt and equity capital, and those estimates are weighted by an estimate of the proportions of debt and equity finance used to finance the firm.

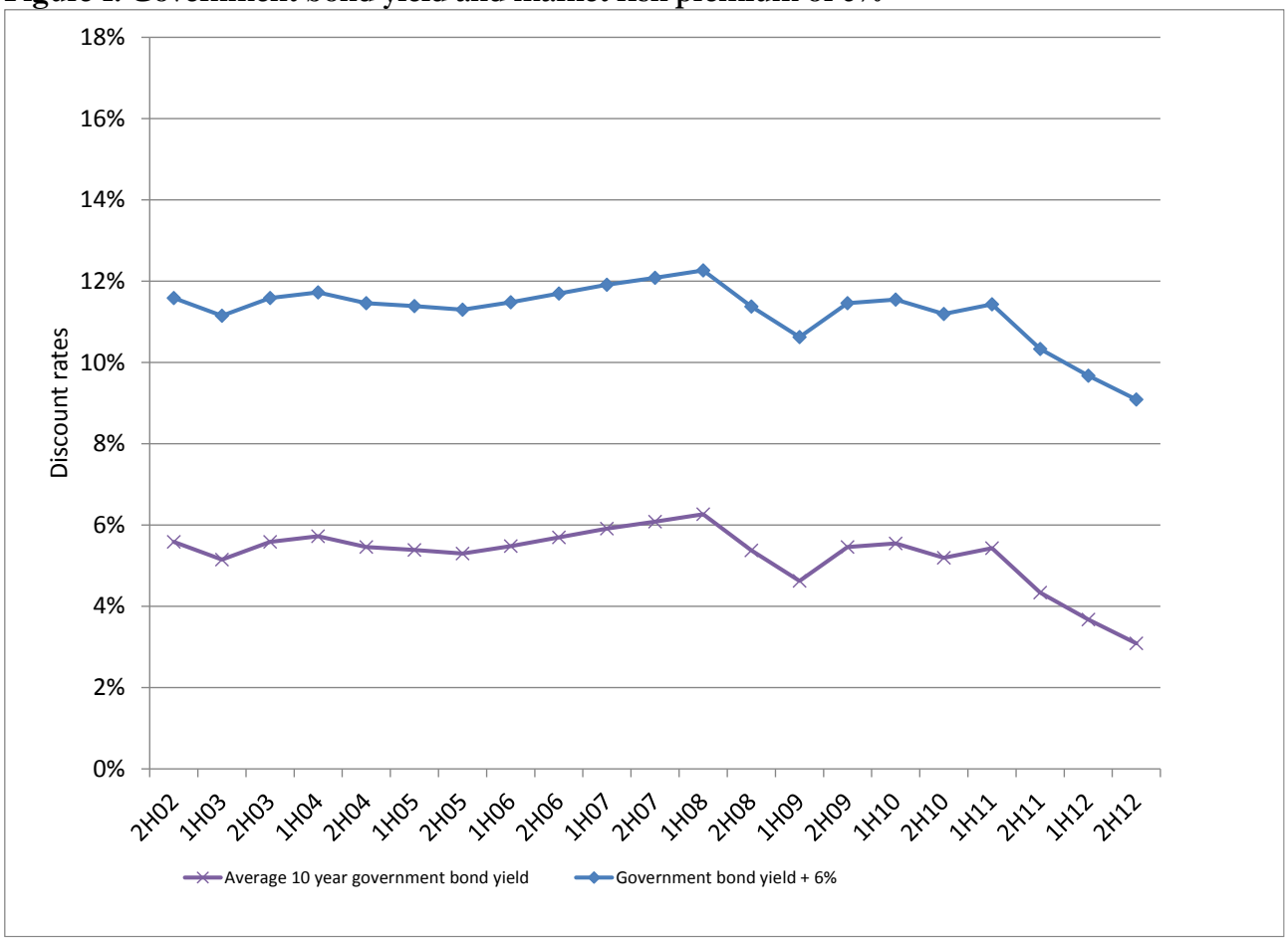
In recent years the estimate of the market risk premium has become contentious because regulators have almost uniformly maintained an estimate of 6%, despite historically low government bond yields. The figure of 6% is an approximation of the annual average difference between Australian equity market returns and government bond yields.[1] At present, the yield on 10-year Australian government bonds is approximately 3.5% per year, which implies an equity return of 9.5%. Assuming a corporate tax rate of 30% and a value for gamma of 0.25 to account for the imputation value of corporate tax, as assumed by IPART, the implied return from dividends and capital gains is 8.6%.[2] In July of 2012 the government bond yield fell to around 2.9%. Performing the same computation at this point implies a return to equity holders of 8.9% including just 8.0% from dividends and capital gains.

The combination of low government bond yields and a constant market risk premium estimate led to estimates of the required return to equity holders which seemed implausibly low, as they occurred during periods of above-average volatility in equity market returns and share prices which were low compared to earnings and dividends. These equity market signals suggest that the cost of equity capital is above average, while the regulatory estimate suggests that the cost of equity capital is below average. In Figure 1 we present average daily values for 10 year government bond yields every six months, along with a constant market risk premium assumption of 6%.

[1] There is not general agreement that the long run average equity market return relative to government bond yields is 6.0%. For example, the most recent estimate reported by the Queensland Competition Authority (2012) is 6.21% but the QCA considers this estimate to potentially be overstated. The Australian Rail Track Corporation (2013) submitted that "studies over various time periods have consistently produced estimates in the range of 6% to 8%." Brailsford, Handley and Maheswaran (2012) estimated the average equity market return relative to government bond yields at 6.1% over the 53 years from 1958 to 2010, and for the 128 years from 1883 to 2010. The reason for the two different start dates is that the authors question the reliability of data prior to 1958, which reiterates the concern they expressed in Brailsford, Handley and Maheswaran (2008). However, for the purposes of this paper we treat the figure of 6.0% as the market risk premium that would be assumed by the Tribunal if it relied exclusively on historical returns relative to government bond yields to make its estimate of the market risk premium.

[2] In cases where the cost of equity under imputation is estimated using the equation from Officer (1994) we have $Return\ from\ div\ \&\ capital\ gains = r_e \times \left[\frac{1-\tau}{1-\tau(1-\gamma)}\right] = 0.095 \times \left[\frac{1-0.30}{1-0.30(1-0.25)}\right] = 0.095 \times 0.903 = 0.086$. This equation relies upon the assumption that expected cash flows are a level perpetuity, which is not generally the case in reality, but is an equation often adopted by regulators.

Figure 1. Government bond yield and market risk premium of 6%



The reason for these contrasting signals relates to estimation error. The reason IPART and other regulators have maintained a constant estimate of the market risk premium of 6% is because in their view they have not had a reliable, transparent technique for making adjustments to this estimate on the basis of market data. While it makes intuitive sense that the market risk premium is high when share prices fall and volatility increases, regulators are concerned that an adjustment to the market risk premium will be subjective and lead to a lack of confidence amongst regulated entities and consumers.

This rationale was convenient prior to the global financial crisis. But as the figure above illustrates, this argument does not contemplate the situation where yields on government bonds exhibit sharp, sustained declines. This leads to the question of whether we have techniques and data available to us to make a timely estimate of the market risk premium.

1.2 Why is the solution not simple?

The problem outlined above is that assuming that the market risk premium is equal to a long term average equity market return above government bond yields led to implausibly low cost of equity estimates when bond yields fell substantially. This begs the question as to why the solution is not simply to estimate equity market returns as their long term average, and estimate the market risk premium as the difference between this long term average and the current risk free rate. The reason the solution is not quite so simple is that there are at least two possible explanations for low government bond yields at any point in time.

The first possible explanation is that there are low inflation expectations. In this circumstance it might be the case that the real expected return on equity is normal, so applying a constant market risk premium of 6% might be appropriate. In nominal terms it would lead to a low estimate of expected

returns, compared to what we have observed historically. But the real expected return would be appropriate.

The second possible explanation is that there is a flight to quality. Investors pay high prices for the safest security available, pushing down yields on government bonds. This would occur when the cost of equity capital is high, and it would be entirely inappropriate to apply the normal market risk premium to these government bond yields to estimate the cost of equity. During the global financial crisis we observed illiquid debt markets, sharp falls in equity prices, investment funds increase their allocations to cash and falls in government bond yields. It is hard to argue against the flight to quality explanation in this circumstance.

The challenge, however, is that we need a technique for estimating the market risk premium in all circumstances, not just during normal market conditions (when applying a constant premium of 6% had previously seemed to suffice), and not just during crisis periods (when using a long term average equity return would probably have led to more plausible estimates of the cost of equity than applying a constant premium of 6%).

1.3 What are we trying to measure?

An alternative solution to the problem identified above is to alter the risk free rate assumption, rather than the estimate the market risk premium with respect to market conditions. This is an option being considered by the Tribunal and which has received broad support in submissions by regulated entities.[3] The broad support for the use of long term average estimates for the risk free rate and the market risk premium requires some comment on what we are trying to measure and why, and what we are not trying to measure and why.

What we are trying to measure is the cost of equity capital at a point in time, which sets the present value of all future cash flows to equity holders equal to the share price. It can be labelled a "spot" cost of equity, or a "short run" cost of equity in the sense that it represents the cost of equity at one point in time. But this does not imply that it is the required return for an investment horizon over a short period of time. It is still an estimate of the cost of equity capital applying to all cash flows available to equity holders in perpetuity.

Stakeholders have commented that investors make decisions with a long term perspective which might differ from the short term equity returns implied by share prices. But it is important to recognise that what the share price implies *is* the long term required return of investors, if we derive that required return as the internal rate of return from all future cash flows. Consider the case of a superannuation fund that makes three investments – a 10 year corporate bond offering a yield to maturity of 8% per year, an investment in an unlisted infrastructure asset with an estimated internal rate of return of 10% per year, and an investment in a listed equity security with an estimated discount rate of 12% per year. All three investments have been evaluated with reference to expected cash flows over the long term.

[3] Australian Rail Track Corporation (2013) stated that "ARTC has argued in previous submissions to the Tribunal that the best estimate of the true long-run market risk premium is the current long-run market risk premium (p.16)." EnergyAustralia (2013) stated that "[t]he approach used by IPART for the risk free rate should be considered in such a way that is consistent with the estimation of the market risk premium (p.3)." Sydney Catchment Authority (2013) noted that the use of a short-run risk free rate and a long-run MRP would not be internally consistent (p.3). Sydney Water submitted that the use of a long-term average risk free rate in combination with a long-term average MRP estimate, or the use of a short-run risk free rate with a short-run MRP estimate were both "modifications to the standard specification of the CAPM that could potentially resolve the issue of prevailing low risk free rates (p.22 of the NERA report)." Origin (2013) stated that the MRP and risk free rate should be estimated as long term averages, using the same averaging period, to avoid an under or overestimation of the return on equity (p.6). Furthermore, Origin unequivocally stated its view that it "does not believe that forward looking models for MRP provide a greater degree of certainty or accuracy around the MRP than historical averages."

Now suppose that there is a financial crisis, leading to falls in the prices of all three risky securities. Corporate bond yields rise to 11% per year, the valuation of the unlisted infrastructure asset falls such that the IRR rises to 13% per year, and the price of the shares falls to the point where the discount rate for equity rises to 15%. The yields on these three securities have risen because they reflect the required returns to investors who are entitled to all future cash flows.

So what we are trying to measure is the true changes in equity investors' required returns, over the entire asset life, under different market conditions. The motivation for the measurement of the true cost of capital relates to incentives. There is a risk that, if the regulated return is below the true cost of funds then investment will be delayed and reliability standards will be met using programs that rely upon higher operating costs. Alternatively, if the regulated return is above the true cost of funds then there is the risk that infrastructure providers will attempt to justify capital expenditure which is above what is economically efficient.

In setting the regulated return the Tribunal will need to consider these incentive implications as well as the potential adverse impacts of cost of capital estimates that vary over time. At the IPART workshop on 25 March 2013 participants noted some of these potential adverse impacts – that consumers might be adversely affected if utility prices vary over time with rises or falls in the stock market; investor confidence in the regulator might be lowered if there is substantial variation in regulated rates of return over time; two different utilities in the same industry might receive materially different regulated rates of return merely because of the timing of their regulatory determinations; and infrastructure owners including local councils are facing substantial reductions in revenue due to falls in the risk free rate of interest.

This leads to what our analysis does not attempt to measure, which is the economic consequences of setting the regulated rate of return at the prevailing cost of funds. It is a matter for the Tribunal to determine whether the objectives of regulation are most likely to be achieved by setting the regulated return in this manner, or with reference to historical realised returns (on equity or debt), or historical realised yields (on equity or debt). The only way in which stakeholders can debate the implications of any deviation in the regulated rate of return and the true cost of funds is if there is, in fact, a measurement of the true cost of funds.

1.4 Stability

In considering the estimates presented in this paper it is also important to note that more stable estimates over time are not necessarily better or worse. The cost of funds over time varies, even for the risk free proxy as illustrated in Figure 1. But we can only observe an *estimate* of the true cost of funds over time. This means that we cannot disentangle variation over time due to estimation error (or "noise") and variation over time in the true cost of funds. An estimate which is relatively more stable over time might be better because it is contaminated with less noise, or it might be worse because it does not capture the true variation in the cost of capital.

For this reason we consider alternative estimates of the prevailing cost of funds, in an attempt to mitigate estimation error in any one metric. We derive estimates in two ways. One technique relies upon four market-wide indicators of economic conditions, and the second technique relies upon analyst forecasts for earnings and dividends. In turn, we present two alternative cost of capital estimates derived from analyst forecasts – we compute one set of estimates and use Bloomberg estimates as another source.

1.5 Analysis is independent of the CAPM

IPART relies upon the Capital Asset Pricing Model ("CAPM") to estimate the cost of equity component of the regulated rate of return, and the market risk premium is an input into this model.

However, the estimate of the prevailing cost of equity for the market will be required, regardless of the particular model or estimation techniques used to estimate the cost of equity for the regulated entity. In its submission for Sydney Water (2013), NERA proposes that models other than the CAPM should be adopted, including the Fama & French model, the Black CAPM and the dividend growth model. NERA also considers the use of independent export reports. With respect to these first two models, the market risk premium estimate remains a direct input into the model. With respect to the application of a dividend growth model to a particular firm, or reference to independent expert reports, it is important for the Tribunal to consider what its estimate of the cost of equity would be for the average firm, so it can determine whether the risks to the regulated entity justify a cost of equity which is above or below average.

It is important to emphasise that the problem of implausibly low cost of equity estimates implied by low government bond yields is independent of IPART's selection of the CAPM as its equation for computing the cost of equity. The problem would have arisen if any other equation or estimation technique was populated with the long run average equity market return relative to government bond yields and the current spot rate on government debt. In other words there are three issues that are independent – one issue is the risks that the Tribunal considers are incorporated into the cost of equity capital (this leads to the selection of the models for determining the cost of equity), the second issue is just what is the prevailing cost of equity at the time of the determination for the average firm, and the third issue is whether the cost of equity should be set at the prevailing cost of funds or as an estimate based upon long term realised returns.

1.6 Imputation credits

Our analysis does not consider the impact of imputation credits on the cost of capital. At all times in this paper our estimates of the cost of equity represent the expected returns from dividends and capital gains only. If part of the return allowed to a regulated entity reflects compensation for the value of imputation credits, then if our estimates were adopted, the total allowed return would need to be increased to allow for the value of these credits.

2. Alternative estimates

2.1 Introduction

To estimate the market cost of equity, and by extension the premium over government bond yields at each point in time, we present two feasible approaches. One approach is to examine some market-wide indicators of the market risk premium. Depending upon the level of these indicators compared to average levels, we can make an estimate of how far above or below a normal level is the market risk premium at any point in time. A second approach is to directly estimate the cost of capital as that which directly sets the present value of expected future dividends equal to current share prices. In the paragraphs below we discuss each of these approaches.

2.2 Market-wide indicators

There are four market-wide indicators of the market risk premium which are useful for estimation – dividend yield, risk free rate, corporate bond spread and term spread. These indicators are used in the finance literature as proxies for market conditions in a number of fields. For example, Petkova and Zhang (2005) measure the relative risk of value and growth stocks during periods of different market conditions. They use these four variables as indicators of the expected market risk premium and estimate the expected market risk premium as the predicted value from the following regression equation, presented as equation 1 in their paper:

$$r_{mt+1} = \delta_0 + \delta_1 DIV_t + \delta_2 DEF_t + \delta_3 Term_t + \delta_4 TB_t + e_{mt+1}$$

where r_{mt+1} is the market return relative to the risk free rate in month *t+1* and the four conditioning variables in month *t* are the dividend yield *(DIV),* default spread *(DEF),* the term spread *(TERM)* and the short term treasury bill rate *(TB).*[4]

Given that there are no regulators in Australia that estimate the market risk premium directly with reference to these indicators, we have compiled estimates using an approach that we believe is as simple to estimate and explain to businesses and consumers as possible. There may be more sophisticated approaches to incorporating these indicators into the analysis. But at this stage we think it is important to establish the validity of this approach as providing useful information about the market risk premium at each point in time, without conjecture about just how precise the measurement can be made with more sophisticated analysis.

The advantage of this technique is that it is transparent and easily implemented. Its disadvantage is that it remains an indirect estimate of the market risk premium, rather than being a direct estimate of the discount rate incorporated into share prices at a point in time. It should be emphasised, however, that reference to these indicators is entirely consistent with the intuition of regulated entities that, given historically low government bond yields, the application of a constant MRP estimate of 6% is too low. They make the argument that it is implausible that equity finance at around 9.5% is cheaper than prior to the global financial crisis. In general terms they contend that equity market conditions are worse than five years before so the cost of equity should be higher than five years before. We simply take four indicators of those equity market conditions are derive an explicit estimate of the market risk premium.

The approach presented is this paper is to estimate, at each point in time, where the indicator lies relative to its historical distribution, and then apply this to a distribution for the market risk premium.

[4] In turn, Petkova and Zhang (2005) cite the following papers as justification for the use of these found indicators of the market risk premium – Fama and French (1988) for the dividend yield, Keim and Stambaugh (1986) for the default premium, Campbell (1987) and Fama and French (1989) for the term premium, and Fama and Schwert (1977) and Fama (1981) for the short-term Treasury bill rate.

We have assumed that the market risk premium is uniformly distributed between 3% and 9%, so that the mid-point is equal to the regulators' standard assumption that the market risk premium is 6%. We arrived at the lower bound of 3% because in estimates of the market risk premium derived from share prices published in the academic literature, there are few estimates that are below 3%, and that for the purposes of regulation it seems unrealistic to think that a regulator would actually set the MRP below this level. The regulator would be unlikely to set the MRP below this level because of the risk that the regulated rate of return is below the true cost of funds purely because of measurement error.

The four market-wide indicators we rely upon are:

1. The risk free rate – 10 year government bond yields estimated by the Reserve Bank of Australia;

2. The term spread – The difference between 10 year and 2 year government bond yields estimated by the Reserve Bank of Australia;

3. The corporate spread – The difference between the UBS all maturities credit yield and the UBS treasury yield; and

4. The dividend yield on the All Ordinaries Index, estimated by Datastream.

We take average values of these indicators each calendar month, and compute the percentile based upon where this average lies compared to all previous monthly averages and the current monthly average. In compiling percentiles we use all available historical information for the relevant indicator. To illustrate, in January 2013 we had the following four averages and percentiles:

1. The risk free rate was 3.4% which was the 99th percentile compared to the average monthly risk free rate from July 1969 to January 2013.[5]

2. The term spread was 0.6% which was the 61st percentile compared to the average monthly term spread from January 1976 to January 2013.

3. The corporate spread was 1.0% which was the 67th percentile compared to the average monthly corporate spread from September 1996 to January 2013.[6]

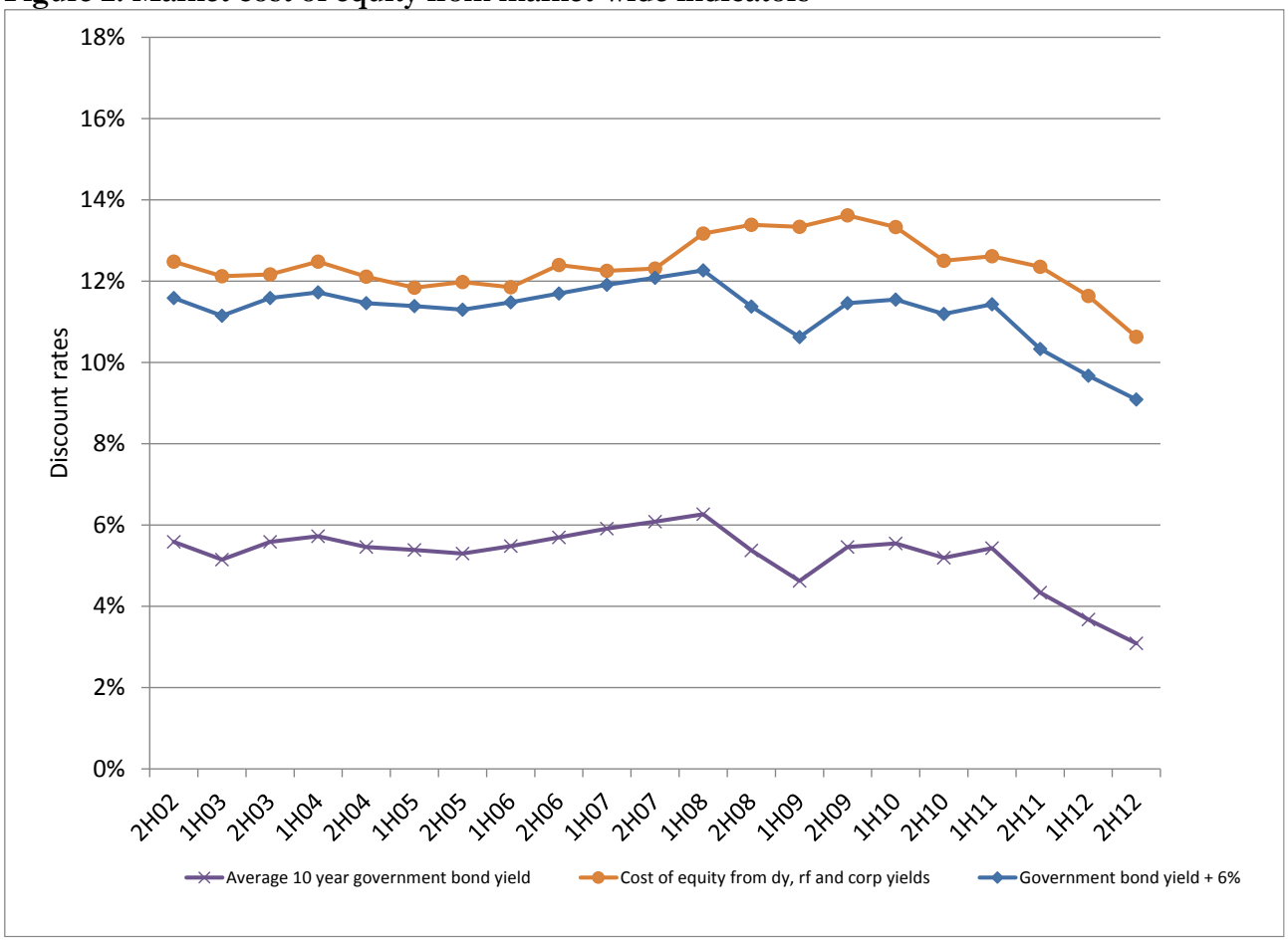
4. The dividend yield was 4.2% which was the 75th percentile compared to the average monthly dividend yield from January 1987 to January 2013.

All four indicators suggest that the market risk premium in January 2013 is high relative to what we would observe in average market conditions. On average, each indicator is at the 75th percentile of its historical distribution. Applying this to a uniform range of 3% to 9% for the market risk premium, we have an estimate of 7.5%, computed as $3\% + 0.75 \times (9\% - 3\%) = 7.5\%$.

[5] With respect to the risk free rate we convert this from the 1st percentile to the 99th percentile so that it is directionally consistent with the other indicators.

[6] This is not of the same magnitude as the investment grade corporate bond spread typically estimated by regulators in determining the debt component of the regulated rate of return. It is derived from a broad sample of corporate credit instruments with different default risk and different terms to maturities. The spread is lower than the spread on BBB or BBB+ corporate bonds with five or ten years to maturity.

Figure 2. Market cost of equity from market-wide indicators



In Figure 2 we illustrate our estimates of the market risk premium on a six monthly basis over the 11 year period from 2002 to 2012. The data points are average estimates every six months, but the estimates can also be computed as a point estimate on a monthly basis or as a rolling average every month. With respect to the six month average estimates the highest market cost of equity estimate was 13.6% in the second half of 2009 and the lowest cost of equity estimate was 10.6% in the second half of 2012. The range for the market risk premium was from a high of 8.7% observed in the first half of 2009 to a low of 5.9% observed in the first half of 2002. Until government bond yields began to decline in the second half of 2008, the average estimated market risk premium from 1H02 to 1H08 was 6.6%, which is 0.6% higher than under the assumption of a constant market risk premium of 6.0%.

2.3 Analyst-implied estimates

Estimates of the cost of equity derived from analyst forecasts for earnings and dividends are the most direct estimate of the cost of equity capital. In this section we present two sets of estimates. One set of estimates is derived from our own technique and the second set of estimates is compiled by Bloomberg according to Bloomberg's technique. While a more direct approach than the market-wide indicators approach, this method suffers from two limitations. First, it is more computationally-intensive than the market-wide indicators approach. Second, it relies upon an assumed process by which dividends over a long period are expected to evolve. The specification of that process will influence both the level and variation of the estimated market risk premium over time. While these are relevant limitations, they are not insurmountable.

Cost of equity estimates derived from analyst forecasts are often referred to as *dividend growth model* estimates. The reason for this terminology is that the task is to estimate the cost of equity after accounting for near term dividend forecasts, typically from one to three years, and the growth in those

dividends over time. However it is important to understand that there is no requirement that dividends grow at a single, constant rate outside of this near term forecast horizon.

The conceptual task is relatively straightforward to understand. It is analogous to estimating the yield to maturity on corporate bonds as the discount rate which sets the present value of payments to bond holders equal to the bond price. The application, however, is more challenging because we need to estimate a perpetual series of dividends, despite only having a short series of dividend and earnings expectations from analyst forecasts. This means that we need to *jointly* estimate a series of dividends and a cost of capital. The dividend series will be determined, in the short term, by analyst expectations of earnings and dividends per share. But outside of this explicit forecast period, this dividend series will be determined by expectations for growth of those dividends. Depending on the model adopted there could be one or more growth stages. The reason we refer to this as a process by which dividends evolve is to emphasis that growth does not need to be constant at any particular stage or in perpetuity. While convenient for computations, constant growth is just one process by which dividends could evolve.

The most important issue to understand about growth expectations is that these cannot be arbitrarily imposed on the analysis on the basis of what is considered reasonable by the person undertaking the task. What is being estimated is the growth rates incorporated into share prices set by the market, not imposed on the analysis from an external source.

The caution against imposing a growth rate on the analysis according to the researcher's or analyst's view as to what is correct is made by Easton (2006) who states:

> In light of the fact that assumptions about the terminal growth rate are unlikely to be descriptively valid, the inferences based on the estimates of the expected rate of return that are based on these assumptions may be spurious. The appeal of O'Hanlon and Steele (2000), Easton, Taylor, Shroff and Sougiannis (2002) and Easton (2004) is that they simultaneously estimate the expected rate of return and the expected rate of growth that are implied by the data. The other methods assume a growth rate and calculate the expected rate of return that is implied by the data and the assumed growth rate. Differences between the true growth rate and the assumed growth rate will lead to errors in the estimate of the expected rate of return.

The simplest formation of the dividend discount model of equity valuation is the case where dividends are expected to grow at a constant rate in perpetuity. In this constant growth version of the dividend discount model, we have the following equation:

$$P = \frac{D_1}{r_e - g}$$

where P is the share price, D_1 is the expected dividend in one year, r_e is the cost of equity capital and g is the constant expected growth rate of dividends.

So in this simplest case, we have a reasonable expectation for dividends, but need to jointly estimate the cost of equity and growth. Bloomberg uses a more detailed approach than this. It has two stages of growth prior to reaching this perpetual growth state, and the length of these stages is contingent upon whether the security is classified as having low, average, high or explosive growth. Ultimately, however, the assumption incorporated into the terminal value is that returns on reinvested earnings equal their cost of capital.

This means that Bloomberg solves the problem of simultaneously estimating g and r_e by assuming that, in the terminal state, g = (1 – dividend payout ratio) × r_e. This is the crucial assumption adopted by

Bloomberg to allow it so estimate the cost of equity capital for each firm in the market, and for the market risk premium as a market capitalisation-weighted average for all firms.[7]

The process by which we project dividends and then simultaneously estimate g and r_e is different on two fronts. The first difference is that we use individual analyst forecasts for each stock to jointly estimate a set of three parameters (long-term growth, cost of equity and long-term return on equity). In contrast, Bloomberg relies upon the consensus (that is, average) dividend and earnings forecasts for each stock and imposes the assumptions that the long-term payout ratio is 45% and that long-term returns on equity equal the cost of equity capital.

In our technique, we consider 2,672 possible values for the cost of equity, long-term growth and return on equity and determine which combination provides valuations close to analyst price targets, and which allows a smooth transition from near-term growth to long-term growth. The cost of equity takes on a range of 4% to 20%, long term *ROE* takes on a range of 3% to 30% (and which can't be more than 1% below the cost of equity) and long-term growth takes on a range of 1% to 10% (and which must be less than the cost of equity). We measure *ROE* according to earnings per share forecasts in year two and book value of equity at the end of year one, and then assume that this return on equity changes incrementally in equal amounts to the long-term *ROE* estimate. The dividend payout ratio also changes incrementally in equal amounts to the long-term dividend payout ratio, which is equal to $1 - g \div ROE$.

In estimating the beginning dividend payout ratio, we take into account growth from new share issuance. On average, firms issue 1.7% new shares each year, which will lead to positive growth in earnings per share if investments made from that new equity earn returns above the cost of capital. So we first estimate combined growth from new share issuance and reinvestment of earnings, and then ask, "If growth was instead financed entirely with reinvestment of earnings rather than new share issuance, what would the reinvestment rate need to be to achieve the same growth?"

From all combinations of r_e, g and *ROE* this allows us to compute 2,672 valuations for each analyst price target, earnings and dividend forecast on each stock. We take all the cases in which the valuation is within 1% of the price target. We then want to know which combination of inputs provides the best fit, or in other words, which is most likely to represent the dividend projections and discount rate incorporated into the valuation. Our criteria is to compare the earnings growth rate in year 10 with the long term growth rate. We select the case in which the ratio of year 10 growth to long term growth is closest to one, and this provides us with our best estimate of the cost of equity, long-term growth and long term return on equity.[8]

[7] Note that the cost of equity estimates that Bloomberg reports for individual firms are a combination of dividend discount model estimation and a Capital Asset Pricing Model estimate. Bloomberg compiles individual firm cost of equity estimates, takes a market capitalisation weighted average of these estimates to determine the market-wide cost of equity and market risk premium, and then applies its estimate of firm-specific beta to determine each firm's cost of equity estimate.

[8] The process by which we project earnings and dividends over a 10 year forecast horizon and then into perpetuity is presented in more detail in Fitzgerald, Gray, Hall and Jeyaraj (2013). There are two differences between the method presented in that paper and the one applied here. First, in the current analysis we incrementally adjust the year two dividend payout ratio to the long term dividend payout ratio. In the academic paper we maintain a constant dividend payout ratio over the first 10 years and then shift in one step to the long term dividend payout ratio. Second, in the current analysis we determine the best estimates according to the ratio of year 10 growth in earnings compared to long term growth in earnings. The ratio closest to one implies the smoothest transition of growth over time. In the academic paper we assume that all analysts covering the stock incorporate the same cost of equity capital, long term growth rate and long term *ROE* and measure which combination generates the lowest dispersion of valuations relative to price targets. This assumption leads to estimation error because the analyst price targets exhibit too much dispersion for it to be reasonable to assume they all have the same long term inputs. Other published papers make the even more tenuous assumption that all firms in the same industry have the same long term expectations.

In the table below we summarise the differences between the computation of our cost of equity estimates and those of Bloomberg. There are two fundamental differences. First, Bloomberg makes the assumption that long term growth is equal to a long term reinvestment rate of 55% and the cost of equity capital. In other words, Bloomberg assumes that investments are expected to earn a return equal to the cost of equity capital in the mature stage. In contrast, we transition to a variety of long term growth rates and *ROE* assumptions, and select the growth rate which provides a valuation close to price target and for which the ratio of year 10 growth to long term growth is closest to one.

Second, our analysis is performed for each analyst covering each firm, rather than for the average analyst covering each firm. This provides a richer data set for analysis and allows us to match earnings expectations with price targets of the same analyst.

In this paper our estimates of the market cost of equity is the market capitalisation weighted average estimate for all stocks for which sufficient information is available for analysis.[9] Each six months we take an average of the cost of equity across all analyst forecasts for each stock, and to estimate the cost of equity for the market we take a market capitalisation average of the cost of equity estimates for each stock.

The total number of analyst inputs which had sufficient data available for analysis was 39,565. This means that over the 10.5 year period there were just under 40,000 combinations of earnings per share expectations, dividends per share expectations and price targets for Australian-listed firms with all other data available for analysis. An individual analyst can make more than one input for each firm in a six month period and these inputs are incorporated into the analysis.

This allows us to construct a sample of 4,568 observations. This means that, on average, each time a firm appears in a six month period, the data is the result of 8.7 analyst inputs and estimates of the cost of equity capital. There were 561 individual firms in the dataset which means that, on average, each firm appears in the dataset 8.1 times over the 10.5 year period.

In Figure 3 we present analyst-implied estimates of the cost of equity capital from our computations and those of Bloomberg. Our estimates of the cost of equity range from 9.7% in the first half of 2006 to 11.3% in the first half of 2009. Our estimates of the market risk premium range from 4.1% in the second half of 2007 to 7.9% in the second half of 2012. There is a noticeable increase in the estimated market risk premium from the second half of 2008, which coincides with the global financial crisis. From 2H02 to 1H08 the average estimated cost of equity is 10.3%, which increases to an average 10.9% from 2H08 to 2H12. The market risk premium increases from an estimated 4.7% over 2H02 to 1H08, to an average 6.2% from 2H08 to 2H12.

Bloomberg estimates are only available from the second half of 2008 onwards. For the four and a half years of data that are available, the Bloomberg estimates of the cost of equity are higher than our estimates, by an average of 2.8%. The Bloomberg estimate of the cost of equity averages 13.7%, compared to our estimate of 10.9%. This corresponds to an average market risk premium estimate from Bloomberg of 9.0%, compared to our estimate of 6.2%.

[9] The Bloomberg estimates we present are a market capitalisation weighted average for the Australian equity market for which analyst forecasts are available. Note that the Bloomberg estimates for each individual stock are actually a combination the CAPM beta estimate from regression analysis, the risk-free rate and the market risk premium from the dividend growth analysis. Bloomberg does not report dividend growth cost of capital estimates for individual stocks.

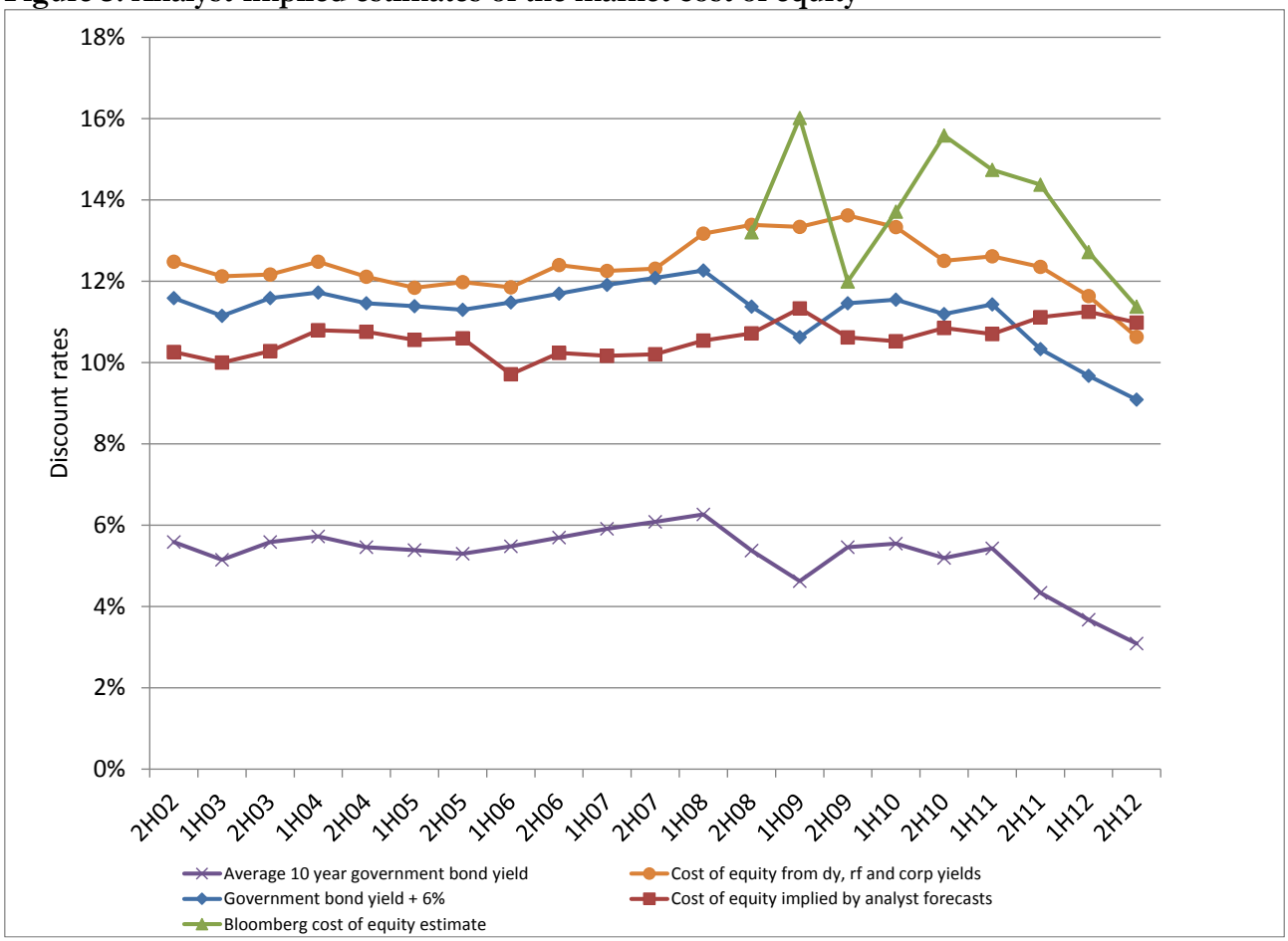
Table 1. Comparison between SFG and Bloomberg estimates of the cost of equity

	SFG	Bloomberg
Time period prior to constant/mature growth	10 years	19 years
What is the *ROE* at maturity?	3% to 30%	r_e
What is the dividend payout ratio at maturity?	$1 - g \div ROE$	45%
What is the constant growth rate at maturity?	1% to 10%	$(1 - DPR) \times r_e$
How to transition to long term growth?	Explicit forecasts of dividends and earnings in years 1 and 2	Explicit forecasts of dividends and earnings in years 1 and 2
	ROE in year 2 reverts to long term ROE over remaining 8 years	"Growth" stage of either 3, 5, 7 or 9 years
	DPR in year 2 reverts to long term DPR over remaining 8 years	"Transition" stage of either 14, 12, 10 or 8 years
	Reversion is in equal increments	Length of stages contingent upon Bloomberg's classification of the firm into explosive, high, average or slow growth. This classification is based upon the distribution of growth rates for all firms.
		Growth rate during "growth" stage is analyst's average estimate of long term growth
		Reversion in equal increments to mature growth rate over transition stage
Data	Individual analyst forecasts of dividends and earnings matched with the individual analyst price target	On each date, average values computed for all outstanding analyst inputs available at that date. Earnings and dividend expectations matched with share price.

Over the time period for which data is available, it is clear that the Bloomberg estimates of the market cost of equity are both higher than our estimates, and more variable over time. We cannot say with certainty which series exhibited the "correct" level of variation over time because both series are estimates of the cost of capital. The Bloomberg series could be more volatile over time because the true cost of equity varied considerably over this time period; or the Bloomberg series could be more volatile because of noise.

The Bloomberg series is more sensitive to short-term price fluctuations because analysts do not instantaneously adjust their earnings forecasts every time the share price moves. When there is a large change in the share price, this reflects news about expected cash flows, or news about the risk of those cash flows, or both. If analysts instantaneously adjusted their earnings forecasts every time the share price moved, the news about expected cash flows would be reflected in the share price and the analyst's earnings forecast. But if the share price changes and analysts do not immediately adjust their earnings forecasts, the movement in the implied cost of capital will be overstated.

Figure 3. Analyst-implied estimates of the market cost of equity



An example illustrates the point. For the purposes of the example we use the constant growth dividend discount model, although Bloomberg does not assume constant growth until a long period into the future. Suppose that a stock is trading at \$10.00 per share, on expectations that the next dividend will be \$0.50, grow at 6% in perpetuity, and the cost of capital is 11%. That is, we have $P = D_1 \div (r_e - g)$ = \$0.50 ÷ (0.11 – 0.06) = \$10.00. Now suppose that the market receives bad news about dividends, so expected dividends fall to \$0.40. There is no change in risk and no change in the anticipated growth of those dividends. The share price falls by 20% to \$8.00.

If analyst forecasts had been immediately updated to reflect the dividend fall to \$0.40, the implied cost of equity would still be 11%. We would have $r_e = D_1/P + g$ = \$0.40/\$8.00 + 0.06 = 0.05 + 0.06 = 11.00%. But if analyst forecasts were not updated at all, the share price movement will lead to an estimate of the cost of capital which is unreasonably high. If the dataset still includes a dividend forecast of \$0.50 we would have $r_e = D_1/P + g$ = \$0.50/\$8.00 + 0.06 = 0.0625 + 0.06 = 12.65%.

At each point in time, the consensus analyst forecasts used by Bloomberg lag behind the information contained in share prices, so time series of the cost of equity will exhibit more volatility than the true cost of capital. Our estimates are not affected by this lag, because our estimates are made with respect to analyst earnings forecasts and price targets. In addition, those estimates of earnings forecasts and price targets are made at approximately the same point in time by the same analyst.

The discussion above explains why the Bloomberg estimates exhibit more variation over time than our estimates. We also need to consider why the Bloomberg estimates are higher than our estimates over the recent time period. On average this difference is 2.8% over the period 2H08 to 2H12. This can be allocated into a 1.0% difference from higher dividend yields in the Bloomberg estimates and 1.8% from assumptions which lead to higher growth projections.

The difference in yields is due to Bloomberg matching analyst earnings forecasts with share prices, rather than price targets. The difference in growth assumptions results from Bloomberg allowing higher average returns on investment in the early years of cash flow forecasts, before setting those returns equal to the cost of capital in the long-term. The profile for investment returns which underpin our cost of equity estimates is smoother than the Bloomberg profile. On average the return on equity generated by our technique, in the long term, is similar to existing returns on equity for the firms. Firms earning high returns initially eventually earn lower returns, and firms earning low returns eventually earn higher returns. But on average returns on equity across the sample, and across industries, are approximately the same in the long term as in the historical data. In contrast, the implied returns on investment which underpin the Bloomberg estimates are higher than observed in historical data, and lower in the long-term. The net impact of this difference in returns is higher growth rates from the Bloomberg estimates.

2.4 Summary of cost of equity and market risk premium estimates

It is useful to summarise the various estimates of the cost of equity and market risk premium for two periods of 2H02 to 1H08, and 2H08 to 2H12. Average estimates are presented in Table 2. In the first period which precedes the global financial crisis, we have average estimates for the cost of equity of 10.3% implied by analyst forecasts, 11.6% if we simply add 6.0% to the risk free rate and 12.3% from market-wide indicators. These averages correspond to MRP estimates of 4.7%, 6.0% and 6.6%, respectively.

In the second period, the average cost of equity estimates from analyst forecasts increases to 10.9% and the average estimate from market-wide indicators increases to 12.6%. We also have an estimate from Bloomberg which averages 13.7%. These three estimates correspond to MRP estimates of 6.2%, 7.9% and 9.0%, respectively. In contrast, applying a constant MRP estimate of 6.0% would imply that the cost of equity had fallen by 0.9% from the first period.

Table 2. Estimates of the cost of equity and market risk premium

Period	Technique	Cost of equity (%)	MRP (%)
2H02 to 1H08	r_f + 6%	11.6	6.0
	Market-wide indicators	12.3	6.6
	Analyst implied (SFG)	10.3	4.7
	Analyst implied (Bloomberg)	Not available	Not available
2H08 to 2H12	r_f + 6%	10.7	6.0
	Market-wide indicators	12.6	7.9
	Analyst implied (SFG)	10.9	6.4
	Analyst implied (Bloomberg)	13.7	9.0

The average risk free rate from 1H02 to 1H08 is 5.7% and the average risk free rate from 2H08 to 2H12 is 4.7%.

2.5 Implied volatility based models

With respect to implied volatility based models based on options, this can be considered an extension to the economic indicators approach discussed above, in which the market implied volatility implied by options is another indicator of risk. In this case, we have an explicit equation to estimate the market risk premium. The Sharpe ratio is the ratio of the market risk premium to market volatility. So if we have an estimate of the Sharpe ratio and an estimate of market volatility we have an estimate of the market risk premium.

A specific application of this technique is presented by Bishop, Fitzsimmons and Officer (2011). The authors document the implied volatility from call options on the S&P/ASX 200 over 14 years from 1997 to 2010, highlighting two periods when implied volatility is above average for extended periods of

time. The first period is from October 1997 to June 2000, which coincides with the Asian currency crisis and the peak of the U.S. technology sector in 2000. The second period is from June 2007 to December 2010 when their sample period ends and which coincides with the global financial crisis. They also note that the correlation between the volatility implied by call option prices and the 90-day standard deviation of returns is 90%, implying that stock return volatility over a recent period can be used as a proxy for the volatility implicit in stock prices at a point in time.

As a specific example, what is required to estimate the market risk premium is an estimate of the amount of risk (the standard deviation of stock returns) and the return the market requires per unit of risk, also termed the price of risk or the Sharpe ratio. While we can estimate volatility with reference to call option prices or as a trailing average of short-term historical stock returns, we are unable to directly observe the price of risk at any particular point in time. The authors' estimate of the price of risk is 0.43, which is the ratio of 6% (the historical average excess returns) to 14% (average annualised volatility from January 1980 to November 2009 derived from 30 or 90 day moving averages of daily data).

So for example, if the estimated volatility was 22.5% (as it was at the time the authors wrote their paper) one estimate of the market risk premium at that time would be 9.6%, computed as $0.225 \times 0.06/0.14 = 0.225 \times 0.429 = 0.096$. Put another way, the estimated volatility at the time of writing (22.5%) was 61% higher than the estimated historical volatility (14%). This implies that the market risk premium should also be 61% higher than average, so $0.06 \times 1.61 = 9.6\%$.

A limitation of this analysis is that we have no objective measure of the Sharpe ratio at each point in time. We can estimate the average excess return relative to volatility in time series. But you can have a situation in which volatility is high, but investors' required return per unit of volatility is low (that is, a low price of risk).

Furthermore, even if we make the assumption that historical stock returns can be used to measure a constant price of risk, there are material differences in possible assumptions. For example, an alternative estimate of the price of risk is 0.27 (Brailsford, Handley and Maheswaran, 2012). This is the ratio of annual average excess returns of 6.1% relative to the standard deviation of annual returns of 22.7% over the 53 years from 1958 to 2010.[10] Under this alternative assumption the market implied volatility of 22.5% is approximately normal, so the estimated market risk premium will also be approximately normal. The reason for the difference in estimated Sharpe ratios, especially over the same time periods, is that estimates of annual volatility derived from daily data are generally lower than standard deviation estimates using yearly data.

The final limitation of this application of volatility based models is that the implied volatility from call options reflects volatility over a relatively short period of time. So the authors recommend that the market risk premium estimate gradually reverts to a long-term average value. They do not reach a definitive conclusion as to how long this period of time should be, but imply that five years might be reasonable as this approximates the length of recovery from a market crash.

So there are three concerns with the *direct* application of volatility based models to the market risk premium: (1) we cannot directly observe the price of risk at any time; (2) if we rely upon an estimated

[10] Recall that the data from 1958 onwards is considered by the authors of that study to be more reliable than the data prior to 1958. Also note that the estimates are approximately the same if we only use the data reported by Brailsford, Handley and Maheswaran (2012) from 1980 to 2009. In that series the average excess return is 5.9% and the standard deviation of excess returns is 23.3%, implying a Sharpe ratio of 0.25.

price of risk from historical returns there can be substantial differences in estimates; and (3) we require an assumption about how long it will take for conditions to revert to normal.[11]

However, these are concerns only with the direct application of volatility based models to estimate the market risk premium as the product of a price of risk and a volatility estimate. Those concerns do not invalidate using implied volatility as a directional indicator of the market risk premium, alongside the indicators considered earlier (dividend yield, credit spread, term spread and the risk free rate). The task at hand is making the most reliable estimate of the market risk premium at each point in time. This estimate is likely to be improved by also incorporating market implied volatility as an indicator of whether the market risk premium is above- or below-average. This can be incorporated into the estimate of the market risk premium in the same manner as the other four indicators. This avoids needing to make an assumption about the market price of risk at each point in time, but it does require making the alternative assumption about the upper and lower bounds of the market risk premium (recall we used a range of 3% to 9%) and how estimated volatility maps onto this range (we assumed a uniform distribution). This is likely to provide a more reliable estimate of the prevailing cost of equity at each point in time than simply adding a constant premium of 6% to government bond yields.

2.6 Surveys

With respect to survey-based estimates of the market risk premium, surveys presently available are unlikely to provide reliable estimates of the market risk premium. For survey evidence to be relied upon, it must be clear that the question being asked relates to an assessment of the cost of capital at the point in time. It cannot be an estimate of long-term average returns. For example, if we were to ask respondents what government bond yields are today, a good respondent would refer to the RBA website and quote the most recent government bond yield. The respondent would not compile the long term average government bond yield and would not form a view that yields are too high or low relative to what the respondent would value government bonds at. There is a risk in equity market surveys that respondents use their own estimate of a normal equity market return, rather than what is incorporated into equity prices.

A second limitation of surveys is that the respondent does not have an economic stake in the conclusion, unlike market participants. Even equity analysts, while not actually trading the stocks they cover, know that their analysis is scrutinised by clients and their sales desk. So their earnings forecasts, dividend forecasts, and price targets (and by extension their cost of capital assumptions) will have been framed on this basis.

A survey which has been given some coverage in recent times is that of Fernandez, Aguirreamalloa and Corres (2011).[12] Respondents in that survey were asked the following three questions.

> 1. The Market Risk Premium that I am using in 2011 for my country _____ is: _____%
> 2. The Market Risk Premium that I am using in 2011 for United States is: _____%
> 3. Books or articles that I use to support this number:

There were 3,874 responses with market risk premium figures excluding outliers, 124 outliers and 2,016 responses in which no figure was provided. For the United States there were 1,503 responses and the

[11] The Australian Energy Regulator relied upon similar reasoning to reject the use of implied volatility of an indicator of the market risk premium in its decision with respect to Multinet in 2012. The regulator rejected the use of implied volatility as both a directional indicator of the market risk premium (as submitted by SFG Consulting) and for making a direct estimate of the market risk premium (as submitted by Value Adviser Associates.

[12] The IPART discussion paper refers to a more recent version of the survey paper released in 2012, but the same concerns remain.

average MRP estimate was 5.5%. For Australia there were 40 responses and the average MRP estimate was 5.8%.

Of most concern in the application of the survey is the sources used to support the MRP estimate. These responses suggest that respondents relied primarily upon historic average returns to estimate the MRP. There were 1,719 sources listed by respondents to justify their answer and at least 40% of sources are likely to represent estimates based upon historical returns. We have no way of knowing whether the participants rely upon historic returns because they consider this to be the best estimate of the prevailing market risk premium, or because they simply use a long-term MRP estimate for all valuations, regardless of market conditions.

Surveys have the appeal of being relatively easy to explain to stakeholders, and if properly implemented could provide a direct estimate of the market risk premium at a point in time. But the practical impediments to implementing a large-scale, controlled survey in a timely manner should not be under-estimated. In a sense, submissions to regulators already constitute a survey, albeit with a small sample of very detailed responses. The challenge of survey evidence even comes down to the question of who can be asked the question. Do we survey investors in infrastructure assets, who would benefit from higher regulated rates of return? Do we survey equity analysts, when we can already derive their estimates of the cost of equity from their earnings forecasts and price targets?

While not wanting to be entirely dismissive of surveys, we have not observed a survey which could both be considered an informative estimate of the prevailing market risk premium *and* which is sufficiently timely to be used in regulation. We are able to examine surveys which indicate what participants thought the market risk premium was at a previous point in time, and this might aide our understanding of the factors associated with the market risk premium. But there is likely to be more benefit in examination of market data than examination of surveys.

3. Conclusion

In this report we recommend estimating the market risk premium with reference to both market indicators and the cost of equity capital derived from analyst forecasts. With respect to the market-wide indicators approach we recommend the use of the four indicators we have used in measurement (dividend yield, corporate spread, term spread and risk-free rate). Another potential indicator is the volatility implied by option prices, although we note that there are limitations associated with the direct application of this indicator in an equation.

With respect to analyst-implied estimates, we have presented a technique that generates a cost of equity for the market which is reasonably stable over time, but does exhibit the expected upwards movement during the global financial crisis. It allows the cost of equity to be determined by a large sample of data rather than an assumption about the growth rates which are appropriate in the view of the analyst tasked with estimating the cost of capital.

Both estimation techniques provide useful information for estimating the market risk premium using an objective process. They overcome the limitation of estimating the cost of equity by adding a constant estimate of the market risk premium to government bond yields, which has led to implausibly low estimates of the cost of equity in recent years.

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