ATCO Gas AUSTRALIA

Alternative versions of the dividend discount model and the implied cost of equity, Stephen Gray, SFG Consulting May 2014

Appendix 9.5

27 November 2014

Response to the ERA's Draft Decision on required amendments to the Access Arrangement for the Mid-West and South-West Gas Distribution System

Connecting WA to natural gas

Alternative versions of the dividend discount model and the implied cost of equity

Report for Jemena Gas Networks, ActewAGL, APA, Ergon, Networks NSW, Transend and TransGrid

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a: The original version of this report was incorrectly dated 15 May 2015.

Contents

1. Preparation of this report

1. This report was prepared by Professor Stephen Gray and Dr Jason Hall. Professor Gray and Dr Hall acknowledge that they have read, understood and complied with the Federal Court of Australia's *Practice Note CM 7, Expert Witnesses in Proceedings in the Federal Court of Australia*. Professor Gray and Dr Hall provide advice on cost of capital issues for a number of entities but have no current or future potential conflicts.

2. Introduction

2.1 Overview and instructions

2. SFG Consulting has been retained by Jemena Gas Networks, ActewAGL, APA, Ergon, Networks NSW, Transend and TransGrid to provide our views on the use of the dividend discount model[1] for estimating the cost of equity under the National Electricity Rules and National Gas Rules (**Rules**).

3. In particular, we have been asked to provide an opinion that uses the dividend discount model to estimate the return on equity that is commensurate with the efficient financing costs of (1) a benchmark efficient entity and (2) the average firm in the market, and which is reflective of prevailing conditions in the market for funds.

4. We have also been asked to consider any comments raised by the AER, other regulators or their consultants on matters that include whether the dividend discount model applies in Australia, the best version of the dividend discount model, and the best inputs into the dividend discount model.

2.2 Terms of reference

5. We have been provided with terms of reference that require us to comment on a number of specific issues. The terms of reference are attached to this report.

2.3 Context

6. From June 2013 to October 2013, we submitted a series of reports to the Australian Energy Regulator (**AER**) relating to the use of the dividend discount model. We used the dividend discount model to estimate the cost of equity for the Australian listed equity market as a whole, and for a sub-sample of nine listed network businesses.[2]

7. In December 2013, the AER released its final guideline on the cost of equity. The AER has had regard to dividend discount model estimates of the cost of equity in order to estimate the market risk premium. The AER's estimate of the market risk premium in December 2013 stands at 6.5%, a figure which accounts for both historical average excess returns on the Australian sharemarket,[3] and contemporaneous information about the cost of equity, including dividend discount model analysis.

8. However, the AER has not had any regard to dividend discount model analysis for estimating the overall cost of equity for a benchmark energy network. The AER considers that it is unable to form reasonable estimates for the cost of equity at this industry level.

9. The AER's computation of dividend discount model estimates differ from our computations in a number of respects. In this report, we analyse the areas of agreement and disagreement with the AER, and provide further information relating to the robustness of our dividend discount model estimates. Our cost of equity estimates from the dividend discount model can be used to estimate the cost of equity for the Australian market as a whole, and at the industry level. In our view, they are the most reliable dividend discount model estimates at the market level and benchmark entity level that are currently available.

10. In particular, we provide additional information relating to why our cost of equity estimates exhibit less dispersion over time, and less dispersion across firms, than those compiled by the AER. The AER has expressed reservations about its own techniques for estimating the cost of equity using the dividend

[1] The term *dividend growth model* (DGM) is used in the terms of reference and by the Australian Energy Regulator (AER), while we use the tem *dividend discount model*. In practice, the term dividend growth model is often interpreted as a specific form of the dividend discount model, in which dividends grow at a constant rate in perpetuity from the first forecast year. In order to mitigate the risk of this interpretation, we use the term dividend discount model throughout.

[2] Dividend discount model estimates of the cost of equity (June), Reconciliation of dividend discount model estimates with those compiled by the AER (October), and Cost of equity estimates implied by analyst forecasts and the dividend discount model (October).

[3] The term *excess returns* refers to returns above an estimate of the risk-free rate of interest.

discount model, due to the sensitivity of the estimates to input assumptions. The point we make in this paper with additional information, and which we have made previously, is that the very techniques we adopt mitigate the sensitivity of cost of equity estimates to assumptions. Furthermore, the techniques we adopt allow estimates of how industry cost of equity estimates differ from market estimates, which the techniques adopted by the AER do not allow.

11. The discussion about methodological choices relates to the use of forecast horizon, target prices versus market prices, matching dates of dividend and earnings forecasts to prices (regardless of whether target prices or market prices are used) and the use of a term structure for equity. We conclude that, even if a dividend discount model was adopted in which long-term growth is a fixed input to the model (like the technique adopted by the AER), rather than the simultaneous growth/cost of equity estimation technique we adopt, the cost of equity estimate for the average firm will be more reliable if:

   a) There is a gradual transition period over which short-term growth reverts to long-term growth.[4]

   b) Target prices are used, rather than market prices;

   c) Earnings per share forecasts, dividend per share forecasts and prices are compiled on approximately the same dates, rather than prices being matched with average earnings per share and dividends per share forecasts that have resulted from a series of past individual estimates (this point holds regardless of whether target prices or market prices are used); and

   d) The cost of equity is estimated to be constant in every future year, rather than assumed to follow a term structure in which the long-term cost of equity differs from the short-term cost of equity.

12. We devote extensive discussion to estimates of the long-term dividend growth rate. The estimation technique we adopt does not rely upon an input assumption for long-term growth. Rather, long-term growth is estimated jointly with the cost of equity. The process adopted by the AER requires a long-term growth input. In prior reports we have not directly addressed the magnitude of long-term growth under the fixed input approach, because we have devoted our attention to estimating long-term growth as an outcome from prices, earnings and dividends.

13. However, in this paper, we need to address whether the AER's estimation process for long-term growth is consistent with the empirical evidence. The AER's view is that the best long-term growth estimate is 4.6% in nominal terms. Underlying this long-term growth estimate is a real growth rate of 2.0% and an inflation rate of 2.5%.[5] In turn, the real growth rate in dividends is estimated to be 1% less than an estimate of real growth in gross domestic product (GDP) of 3.0%. We refer to this real, long-term growth assumption as *GDP minus 1%.*

14. The basis for this long-term growth assumption is historical data showing that GDP growth has exceeded earnings per share growth and dividends per share growth.[6] We analysed data from Australia and the United States (U.S.), and document that this result from the prior evidence is confined to the period prior to the substantial reductions in inflation that occurred over the last 20 to 30 years in Australia and the U.S., and central bank focus on maintaining moderate inflation over this time period. Since this change in inflation and central bank policy, real growth in earnings per share has matched or exceeded real growth in GDP.

15. Over the same time period, price/earnings ratios rose substantially. So in applying the *GDP minus 1%* approach, the AER incorporates a growth assumption from the period *prior* to inflation/central bank regime change, and applies that growth assumption to high price/earnings stocks *post* the

[4] The AER refers to this as its three-stage dividend growth model, in which the middle stage is the transition stage.

[5] That is, (1 + real growth) × (1 + inflation) – 1 = 1.020 × 1.025 – 1 = 4.6%. The equation that relates real growth, inflation and nominal growth is called the Fisher equation and is used throughout this paper.

[6] Bernstein and Arnott (2003) and MSCI Barra (2010).

inflation/central bank regime change. Our point is that price/earnings ratios in recent decades have likely increased because the cost of capital is lower *and* growth estimates are higher. Under the AER growth assumption, the increase in price/earnings ratios is attributed to reductions in the discount rate.

16. If the market cost of equity was to be estimated using a fixed input for long-term growth that is independent of share prices, there is no reason to think that earnings per share growth will lag behind GDP growth. We maintain the position that the most appropriate manner for estimating long-term growth is to use a technique that is not anchored to GDP, but rather incorporates reinvestment and returns on investment.

17. Finally, we reach conclusions on the cost of equity for the market and for a benchmark energy network. Those specific conclusions are contained in Sub-section 5.4 and Sub-section 7.1 and are not repeated here. The cost of equity estimates must be considered jointly with a discussion of the value of imputation credits presented in Section 6. We have made estimates of the return on equity from dividends and capital gains for a benchmark entity, and then determined what input into the AER's post-tax revenue model is required in order to allow an entity to achieve these returns from dividends and capital gains.[7]

18. We reiterate the position that, embedded within the AER post-tax revenue model is a treatment of imputation credits with is inconsistent with the treatment of imputation credits in the AER's dividend discount model analysis. This inconsistency could be resolved either by using a different computation in the dividend discount model analysis, or by altering the post-tax revenue model.

2.4 Outline

19. In Section 3 of the report we devote our attention to methodological choices relating to the dividend discount model. While our ultimate aim is to estimate the cost of equity for the market and a benchmark energy network, we canvass methodological issues first for the following reason. The AER's primary objections to our prior analysis relate to transparency and complexity. As a general statement, we think the AER wants regulatory participants to better understand why we make particular choices, and also wants to be persuaded that the benefits of more data analysis outweigh the costs. So before presenting more cost of equity estimates we want to provide additional information to improve transparency, address concerns over complexity, and provide more information to show that there are benefits to each choice that we make.

20. In Section 4 we focus entirely on issues relating to long-term growth, paying particular attention to the merits of the *GDP minus 1%* assumption. We discuss the impact of share repurchases and new share issues on growth in earnings per share and dividends per share, and then consider historical evidence on growth in GDP, earnings per share and dividends per share.

21. In Section 5 we present our estimates of the cost of equity for the market and a benchmark energy network. This is followed by a brief discussion of imputation credits in the AER's post-tax revenue model in Section 6 and we reach conclusions in Section 7.

[7] This comment applies equally to any post-tax revenue model which estimates the benefit of imputation credits in the same manner as the AER's post-tax revenue model.

3. Methodology issues

3.1 Alternative versions of the dividend growth model

3.1.1 Our prior recommendation

22. In our report entitled *Reconciliation of dividend discount model estimates with those compiled by the AER*[8] we made the following recommendation:

> We recommend that the AER incorporate an eight year transition period over which parameter inputs gradually revert to long-term estimates. The current version of the AER's dividend discount model equation assumes a transition period of zero years. In the AER's version of the dividend discount model, there is only one parameter input in question, the growth rate of dividends. So the specific application would be for growth to revert to the long-term estimated value over forecast year three to year ten. Regardless of the period over which initial inputs transition to long-term estimates, or the process by which this occurs (equal increments, exponential decline, or something else) in the dividend discount model there will always be an assumption about dividends in every forecast year. So it is not a matter of the AER needing to make an extra assumption. It is a matter of the AER making an assumption that is most likely to represent the market's expectations for future dividends.[9]

3.1.2 Response to the final guideline

23. Our recommendation regarding the transition to long-term parameter inputs is supported by Lally (2013b) who states that:

> Clearly a three-stage model is more likely to be closer to the truth than either a one or two-stage model, and a two-stage model is more likely to be closer to the truth than a one-stage model.[10]

24. In its draft guideline, the AER relied upon a two-stage version of the dividend discount model. In the two-stage version, the AER projects dividends for two years based upon analyst forecasts and then assumes constant growth.[11]

$$P = \frac{D_1}{(1+r_e)^1} + \frac{D_2}{(1+r_e)^2} + \frac{D_2 \times (1+g)}{(r_e - g) \times (1+r_e)^2} = \sum_{t=1}^{2} \frac{D_t}{(1+r_e)^t} + \frac{D_2 \times (1+g)}{(r_e - g)(1+r_e)^2}$$

25. In its final guideline, the AER now relies upon both a two-stage version of the dividend discount model, and a three-stage version of the dividend discount model. In the three-stage version of the dividend discount model, there is mean-reversion in dividend growth over eight years, and then constant growth. So the difference is the intermediate period of eight years in which there is a transition from the explicit forecast period to a terminal growth phase.

[8] SFG Consulting (2013b).

[9] SFG Consulting (2013b), p. 9.

[10] Lally (2013b), Section 3, p. 8.

[11] AER Explanatory Statement to the draft guideline, Sub-sections H.1 (p.219) for the general equation and Sub-section H.2 (p.220) for the disclosure of a two-year explicit forecast period prior to the constant growth assumption. In this equation, P refers to share price of a company or a portfolio of companies, D_t refers to the dividend forecast in year t for a company or a portfolio of companies, g refers to an estimate of the long-term growth in dividends for a company or portfolio of companies, and r_e refers to the cost of equity for a company or portfolio of companies.

$$P = \frac{D_1}{(1+r_e)^1} + \cdots + \frac{D_{10}}{(1+r_e)^{10}} + \frac{D_{10} \times (1+g)}{(r_e - g) \times (1+r_e)^{10}}$$
$$= \sum_{t=1}^{2} \frac{D_t}{(1+r_e)^t} + \sum_{t=3}^{10} \frac{D_t}{(1+r_e)^t} + \frac{D_{10} \times (1+g)}{(r_e - g)(1+r_e)^{10}}$$

26. The transition from short-term growth to long-term growth is done in a linear manner. This means that the growth assumption changes at a constant rate (that is, if dividend growth was 10% in year two, and projected to be 6% in year ten, growth is reduced by 0.5% for each of the eight transition years). We agree with the use of an eight-year transition period (which we also adopt) and we agree with linear extrapolation from short-term to long-term inputs (while we have more inputs than growth, we revert from short-term to long-term estimates for those inputs at a constant rate).

27. The difference in the AER's estimates of the market risk premium under the two alternative assumptions is material. The AER compiles estimates of the market risk premium from January 2006 to November 2013 on a monthly basis. Using the AER's 4.6% long-term growth assumption, the AER estimates an average market risk premium over this time period of 5.9% according to the two-stage model, and 6.5% according to the three-stage dividend discount model.[12] Furthermore, the market risk premium estimate is higher under the three-stage version of the dividend discount model for every month during the period.[13]

28. In its final guideline, the AER has not reached a conclusion on whether the two-stage or three-stage version of the model is more useful for reaching a decision. In the final guideline, the conclusion of the AER from the dividend discount model analysis is that the market risk premium lies within a range of 6.1% to 7.5%.[14] The basis for this range is six computations for the market risk premium over October and November 2013, involving three long-term growth assumptions (4.0%, 4.6%, and 5.1%), and the two versions of the model.[15]

29. The reason the cost of equity estimates are higher under the three-stage version of the dividend discount model is that, empirically, listed firms exhibit dividends and earnings growth above the AER's long-term growth assumption.[16] The basis for the AER's long-term growth assumption is that firms listed today are expected to have long-term growth 1% below long-term GDP growth. The AER assumes real GDP growth of 3.0% per year and inflation of 2.5%, which implies nominal long-term GDP growth of 5.575%.[17] The AER also assumes real growth in dividends per share is 1.0% below real GDP growth, implying nominal GDP growth of 4.55%.[18] This means that, under the three-stage version of the model, there will be an eight year period in which dividend growth is higher under the three-stage version of the model, compared to the two-stage version of the model.

30. The basis for the *GDP minus 1%* assumption is the view that listed firms cannot grow at rates above growth in the aggregate economy for an indefinite period. The AER takes this one stage further and considers that listed firms today will exhibit lower growth than the aggregate economy, on the basis that new ventures contribute to GDP growth.

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[12] AER Explanatory Statement to the final guideline, Appendix E.2, p. 118.

[13] AER Explanatory Statement to the final guideline, Appendix E.2, p. 118, Figure E.1

[14] AER Explanatory Statement to the final guideline, Sub-section 6.3.4, p. 93.

[15] AER Explanatory Statement to the final guideline, Appendix E.2, p. 119, Table E.1.

[16] In the data which underpins our conclusions to Sub-sections 3.2, 3.3 and 3.4, the forecast earnings per share growth for the market in year two, on a monthly basis from July 2002 to 2014, has an average value of 12.5% and a median value of 11.1%. So if growth falls to 4.6% in year three the cost of equity will be higher than if growth falls gradually to 4.6% over forecast years three to ten. This higher growth assumption in the early forecast years must also be a feature of the AER dataset in order for the cost of equity estimates to be always higher under the AER three-stage model.

[17] Nominal growth if GDP = (1 + real growth in GDP) × (1 + inflation) – 1 = 1.030 × 1.025 – 1 = 5.575%.

[18] Nominal growth if dividends per share = (1 + real growth in dividends per share) × (1 + inflation) – 1 = 1.020 × 1.025 – 1 = 4.550%.

31. This is a long-term perspective on why the earnings of listed companies are not projected to grow as fast as GDP. There is no reason to think that a GDP growth constraint is binding on listed earnings growth from as early as forecast year three. It is only the AER's three-stage version of the dividend discount model, in which long-term growth is achieved in forecast year 10, which is broadly consistent with the logic for the long-term growth assumption.[19]

32. There is discussion by McKenzie and Partington (2013) about the length of the business cycle being shorter than ten years as the basis for a shorter transition period.[20] This discussion is not relevant to the selection of the transition period from high dividend growth to a long-term value equal to 1% below the GDP growth projection. The short-term growth forecasts for listed firms are above 4.6% for the entire time period for which data is available. This is the reason why the market cost of equity estimates relied upon by the AER are always higher under the three-stage model, compared to the two-stage model. In our data, which produces estimates similar to that of the AER using the three-stage model with the same inputs, the year two growth in dividends is around 10%. So the market comprises firms growing at above 4.6%, and the only issue is how long it would take for these firms to revert to an expectation of normal growth. If that expectation is only two years away, it is equivalent to assuming that growth will shrink dramatically in year three, rather than gradually over ten years.

33. The business cycle data provides an indication of how long it would take for a boom economy or recession economy to revert to a normal growth state. It does not provide an indication of how long it would take for a high growth firm to revert to a normal growth firm. This argument is particularly inappropriate when the long-term growth assumption is predicated on the argument that growth of a business cannot exceed growth in the overall economy in perpetuity. That argument is based upon long-term growth potential, not growth potential in forecast year three.

3.1.3 Implication

34. Our empirical estimates of the cost of equity for the market, and a benchmark efficient entity, rely upon an eight-year transition period after a two-year explicit forecast period. In our view, a transition period will lead to the most reliable cost of equity estimates. This transition approach is consistent with the AER's three stage dividend discount model, in which short-term growth estimates change linearly to long-term growth estimates. It is not appropriate to place any weight on the AER's two stage dividend discount model, under which high growth rates in year two are expected to fall abruptly to long-term levels.

35. According to the AER's market risk premium estimates, if we refer only to the results of the three-stage dividend discount model, this implies a range of market risk premium estimates of 6.6% to 7.5% from October to November 2013. This stands in contrast to the range of 6.1% to 7.5% relied upon by the AER in reaching its conclusion that the market risk premium is 6.5%. Under the AER's best estimate of long-term growth of 4.6%, the market risk premium is estimated at 7.1% in the three-stage model, rather than 6.7% in the two-stage version.

3.2 Share price versus price target

3.2.1 Our prior recommendation

36. In our report entitled *Reconciliation of dividend discount model estimates with those compiled by the AER* we made the following recommendation:

[19] As discussed later, we do not agree with the *GDP minus 1%* assumption. In this section we are focused only on the rationale behind the assumption, not the magnitude of the assumption.

[20] McKenzie and Partington (2013), pp. 16–19.

> We recommend that the AER use price targets in its analysis, rather than share prices, because there is more likely to be a reliable relationship between the analyst's earnings forecasts, dividend forecasts and price target, compared to the relationship with share prices. Implementing the analysis with price targets is no more complex than implementing the analysis with share prices. It is simply a matter of using a different price input. If analysis is conducted with consensus forecasts, this issue is less problematic than if the analysis is conducted with respect to individual analyst forecasts.
>
> With respect to individual analyst forecasts, recall that we compiled results derived from both consensus forecasts and individual analyst forecasts. What this was intended to convey was that the overall conclusions weren't unduly affected by this choice, but that there was a reduction in dispersion of cost of equity estimates when individual forecasts were used. The only difference in performing the analysis is the number of computations to be performed. Each individual estimate is done in exactly the same way, regardless of whether we use 4,000 consensus forecasts, or 40,000 individual forecasts. So if it is useful to reduce the dispersion of outcomes merely by performing more computations, we recommend that this should be adopted. We would note, however, that combining individual analyst earnings and dividend forecasts with share prices, rather than target prices, could lead to more dispersion of outcomes.[21]

3.2.2 Response to the final guideline

37. The cost of equity estimates in the final guideline continue to be based on market prices, for two reasons. First, the AER states that the use of market prices is standard practice. Second, the AER states that the objective is to estimate the cost of equity that is incorporated in market prices, rather than the cost of equity used by analysts.[22]

38. With respect to practice, we agree that it has been more common to incorporate market prices in the analysis, rather than target prices. But there is an important reason for this. In prior applications of the dividend discount model, advisors relied upon consensus analyst forecasts for individual stocks, the consensus forecast being the mean forecast from a set of analysts. Some of those analysts will think the company's earnings will be high, and some of those analysts think the company's earnings will be low. So the consensus forecast is a proxy for the average forecast of investors in the market, and is matched with the market price to estimate the cost of equity.

39. In our analysis, we start with each individual analyst's forecast. So one observation is for the analyst who thinks the company will generate high earnings, and another observation is for the analyst who thinks the company will generate low earnings. If we use the same market price for both analysts, the implied cost of equity for the analyst who forecasts high earnings will be overstated, and the implied cost of equity for the analyst who forecasts low earnings will be understated.

40. As highlighted in the quote above from our previous paper, when consensus forecasts are used for analysis, the overall conclusions on the cost of equity are not much different from the conclusions which result from analysis of individual forecasts. But there is less dispersion in cost of equity estimates across firms when the individual analyst forecasts are used. The use of individual analyst forecasts mitigates estimation error. If an objective is to mitigate estimation error, use of individual analyst forecasts is useful. The computations are essentially the same, just in a different order, (and this applies regardless of whether our dividend discount model estimation process is adopted or not). We can either (a) for each firm, average the forecasts from different analysts and then estimate the cost of equity for the firm; or (b) compute the cost of equity for each analyst covering each firm, and then compute the average cost of equity. The latter choice results in less estimation error, so is our preferred choice.

[21] SFG Consulting (2013b), p. 11.

[22] AER Explanatory Statement to the final guideline, Appendix E.3, p. 123.

41. With respect to the AER's second concern, regardless of whether we use the market price or the target price, we are still making an estimate of the market-implied cost of equity. We are just using a more appropriate proxy for price. When we observe a traded price we do not know what that investor's forecast for dividends or earnings is, so we make an estimate of the earnings or dividend forecast from an analyst covering the stock. So we are already drawing upon analyst expectations as a proxy for investor expectations in estimating the cost of equity. The only issue is whether, in estimating the cost of equity, we will get a better estimate if we use the market price or the target price for computations. The better input is the target price because, if there is any difference in the analyst's expectations and the investor's expectations for earnings, we would also expect there to be a difference in the analyst's and the investor's views on price.

42. To illustrate the impact of the target price versus market price decision on the overall market cost of equity, we performed the following analysis. We compiled a dataset of dividend forecasts, target prices and market prices on a monthly basis from July 2002 to January 2014 in the following manner.

43. First, we matched the date the dividend forecast was made to the date the analyst released a price target, within a 28-day tolerance (that is, a price target can be released within four weeks of the earnings forecast to be matched). We also matched the dividend forecasts with the share price in the middle of the month the dividend forecast was made. We retain this as the analyst's dividend forecast/matched target price/matched share price until the analyst released another dividend forecast. This same dataset is used in another section to illustrate the detrimental impact on precision associated with stale forecasts.

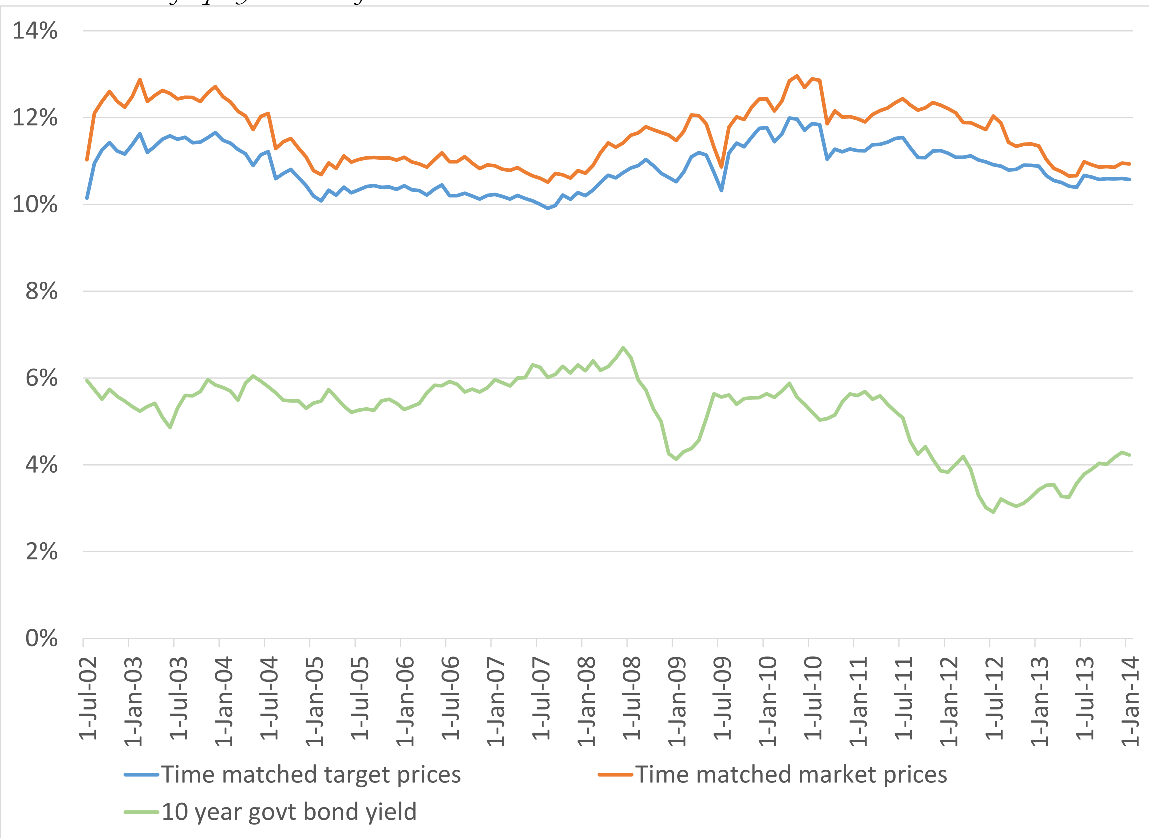
44. Second, for each stock in each month we computed the averages over the month for dividend forecasts matched with market prices, and for dividend forecasts matched with target prices. So this provides us with consensus analyst information for dividends/matched target prices and dividends/matched market prices.

45. Finally, for each month we weighted the consensus information for each stock by market capitalisation to arrive at forecasts for the aggregate market. This allowed us to estimate the cost of equity using the three-stage dividend discount model adopted by the AER. We perform the same adjustment for imputation credits as relied upon by the AER, namely assuming that 75% of dividends are franked, the value of a distributed imputation credit is 0.70, and the corporate tax rate is 30%. So the adjusted dividends over forecast years one and two is the cash dividend forecast multiplied by 1.225 (that is, $1 + 0.75 \times 0.70 \times 0.30 \div (1 - 0.30) = 1.225$). We assume the same long-term growth rate of 4.55% as the AER (assuming real growth of 2.00% and inflation of 2.50%). We also assume the same half-year adjustment as the AER, so assume that dividends are received at the end of year 0.5, 1.5 and so on, rather than at the end of year 1, 2 and so on. This allows us to solve for the cost of equity that sets the present value of dividends equal to either the target price or the market price.

46. Given this information we can isolate the impact of using target prices versus market prices on the overall cost of equity estimate. This does not alleviate the problem of matching stale earnings and dividend forecasts with current market prices, which introduces another layer of imprecision. We cover this separate issue in a separate section. In the current analysis, we have aligned the timing of the dividend forecast with the timing of the target price and the timing of the market price. Also note that the figures presented in the current section are directly comparable to those reported by the AER. There is a separate issue related to how the AER accounts for imputation in the post-tax revenue model. But in the current section we focus entirely on the relevance of target prices and market prices.

Figure 1. Comparison of cost of equity and market risk premium estimates derived from target prices

Panel A: Cost of equity and risk-free rate



Panel B: Market risk premium

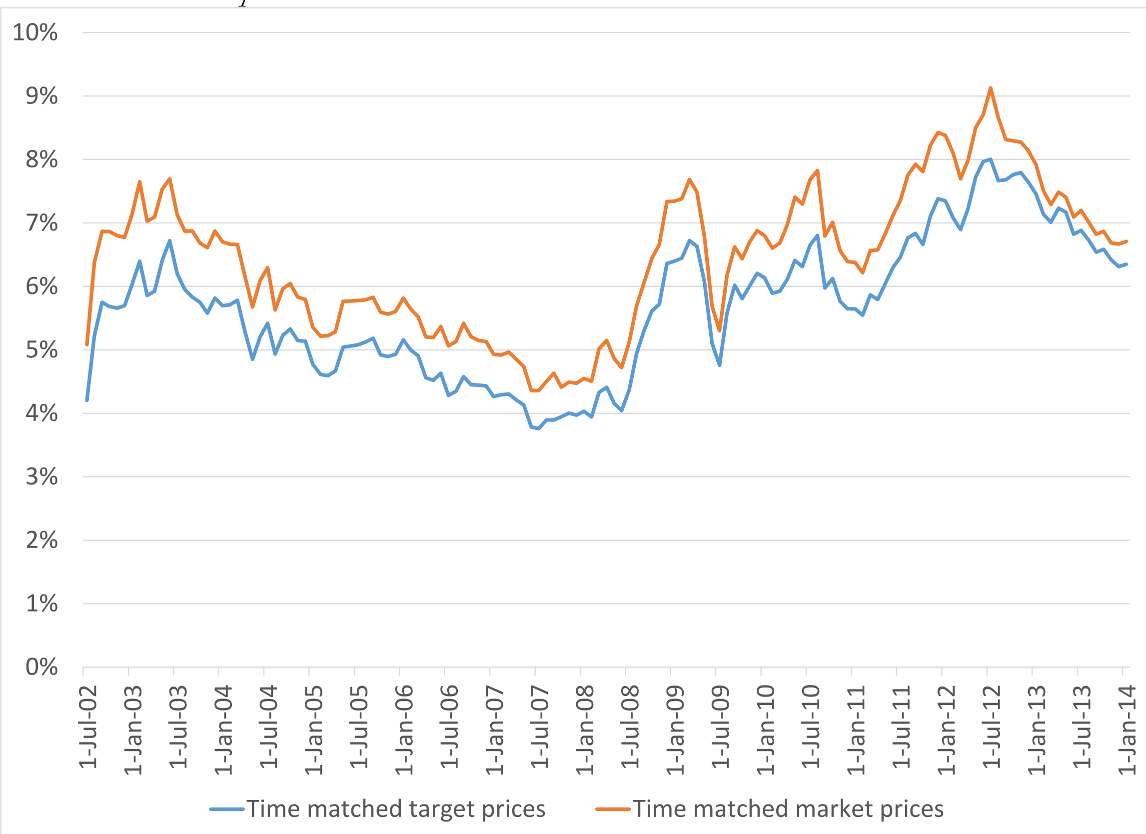


Table 1. Target prices, market prices and the estimated cost of equity (%)

	Market cost of equity			Market risk premium			
	Target prices	Market prices	AER	Target prices	Market prices	AER	Govt bond yield
July 2002 to January 2014							
Average	10.86	11.61		5.68	6.43		5.18
Std Dev	0.52	0.67		1.08	1.13		0.90
Minimum	9.91	10.52		3.76	4.26		2.91
Maximum	11.99	12.96		8.00	9.13		6.70
March 2006 to November 2013							
Average	10.84	11.54	11.54	5.80	6.51	6.50	5.04
Std Dev	0.53	0.65		1.24	1.29		1.04
Minimum	9.91	10.52		3.76	4.36		
Maximum	11.99	12.96		8.00	9.13		
March 2006 to December 2007							
Average	10.18	10.84	10.33	4.25	4.91	4.40	5.93
Std Dev	0.12	0.17		0.30	0.36		0.23
Minimum	9.91	10.52		3.76	4.36		5.41
Maximum	10.45	11.19		4.91	5.52		6.30
January 2008 to December 2009							
Average	10.88	11.61	12.17	5.37	6.11	6.66	5.50
Std Dev	0.40	0.43		0.93	1.02		0.76
Minimum	10.20	10.72		3.94	4.51		4.13
Maximum	11.75	12.43		6.72	7.69		6.70
January 2010 to November 2013							
Average	11.12	11.84	11.78	6.74	7.46	7.40	4.38
Std Dev	0.42	0.65		0.69	0.73		0.96
Minimum	10.39	10.65		5.54	6.21		2.91
Maximum	11.99	12.96		8.00	9.13		5.88

47. In Figure 1 we present a comparison of the cost of equity estimates, and equity risk premium estimates over time using different estimation techniques. In Panel A, the blue line represents estimates of the cost of equity based upon target prices and the three-date dividend discount model of the AER. The orange line represents estimates of the cost of equity based upon market prices and the three-stage dividend discount model of the AER. Throughout the estimation period, the cost of equity based upon target prices is lower than the cost of equity based upon market prices. As shown in the descriptive statistics in Table 1, on average the cost of equity estimate is 0.75% lower, based upon target prices. For the 11 years and seven months from July 2002 to January 2014, the cost of equity is estimated at 10.86% using target prices, and 11.61% using market prices. This corresponds to estimates of the market risk premium of 5.68% and 6.43%, respectively.

48. As expected, cost of equity estimates based upon target prices exhibit less dispersion over time than cost of equity estimates based upon market prices. The range of cost of equity estimates based upon target prices is from 9.91% to 11.99% (a difference of 2.08%), compared to a range of 10.52% to 12.96% for estimates based upon market prices (a difference of 2.45%). The standard deviation of estimates is 0.52% based upon target prices and 0.67% based upon market prices.

3.2.3 Implication

49. This analysis has two implications for estimating the cost of equity. First, using analyst target prices reduces the dispersion of market cost of equity estimates over time. Second, it demonstrates that there is no adverse impact on the cost of capital for consumers from using analyst target prices rather than market prices. The estimated market cost of equity is lower for every month analysed when formed on the basis of target prices, and is on average 0.75% lower. The AER has expressed its preference for using market prices, but also expressed a concern about potential bias associated with using market

prices. The most appropriate manner to address any potential bias in dividend forecasts is to match that forecast with the price target from the same analyst.

3.3 Timing of price inputs and analyst forecast inputs

3.3.1 Our prior recommendation

50. In our report entitled *Reconciliation of dividend discount model estimates with those compiled by the AER* we made the following recommendation:

> We contend that an important reason why our cost of equity estimates over time are more stable than those compiled by the AER and by Bloomberg is that we closely match the date at which analysts enter their dividend and earnings forecasts into the database, with the date used to measure prices. If consensus estimates are to be relied upon, a matched dataset can be compiled with price targets or share prices, and then averages computed to generate a set of consensus forecasts for each company over time.
>
> This is purely a data compilation exercise and does not involve any complicated mathematics. The AER has commented that stability in the cost of equity over time is appealing to both investors and consumers. Given the increase in stability that is likely to result from this date matching, we recommend that the AER implement this technique. It can be done independently of any other methodological choices made in the implementation of the dividend discount model.[23]

3.3.2 Response to the final guideline

51. In the final guideline, the cost of equity estimates relied upon by the AER have been compiled on the basis of consensus earnings and dividend forecasts, which incorporates stale forecasts into the analysis. The AER has not incorporated our suggestion for two reasons. First, the AER states that we did not, in relation to increased variation in the cost of equity over time:

> provide evidence of the magnitude of this effect, or indeed, whether the effect on the volatility of the return on equity is material.

52. We have previously noted that stale forecasts is one likely explanation for the high volatility of the Bloomberg cost of equity estimates over time, in comparison to our cost of equity estimates and those compiled by the AER.[24] In the current paper we provide direct evidence on the impact of using forecasts and prices matched in time, compared to using stale forecasts matched with current prices. To perform this analysis we adopt the AER's three-stage dividend discount model, just as we did in Sub-section 3.2, with respect to the target price versus market price analysis.

53. On average, the cost of equity is very close using the two approaches, and is close to the AER's cost of equity estimates. The difference is in the volatility of the cost of equity estimates over time. As we will show with reference to Figure 2 and Table 2 there is a material reduction in the volatility of the cost of equity estimates over time when prices and forecasts are compiled at the same point in time. (We reiterate that, in this section, there are no target prices used. All the analysis relies upon market prices.)

54. The second reason the AER has not incorporated our suggestion is that the AER:

> did some sensitivity analysis, examining the effect on our estimates of the MRP of adjusting for sluggish analyst forecasts. We decided that, given the moderate magnitude of the adjustments, and also the given uncertainties surrounding the calculation of the adjustment, that we would not incorporate the adjustment into our estimates of the MRP.

[23] SFG Consulting (2013b), p. 17.
[24] SFG Consulting (2013b), p. 27.

55. Resulting from this sensitivity analysis, the AER notes that:

> If 2008 and 2009 are omitted to exclude the effects of the Global Financial Crisis, the average absolute difference between the unadjusted and adjusted MRP was less that 20 basis points.

56. Unfortunately, it is periods when the market cost of equity might be different from the historical average (like the Global Financial Crisis or a boom period for the equity market) that it is most important to place reliance on a dividend discount model estimate of the cost of equity. The objective is not to adopt a process to estimate a timely cost of equity that works best during normal market conditions. The objective is to adopt a process to estimate a timely cost of equity that works best during periods when the cost of equity might be different to normal levels.

57. So a technique to estimate the cost of equity in a timely manner needs to mitigate estimation error as much as possible. We want to maximise the ability of the technique to respond to changes in market conditions, but minimise the impact of noise in the data that perhaps does not provide an indication of the cost of equity. One technique to mitigate this noise, that does not involve any debate about the forecast horizon, growth rates or any other aspect of the estimation process, is to ensure that there is a match in time between the compilation of the earnings forecast for an analyst, and the price associated with that forecast.

58. Using exactly the same dataset and computational technique described in Sub-section 3.2, we compiled estimates of the cost of equity in which there was, or was not, a match in time between the earnings forecast and price date. Our cost of equity estimates and market risk premium estimates can be compared to those presented by the AER, which relies upon Bloomberg consensus cost of equity estimates for the ASX200 index. As mentioned in Sub-section 3.2 the treatment of dividend imputation in the post-tax revenue model is not considered here.

59. In Figure 2 we present a comparison of the cost of equity estimates, and equity risk premium estimates, over time. In Panel A, the grey line represents estimates of the cost of equity over time based upon consensus dividend forecasts. This means that average dividend forecast from dividends entered into the database over previous days is matched with the share price on a particular day.

60. For example, suppose analyst Jane made a dividend forecast of $1.00 on the 1st of January (when the price was $20.00), analyst John made a dividend forecast of $1.20 on the 1st of February (when the price was $22.00) and it is now the 1st of March and the price is $19.00. The consensus dividend forecast is $1.10 and today's price is $19.00, so the dividend yield is 5.8%.[25] One dividend forecast is stale by one month, and the other dividend forecast is stale by two months. Because analysts do not update their forecasts continuously, cost of equity estimates based upon consensus estimates will be more volatile than in reality.

61. The orange line represents estimates of the cost of equity based upon matched market prices and the dividend discount model of the AER. In the context of the example, and suppose we were compiling analysis on a quarterly basis, we have a dividend forecast of $1.00 matched with a price of $20.00, and a dividend forecast of $1.20 matched with a price of $22.00. So the average dividend is $1.10, the average time-matched price is $21.00, so the dividend yield is 5.2%.[26]

62. There are some periods when the cost of equity estimates based upon consensus estimates are relatively high, and some periods when the cost of equity estimates based upon consensus estimates are relatively low. On average, over the entire estimation period, the cost of equity based upon matched market prices is 11.61%, compared to 11.33% based upon consensus estimates. So the issue is not the average estimate of the cost of equity, but is the variation in the cost of equity over time.

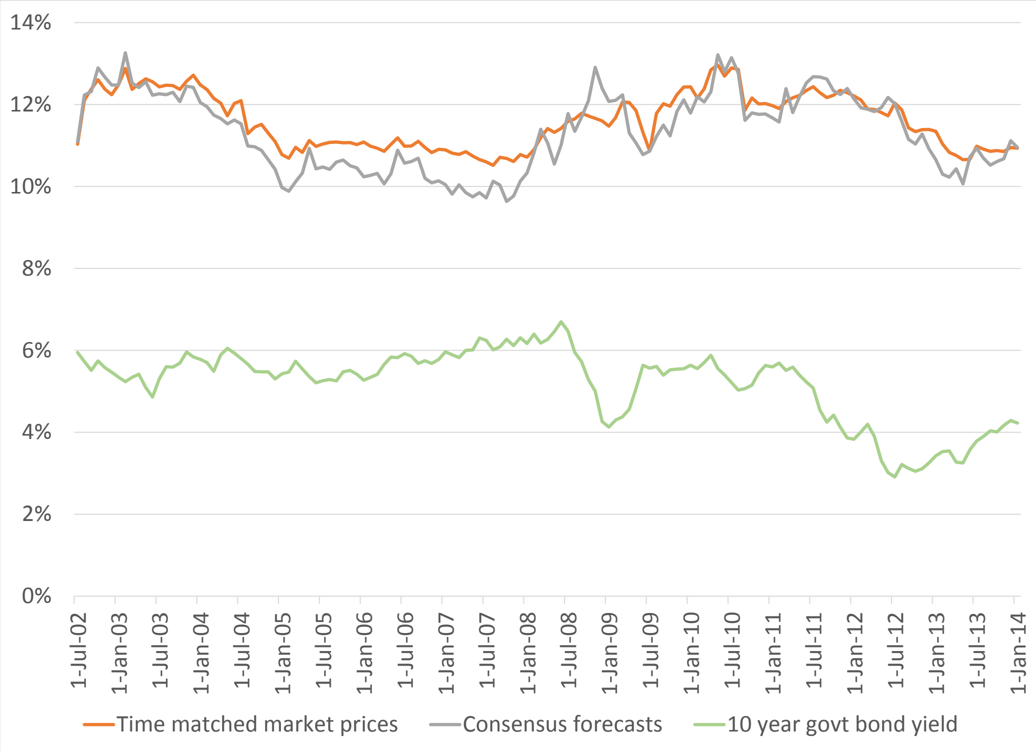
---

[25] Dividend yield based upon the consensus forecast = $1.10 ÷ $19.00 = 5.8%.

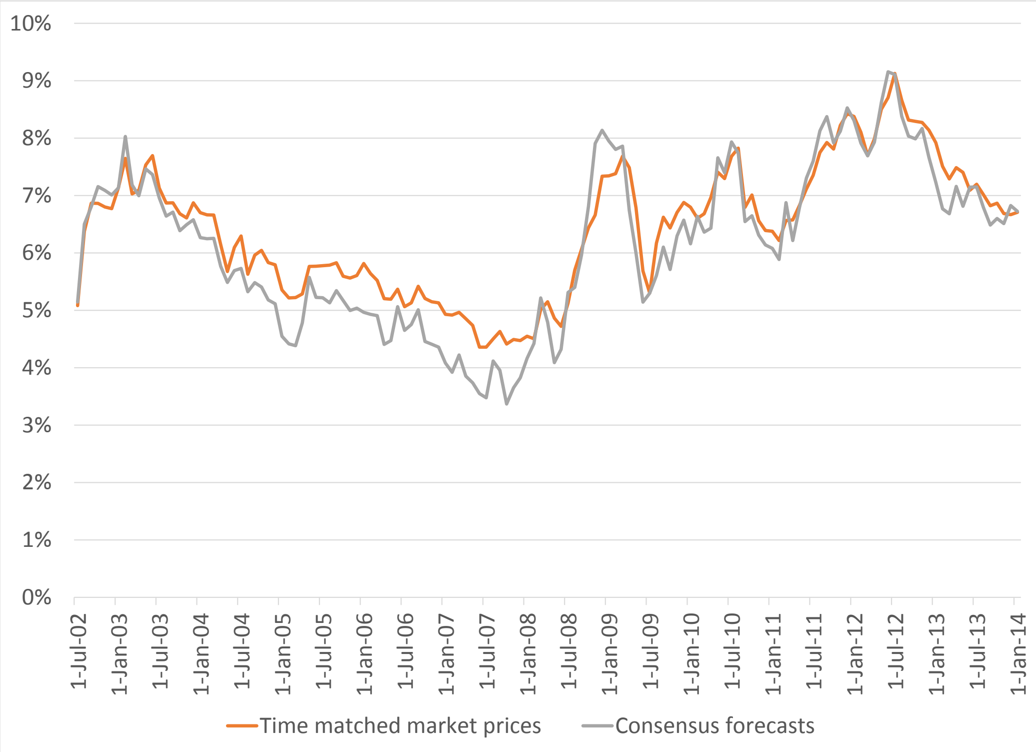
[26] Dividend yield based upon time-matched forecasts = $1.10 ÷ $21.00 = 5.2%.

Figure 2. Comparison of cost of equity and market risk premium estimates derived from time matched versus non-time matched forecasts and market prices

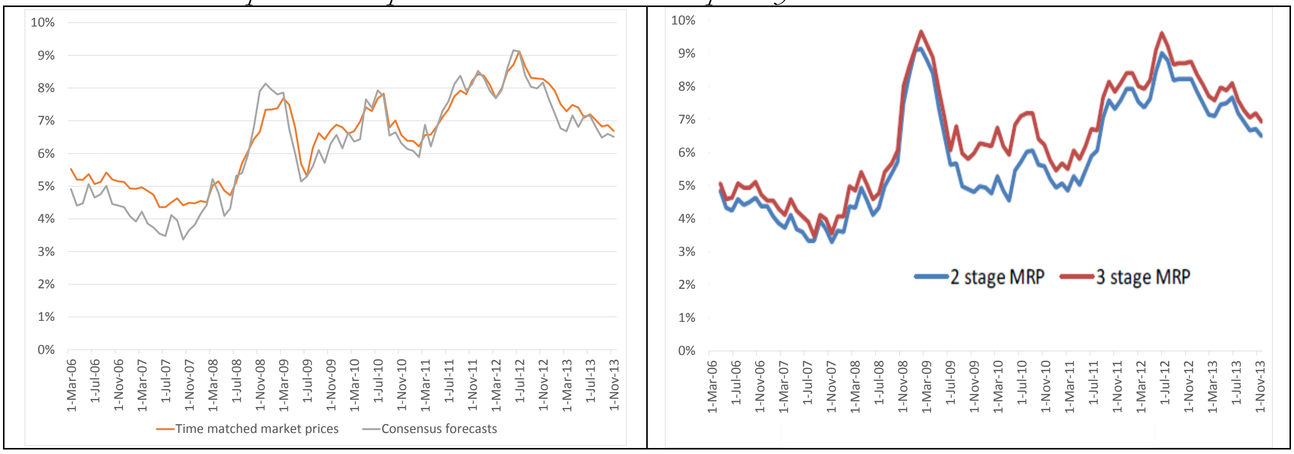
Panel A: Cost of equity and risk-free rate



Panel B: Market risk premium



Panel C: Market risk premium comparison with the estimates compiled by the AER



63. For instance, note that the wide gap between the cost of equity estimates over 2004 to 2007. This occurred during the rapid rise in share prices that occurred in the lead-up to the market peak in November 2007. The larger the share price movement in comparison to the frequency with which analysts update their forecasts, the more there will be a distortion to the cost of equity estimate due to stale prices. So, according to the consensus forecasts (the grey line) the cost of equity would be understated from 2004 to 2007, and overstated in 2008.

64. The impact of the two different data compilation techniques is in the volatility of the estimates over time. (It is worth reiterating that this is purely a data compilation analysis, and nothing to do with a valuation equation.) As shown in the descriptive statistics in Table 2, for the 11 years and seven months from July 2002 to January 2014, using time-matched prices the cost of equity lies within the range of 10.52% to 12.96% (a difference of 2.45%). This can be compared to a range of 9.64% to 13.26% using consensus forecasts (a difference of 3.63%). The standard deviation of estimates is 0.67% using time-matched forecasts and 0.94% using consensus forecasts.

65. We can also compare the cost of equity estimates and market risk premium estimates we compiled to those reported by the AER in the final guideline. The AER's average market risk premium estimates for the full sample period for which it has data available (March 2006 to November 2013), and for all sub-periods it reported, are presented in Table 2. We also re-produced the AER's time-series graph of market risk premium estimates in Panel C of Figure 2. These are presented on the same scale and time period as our market risk premium estimates in the left hand panel.

66. We first verify that, on average over the entire time period, all three sets of data generate approximately the same equity risk premium, as shown under the heading *March 2006 to November 2013*. The averages are 6.51% based upon matched forecasts, 6.24% based upon our compilation of consensus forecasts, and 6.50% as reported by the AER.[27]

67. Once we examine the dispersion of estimates, however, differences emerge. Across the entire sample period from July 2002 to January 2014, the range of cost of equity estimates resulting from matched forecasts is 10.52% to 12.96%, which represents a range of 2.45%. In comparison, the range resulting from consensus forecasts is 9.64% to 13.26%. The standard deviation of cost of equity estimates is 0.67% when matched forecasts are used, and 0.94% which non-matched forecasts are used.

[27] Note that we also report market cost of equity estimates under the heading AER, by adding the average 10-year government bond yield for the corresponding period to the AER market risk premium estimate. We also compile estimates for the AER for the 2008 to 2009 period by backing these out from the reported figures over the entire time period, and the sub-period averages reported by the AER.

Table 2. Comparison of market cost of equity estimates on a monthly basis from July 2002 to January 2014, based upon time matched versus non-time matched forecasts and market prices (%)

	Market cost of equity			Market risk premium			
	Matched	Not matched	AER	Matched	Not matched	AER	Govt bond yield
July 2002 to January 2014							
Average	11.61	11.33		6.43	6.15		5.18
Std Dev	0.67	0.94		1.13	1.39		0.90
Minimum	10.52	9.64		4.36	3.37		2.91
Maximum	12.96	13.26		9.13	9.16		6.70
March 2006 to November 2013							
Average	11.54	11.27	11.54	6.51	6.24	6.50	5.04
Std Dev	0.65	0.94		1.29	1.56		1.04
Minimum	10.52	9.64		4.36			
Maximum	9.64	13.21		9.13			
March 2006 to December 2007							
Average	10.84	10.12	10.33	4.91	4.19	4.40	5.93
Std Dev	0.17	0.33		0.36	0.50		0.23
Minimum	10.52	9.64		4.36	3.37		5.41
Maximum	11.19	10.88		5.52	5.06		6.30
January 2008 to December 2009							
Average	11.61	11.49	12.17	6.11	5.98	6.66	5.50
Std Dev	0.43	0.64		1.02	1.27		0.76
Minimum	10.72	10.33		4.51	4.09		4.13
Maximum	12.43	12.91		7.69	8.14		6.70
January 2010 to November 2013							
Average	11.84	11.70	11.78	7.46	7.32	7.40	4.38
Std Dev	0.65	0.82		0.73	0.85		0.96
Minimum	10.65	10.06		6.21	5.89		2.91
Maximum	12.96	13.21		9.13	9.16		5.88

68. This difference in outcomes is material because, in setting the regulated rate of return, the AER is concerned with estimation error. It has noted the sensitivity of estimates of the market cost of equity from the dividend discount model. So we would expect that, in estimating the market return in a decision, the AER will give some weight to historical average equity market returns, and some weight to dividend discount model estimates. The AER has done so in its final guideline. Given that the AER has never set the market risk premium outside the range of 6.0% to 6.5%, the AER appears to be relatively low confidence in cost of equity estimates from market data.

69. Our view is that matching the timing of forecasts and prices, is likely to lead to cost of equity estimates that better reflect prevailing market conditions. The difference in the variation over time between the two sets of cost of equity estimates is entirely due to one set of information (matched prices and forecasts) being more relevant at each point in time than another set of information (non-matched prices and forecasts).

3.3.3 Implication

70. Our view is that that material improvements to the reliability of the market cost of equity estimate can be made simply by compiling data in a manner that aligns the time a forecast is made to the corresponding share price. This is entirely independent of any assumptions about valuation models and inputs to those models. The analysis presented in this section demonstrates this technique does not lead to market cost of equity estimates that are, on average, any higher or lower than those resulting from consensus forecasts, including the cost of equity estimates compiled by the AER. This technique will, however, lead to lower variability of the market cost of equity estimates over time, which is a direct result of using more relevant information.

3.4 Incorporating a term structure assumption

3.4.1 Term structure recommendation put to the AER

71. A recommendation of Lally (2013b) is to incorporate an assumption about the term structure of the cost of equity. The basis for this approach is that the cost of equity in the short term might be different to the cost of equity in the long term. This is analogous to the term structure for bond yields, in which the yield to maturity on a 10-year bond will be different to the yield to maturity on a 30-year bond. Under the approach of the AER, and our approach, there is one cost of equity over all forecast years into perpetuity. This is the internal rate of return that sets the present value of dividends equal to the share price.

72. The recommendation put forward by Lally (2013b) is that, at the end of the transition period from short-term to long-term growth, there be an assumption that the cost of equity is equal to a long-term assumption. This means that what we solve for is the discount rate over the period of short-term dividend forecasts and the transition period. Expressed as an equation, we solve for r_e after inputting a value for *long term* r_e. In the equation below we have assumed a two-year explicit forecast period and an eight-year transition period, consistent with all other analysis presented in this paper.

$$P = \frac{D_1}{(1+r_e)^1} + \cdots + \frac{D_{10}}{(1+r_e)^{10}} + \frac{D_{10} \times (1+g)}{(long\ term\ r_e - g) \times (1+r_e)^{10}}$$
$$= \sum_{t=1}^{2} \frac{D_t}{(1+r_e)^t} + \sum_{t=3}^{10} \frac{D_t}{(1+r_e)^t} + \frac{D_{10} \times (1+g)}{(long\ term\ r_e - g)(1+r_e)^{10}}$$

73. To incorporate a term structure into the estimate of the cost of equity means there needs to be an assumption of *long term* r_e. One approach to this estimation would be to make this long-term assumption with reference to historical returns, which incorporates an assumption that current equity prices say nothing about the cost of equity for cash flows received after the transition period. For example, in the above equation, the current share price would have no relevance for the estimate of the cost of equity after year 10. Another approach is to jointly estimate the near term cost of equity (r_e) and the long term cost of equity (*long term* r_e).

74. If we take the first approach – assuming the long-term cost of equity can be estimated from historical data – we confront the following problem. We do not really have useful information about whether there is a term structure for equity. We are attempting to estimate the cost of equity from share prices to obtain a timely estimate of required returns. It might be the case that the cost of equity from year 10 onwards is different to the cost of equity for years 1 to 10, and it might be the case that the cost of equity is the same for all years.

75. What is clear, however, is that if we assume a high value for the long term cost of equity, the estimate for the cost of equity over the first 10 years will come down; and if we assume a low value for the long term cost of equity, the estimate for the cost of equity over the first 10 years will come up. This will increase the variation in the estimated cost of equity over time. The AER has already expressed concern over the stability of the cost of equity estimate over time, and we quantify this time series variation below.[28]

76. We compare the cost of equity and market risk premium over time, incorporating a long term cost of equity versus not incorporating a long term cost of equity. The dividend forecasts we use for the comparison are the consensus dividend forecasts that we analysed in the previous section. So we are

[28] The AER states that "a relatively stable regulatory return on equity would have two effects: It would smooth prices faced by consumers and it would provide greater certainty to investors about the outcome of the regulatory process," AER Explanatory Statement, Sub-section 5.3.7, pp. 65–66.

isolating the impact of taking the AER's existing approach, which relies upon consensus forecasts, and then incorporating a long term cost of equity.

77. The assumption we use for the long term cost of equity is 11.28%. The reason for this assumption is that we want to make no claims in this section about what is the "right" long-term cost of equity. We want to illustrate the *variation* in the cost of equity from a term structure assumption, not make claims about the *level* of the short-term or long-term cost of equity. At a long-term cost of equity input of 11.28%, this results in an average cost of equity of 11.28% over the first 10 years. So, on average, the cost of equity is neither rising nor falling.

78. Turning to Figure 3 we observe that the cost of equity and market risk premium estimates are considerably more volatile once a term structure is incorporated. The blue lines represent the case in which a term structure is incorporated, and the grey lines represents the case in which the cost of equity is constant. For instance, incorporating a term structure into the analysis results in the estimated cost of equity increasing from 7.2% in October 2007 to 14.7% in October 2008, an increase of 7.5%. In comparison, the cost of equity estimate that does not incorporate a term structure increases from 9.6% to 13.0% over the same time period, an increase of 3.4%.[29]

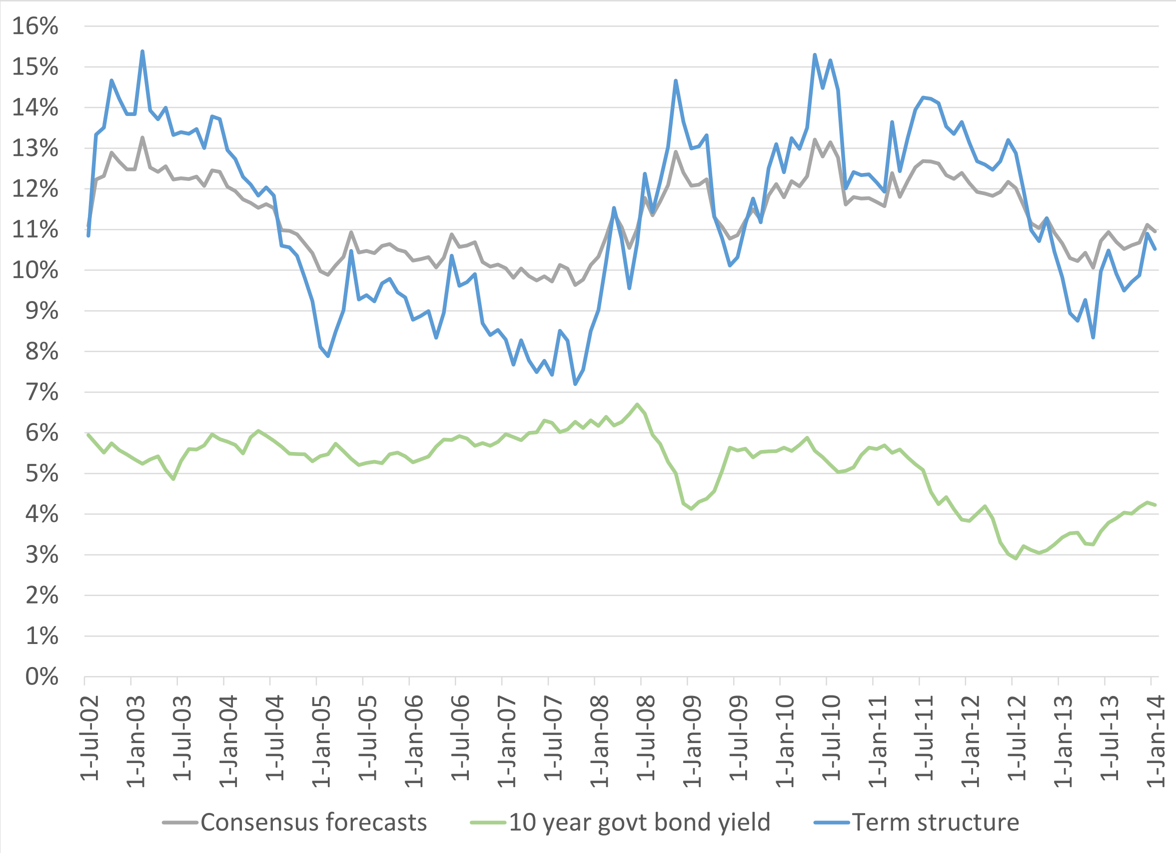
79. In Table 3 we present descriptive statistics which can be compared to the descriptive statistics presented in Table 1 and Table 2. On average, across the entire sample period, there is no difference to the cost of equity estimate from incorporating a term structure assumption. The average cost of equity estimate is 11.3%. However, the variation in the cost of equity estimate over time is substantial. The standard deviation of the cost of equity estimate is 2.1% per month under a term structure assumption, versus 0.9% otherwise. But most importantly there is substantial variation in the cost of equity estimate over different extended time periods.

80. Consider the three sub-periods for which the AER reported average cost of equity estimates. From March 2006 to December 2007, incorporating a term structure assumption results in an average cost of equity estimate of 8.5%, compared to 10.1% otherwise. Over 2008 to 2009 there is little difference in the average cost of equity estimate with or without a term structure assumption. This occurs because, over this time period, the average cost of equity estimate is close to the long-term assumption of 11.28%. But over January 2010 to November 2013, the average cost of equity estimate which incorporates a term structure assumption is 14.1%, compared to 11.7% otherwise.

[29] Note that, for the case in which there is no term structure assumption, if market prices are date-matched with the release of the earnings forecast, the cost of equity increases from 10.7% to 11.7% over the same time period, an increase of 1.0%. In addition, if target prices are used and date-matched with the release of the earnings forecast, the cost of equity increases from 10.2% to 10.9% over the same time period, an increase of 0.7%. So the 3.4% change in the cost of equity over this period (compared to 1.0% of 0.7%) is almost entirely due to the use of stale forecasts in the analysis.

Figure 3. Market cost of equity estimate incorporating a term structure assumption

Panel A: Cost of equity and risk-free rate



Panel B: Market risk premium

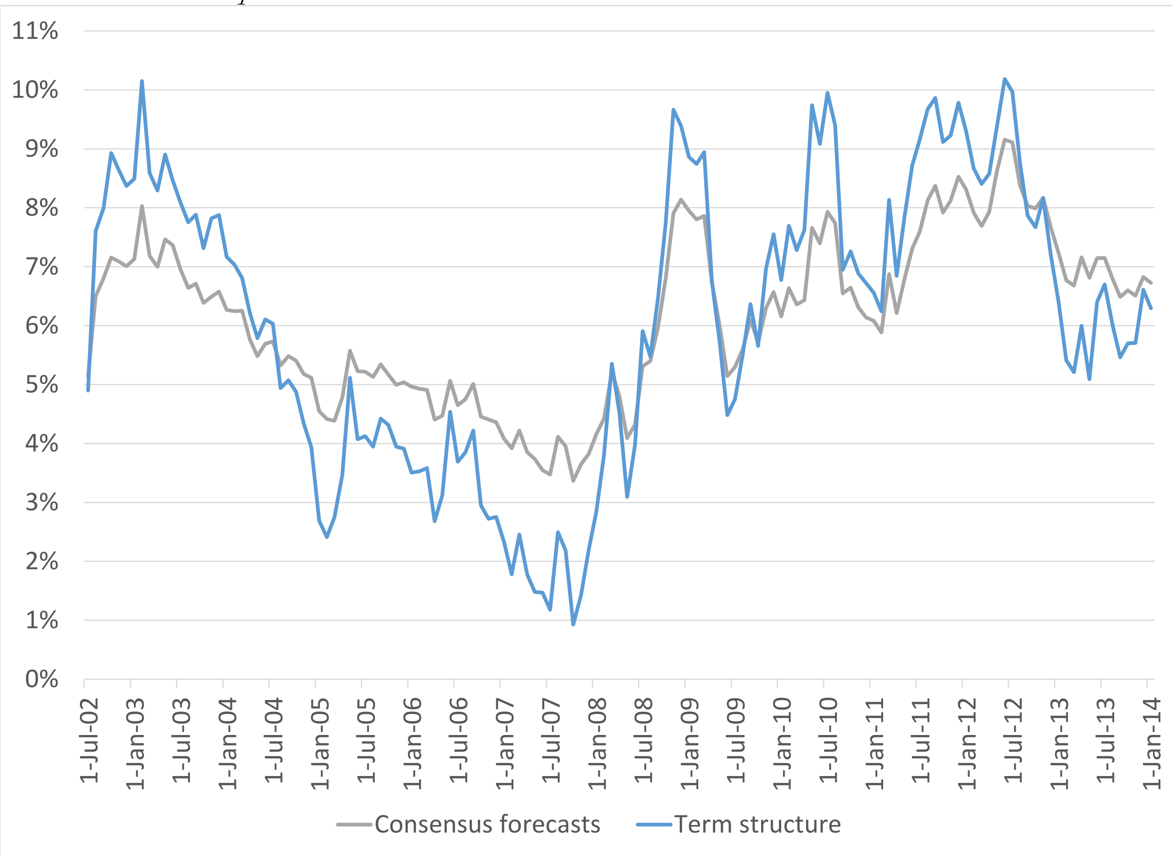


Table 3. Impact of assuming a term structure for the cost of equity on the estimated market cost of equity and market risk premium (%)

	Market cost of equity			Market risk premium			
	Term structure	No term structure	AER	Term structure	No term structure	AER	Govt bond yield
July 2002 to January 2014							
Average	11.28	11.33		6.10	6.15		5.18
Std Dev	2.13	0.94		2.43	1.39		0.90
Minimum	7.20	9.64		0.93	3.37		2.91
Maximum	15.39	13.26		10.18	9.16		6.70
March 2006 to November 2013							
Average	11.16	11.27	11.54	6.12	6.24	6.50	5.04
Std Dev	2.14	0.94		2.60	1.56		1.04
Minimum	7.20	9.64		0.93			
Maximum	15.30	13.21		10.18			
March 2006 to December 2007							
Average	8.46	10.12	10.33	2.54	4.19	4.40	5.93
Std Dev	0.85	0.33		1.00	0.50		0.23
Minimum	7.20	9.64		0.93	3.37		5.41
Maximum	10.36	10.88		4.54	5.06		6.30
January 2008 to December 2009							
Average	11.69	11.49	12.17	6.19	5.98	6.66	5.50
Std Dev	1.41	0.64		1.98	1.27		0.76
Minimum	9.02	10.33		2.85	4.09		4.13
Maximum	14.66	12.91		9.66	8.14		6.70
January 2010 to November 2013							
Average	14.14	11.70	11.78	7.76	7.32	7.40	4.38
Std Dev	1.80	0.82		1.50	0.85		0.96
Minimum	8.34	10.06		5.09	5.89		2.91
Maximum	15.30	13.21		10.18	9.16		5.88

3.4.2 Implication

81. In summary, the impact of incorporating a term structure assumption in the cost of equity estimate leads to highly variable estimates of the cost of equity over time. If this assumption is adopted, the slope of the equity yield curve would be very steep at different points in time. In October 2007 the cost of equity over 10 years would be 7.2%, and 11.3% thereafter, a rise of 4.1%. A year later the cost of equity over 10 years would be 14.7% and 11.3% thereafter, a fall of 3.4%. This means that the cost of equity estimates generated by the analysis are unlikely to be used with any confidence by a regulator in setting the regulated rate of return. There is the risk that the regulated rate of return varies by substantial amounts over time because of estimation error, associated with whether a term structure exists and the assumption about the long term cost of equity.

4. Estimation of long-term growth

4.1 Our prior recommendation

82. In our report entitled *Reconciliation of dividend discount model estimates with those compiled by the AER* we made the following recommendation:

> In the previous sub-sections we illustrated the outcomes from three alternative ways of estimating the cost of equity. The first method invokes an assumption that growth is constant at a given value from year three onwards. The second method invokes an assumption that growth gradually reverts to its long-term value over year three to year ten. The third method invokes assumptions that (1) the reinvestment rate and the return on equity revert to long-term values over year three to year ten, and (2) the estimates for *g*, *ROE* and r_e are those that don't allow growth to reverse course over ten years, and which mean that year ten growth is closest to long-term growth.
>
> We recommend that the AER estimate growth as the product of a reinvestment rate and return on equity. At present, the AER already makes an implicit assumption about these inputs. Further, the AER assumes that the share price tells us nothing about prospects for growth outside of the first two forecast years. All we propose is that the AER solve for the inputs which allow growth to be estimated simultaneously with the return on equity, and have provided a useful method for this simultaneous estimation.[30]

4.2 Response to the final guideline

4.2.1 Joint estimation of growth and cost of equity

83. In the paragraphs above we express two views on estimation of long-term growth. The first view is that the best estimate of long-term growth will incorporate the reinvestment rate and the return on equity. Any estimation method that assumes a constant input for long-term growth makes an implicit assumption about these two components.[31] The second view is that the best estimate of long-term growth will, in part, be determined by share prices relative to dividend and earnings forecasts. The simultaneous estimation technique we use is a method for ensuring that the growth input into the dividend discount model is not independent of these three pieces of timely information actually used to measure the cost of equity.

84. The AER's response is that our approach is unusually complex and lacks transparency, so the AER does not place any reliance on our cost of equity estimates. Rather, the AER makes an assumption that, regardless of any information about share prices, dividends and earnings, the best estimate of the market's long-term dividend growth assumption is 4.6%. The basis for the 4.6% growth assumption is that real growth in dividends for Australian-listed shares will be 2.0%, which is 1.0% below the AER's estimate of long-term nominal GDP growth. This is combined with a 2.5% estimate for inflation.[32]

85. To place this in context, consider the time series of cost of equity estimates presented in Figure 2. In this monthly time series from July 2002 to January 2014 the highest first year forecast dividend yield is observed in November 2008.[33] In that month, one-year dividends relative to share prices are projected to be 6.0%, two-year dividends relative to share prices are projected to be 6.4%, the earnings yield

[30] SFG Consulting (2013b), Sub-section 5.3, p. 15.

[31] The AER does not specify what long-term reinvestment rate underpins its growth forecast. At a 30% reinvestment rate, the AER growth assumption implies a return on reinvested equity of 15.3%.

[32] The nominal growth estimate = (1 + real growth) × (1 + inflation) – 1 = 1.020 × 1.025 – 1 = 4.55%.

[33] The time series of cost of equity estimates discussed here is based upon non-matched market prices, consistent with the AER's methodology.

based upon one-year ahead forecasts is 8.8%, and the earnings yield based upon two-year ahead earnings forecasts is 9.8%.[34] The assumed long-term growth rate is 4.6% and the estimated market cost of equity is 12.9%, according to the computations we performed under a constant growth assumption. Government bond yields are 5.0% so the estimated market risk premium is 7.9%. In sum, share prices are *low*, growth is independent of share price, earnings and dividends, so the estimated cost of equity is *high*.

86. The lowest first year forecast dividend yield is observed in July 2007. In that month, one-year dividends relative to share prices are projected to be 3.4%, two-year dividends relative to share prices are projected to be 3.7%, the earnings yield based upon one-year ahead forecasts is 5.2%, and the earnings yield based upon two-year ahead earnings forecasts is 5.8%. The assumed long-term growth rate is 4.6%, and the estimated market cost of equity is 9.7%. Government bond yields are 6.2% so the estimated market risk premium is 3.5%. In sum, share prices are *high*, growth is independent of share price, earnings and dividends, so the estimated cost of equity is *low*.

87. So from July 2007 to November 2008, the estimated market cost of equity increased from 9.7% to 12.9%, and the estimated market risk premium increased from 3.5% to 7.9%. This computation overstates the volatility in the cost of equity, because share prices would likely have factored in more than just discount rate changes. Share prices would have incorporated changes in returns on investment in the short- and long-term, and reinvestment rates in the short- and long-term, which ultimately affect the expected dividend stream. In effect, the rationale behind fixing long-term growth as an input, regardless of share price, is that the share price tells us nothing that can be reliably used to estimate the market's view on any dividend.

88. Suppose we considered the following alternative cases. In July 2007, when share prices were at their *highest* level relative to dividends in the time series, it is likely that the market was relatively optimistic about long-term growth. Suppose, as an example, expectations at that time were for long-term growth 1.0% *above* the baseline estimate, say 5.6%. The true situation is like to be far more complicated, but for the purpose of the example, suppose that rising share prices are good news, which means lower cost of capital and higher cash flows, and we factor in those higher cash flows in a growth rate adjustment. This 1.0% increment seems at least plausible, after all, this is the period when share prices compared to dividends are *highest* in the time series. Under this 5.6% long-term growth assumption, the market cost of equity would be 10.5% (rather than 9.7%). The market risk premium would be estimated at 4.3% (rather than 3.4%).

89. When the financial crisis hit in 2008, share prices fell, and the *lowest* point for share prices relative to dividends was November 2008. Suppose we also consider that the market factored in long-term growth 1.0% *below* the baseline estimate, say 3.6%. Again, this seems at least plausible as a result of the financial crisis. Bad news flows through to a higher discount rate and lower cash flows, and we factor in those lower cash flows via a growth rate adjustment. Under this 3.6% long-term growth assumption, the market cost of equity would be 12.1% (instead of 12.9%). The market risk premium would be estimated at 7.1% (rather than 7.9%).

90. This example is relatively straightforward, but makes an important point. Share price changes reflect expectations for more than changes in discount rates. The more inputs into the valuation equation that are held constant, when we would expect them to be associated with share price changes (like reinvestment rates and returns on investment), the more we transfer all of the change in share prices to the discount rate. This leads to discount rate estimates that are likely to be more volatile than the true cost of equity.

91. So what would be useful is a mechanism for allowing share price changes to be reflected in more than one input. A rise in share prices (compared to earnings and dividend expectations) would signal a lower

[34] The earnings yield is earnings per share divided by share price. It is the inverse of the price/earnings ratio.

cost of equity and an increase in cash flow expectations, and a fall in share prices (compared to earnings and dividend expectations) would signal a higher cost of equity and lower cash flow expectations.

92. Furthermore, suppose that in reality, input assumptions varied across firms (like growth in dividends, reinvestment rates and returns on investment). What would be useful is a mechanism for allowing share prices across firms to be reflected in more than just discount rates. When the AER applied its dividend discount model to listed energy networks, the discount rates were very high. This occurs because too many inputs are held fixed. When we applied our approach to listed energy networks, the discount rates were not very high. They were below the market cost of equity. This occurs because more inputs are allowed to vary.

93. The AER has not adopted our approach to joint estimation of the cost of equity and long-term growth. It considers the method to be complex and non-transparent. Immediately below, we hope to resolve both of these concerns. With respect to complexity, we reiterate that our approach requires the computation of many valuations, rather than one valuation, for each firm. But the computation of any individual valuation is not complex. A computer performing many computations takes longer than a computer performing one computation. But if one computation can be understood then many of the same (or similar) computations can be understood.

94. With respect to transparency, we reiterate the criteria for the "best" estimate of r_e, g and *ROE* for any given firm is that which is unbiased (valuation is within 1% of price), in which growth does not change sign from negative in year 10 to a positive value thereafter, and in which the computed growth in year 10 is close to the growth input. This will not lead to perfectly reliable cost of equity estimates for every single firm in every single period. But we have already provided extensive descriptive statistics showing that the dispersion of cost of equity estimates across firms is less than would be implied by the use of a regression-based beta estimate in the CAPM. Furthermore, once estimates are aggregated at an industry level or the market level, firm-specific estimation error is mitigated.

95. To illustrate our estimation technique, thereby addressing the issues of complexity and transparency, suppose we consider a single firm and just four combinations of r_e, g and *ROE*. The share price is \$10.00, book value is \$5.00 per share, earnings per share forecasts for years 1 and 2 are \$0.71 and \$0.81, respectively, and dividends per share forecasts for years 1 and 2 are \$0.47 and \$0.52, respectively.

96. The table below summarises the four combinations of r_e, g and *ROE* considered in this illustration. In our implementation of this method, we consider 2,672 combinations which are described in detail in prior papers. We simply apply the same rationale to 2,672 combinations.[35]

[35] As documented previously, 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) (SFG, 2014a, Sub-section 3.3, p. 13).

Table 4. Example combinations of cost of equity, long-term growth and return on equity

Combination	1	2	3	4
Cost of equity	10%	14%	7%	12%
Long-term growth	6%	10%	4%	7%
Return on equity	14%	20%	9%	15%

97. The long-term growth assumption and long-term return on equity assumption determine the proportion of earnings per share that are expected to be reinvested each year in the perpetual growth state, under the equation that *growth = reinvestment rate × return on equity*.[36] For example, under combination 1, long-term growth is estimated at 5%, long-term return on equity is estimated at 15%, so the reinvestment rate = growth ÷ return on equity = 0.05 ÷ 0.15 = 33%.

98. In Table 5 we have augmented the combinations to show the implied reinvestment rate at the end of year 10. The reinvestment rate is 43% under combination 1, 50% under combination 2, 44% under combination 3 and 47% under combination 4.

99. The next step is to estimate earnings per share and dividends per share over forecast years 3 to 10. This is done by gradually adjusting the initial return on equity towards to long-term estimate, and the initial reinvestment rate towards the long-term estimate. For instance, on average over the first two years, the reinvestment rate is 35% (in year 1 the reinvestment rate is projected to be $0.47 ÷ $0.71 = 34%, and in year 2 the reinvestment rate is projected to be $0.52 ÷ $0.81 = 36%. The reinvestment rate over years 3 to 10 gradually shifts, in equal amounts, to the final reinvestment rate. With respect to the initial return on equity, we compute the average return on equity over the first two years to arrive at a starting point. This is illustrated in Table 6. We then shift towards the long-term return on equity in equal increments.

[36] Lally (2013b) takes issue with the use of this equation. He points to a paper of his in which he derives equations which separately account for growth from inflation and real growth. His point is that, according to his derivation, *nominal growth = inflation + proportion of inflation-accounted earnings retained* × (*nominal return on equity – inflation*) (Lally, 1988, p. 47). Lally (2013b, p. 9) makes this point so strongly that "all of SFG's calculations are nullified." This conclusion is incorrect. Furthermore, even if the analysis needed to be even more sophisticated to account differently for inflation, the statement that all of the calculations are nullified is entirely inappropriate. If that statement that "all … calculations are nullified" were accepted, it is unlikely that any analysis that differed from Lally's (2013) preferred approach would carry any weight at all. The specific discussion of this equation is presented below.

In terms of the data presented in the example above, recall that in year 2 earnings per share is projected to be $0.80 and dividends per share is projected to be $0.52. This means that $0.28 per share is retained for investment (which represents a reinvestment rate of 35%). The idea behind our equation is that we can project next year's earnings per share as this year's earnings per share, plus a return from the earnings reinvested. It is a process for forecasting earnings outside of the short-term forecasting period. As Lally (1988) acknowledges, the equation we used is well-accepted in the finance literature. If the reinvestment of $0.28 per share earned a return of 15%, this investment would generate a return of $0.042 per share (that is, $0.28 × 0.15 = $0.042). So the estimate of earnings per share next year is $0.842. This represents growth in earnings per share of 5.3%, computed as $0.042 ÷ $0.800 = 5.3%. We arrive at the same growth rate if we take the product of the reinvestment rate (35%) and the return on equity on the reinvested earnings (15%) (that is, 0.35 × 0.15 = 5.3%). The equation presented by Lally (1988), assuming inflation of 2.5%, would imply growth of 6.9% from the same inputs [that is, growth = 0.025 + 0.35 × (0.150 – 0.025) = 0.025 + 0.044 = 0.069].

The reason Lally's (1988) equation is different is that Lally makes the assumption that, under inflation, if there is no reinvestment there will still be growth in revenues and costs (including depreciation) due to inflation. In the example presented above, Lally would estimate growth of 2.5% even if the reinvestment rate was zero. But this outcome is not the case under the accounting conventions that underpin our equation, and which underpin the text book applications of the same equation. Earnings will not simply grow at the inflation rate without reinvestment, because capital expenditure needs to offset depreciation in nominal terms (depreciation does not simply grow with inflation). If depreciation is $100 each year and capital expenditure is $100 each year there is no reinvestment, and each year $100 of capital expenditure will buy less and less upkeep of the asset base. Earnings will only grow at inflation if capital expenditure is sufficiently large to more than offset depreciation. This means that positive reinvestment is needed even if there is only growth at the rate of inflation.

Table 5. Example combinations incorporating reinvestment rate

Combination	1	2	3	4
Cost of equity	10%	14%	7%	12%
Long-term growth	6%	10%	4%	7%
Return on equity	14%	20%	9%	15%
Reinvestment rate	43%	50%	44%	47%

100. In Table 6, we augment Table 5 to illustrate the estimation of the beginning return on equity, beginning reinvestment rate, and the gradual movement of these inputs towards long-term levels. The return on equity in years one and two is estimated to be 14.2% and 15.5%, respectively, for an average of 14.8%. We see in each column the incremental change from this initial return on equity to the long-term input. The reinvestment rate in years one and two is estimated to be 33.8% and 35.8%, respectively, for an average of 34.8%. Again, we see in each column the reinvestment rate adjusts in equal amounts each year to its long-term assumption.

101. This provides us with enough information to project earnings per share and dividends per share over the forecast horizon, and then to perform a valuation. These estimates are presented in Table 7. The fourth combination of inputs is rejected because the valuation is too low. At a cost of equity of 12%, long-term growth of 7% and return on equity of 15%, the present value of expected dividends is $7.73. This is 23% below the price of $10.00. For the inputs to lead to an appropriate valuation, there needs to be either a lower cost of equity, a higher growth rate, or higher returns on investment.

102. The third combination provides a valuation that is within 1% of the price of $10.00. At a cost of equity of 7%, long-term growth of 4%, and return on equity of 9%, the present value of expected dividends is $9.97. But this results in negative growth in earnings over forecast years three to 10, followed by a rebound in growth to 4% at the end of year 10. The projection would be earnings per share growth of +14% in year two, then be as low as –4% over years three to 10, and then +4% thereafter. This growth transition is ruled out because, as an expectation, this is unlikely to be true. We do not allow growth to switch sign from negative in year 10 to positive thereafter.

103. This leaves combinations 1 and 2, which both provide unbiased valuations ($10.00 and $9.98, respectively) and which both have positive growth in year 10. Combination 1 has year 10 earnings per share growth of 5% in year 10 (compared to 6%, thereafter), while combination 2 has year 10 earnings per share growth of 13% (compared to 10%, thereafter). The criteria we apply selects combination 1 to estimate the cost of equity, because by year 10 there is a closer ratio of earnings per share growth to long-term growth. This is equivalent to saying, it is relatively more likely that the share price reflects growth rates of 4.9% in year 8, 5.0% in year 9, 5.1% in year 10, and 6.0% thereafter, compared to growth rates of 11.9%, 12.4%, 13.0% and then 10.0% thereafter.

104. We make no claim that the estimation technique we use is perfect, and make no claim that for an individual firm at one point in time that unusual estimates for the cost of equity will not arise. However, we do contend that when considered amongst portfolios of firms (including the industry and market level) this is the most reliable estimation technique that is currently available to estimate the cost of equity using the dividend discount model. We also contend that the estimation technique is transparent, and is not unreasonably complex.

105. In Sub-section 5.2 of our prior paper, *Reconciliation of dividend discount model estimates with those compiled by the AER,* we presented a step-by-step estimation of the cost of equity for an individual case. In the current report we have presented the step-by-step estimation of the cost of equity amongst four possible combinations of inputs. In the actual analysis we replicate this process many times across thousands of firms. But the replication of a computation many times does not mean that the process lacks transparency or increases complexity. It would not be complex to replicate regressions across thousands of firms in estimating beta, and it would not be complex to replicate yield to maturity computations across thousands of bonds in estimating the cost of debt. It would be data-intensive, but not complex.

Table 6. Example combinations presenting reinvestment rates and return on equity projections

Combination	1	2	3	4
Cost of equity	10%	14%	7%	12%
Long-term growth	6%	10%	4%	7%
Return on equity	14%	20%	9%	15%
Reinvestment rate	43%	50%	44%	47%
BPS_0	$5.00	$5.00	$5.00	$5.00
EPS_1	$0.71	$0.71	$0.71	$0.71
EPS_2	$0.80	$0.80	$0.80	$0.80
DPS_1	$0.47	$0.47	$0.47	$0.47
DPS_2	$0.52	$0.52	$0.52	$0.52
$BPS_1 = BPS_0 + EPS_1 + DPS_1$	$5.23	$5.23	$5.23	$5.23
$BPS_2 = BPS_1 + EPS_2 + DPS_2$	$5.51	5.51	$5.51	$5.51
$ROE_1 = EPS_1 \div BPS_0$	14.2%	14.2%	14.2%	14.2%
$ROE_2 = EPS_2 \div BPS_1$	15.5%	15.5%	15.5%	15.5%
Initial ROE = Avg (ROE_1, ROE_2)	14.8%	14.8%	14.8%	14.8%
Reinvestment $rate_1$ = (1 – $DPS_1 \div EPS_1$)	33.8%	33.8%	33.8%	33.8%
Reinvestment $rate_2$ = (1 – $DPS_2 \div EPS_2$)	35.8%	35.8%	35.8%	35.8%
Initial reinvestment rate = Avg (RR_1, RR_2)	34.8%	34.8%	34.8%	34.8%
ROE_3	14.7%	15.5%	14.1%	14.9%
ROE_4	14.6%	16.1%	13.4%	14.9%
ROE_5	14.5%	16.8%	12.6%	14.9%
ROE_6	14.4%	17.4%	11.9%	14.9%
ROE_7	14.3%	18.1%	11.2%	14.9%
ROE_8	14.2%	18.7%	10.5%	15.0%
ROE_9	14.1%	19.4%	9.7%	15.0%
ROE_{10}	14.0%	20.0%	9.0%	15.0%
Reinvestment $rate_3$	35.8%	36.7%	36.0%	36.3%
Reinvestment $rate_4$	36.8%	38.6%	37.2%	37.8%
Reinvestment $rate_5$	37.8%	40.5%	38.4%	39.3%
Reinvestment $rate_6$	38.8%	42.4%	39.6%	40.7%
Reinvestment $rate_7$	39.8%	44.3%	40.8%	42.2%
Reinvestment $rate_8$	40.8%	46.2%	42.0%	43.7%
Reinvestment $rate_9$	41.9%	48.1%	43.2%	45.2%
Reinvestment $rate_{10}$	42.9%	50.0%	44.4%	46.7%

106. An objection to our estimation technique has been raised by McKenzie and Partington (2013) on the basis that we have replaced the long-term growth assumption with "assumptions about the filtering procedure and the term over which growth transitions to an equilibrium long-term rate."[37] With respect to the term assumption, this is entirely independent of our estimation technique, as we assume a transition period, and the AER assumes transition periods (in both its implementation of the two stage and three stage growth models). So the transition period assumption is independent of the process by which growth is estimated.

[37] McKenzie and Partington (2013), p. 21.

Table 7. Example combinations presenting dividends, earnings and valuations

Combination	1	2	3	4
Cost of equity	10%	14%	7%	12%
Long-term growth	6%	10%	4%	7%
Return on equity	14%	20%	9%	15%
Reinvestment rate	43%	50%	44%	47%
BPS_0	\$5.00	\$5.00	\$5.00	\$5.00
EPS_1	\$0.71	\$0.71	\$0.71	\$0.71
EPS_2	\$0.80	\$0.80	\$0.80	\$0.80
DPS_1	\$0.47	\$0.47	\$0.47	\$0.47
DPS_2	\$0.52	\$0.52	\$0.52	\$0.52
$BPS_1 = BPS_0 + EPS_1 + DPS_1$	\$5.23	\$5.23	\$5.23	\$5.23
$BPS_2 = BPS_1 + EPS_2 + DPS_2$	\$5.51	5.51	\$5.51	\$5.51
$ROE_1 = EPS_1 \div BPS_0$	14.2%	14.2%	14.2%	14.2%
$ROE_2 = EPS_2 \div BPS_1$	15.5%	15.5%	15.5%	15.5%
Initial ROE = Avg (ROE_1, ROE_2)	14.8%	14.8%	14.8%	14.8%
Reinvestment $rate_1 = (1 – DPS_1 \div EPS_1)$	33.8%	33.8%	33.8%	33.8%
Reinvestment $rate_2 = (1 – DPS_2 \div EPS_2)$	35.8%	35.8%	35.8%	35.8%
Initial reinvestment rate = Avg (RR_1, RR_2)	34.8%	34.8%	34.8%	34.8%
$EPS_3 = BPS_2 \times ROE_3$	0.71	0.71	0.71	0.71
$EPS_4 = BPS_3 \times ROE_4$	0.81	0.81	0.81	0.81
$EPS_5 = BPS_4 \times ROE_5$	0.81	0.86	0.78	0.82
$EPS_6 = BPS_5 \times ROE_6$	0.85	0.94	0.78	0.87
$EPS_7 = BPS_6 \times ROE_7$	0.89	1.04	0.77	0.92
$EPS_8 = BPS_7 \times ROE_8$	0.93	1.15	0.76	0.97
$EPS_9 = BPS_8 \times ROE_9$	0.98	1.29	0.75	1.03
$EPS_{10} = BPS_9 \times ROE_{10}$	1.03	1.44	0.73	1.10
$DPS_3 = EPS_3 \times (1 –$ Reinvestment $rate_3)$	1.08	1.62	0.71	1.17
$DPS_4 = EPS_4 \times (1 –$ Reinvestment $rate_4)$	1.13	1.83	0.69	1.25
$DPS_5 = EPS_5 \times (1 –$ Reinvestment $rate_5)$	0.47	0.47	0.47	0.47
$DPS_6 = EPS_6 \times (1 –$ Reinvestment $rate_6)$	0.52	0.52	0.52	0.52
$DPS_7 = EPS_7 \times (1 –$ Reinvestment $rate_7)$	0.52	0.54	0.50	0.52
$DPS_8 = EPS_8 \times (1 –$ Reinvestment $rate_8)$	0.54	0.58	0.49	0.54
$DPS_9 = EPS_9 \times (1 –$ Reinvestment $rate_9)$	0.55	0.62	0.47	0.56
$DPS_{10} = EPS_{10} \times (1 –$ Reinvestment $rate_{10})$	0.57	0.66	0.46	0.58
Valuation = Present value of dividends	10.00	9.98	9.97	7.73
Valuation ÷ price	1.00	1.00	1.00	0.77
What happened?	Yr 10 eps growth (5%) ÷ long-term growth (6%) = 0.85 Smoothest transition to long-term growth	Yr 10 eps growth (13%) ÷ long-term growth (10%) = 1.30	Negative growth switches to positive growth	Value is too low

107. With respect to what is termed the filtering procedure, McKenzie and Partington (2013) are referring to the criteria by which we determine which is the best unbiased choice amongst combinations of cost of equity, growth and return on equity. Yet if we are to allow the share prices and reinvestment rates to be related to growth expectations, there needs to be some criteria to determine how growth expectations might increase when share prices are high, or when reinvestment rates are high, and decrease when share prices are low, or when reinvestment rates are low. The criticism imposed by McKenzie and Partington is that "the particular combination selected is likely to be sensitive to the filtering procedure

applied."[38] The alternative criteria proposed by the AER is simply "g = 4.6%." We contend that it is not reasonable to rule out one estimation approach on the basis that alternative selection criteria could provide a different answer, but accept another estimation approach that imposes more restrictive criteria.

4.2.2 Growth, reinvestment, buybacks and dividend reinvestment plans

108. The AER's analysis of the market cost of equity using the dividend discount model relies upon an assumption that long-term growth is 4.6%. The basis for this estimate is that real long-term growth of listed firms will be 1.0% below real long-term GDP growth of 3.0%, and that inflation will be 2.5%.[39] In this sub-section we discuss the basis for this conclusion, and whether it appears reasonable. We have not yet discussed our current estimates of long-term growth for the market. But to place this debate in context, as shown in Table 11, our average estimate of long-term growth is 5.8%.[40] So as a baseline estimate, the debate over the level of long-term growth is within a margin of 1.2%. Further, our average estimate of long-term growth is close to the AER's estimate of nominal GDP growth of 5.6%.

109. The first issue to consider is the relevance of GDP growth for the growth in earnings per share of listed companies at a point in time. As we have discussed previously, our concern over this reference point is that it has nothing to do reinvestment rates for listed companies. The basic argument relied upon by the AER is that it makes no difference what reinvestment rates are, listed companies cannot grow faster than GDP, because eventually the earnings of listed companies would be larger than the whole economy.

110. The troubling extension to this argument is that it simply does not allow expectations for growth to vary across firms according to reinvestment rates, or over time in response to economic or policy changes that encourage dividends versus share buybacks at different points in time. Linking earnings per share growth in listed companies to GDP growth is a blunt instrument. It is likely that more reliable estimates of the cost of equity, at the market and industry level, would result from consideration of reinvestment rates and returns on investment. This includes investments in new projects, as well as share repurchases (which is just one particular type of investment – the purchase of a company's own shares), and new share issues (which has the opposite impact of reinvestment).

111. In respect of the U.S. equity market, McKenzie and Partington (2013) refer to Damodaran (2006) in making the statement that "over the period 1960 to 1998, approximately the same amount was paid out in the form of stock buybacks as was paid as dividends."[41] McKenzie and Partington go on to say that in Australia, share repurchases are much less important than in the United States and historically have been small relative to dividends, but their importance has grown."[42]

112. As an example, suppose that a firm has just generated earnings per share of $1.00, the cost of equity is 10%, the firm reinvests $0.35 in new projects, pays a dividend of $0.65, and dividends and earnings are expected to grow in perpetuity at 4.6%. There are 100 million shares on issue. Prior to the dividend payment the value of the share is $13.24, computed as shown below, and the total equity value is $1324 million.

[38] McKenzie and Partington (2013), p. 21.

[39] The nominal growth estimate = (1 + real growth) × (1 + inflation) – 1 = 1.020 × 1.025 – 1 = 4.55%.

[40] This is the average of six-monthly estimates of long-term growth for Australian-listed firms, on a market capitalisation-weighted basis, from the second half of 2002 to the first half of 2014.

[41] McKenzie and Partington (2013), p. 10.

[42] McKenzie and Partington (2013), p. 10.

$$Equity\ value\ per\ share_0 = DPS_0 + \frac{DPS_0 \times (1+g)}{r_e - g}$$
$$= \$0.65 + \frac{\$0.65 \times 1.046}{0.100 - 0.046}$$
$$= \$0.65 + \frac{\$0.68}{0.054}$$
$$= \$0.65 + \$12.59$$
$$= \$13.24$$

113. After the dividend is paid, the share price will fall to \$12.59 and the market capitalisation will be \$1259 million. This is the present value of expected dividends after the first dividend is paid. We can see in this instance that, after the ex-dividend date, the dividend yield will be 5.4% (\$0.68 ÷ \$12.59 = 5.4%), the growth rate is 5.4%, which sum to the cost of equity of 10.0%.

114. In this example the firm decided to invest \$35 million in new projects and return \$65 million to shareholders via dividend payments. Now suppose that the firm decides that the way it returns cash to shareholders will change. Rather than pay dividends of \$65 million it will use \$65 million to repurchase shares.[43] What happens? The post-buyback value of the equity will still be \$1,259 million because there has been no change to the firm's investment prospects, nor to its cost of capital. Prior to the payment of any dividend or repurchase of shares the market value of the equity will still be \$1,324 million. But the market will recognise that there will be fewer shares on issue after the buyback. This will alter the mix of return from dividends versus capital gains.

115. Now suppose that the company offers shareholders \$13.24 per share in a buyback. If the shareholders accept the offer they will not be entitled to the dividend. With \$27 million of cash available for the repurchase of shares, this means that 2.04 million shares will be repurchased (that is, \$27 million ÷ \$13.24 per share = 2.04 million shares). The remaining shareholders will split the dividend of \$38 million amongst 97.96 million shares, so each shareholder will receive a dividend of \$0.39 (that is, \$38 million ÷ 97.96 million shares = \$0.39 per share). The share price after the buy-back and the dividend payment will be \$12.85 per share (that is, \$1,259 million ÷ 97.96 million shares = \$12.85 per share).

116. In sum, shareholders who participated in the buyback receive cash for their shares of \$13.24. Shareholders who did not participate in the buyback receive a cash dividend of \$0.39, and hold a share worth \$12.85, so their total wealth per share is also \$13.24. In the all dividend case, shareholders received a cash dividend of \$0.65 and were left with a share worth \$12.59, so their wealth is \$13.24 per share.[44]

117. If this process is repeated each year, with the same proportion of total earnings being used to pay dividends and repurchase shares, we see a trade-off between dividend yield and growth in how shareholders receive their total return of 10.00%. In the all-dividend case, the dividend yield is 5.40% and capital gains are 4.60%. Capital gains exactly match the growth in earnings per share and dividends per share. In the buy-back case, the dividend yield is 3.22% and capital gains are 6.78%.

118. This outcome is presented in Table 8, which shows financial information over the five forecast years. In Panel A we present the situation in which there are only dividends paid, and in Panel B we present

[43] For the purposes of the example, we assume that the buyback announcement itself does not signal anything to the market about undervaluation of the company's real assets, and that there are no tax benefits associated with a buyback versus a dividend.

[44] The reason buybacks are useful is that some shareholders have a preference to receive cash and some shareholders have a preference for capital gains. So the buyback allows shareholders with a preference for cash to exercise their preference and shareholders with a preference for capital gains to exercise their preference. Often these preferences are motivated by different taxes applicable to classes of shareholders, and different taxes applicable to the return of capital, dividends and capital gains. For the purposes of this discussion the reason why buybacks exist is not important. What matters is how buybacks alter the mix of expected returns amongst dividend yield and growth.

the situation in which there are dividends and share repurchases. The implications are the same, regardless of the number of years presented. One distribution policy leads to high dividends and low growth, another distribution policy leads to low dividends and high growth.

119. This example highlights the limitation of anchoring growth expectations to GDP growth, which takes no account of reinvestment rates. In the example, the investment in new projects is the same. But the manner in which benefits are returned to shareholders is altered. The buyback means that the firm *is* making more investments. It just happens to be making investments in its own stock. This leads to higher growth in earnings per share, dividends per share, and share price.

120. The example can be extended to dividend reinvestment plans, and the implication is the same, that growth is altered by reinvestment policy with no change in real investments. A dividend reinvestment plan is a share repurchase plan in reverse. The company pays a dividend, shareholders with a preference for shares rather than cash elect to reinvest their dividend in shares of the company. If the company wants to use the cash for new projects, or to repay debt, it will issue new shares in exchange for cash. If the company decides it has no need for additional cash, or to repay debt, it will repurchase shares on the market on behalf of the shareholders who want to reinvest their dividends. The latter situation is basically the company providing some convenience for shareholders who want to avoid the transaction costs and time involved in buying additional shares themselves on the market.

121. The example just provided can be extended to the dividend reinvestment plan situation. Suppose that the company decides to return all $100 million of earnings to shareholders as a dividend, but just prior to the payment of the dividend raises $35 million in new equity.[45] All shareholders are entitled to participate at the fair price of $13.24 per share.[46] The reinvestment of $35 million means that the company issues 2.64 million new shares (that is, $35 million ÷ $13.24 per share = 2.64 million shares). A shareholder who elects not to participate in the capital raising will receive a dividend of $0.97, and be left with a share worth $12.27. A shareholder who does participate in the capital raising now owns 1.0264 shares, so has dividends worth $1.00 ($0.97 per share × 1.0264 shares = $1.00), shares worth $12.59 ($12.27 per share × 1.0264 shares = $12.59), but paid out $0.35. So the total wealth of the shareholder who participated in the capital raising is $1.00 + $12.59 – $0.35 = $13.24.

122. If this situation continues we will have a dividend yield of 8.09% and capital gains of 1.91% per year. This is depicted in Table 8, Panel C. There is a payout ratio of 100% of earnings, but there is still positive growth in earnings per share because capital for investment is raised via the dividend reinvestment plan.

123. So in this extended example we have a dividend only case, a buyback case, and a reinvestment case, in which the total returns to shareholders are identical, but the growth rates vary from 1.91% in the reinvestment case, 4.60% in the dividend case, and 6.78% in the buyback case. There has been no change in the aggregate earnings growth of the company, which has been 4.60% throughout. The key point is that growth in earnings per share should not be anchored to GDP growth without consideration of how reinvestment impacts upon earnings per share growth.

[45] This approach might be adopted by companies with shareholders who have a preference for dividends, rather than capital gains.

[46] Some dividend reinvestment plans offer shares at a small discount to the market price. In situations in which the company has a need for new equity for investment or repayment of debt, the discount will typically be larger to encourage participation in the plan. In situations in which the dividend reinvestment plan is not needed for new capital, the discount will generally be lower and will often be zero.

Table 8. Example of dividends versus share repurchase

Panel A: Dividends only

Year	0	1	2	3	4	5
NPAT	100.00	104.60	109.41	114.44	119.71	125.22
Investment in new projects	35.00	36.61	38.29	40.06	41.90	43.83
Cash used for buyback	0.00	0.00	0.00	0.00	0.00	0.00
Dividends	65.00	67.99	71.12	74.39	77.81	81.39
Cash used for buyback and dividends	65.00	67.99	71.12	74.39	77.81	81.39
% of earnings invested in new projects	35%	35%	35%	35%	35%	35%
% of earnings used to repurchase shares	0%	0%	0%	0%	0%	0%
% of earnings paid as dividends	65%	65%	65%	65%	65%	65%
Shares pre buyback	100.00	100.00	100.00	100.00	100.00	100.00
Buyback price	13.24	13.85	14.49	15.15	15.85	16.58
Shares repurchased	0.00	0.00	0.00	0.00	0.00	0.00
Shares post-buyback	100.00	100.00	100.00	100.00	100.00	100.00
Earnings per share	1.00	1.05	1.09	1.14	1.20	1.25
Dividends per share	0.65	0.68	0.71	0.74	0.78	0.81
Earnings per share growth		4.60%	4.60%	4.60%	4.60%	4.60%
Dividends per share growth		4.60%	4.60%	4.60%	4.60%	4.60%
Equity value per share prior to dividend	13.24	13.85	14.49	15.15	15.85	17.32
Equity value per share after dividend	12.59	13.17	13.78	14.41	15.07	16.51
Market cap prior to dividend and buyback	1324.07	1384.98	1448.69	1515.33	1585.04	1657.95
Market cap after dividend and buyback	1259.07	1316.99	1377.57	1440.94	1507.22	1576.56
Dividend yield		5.40%	5.40%	5.40%	5.40%	5.40%
Capital gains		4.60%	4.60%	4.60%	4.60%	9.51%
Total return to equity holders		10.00%	10.00%	10.00%	10.00%	14.91%
Growth in NPAT	4.60%					
Long-term growth in dividends per share	4.60%					
Cost of equity	10.00%					

Panel B: Dividends and share repurchase

Year	0	1	2	3	4	5
NPAT	100.00	104.60	109.41	114.44	119.71	125.22
Investment in new projects	35.00	36.61	38.29	40.06	41.90	43.83
Cash used for buyback	27.00	28.24	29.54	30.90	32.32	33.81
Dividends	38.00	39.75	41.58	43.49	45.49	47.58
Cash used for buyback and dividends	65.00	67.99	71.12	74.39	77.81	81.39
% of earnings invested in new projects	35%	35%	35%	35%	35%	35%
% of earnings used to repurchase shares	27%	27%	27%	27%	27%	27%
% of earnings paid as dividends	38%	38%	38%	38%	38%	38%
Shares pre buyback	100.00	97.96	95.96	94.01	92.09	90.21
Buyback price	13.24	14.14	15.10	16.12	17.21	18.38
Shares repurchased	2.04	2.00	1.96	1.92	1.88	1.84
Shares post-buyback	97.96	95.96	94.01	92.09	90.21	88.37
Earnings per share	1.00	1.07	1.14	1.22	1.30	1.39
Dividends per share	0.39	0.41	0.44	0.47	0.50	0.54
Earnings per share growth		6.78%	6.78%	6.78%	6.78%	6.78%
Dividends per share growth		6.78%	6.78%	6.78%	6.78%	6.78%
Equity value per share prior to dividend	13.24	14.14	15.10	16.12	17.21	18.87
Equity value per share after dividend	12.85	13.72	14.65	15.65	16.71	18.33
Market cap prior to dividend and buyback	1324.07	1384.98	1448.69	1515.33	1585.04	1657.95
Market cap after dividend and buyback	1259.07	1316.99	1377.57	1440.94	1507.22	1576.56
Dividend yield		3.22%	3.22%	3.22%	3.22%	3.22%
Capital gains		6.78%	6.78%	6.78%	6.78%	9.71%
Total return to equity holders		10.00%	10.00%	10.00%	10.00%	12.93%
Growth in NPAT	4.60%					
Long-term growth in dividends per share	6.78%					
Cost of equity	10.00%					

Panel C: Dividends and dividend reinvestment plan

Year	0	1	2	3	4	5
NPAT	100.00	104.60	109.41	114.44	119.71	125.22
Investment in new projects	35.00	36.61	38.29	40.06	41.90	43.83
Cash used for buyback (DRP)	-35.00	-36.61	-38.29	-40.06	-41.90	-43.83
Dividends	100.00	104.60	109.41	114.44	119.71	125.22
Cash used for buyback (DRP) and dividends	65.00	67.99	71.12	74.39	77.81	81.39
% of earnings invested in new projects	35%	35%	35%	35%	35%	35%
% of earnings used to repurchase shares (i.e., DRP)	-35%	-35%	-35%	-35%	-35%	-35%
% of earnings paid as dividends	100%	100%	100%	100%	100%	100%
Shares pre buyback (DRP)	100.00	102.64	105.36	108.14	111.00	113.93
Buyback (DRP) price	13.24	13.49	13.75	14.01	14.28	14.55
Shares repurchased	-2.64	-2.71	-2.78	-2.86	-2.93	-3.01
Shares post-buyback (DRP)	102.64	105.36	108.14	111.00	113.93	116.95
Earnings per share	1.00	1.02	1.04	1.06	1.08	1.10
Dividends per share	0.97	0.99	1.01	1.03	1.05	1.07
Earnings per share growth		1.91%	1.91%	1.91%	1.91%	1.91%
Dividends per share growth		1.91%	1.91%	1.91%	1.91%	1.91%
Equity value per share prior to dividend	13.24	13.49	13.75	14.01	14.28	15.53
Equity value per share after dividend	12.27	12.50	12.74	12.98	13.23	14.45
Market cap prior to dividend and buyback (DRP)	1324.07	1384.98	1448.69	1515.33	1585.04	1657.95
Market cap after dividend and buyback (DRP)	1259.07	1316.99	1377.57	1440.94	1507.22	1576.56
Dividend yield		8.09%	8.09%	8.09%	8.09%	8.09%
Capital gains		1.91%	1.91%	1.91%	1.91%	9.26%
Total return to equity holders		10.00%	10.00%	10.00%	10.00%	17.36%
Growth in NPAT	4.60%					
Long-term growth in dividends per share	1.91%					
Cost of equity	10.00%					

4.2.3 Historical GDP growth and earnings per share growth

124. In the prior section we made the point that, if the assumed earnings per share growth is anchored to GDP growth, without consideration of reinvestment, the assumed growth rate could be very far from the correct growth rate. Even if dollar earnings grow at the same rate as GDP (or GDP ± an assumed percentage) the growth in earnings per share could be very different once reinvestment is accounted for.

125. In this section we consider the historical relationship between GDP growth and growth in both earnings per share and dividends per share for stocks listed in Australia and the U.S. While our task is to estimate the cost of equity for Australian-listed stocks, we refer to U.S. data to mitigate the risk that our conclusions are affected by unexpected events in Australia. We also refer to U.S. data because the research that supports the position of the AER is two studies which examine data from a number of countries.

126. The purpose of this section is to address three reasons why the AER assumes real earnings and dividend growth of 2%, which is 1% below its estimate of long-term GDP growth. These three reasons are summarised below, and we consider each of these reasons in turn.

a) Mathematically, the dollar earnings of the market cannot grow faster than GDP forever. Eventually, corporate earnings of listed firms would exceed the entire output from the economy.

b) Even if aggregate corporate earnings grow at the same rate as GDP, some of those corporate earnings come from new companies. If current listed companies grow at the rate of GDP, and there are some additional earnings from new companies, in aggregate growth in corporate earnings will be more than GDP growth. So, again, aggregate earnings of listed companies would eventually be larger than the economy.

c) Historical data shows dividend and earnings growth in developed markets which is less than historical GDP growth.

Earnings would eventually exceed economic output if earnings growth exceeds GDP growth

127. It is correct to say that, if the earnings of listed companies grow at a faster rate than GDP, eventually those corporate earnings would exceed GDP. Mathematically, that would occur. According to the Australian Bureau of Statistics (ABS), over the calendar year 2013, nominal GDP was estimated at $1,556 billion.[47] The ABS also reports an estimate of company profits before tax, which stands at $180 billion for 2013.[48] So pre-tax corporate profits are estimated at 11.6% of GDP. If GDP grows at 5.6% for 50 years, and pre-tax corporate profits grow faster, at (for example) 6.1% for 50 years, then pre-tax profits will reach 14.7% of GDP. If this continues for 100 years the ratio will be 18.6%. Of course, these ratios would be even lower if we were to consider after-tax corporate profits.

128. For valuation purposes, there has been general agreement that it is useful to factor in a long-term growth rate at some point in the estimation. In our analysis, and that of the AER's three stage model, this point is reached in about 10 years. But the argument that the growth rate assumption cannot mathematically exceed an estimate of GDP growth is a very long term argument. For valuation purposes, we are really talking about the rate of growth over the next 100 years. The perpetual growth assumption is made for convenience. For example, if a cash flow of $100 today is expected to grow at 5.6% per year forever, and the discount rate is 10.0%, the present value of expected cash flows is $2,400.[49] The present value of expected cash flows over 50 years is $2,088, which is 87% of the total present value, and the present value of expected cash flows over 100 years is $2,356, which is 98% of the total.

129. This means that, if we were to write the present value equation as the present value of each individual cash flows over 100 years, rather than a perpetuity, it is much more realistic to consider the situation in which earnings per share growth matches or exceeds GDP growth. The question is whether we could see growth approximate GDP growth over the next 100 years from listed companies, not the case in which we consider the actual perpetuity situation. In other words, it is not appropriate to exclude the possibility that the growth in corporate earnings from listed companies approximates GDP growth over 100 years, because this cannot happen *forever*.

Overview of the historical growth in earnings per share and GDP

130. Addressing the second point – contribution from new companies – the rationale here is that total growth in GDP comes from existing businesses and new businesses, so we cannot attribute all of the GDP growth to businesses in existence today. This ties in to the third point, which is the historical relationship between GDP growth, dividend growth and earnings growth in developed markets. The empirical observation is that dividend growth and earnings growth have been less than GDP growth. So in the discussion below, we examine the historical information.

131. We first draw our attention to analysis presented by Bernstein and Arnott (2013). They report that over 100 years from 1900 to 2000, Australia had real GDP growth of 3.3% per year and real dividend growth of 0.9% per year. The difference of –2.4% between real GDP growth and dividend growth is referred to as *dilution in dividend growth (vis-à-vis GDP growth).*[50] In Table 2 of the report compiled by McKenzie and Partington (2013) the 2.4% dilution appears in the column *Real GDP adjustment*.

132. For the United States, the researchers report real GDP growth of 3.3% per year and real dividend growth of 0.6% per year, which leaves dilution in dividend growth of –2.7% per year. Across the full sample of 16 countries the average real GDP growth is 2.8% per year, the average real dividend growth

[47] ABS Table 5206.0, Series ID A2302467A, Gross domestic product: Current prices.
[48] ABS Table 5676.0, Series ID, A3531604T, Profit before Income Tax; Total (State); Total (Industry); Current Price; CORP.
[49] Value = $100 × 1.056 ÷ (0.100 – 0.056) = $105.6 ÷ 0.044 = $2400.
[50] Bernstein and Arnott (2013), Table 1, p. 51.

is –0.5% per year (that is, on average, dividends are reported to have declined in real terms), which leaves average dilution of –3.3% per year. For countries with growth not unduly affected by war, the average real GDP growth is 3.0% per year and the average real dividend growth is 0.7% per year, which leaves average dilution of –2.3%.

133. The title of the paper is *Earnings growth: The two percent dilution*. The two percent referred to in the title is an aggregate estimate of the difference between real GDP growth and real dividend growth. The AER, correctly, recognises that one reason for the low dividend growth is that the payout ratio has declined over time for listed companies. Earnings growth has not declined as much as dividend growth. So on a forward-looking basis the AER assumes dilution of 1% rather than 2%.

134. The second set of historical data is presented by MSCI Barra (2010). This paper relies upon 40 years of data from 1969 to 2009. The researchers report that, over this period, Australia had real GDP growth of 3.1% per year and real earnings per share growth of 0.5% per year.[51] The difference between the growth rates is 2.7% and this appears in Table 2 of the report by McKenzie and Partington (2013) under the heading *Real GDP adjustment*.

135. For the United States, the estimates from MSCI Barra (2010) are real GDP growth of 2.8% per year and real earnings per share growth of 0.0% per year. Across 16 developed markets the average real GDP growth is 2.4% per year and the average real earnings per share growth is 0.1% per year.

136. The reason both sets of researchers (Bernstein and Arnott, 2013, and MSCI Barra, 2010) reach the conclusion that real dividend or earnings growth falls below real GDP growth is that this is an average result over either 100 or 40 years' worth of data. In analysis presented in detail below, the dilution can be entirely attributed to the early part of the sample periods. For the time period since central banks in Australia and the U.S. began using monetary policy to constrain inflation, real earnings per share growth has matched or exceeded real GDP growth. We discuss the results in more detail below, but the most important results are as follows.

137. In Australia, annual inflation fell from 6.9% in 1990 to 1.5% in 1991. The RBA began referring to its target inflation range of 2% to 3% in mid-1993, but its monetary policy statements show that inflation considerations were influencing official interest rates prior to this point (the bank just did not refer to the target range until 1993). Over the 23 years from the end of 1990 to the end of 2013, trend GDP growth was 3.3% per year, while trend earning per share growth was 4.9% per year.[52] In contrast, the 21 years from 1969 to 1990 saw trend GDP growth of 3.0% per year, compared to trend earnings per share growth of 1.8% per year. So the dilution in earnings per share growth vis-à-vis GDP growth is a feature of the high inflation period of 1969 to 1990, and not the low inflation period of 1990 to 2013. Even if we extend the break-point to 1987, we observe real earnings per share growth (3.2% per year) keeping pace with real GDP growth (3.3% per year). From 1969 to 1987, real earnings per share growth was 1.6% per year versus 2.9% per year for real GDP growth.

138. In the U.S., annual inflation fell from 8.9% in 1981 to 3.8% in 1982. This followed the actions of the U.S. Federal Reserve to constrain inflation since Paul Volcker was installed as Chairman on the 6th of August 1979.[53] Over the 32 years from the end of 1981 to the end of 2013, trend growth in real GDP was 3.2% per year, while trend growth in real earnings per share was 2.8% per year. In contrast, over the 52 years from 1929 to 1981, GDP growth of 4.2% per year exceeded earnings per share growth of 2.8% per year.

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51 MSCI Barra (2010), Exhibit 3, p. 4.

52 As discussed in the following sub-section, we measure trend growth in real GDP and real earnings per share, which is the linear change in the natural logarithm of real GDP and real earnings per share in dollar terms. This can be contrasted with the computations performed by Bernstein and Arnott (2003) and MSCI Barra (2010) who measured annual growth with reference to real GDP growth as geometric means, and which results in the growth estimates being entirely dependent on the level of real GDP and real earnings per share in the first and last years of their samples.

53 Paul A. Volcker became chairman of the Board of Governors of the Federal Reserve System on August 6, 1979. He was reappointed for a second term on August 6, 1983, and served until August 11, 1987.

139. This difference in growth rate estimates over time is important because the objective is to make an estimate of what growth expectations are embedded in market prices. Furthermore, the reason there is debate about the growth assumption is that price-earnings multiples are higher today than in the past.

140. So the question is, "Are price-earnings multiples higher than previously observed because the cost of equity is lower than in the past, because growth expectations are higher than in the past, or are both assumptions important?' The assumption that *growth = GDP minus 1%* would hold if the market priced stocks according to the entire history of GDP and earnings per share growth. And the result would be a cost of equity estimate that is much lower today than in the past. Alternatively, the market could have formed a growth expectation according to more recent information about firm prospects, and the cost of equity would not have fallen as far.

141. The key point is that it is not appropriate to attribute a low growth estimate to market expectations (on the basis of low growth observed decades ago), and then derive the cost of equity on the basis of current prices and earnings prospects. If a growth estimate is adopted that is consistent with the evidence from recent decades, there is no reason to think that earnings per share growth will be less than GDP growth.

Detailed analysis of the historical growth in earnings per share and GDP growth

142. Our first step was to attempt to verify the conclusions reached by Bernstein and Arnott (2003) and MSCI Barra (2010) using the data available to us. While the percentage figures we report are not identical to those reported in prior papers, we agree that over the corresponding time periods GDP growth has outstripped earnings per share growth.

143. The first thing to note is that the reported aggregate growth in earnings per share, dividends per share and GDP from those papers is computed as a geometric mean. So the reported growth rates are highly dependent on the start point and end point of the series.

144. In the first paper by Bernstein and Arnott (2003) the researchers report *dividend per share growth* from 1900 to 2000 of 0.9% per year for Australia and 0.6% per year for the U.S. Our corresponding estimates of dividend growth, based upon the start and end points in the series and computed over the same time periods, are 1.3% per year for Australia, and 1.1% per year for the U.S.[54] So, while our dividend growth estimates are higher than those previously reported, the overall implication is the same, that dividend growth was relatively low over this 100 year time period. As will be shown later, however, this low growth rate is not relevant for estimating the market's view on subsequent growth in dividends per share and earnings per share.

145. In the second paper by MSCI Barra (2010) the researchers report *earnings per share growth* from 1969 to 2009. For Australia, the estimated earnings per share growth rate is 0.5% per year and in the U.S. the estimated earnings per share growth rate is 0.0% per year. Over the corresponding 40-year period, and based upon the start and end points in the series, we estimate earnings per share growth for Australian-listed stocks of 1.8% per year and –1.8% per year for U.S.-listed stocks. The growth rate estimates vary materially, depending upon sample selection (time and datasets) for the following reason. Earnings per share growth is volatile over time, and computing the growth rate as a geometric mean relies entirely on the start and end values for earnings per share. For example, had we started the Australian computation one year later, at the end of 1970, we would have computed earnings per share growth of 1.4% per year, instead of 1.8% per year; and had we ended the U.S. computation one year earlier, we would have computed earnings per share growth of 0.8% per year, rather than –1.8% per year.

146. This means we need to compile growth rate estimates that are not contingent entirely on the first and last year of the series. This can be done by compiling trend growth estimates. Simply take the natural

[54] For dividend data on Australian-listed stocks we analysed dividend yields and closing values for the All Ordinaries Index compiled by Global Financial Data. For dividend data on U.S.-listed stocks we analysed dividend yields and closing values for the S&P500 compiled by Professor Robert Shiller (http://www.econ.yale.edu/~shiller/).

logarithm of each value, and estimate the linear change in log values over time. Expressed as an equation, we estimate the beta coefficient in the following regression (which is also used for GDP growth and dividends per share growth). To express the growth rate in discrete time we then compute $e^{\beta} - 1$.[55]

$$\ln EPS_t = \propto + \beta \times \ln EPS_{t-1}$$

147. This analysis is illustrated in Figure 4, which shows real GDP and real earnings per share for Australian-listed stocks from 1969 to 2013. With trend growth estimated over the entire 44 year time period, real earnings per share growth is estimated at 1.5% per year,[56] and real GDP growth is estimated at 3.2% per year. The trend growth estimate is considerably less sensitive to the start and end points. For example, had the first year been excluded, trend growth in earnings per share would still have been 1.5%. In contrast, if we had computed growth as a geometric average, we would have reported annualised earnings per share growth of 1.4% if the first year was included, and 1.1% if the first year was excluded.

148. We performed computations of earnings per share growth, dividend per share growth, and GDP growth on this basis for a number of time periods. Using Australian data, we separately analysed two periods: (1) the 21-year period from 1969 to 1990; and (2) the 23-year period from 1990 to 2013.[57] The year 1990 signals a change from a high inflation environment to a low inflation environment. Trend inflation from 1969 to 1990 was 9.1%, compared to 2.6% from 1990 to 2013. The four years ending in 1992 were particularly poor for listed company earnings. In aggregate, real earnings per share fell by 81% from 1988 to 1992. So we examine whether this time period unduly impacts upon our results. We present alternative sets of results that extend the first sub-period by three years to the end of 1993, and back three years to the end of 1987.

149. Using U.S. data, we separately analysed three periods: (1) the 69-year period from 1990 to 1969; (2) the 12-year period from 1969 to 1981; and (3) the 32-year period from 1981 to 2013. Inflation in the U.S. substantially declined in 1982 and for the last 32 years trend inflation has been 2.8% per year, compared to 7.7% per year for the 1969 to 1981 period.[58] U.S.-listed firms also experienced a period of poor earnings performance around the transition from high to low inflation. Over four years from 1979 to 1983, earnings per share fell by an aggregate 32%. So, as with the analysis of Australian data, we examine whether changes in the selection of different time periods impact on the results.

150. The primary results are presented in Table 9, Panel A. In Australia, for the most recent 23 years we have observed annual growth in real earnings per share of 5.0%, compared to real GDP growth of 3.4%. In contrast, during the 21 years from 1969 to 1990, real earnings per share grew at an annual rate of 1.8%, compared to real GDP growth of 3.0%.

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[55] Note that if analysis was conducted which measured the relationship between two economic variables over time, as opposed to trend growth, than the more appropriate analysis would be to estimate changes in log growth over time for the two variables. The reason for this is that economic variables generally drift upwards over time, so analysis between two variables can suggest causality when two variables are both drifting upwards without any causal relationship. In this instance we are simply measuring the drift itself. In other words, we are simply asking, "What has been the trend in GDP and earnings per share over time?"

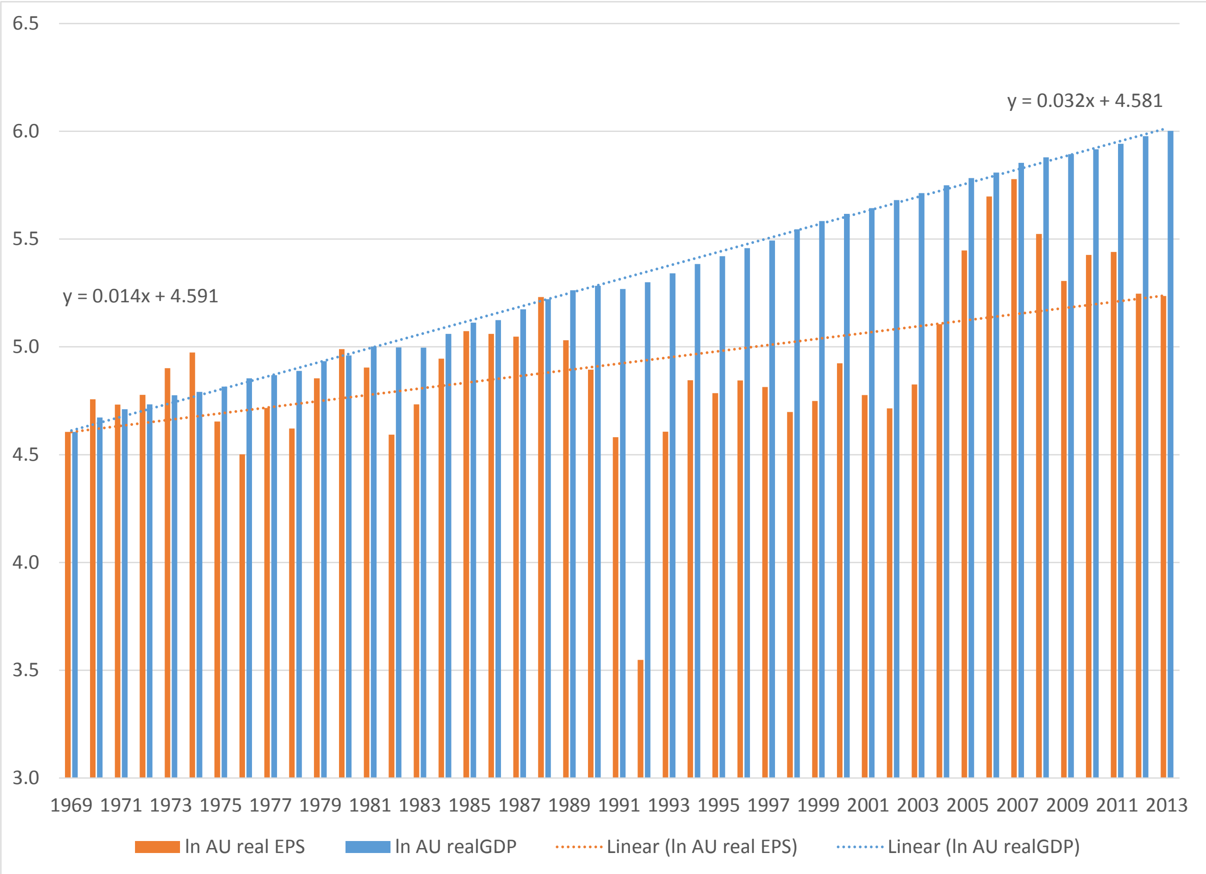
[56] Expressed as logarithmic growth, the rate is 1.442% per year, which corresponds to the figure of 0.014 shown in the chart. Expressed as a discrete annual rate, this is $e^{0.01442} - 1 = 1.453\%$. Similar computations apply throughout the paper.

[57] There is no overlap in these time periods. For instance, there are 22 data points for earnings per share from 1969 to 1990, so we are measuring how earnings per share changed over the 21 years from the end of 1969 to the end of 1990. There are 24 data points for earnings per share from 1990 to 2013, so we are measuring how earnings per share changed over the 23 years from the end of 1990 to 2013. So the first period ends at the end of 1990, and the second period begins at the end of 1990.

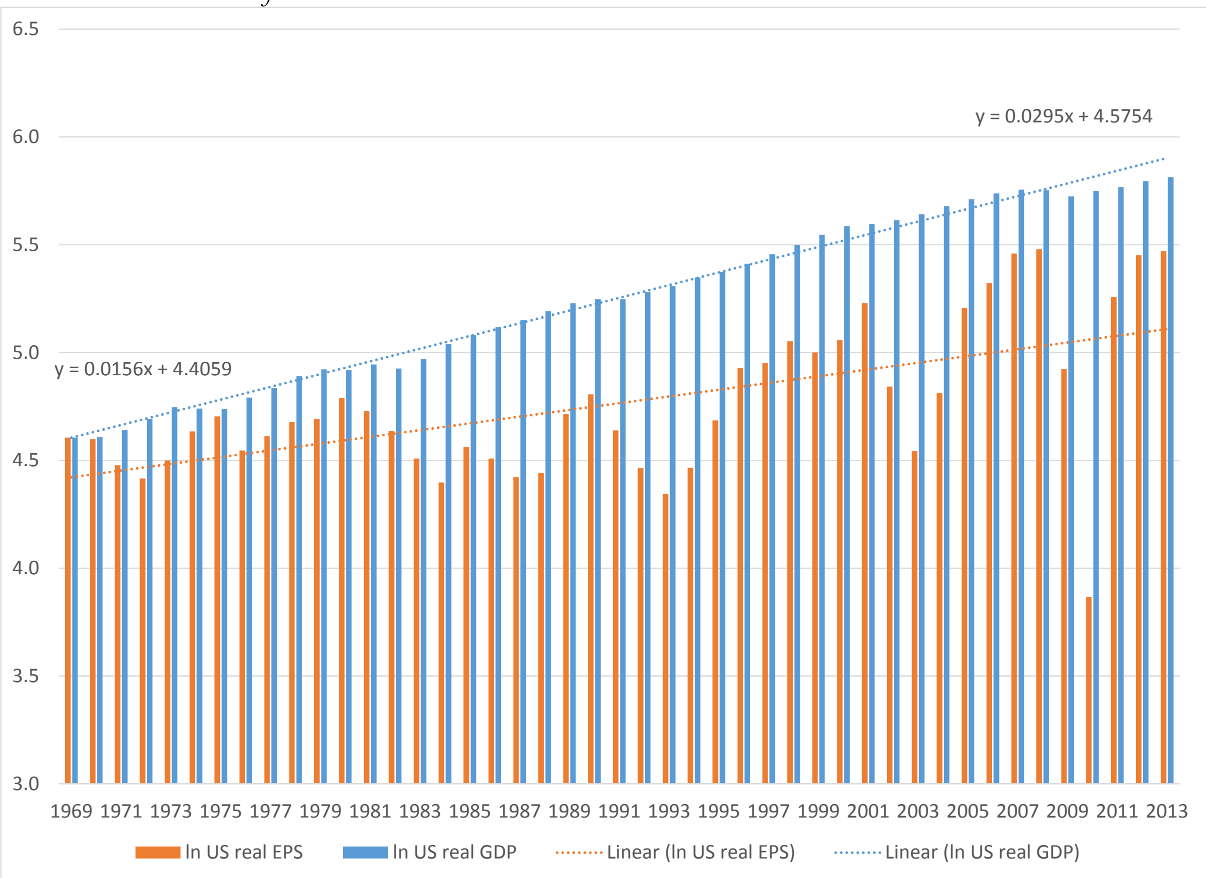
[58] The start year of 1969 for period two in the U.S. is to align the analysis with that presented by MSCI Barra (2010). We do not have earnings per share information for Australian-listed companies prior to 1969, only dividends per share.

Figure 4. Real GDP and real earnings per share growth in from 1969 to 2013

Panel A: Australia



Panel B: United States of America



151. The growth rates over different time periods is reflected in share prices over this time. In Figure 5, Panel A, we present the real price alongside real earnings per share for the Australian equity market. We also present seven year average values for both series, computed at the mid-point of the seven year period (for example, the seven year average from 2007 to 2013 is presented above year 2010). For the most part, prices move in the same direction as corporate earnings, with a handful of exceptions (from 1969 to 1974 prices fell while earnings rose, and from 1988 to 1992 earnings fell while prices rose).

152. Price growth has somewhat outstripped earnings growth, leading to an increase in price-earnings ratios. The median price compared to the previous 12 months earnings was 11.5 from 1969 to 1990, and 19.1 from 1991 to 2013. If we consider real price compared to real 10-year trailing earnings, the median was 12.2 from 1978 to 1990 and 19.8 from 1991 to 2013. This is presented in Figure 5, Panel B.

153. The issue at hand is what is likely to have caused the relatively higher price-earnings ratios that prevail in the latter part of the sample period. Our view is that the higher price-earnings ratios are attributed both to higher growth expectations *and* a lower cost of capital. In the early part of the sample period, GDP growth outstripped earnings per share growth, but this was reversed in the latter part of the sample period. A value-based investor might argue that the peak of the equity market observed in 2007 resulted from investors having high growth expectations that could not be matched by actual corporate performance. But that does not mean we should estimate the cost of equity on the basis of the growth assumptions those investors *should* have adopted. This would attribute a low cost of equity to the market on the basis of a lower long-term growth assumption. If we were to use a lower, long-term growth assumption we would also need to estimate the cost of equity at lower prices which also incorporate that long-term growth assumption.

154. If we consider Table 9, Panel B, we observe that our conclusion – that in recent decades earnings per share growth has at least matched GDP growth – is not sensitive to the selection of the break-point between the high and low inflation periods. If the latter period is extended back to 1987, spanning 26 years, we observe that earnings per share growth has kept pace with GDP growth (3.4% per year for GDP versus 3.3% per year for earnings per share). If we only consider the most recent 20 years, earnings per share growth has outstripped GDP growth by 1.2% per year, while for the prior 24 years earnings per share growth was slightly negative.

155. Considering the U.S. equity market, the implication is the same – subsequent to the increased focus of the U.S. Federal Reserve on maintaining low, stable inflation, there is no material difference in the growth of real GDP and earnings per share of listed companies. The first year in which there was a substantial reduction in inflation is 1982, so we consider the periods 1969 to 1981, and 1981 to 2013.

156. Referring to Table 9, Panel A, we see that since 1981 growth in real earnings per share has kept pace with growth in real GDP (real GDP growth of 2.9% per year compared to real earnings per share growth of 2.8% per year). In contrast, it is during the earlier years of 1969 to 1981 in which real GDP growth outstripped real earnings per share growth. In this earlier time period there is a 1.1% per year difference in real GDP growth and real earnings per share growth. It is only if we begin to include years prior to 1981 in the latter time period that we begin to see growth rates diverge. If we consider any time period from the last 20 years to the last 32 years we observe real earnings per share growth approximate real GDP growth.

157. In Figure 6, Panel A, we present real prices and real earnings per share for U.S. equities, presented in natural log terms, along with seven-year averages. During the 1970's and 1980's, earnings per share was flat. But from the mid- to late-1980's earnings per share growth began to accelerate and matched GDP growth. Share prices began to grow strongly from a low point at the end of 1981. Prices and earnings per share were impacted by the economic downturn that began in 2008, but have since recovered to pre-recession levels.

Table 9. Growth in real GDP, earnings per share and dividends per share (%)

Panel A: Variation in growth rates according to monetary policy regime

Country	Years	GDP	EPS	DPS	Inflation
Australia	1900 to 1969	5.1		2.1	2.7
	1969 to 1990	3.0	1.8	–2.2	9.6
	1990 to 2013	3.4	5.0	3.4	2.7
USA	1900 to 1969	3.5	1.1	0.9	2.1
	1969 to 1981	3.1	2.0	–1.0	8.0
	1981 to 2013	2.9	2.8	1.9	2.9

Panel B: Sensitivity of growth rates to changes in break points

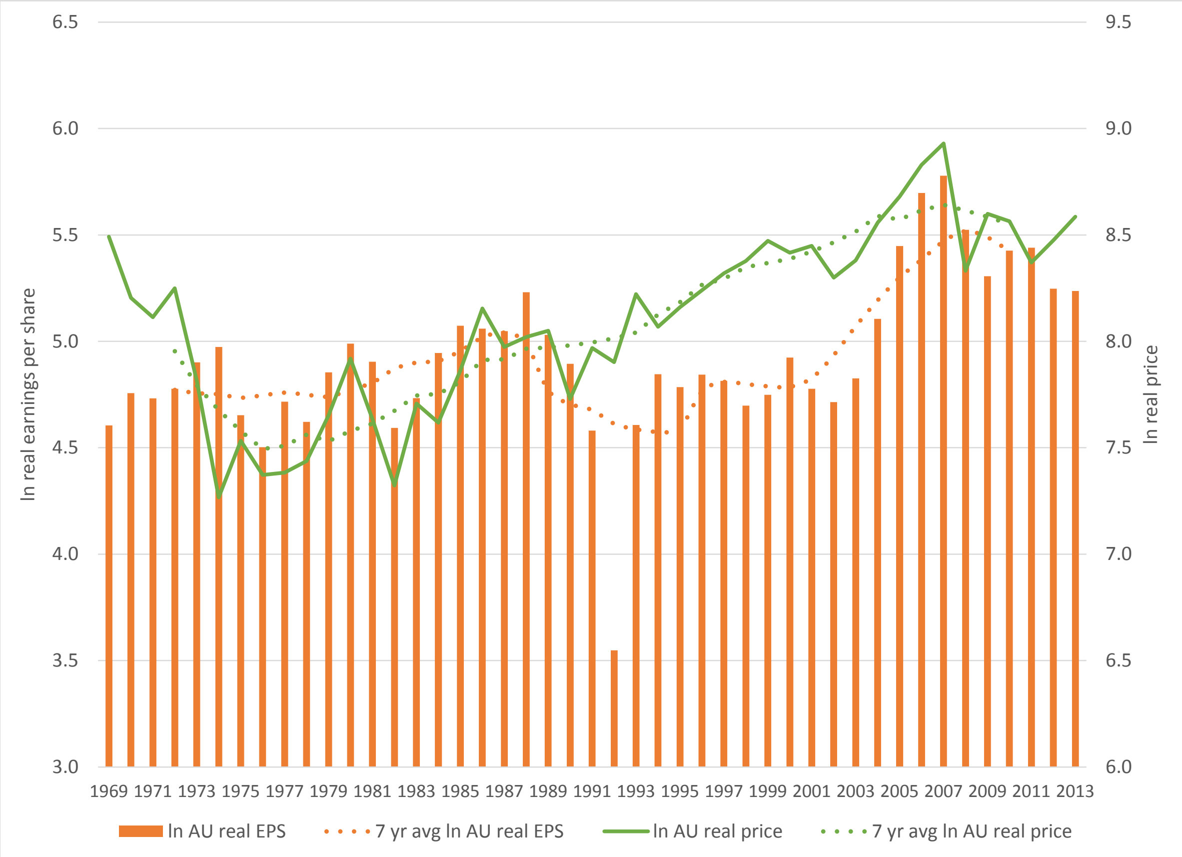
Country	Years	GDP	EPS	DPS	Inflation
Australia	1969 to 1987	2.9	1.6	−4.2	10.0
	1987 to 2013	3.4	3.3	2.6	2.8
	1969 to 1988	3.0	2.0	−3.4	9.8
	1988 to 2013	3.4	3.7	2.7	2.7
	1969 to 1989	3.0	2.0	−2.7	9.7
	1989 to 2013	3.4	4.4	3.0	2.7
	1969 to 1990	3.0	1.8	−2.2	9.6
	1990 to 2013	3.4	5.0	3.4	2.7
	1969 to 1991	3.0	1.3	−2.2	9.4
	1991 to 2013	3.4	5.6	3.8	2.7
	1969 to 1992	3.0	−0.2	−2.3	9.1
	1992 to 2013	3.4	5.9	3.8	2.7
	1969 to 1993	3.0	−0.3	−2.2	8.9
	1993 to 2013	3.4	4.6	3.6	2.8
USA	1969 to 1978	3.1	2.1	−1.7	6.9
	1978 to 2013	2.9	2.3	1.7	3.1
	1969 to 1979	3.2	2.5	−1.3	7.3
	1979 to 2013	2.9	2.4	1.8	3.0
	1969 to 1980	3.2	2.4	−1.1	7.7
	1980 to 2013	2.9	2.6	1.8	2.9
	1969 to 1981	3.1	2.0	−1.0	8.0
	1981 to 2013	2.9	2.8	1.9	2.9
	1969 to 1982	2.9	1.3	−1.0	8.0
	1982 to 2013	2.9	2.9	1.9	2.8
	1969 to 1983	2.8	0.5	−0.9	8.0
	1983 to 2013	2.8	3.0	1.9	2.8
	1969 to 1984	2.9	0.3	−0.8	7.8
	1984 to 2013	2.8	3.0	1.9	2.8

158. The aggregate impact of fluctuations in earnings and share prices has been a substantial increase in price-earnings ratios in recent years. In Figure 6, Panel B, we illustrate the real share price compared to 10-year trailing average real earnings per share. The median price-earnings ratio was 8.9 for the four years ending in 1981, and 21.1 for the 32 years ending in 2013. If we consider the two periods analysed with respect to the Australian data, the median price-earnings ratios are 9.8 for the 13 years ending in 1990 and 24.9 for the 23 years ending in 2013.[59]

[59] Recall that the corresponding median price-earnings ratios were 12.2 and 19.8 for Australian-listed equities.

Figure 5. Real earnings per share and prices for the Australian equity market from 1969 to 2013

Panel A: Real prices and earnings per share



Panel B: Real price relative to 10-year trailing real earnings per share

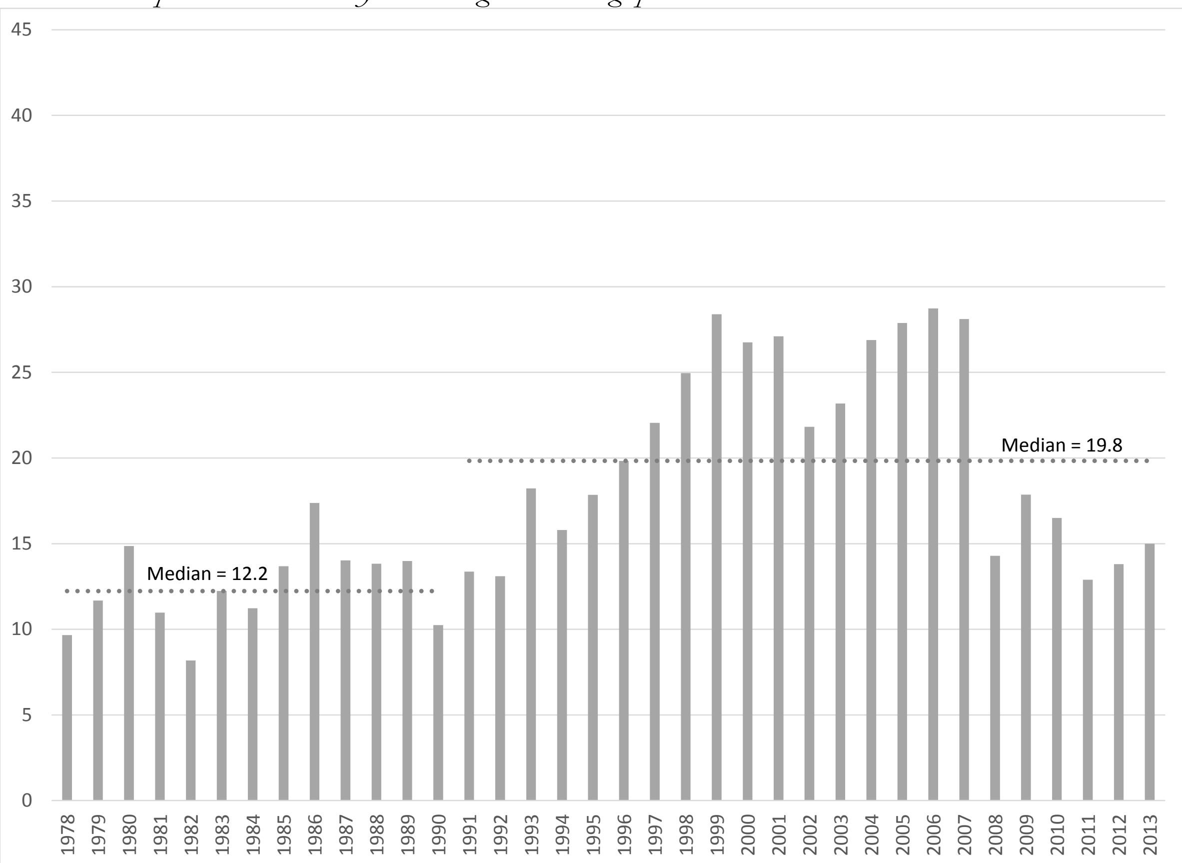
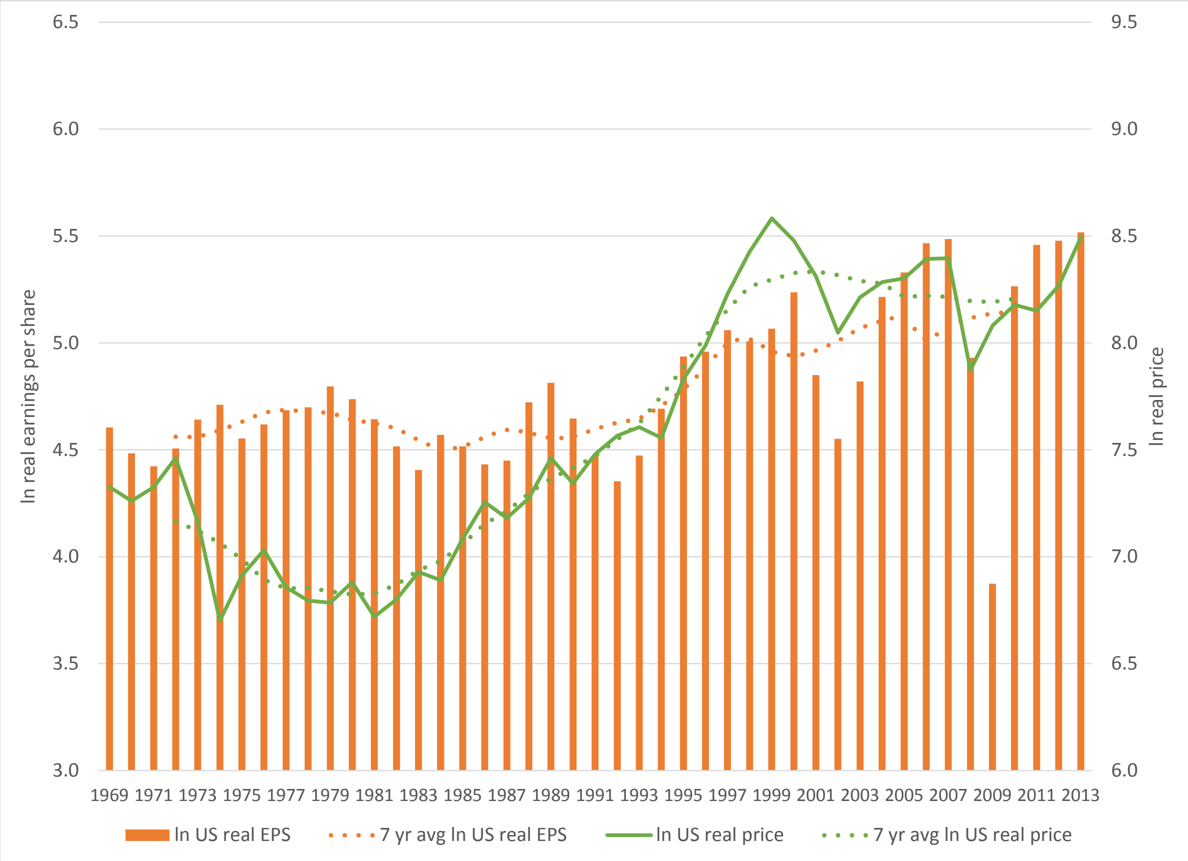
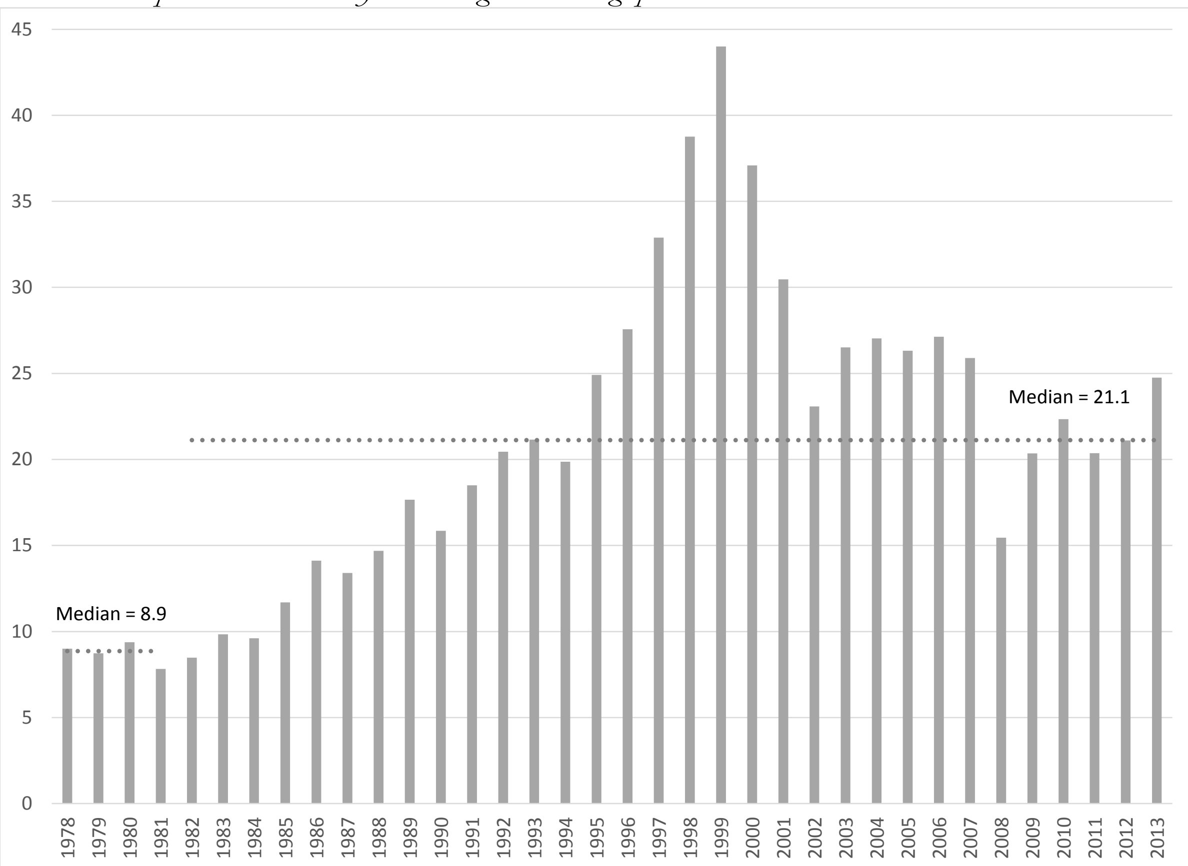


Figure 6. Real earnings per share and prices for the U.S. equity market from 1969 to 2013

Panel A: Real earnings and prices per share



Panel B: Real price relative to 10-year trailing real earnings per share



159. At the end of 2013 the price relative to 10-year trailing earnings is 24.8 for U.S.-listed equities, so is close to what we have observed for the last two to three decades. In estimating the cost of equity prevailing today, the question is whether we should consider growth rates that have been observed over the last two to three decades, or whether we should consider growth rates that prevailed over a longer time period. As with the Australian data, it would not be appropriate to assume that stocks are priced on the basis of growth over 44 years, or 113 years, and therefore assume that the increase in price-earnings ratios reflects only reductions in the discount rate. The increase in price-earnings ratios is likely to reflect both higher growth expectations (which he have observed for two to three decades) *and* reductions in the discount rate.

Dividends, earnings and new share issues, including dividend reinvestment plans

160. The two research papers referred to earlier consider different measures of per share growth, with Bernstein and Arnott (2003) compiling growth in dividends per share, and MSCI Barra (2010) compiling growth in earnings per share. When considering future long-term growth, and if we hold long-term reinvestment rates constant (as we do in our analysis), there will be identical growth in earnings per share and dividends per share. But when considering the historical information the growth rates for earnings per share and dividends per share will diverge because of changes in firm's reinvestment policies.

161. Lally (2013b) makes this point when he states the following, before ultimately agreeing with the AER's proposed long-term growth rate assumption of 4.6%:[60]

> An alternative approach to estimate the long-run expected real growth rate in DPS arises from the fact that the long-run expected real growth rate in DPS should match that for EPS, and the latter can be estimated from the historical average without the bias arising from a change n the payout rate over time.[61]

162. McKenzie and Partington (2013) do not reach the same definitive conclusion on this issue. In Table 2 of their report, they refer to real earnings per share growth reported by MSCI Barra (2010) of 0.5% per year from 1969 to 2009, real dividends per share growth of 0.9% per year from 1900 to 2000 reported by Bernstein and Arnott (2003) and real dividends per share growth of 2.76% per year from 1884 to 2010 reported by CEG (2013).[62]

163. The conclusion of McKenzie and Partington (2013) is that the AER's 4.6% estimate of long-term growth "may be viewed as somewhat on the generous side."[63] The basis for this conclusion is a mean growth estimate of 3.78% from 12 estimates reported in Table 2 of their paper, which exclude the highest and lowest estimates from the full suite of 14 estimates.[64] In Table 10 we have reproduced the estimates reported McKenzie and Partington (2013). All nominal growth estimates have been compiled using an inflation assumption of 2.50% per year so we do not report the inflation column.

[60] Lally (2013b) agrees with assumptions of real growth in dividends per share and earnings per share of 2% (1% less than an estimate of GDP growth of 3%), and inflation of 2.5% per year (the mid-point of the RBA's target inflation range of 2% to 3%) (Section 6, p. 18).

[61] Lally (2013b), Section 6, p. 17.

[62] McKenzie and Partington (2013) also question the magnitude of the 2.76% growth estimate reported by CEG (2013). The reason this appears high to McKenzie and Partington (2013) is because this is an arithmetic mean rather than the geometric mean relied upon by Bernstein and Arnott (2003) and MSCI Barra (2010).

[63] McKenzie and Partington (2013), Sub-section 2.3, p. 15.

[64] The highest estimate in the table is an estimate of 6.50%, which results from a 3.9% real GDP growth estimate from CEG (2013), and an inflation assumption of 2.50% (that is, 1.039 × 1.025 – 1 = 6.50%). The lowest estimate in the table is an estimate of 0.31% which we believe is a computational error because this appears to be an estimate of real growth in dividends, rather than nominal growth.

Table 10. Growth rate estimates (%) compiled from Table 2 of McKenzie and Partington (2013)

Main source	Real GDP growth	Difference between real GDP growth and real dividend growth	Real dividend growth	Nominal dividend growth computed by SFG	Reported nominal dividend growth from M&P
Barra			0.50	3.01	3.01
Bernstein/Ritter			0.90	3.42	3.42
CEG			2.76	5.33	5.33
Lally/Bernstein	3.00	2.40	0.60	3.12	0.62
CEG/Bernstein	3.90	2.40	1.50	4.04	1.54
Lally/Barra	3.00	2.70	0.30	2.81	0.31
CEG/Barra	3.90	2.70	1.20	3.73	1.23
CEG	3.90	0.00	3.90	6.50	6.50
CEG	3.90	0.50	3.40	5.99	6.00
CEG	3.90	1.00	2.90	5.47	5.50
CEG	3.90	1.50	2.40	4.96	5.00
Lally	3.00	0.50	2.50	5.06	5.08
Lally	3.00	1.00	2.00	4.55	4.58
Lally	3.00	1.50	1.50	4.04	4.08
Average			1.88	4.43	3.73
Avg. excl. min. & max.			1.85	4.40	3.78

164. The first thing to note is that there appears to be a transpositional error in compiling the table. The dividend growth estimates reported in data rows 4 to 7 appear to be real dividend growth estimates (which range from 0.31% to 1.54%), while the remaining dividend growth estimates appear to be nominal growth estimates.[65] So we reproduced nominal growth inputs from the estimates of real dividend growth and the inflation rate of 2.50%.

165. In data rows 1 to 3 there is a direct estimate of real dividend growth (ranging from 0.5% to 2.76%). In the remaining rows, real dividend growth is estimated as real GDP growth less an amount ranging from zero to 2.70%). This results in nominal growth estimates that range from 2.81%[66] to 6.50%[67], and which average 4.43%. McKenzie and Partington (2013) compute a mean estimate excluding the highest and lowest values, which leaves a range of 3.01% to 5.99% and a mean estimate of 4.40%. So the analysis compiled by McKenzie and Partington (2013) is consistent with the AER's long-term growth assumption of 4.60% after accounting for a transpositional error in compiling the table. It is not consistent with the conclusion that the AER has been generous in its long-term growth estimate.

166. Aside from this overall conclusion about the level of long-term growth, McKenzie and Partington (2013) stress that any growth rate estimate needs to properly account for capital contributions from shareholders via new share issues and dividend reinvestment plans. The point they are making is that it would be inappropriate to assume that dividends will grow at a high rate, but not account for the capital raised via new shares issues that is required to achieve this growth. Earlier, we gave the example of a firm that paid out all earnings as dividends, but which was able to fund its investments via new share issues; and the example of a firm that reduced its dividends but used excess cash not required for new investments to fund share repurchases.

[65] If we have mis-interpreted the table we apologise. But for these columns, if we subtract 2.5% from our estimates of nominal growth we arrive at the growth rates reported by McKenzie and Partington (2013).

[66] Real GDP growth of 3.00% less 2.70% dilution implies real dividend growth of 0.30%. The figure of 2.70% is the difference between real GDP growth of 3.2% and real earnings per share growth of 0.5% reported by MSCI Barra (2010) for Australia from 1969 to 2009 (Exhibit 3, p. 4). Nominal growth = 1.0030 × 1.0250 – 1 = 2.81%.

[67] Real GDP growth of 3.90% from CEG (2013) and no dilution. Nominal growth = 1.0390 × 1.0250 – 1 = 6.50%.

167. This is the very reason why using historical data to estimate forward growth estimates requires reference to earnings per share, rather than dividends per share. The historical dividend per share growth will reflect the performance of investments and reinvestment policy. If new share issues are used to fund investments that perform poorly, then earnings per share will grow slowly or decline; and if new share issues are used to fund investments that perform well, then earnings per share will grow at a faster rate. It would not be appropriate to observe a low dividend growth rate, and assume that growth rate will continue in the future, when actual and prospective earnings growth is high as a result of the firm making good investments.

168. In Sub-section 2.2 of their report, McKenzie and Partington (2013) suggest that the AER's growth estimate is overly-optimistic because it does not account for the additional capital raised from dividend reinvestment plans and new share issues. It is correct that a growth rate estimate should account for the impact of changes in the number of shares on issue. But there is no reason to think that the AER's growth assumption – real growth of 2.0% and nominal growth of 4.6% – is *overstated* for this reason.

169. For the AER's growth assumption to be *overstated* would require that the AER was matching a *high dividend yield* today (with dividend growth supported by new share issues, such as dividend reinvestment plans) with a *high growth rate* estimate which does not account for new share issues. In the context of the examples presented earlier, this is analogous to matching a high dividend yield of 8.1% from the dividend reinvestment example presented in Table 8, Panel B, with a high growth rate of 4.6% in dividends from the base case. That would be a situation in which the growth rate is overstated.

170. However, there is no indication that the AER is actually doing this – matching a high dividend yield with a high growth rate. McKenzie and Partington (2013) note that the equity raised by dividend reinvestment plans was about 0.75% to 1.25% from 2008 to 2010, compared to dividend yields of around 3.81% to 5.00%.[68] These figures are only illustrative, but they are intended to make the point that the growth estimate could be too high because it is combined with high dividend yields that can only be sustained with the dividend reinvestment plan.

171. This would only be true if the AER's growth rate assumption has not already accounted for the impact of dividend reinvestment plans, and there is no reason to believe this is true. The AER referred to research on the historical relationship between GDP growth and dividend per share growth, and made a decision that 1% dilution was appropriate (rather than 2%) because reinvestment rates are higher in recent years than in early years. The AER states that:

> Expected long–term growth in real GDP is higher than expected long–term growth in real dividends per share because of 'the net creation of shares' through (i) new share issuance (net of buybacks) and (ii) the emergence of new companies.[69]

172. The conclusion by McKenzie and Partington (2013) relies upon the presumption that the 1% adjustment to GDP is insufficient to account for dividend reinvestment plans and other new share issues. But there is no reason to think that the AER under-estimated the impact of dividend reinvestment plans and other new share issues in reaching its conclusions.

173. There are two conclusions to be drawn from this discussion of dividends, earnings and new share issues. First, historical analysis of per share growth should refer to growth in earnings per share, and not dividends per share, because historical dividends are greatly impacted by reinvestment policy – low historical dividend growth and a declining payout ratio implies high future dividend growth and not low future dividend growth. Second, the contention that the AER has overstated growth because it has not fully accounted for new share issues, including dividend reinvestment plans, is not supported by the AER's reasoning.

[68] McKenzie and Partington (2013), Sub-section 2.2, p. 11.

[69] AER Explanatory Statement to the final guideline, Appendix E.2, p. 117.

4.3 Implication

174. There are two implications of the analysis presented in this section. The first implication is that the AER's approach to the dividend discount model introduces variation in the estimated discount rates across time, and across firms, because it attributes differences in share prices entirely to the discount rate. This means that the estimates of the cost of equity are likely to vary more over time than the true cost of equity.

175. The estimation technique we adopted mitigates this variation in discount rates over time because differences in share prices are reflected in different inputs that affect value, like growth, reinvestment and returns on investment. In our view, using market data to infer expectations about reinvestment and returns on investment, likely leads to an estimate that better reflects the true cost of equity than if an assumption, based on other information, was used.

176. The second implication is that, *if* a long-term growth assumption is to be adopted which is independent of short-term share price movements, the growth assumption should at least reflect earnings per share growth rates that reflect a more recent view of the historical data. For more than two decades in Australia, and three decades in the U.S., earnings per share growth has matched or exceeded GDP growth. Price-earnings ratios have also increased over these time periods, which align with material reductions in inflation in both countries, and central banks' diligence in maintaining inflation at low levels. In adopting a long-term growth assumption based upon 40 to 100 years of historical data, the AER combines a *low* growth assumption (from all available data) with *low* dividend yields (from recent data).

177. The implication of the AER's approach to the growth rate is that price-earnings ratios have increased because the cost of equity has fallen. In our view, it is more likely that price-earnings ratios have increased because the cost of equity has fallen *and* expectations for growth have increased. The growth rates from our analysis, presented in Section 5, are below growth rates observed over the last two decades in Australia and are close to estimates of GDP growth.

5. Estimation of the cost of equity for the market and listed networks

5.1 Introduction

178. In this section we present estimates of the market cost of equity over time using our simultaneous estimation technique. We also present estimates of the cost of equity for listed networks based upon estimates of their risk premiums above the risk-free rate, compared to the market risk premium, over time. In this section, our detailed cost of equity estimates take no account of imputation tax credits. Shareholder benefits from imputation tax credits are considered in Section 6.

5.2 Our prior recommendation

179. In several prior reports we have made the recommendation that an estimate of the cost of equity be made simultaneously with an estimate of long-term growth and returns on investment. If the long-term growth assumption is held constant, then all changes in share prices and analyst forecasts are captured in changes to the estimated discount rate. This is unlikely to be true. Share prices are likely to fluctuate because of changes in expectations for growth in dividends outside of the explicit forecast period of two years, *and* because of changes in discount rates. So one reason why dividend discount model estimates of the cost of equity are met with distrust, is they fluctuate too much. In our view, they fluctuate too much because of the fixed growth assumption.[70]

5.3 Response to the final guideline

5.3.1 Addressing concerns raised by the AER

180. The AER does not agree with the use of our estimation technique on the basis of complexity. Our technique is computationally intensive, but this is not the same as complexity. A detailed explanation of our estimation technique is described in our prior papers, in Section 4 and an appendix to this report. But the short explanation of our estimation technique is that we try a very large combination of inputs to a valuation model, to estimate which combination appears to provide us with the best estimate of the cost of equity. The AER's objection to our estimation technique is summarised below.

> The long–term dividend growth rate is an input in our proposed model in the draft explanatory statement. In contrast, in the SFG model, the values for growth rates and the return on equity are jointly estimated. Our view is that SFG's method for jointly estimating the growth rates and the return on equity is excessively complex and insufficiently transparent. SFG's model solves for the growth rate and the return on equity by considering '2,672 possible combinations of the cost of equity, long–term growth and return on equity'. One combination is picked from these 2,672 combinations using an algorithm that is designed to choose a combination that provides (i) 'a valuation close to average analyst price target' and (ii) 'a smooth transition from near-term growth to long–term growth'.
>
> It should be noted that our approach, in which the long–term dividend growth rate is an input to the model, is commonly used. Indeed, over the past few years, such an approach has been adopted in a number of submissions by service providers' consultants.[71]

181. In Sub-section 4.2.1 we provide more explanation of our estimation approach. Our intention with that explanation is to mitigate the AER's concerns over complexity and transparency.

[70] The instability in cost of equity estimates over time is more pronounced the shorter the transition period to long-term growth. As the transition period is extended, the cost of equity estimate is less sensitive to the fixed growth assumption. Combining no transition period and a fixed growth assumption (which is the case in the AER two-stage model) leads to the cost of equity moving almost one-for-one with the dividend yield, so is very unstable.

[71] AER Explanatory Statement to the final guideline, Appendix E.3, p. 124.

182. The response by the AER that its approach is commonly used does not mean it is a better approach. The AER has relied entirely upon a qualitative assessment of our approach to cost of equity estimation, without any consideration of whether it might lead to better estimates.

183. At the outset, it should be established that our estimation method does not lead to cost of equity estimates that will be higher or lower, on average, than the method of the AER.[72] As shown in Table 12, on average our estimate for long-term growth across the entire sample period is 5.8%, our average estimate of the cost of equity (excluding any consideration of imputation benefits) is 10.6%, and our average estimate of the market risk premium (excluding any consideration of imputation benefits) is 5.5%. So our average estimates for the cost of equity and market risk premium are below historical average market returns, and our average estimate for long-term growth is very close to the AER's estimate of nominal GDP growth in the economy of 5.6%. The AER contends that listed firms cannot grow at the rate of GDP growth, and this is an area of disagreement, but it is certainly plausible that the average listed firm grows at about the same rate as nominal GDP. As documented in Sub-section 4.2.3, earnings per share growth has met or exceeded GDP growth for the last two to three decades in Australia and the U.S.

184. It should also be acknowledged that the estimation technique we have adopted has the support of Queensland Treasury Corporation (2014) and the Independent Pricing and Regulatory Tribunal of New South Wales (IPART, 2013). QTC (2014) states that:

> Conceptually, the implied cost of equity produced by the DDM is the most appropriate estimate of the forward-looking expected return on the market portfolio. In practice, different assumptions about the inputs in the DDM, especially the long-term dividend growth rate, often result in a wide range of outputs from the DDM.
>
> SFG's implementation of the DDM seeks to address this issue by allowing the long-term dividend growth rate and the cost of equity to be jointly estimated. As the long-term dividend growth rate is not an input, it is likely that the resulting estimates will be less contentious among different analysts.
>
> The low level of variation in SFG's estimates also support the use of historical data to directly estimate the expected return on the market portfolio.[73]

185. IPART (2013) has adopted six techniques to estimate a range for a contemporaneous estimate of the market risk premium. These estimation techniques include our simultaneous estimation technique, an estimation technique based upon economic indicators,[74] the Bloomberg cost of equity estimation technique, and three dividend discount models that rely upon an input for long-term growth.[75] So IPART has given consideration to both our simultaneous estimation technique, and techniques that rely upon an input for long-term growth. But IPART has adopted a long-term growth assumption of 5.5% which is approximately equal to its estimate of long-term nominal GDP growth.[76] Across the three estimation techniques that require a long-term growth input, the total period prior to long-term growth

[72] Obviously, inputting a low growth rate under the AER approach will lead to a lower estimate of the cost of equity, and inputting a higher growth rate will lead to a higher estimate of the cost of equity. The method itself does not lead to higher or lower cost of equity estimates. Put another way, there is no reason to believe that the method systematically leads to high or low cost of equity estimates, as the cost of equity estimates are about the same as would result from assuming a growth rate in earnings and dividends per share close to nominal GDP growth and close to earnings per share growth over recent decades.

[73] QTC (2014), p.10.

[74] In our report to IPART (SFG Consulting, 2013d) we recommended the use of four economic indicators to estimate the market risk premium, namely the risk-free rate, term spread, a credit spread, and dividend yield. The indicators used by IPART are the S&P/ASX VIX Index, dispersion in analyst forecasts, a credit spread, and the spread between the yield on three month government bills and the three month overnight index swap rate (IPART, 2013, Appendix C, p. 60). The fundamental principle remains the same, that a set of market indicators should be directionally consistent with the market risk premium.

[75] IPART (2013), Section 5, p. 15.

[76] IPART (2013), Appendix A, p. 35.

being reached is four years according to the technique of Inkinen, Stringer and Voutsinou (2010),[77] five years according to the technique of Damodaran (2013), and 12 years according to the technique of the Panigirtzoglou, and Scammell (2002).[78] So, while IPART has adopted both a simultaneous estimation approach, and approaches that require a long-term growth input, it does not endorse an approach that allows growth to revert to a long-term estimate as early as year three (as the AER's two-stage model does), and it does not endorse an approach under which long-term dividend growth is less than GDP growth.

186. We should not judge estimation approaches according to a list of which organisations use one approach versus another. But it is worth pointing out that there is support for the use of simultaneous estimation techniques amongst other institutions. In addition, even though the approach of the AER has often been used, this does not mean there is widespread agreement amongst *how* the approach is to be used. The extensive arguments about the correct input for long-term growth highlight that, even though it is common to input a growth rate and solve for the cost of equity, there is extensive disagreement about the magnitude of the estimate of long-term growth. The main difference between our estimation technique, and that of the AER, is that our growth rate estimate is contingent upon the share price, earnings per share forecast, and dividends per share forecast, and the AER's growth rate estimate is independent of the share price, earnings per share forecast, and dividend per share forecast.

187. What our technique does generate is cost of equity estimates that are more stable over time than a technique that assumes constant growth. This stability over time is considered by the AER to be a worthwhile attribute of the cost of equity for setting the regulated return.[79] We provided the AER with cost of equity estimates that are more stable over time than result from its preferred technique, and more stable than estimates which are compiled by Bloomberg. But the stability of the cost of equity estimates over time from our analysis has not been mentioned in the AER guideline or supporting explanatory materials.

188. Furthermore, our technique generates cost of equity estimates on an industry basis that are useful for estimation purposes. In our previous reports we compiled extensive descriptive statistics showing cost of equity estimates on an industry basis, paying particular attention to the listed network businesses relied upon by the AER for estimation. According to the AER's approach to estimating the cost of equity, the resulting cost of equity estimates are well above those for the broader market. But our analysis shows that the typical premium above the risk-free rate for these businesses is 0.94 times that for the broader market.[80] The AER has placed no reliance on dividend discount model estimates at an industry level because it considers its estimates to be implausibly high. We provided the AER with cost of equity estimates at an industry level that are not implausibly high. We think it reasonable that analysis be considered in its entirety by the AER, which includes consideration of the outcomes of the analysis. The methodological choices that underpin our cost of equity estimates directly lead to the lower network cost of equity estimates we computed.

189. In setting the cost of equity according to the Sharpe-Lintner CAPM, the AER is basically making an assessment of risk relative to the market. The AER acknowledges that there is estimation error in beta estimates from regression of stock returns on market returns. Our analysis generates cost of equity estimates on an individual firm basis that exhibit less dispersion than result from individual firm cost of equity estimates. As with the comment above about the magnitude of cost of equity estimates, we think that the dispersion of cost of equity estimates should be considered by the AER. The methodological choices we made directly lead to the comparatively low dispersion in the cost of equity estimates.

[77] This is referred to as the technique of the Bank of England (2010).
[78] This is referred to as the technique of the Bank of England (2002).
[79] As mentioned previously, the AER states that "a relatively stable regulatory return on equity would have two effects: It would smooth prices faced by consumers and it would provide greater certainty to investors about the outcome of the regulatory process," AER Explanatory Statement, Sub-section 5.3.7, pp. 65–66.
[80] See the last row of Table 12.

190. In summary, throughout our analysis we have made a number of methodological choices that are designed to arrive at the best possible estimate of the cost of equity using the dividend discount model. In this report and prior reports we have made attempts to address the AER's concerns over transparency and complexity. It should be stressed, though, that our estimation technique does not add a layer of complexity for its own sake. Each part of the method contributes to achieving the best estimate of the prevailing cost of equity, and overcome limitations of a more simple approach that the AER has acknowledged has deficiencies.

5.3.2 Data

191. For Australian-listed firms we compiled individual analyst forecasts of earnings per share, dividends per share and price targets over the 11.6 year period from 1 June 2002 to 20 February 2014 from the Institutional Brokers' Estimate System ("IBES"). We then grouped the sample into six monthly intervals according to the announcement date of the year one earnings per share forecast. An individual analyst can have more than one input during the six month period. So if a stock was covered by two analysts, and the first analyst submitted one forecast and the second analyst submitted two forecasts, we compile three estimates of the cost of equity for that firm during the six month period. Our estimation method is described in detail in Sections 3 and 4, and there are technical issues relating to the estimation of initial inputs discussed in an appendix.

192. The total number of analyst inputs in the IBES dataset which had sufficient data available for analysis was 47,908. This means that over the 11.6 year period there were 47,908 combinations of earnings per share expectations, dividends per share expectations and price targets for Australian-listed firms with all other data available for analysis. We partitioned the sample into six month intervals so we have a large number of firms and analyst inputs available in every six month period. An individual analyst can make more than one input for each firm in a six month period. For each of the 47,908 observations we estimate the cost of equity capital, and average these estimates across all analyst inputs for each firm every six months.

193. This allows us to compile a sample of 5,334 estimates of firm cost of equity estimates. On average, each time a firm appears in a six month period, there are 9.0 cost of equity estimates for that firm. There are also 595 individual firms in the dataset which means that, on average, each firm appears in the dataset 9.0 times over the 11.6 year period. There were 31 firms that appeared in the sample in all 24 half-year periods. On average, each firms previously used by the regulator in benchmarking appeared in the sample in 11.0 periods and the remaining 586 firms appeared in the sample in 8.9 periods.

194. Across the 5,334 sample firm/half-years, we have the following median values – dividend yield of 4.6%, initial return on equity of 16.1%, cost of equity excluding consideration of imputation credits of 10.9%, long-term growth of 6.2% and long-term return on equity of 16.9%. Summary statistics are presented in Table 11.

Table 11. Summary statistics

	N	Mean	StDev	5th	25th	Percentiles Median	75th	95th
All firms								
Dividend yield years 1-2	5334	4.6	2.0	1.5	3.2	4.5	5.8	8.1
Return on equity years 1-2		21.7	18.8	4.9	9.5	16.1	26.7	60.6
Cost of equity		10.8	2.4	6.2	9.5	10.9	12.1	14.6
Long-term growth		5.9	2.2	1.7	4.8	6.2	7.3	9.5
Long-term return on equity		17.9	5.7	10.3	13.0	16.9	22.7	27.8
Non-network								
Dividend yield years 1-2	5235	4.6	2.0	1.5	3.2	4.4	5.8	8.1
Return on equity years 1-2		21.8	18.9	4.9	9.6	16.2	26.9	60.8
Cost of equity		10.8	2.4	6.1	9.5	10.9	12.1	14.7
Long-term growth		5.9	2.2	1.7	4.7	6.2	7.3	9.5
Long-term return on equity		18.0	5.7	10.3	13.1	17.0	22.8	27.9
Network								
Dividend yield years 1-2	99	6.0	2.1	2.2	4.7	5.8	7.4	10.0
Return on equity years 1-2		12.5	8.6	4.1	7.6	9.2	15.3	31.0
Cost of equity		10.3	1.6	7.8	9.5	10.3	11.2	13.0
Long-term growth		6.8	1.6	3.7	5.8	7.0	8.0	9.0
Long-term return on equity		15.4	5.0	9.7	11.7	14.1	17.6	26.7

5.3.3 Cost of equity for the market

195. In this sub-section we present our estimates of the cost of equity for the market. We have compiled estimates on a six-monthly basis from the second half of 2002 (2H02) to the first half of 2014 (1H14). The estimates for the most recent six month period are based upon data from 1 January 2014 to 20 February 2014, which accounts for some reduction in the number of firms with information available for analysis. As shown under the column *N* in Table 12 the most recent estimate is based upon 189 firms, compared to 249 firms for the previous six month period.

196. For the most recent period, the market cost of equity is estimated at 10.3%. On average over all periods the market cost of equity is estimated at 10.6%, and the average cost of equity was lower prior to the financial crisis of 2008 (10.4% versus 10.9%). Our long-term growth estimate is 5.8% for the most recent period, and is also 5.8% on average across all time periods. Our cost of equity estimate is 0.7% below the estimate reported by Bloomberg for the most recent six month period, and 2.2% below the average estimate reported by Bloomberg since the second half of 2008 when Bloomberg began compiling data for Australia.

197. The variation in the market cost of equity estimate over time is illustrated in Figure 7. There are two important aspects of this time-series variation.

198. First, the estimated cost of equity does not decrease when government bond yields begin to decline in the second half of 2008. The cost of equity increases over this period. The reason this occurs is because investors have been prepared to pay high prices for government bonds (reducing bond yields) but equity prices fell in 2008 and have not recovered to levels observed prior to the financial crisis. In real terms, at the end of 2013 the All Ordinaries Index remained 29% below the level observed at the end of 2007. The blue line illustrates what the market cost of equity would be if there was a simple addition of a 6% market risk premium to the estimate of the risk-free rate. It is highly unlikely that the market cost of equity fell to 9.1% in the second half of 2012, down from 12.1% in the second half of 2007.

Table 12. Market capitalisation-weighted estimates (%)

Period	N	Cost of equity excl imp ben	Long-term growth	Return on equity	Dividend yield	Risk-free rate	Market risk premium	Bloom-berg r_e	Bloom-berg MRP
2H02	153	10.3	6.1	19.8	4.1	5.6	4.7		
1H03	155	10.3	5.6	19.9	4.4	5.1	5.1		
2H03	147	10.5	6.0	19.9	4.5	5.6	4.9		
1H04	156	10.7	6.2	20.3	4.6	5.7	5.0		
2H04	166	10.8	6.2	19.4	4.7	5.5	5.4		
1H05	185	10.6	5.9	19.7	4.3	5.4	5.2		
2H05	171	10.5	5.2	21.8	4.2	5.3	5.2		
1H06	166	9.6	4.4	22.2	3.8	5.5	4.1		
2H06	189	10.3	4.8	22.5	4.3	5.7	4.6		
1H07	232	10.2	5.2	20.8	3.6	5.9	4.3		
2H07	252	10.2	5.3	21.2	3.7	6.1	4.1		
1H08	266	10.6	5.9	19.8	4.5	6.3	4.4		
2H08	248	10.7	5.5	18.7	5.2	5.4	5.3	13.2	7.8
1H09	235	11.4	6.4	18.6	5.0	4.6	6.8	16.0	11.4
2H09	270	10.8	6.3	18.0	4.2	5.5	5.3	12.0	6.5
1H10	289	10.5	6.0	17.9	4.1	5.5	5.0	13.7	8.2
2H10	277	10.9	5.9	18.5	4.3	5.2	5.7	15.6	10.4
1H11	285	10.7	5.7	18.3	4.3	5.4	5.2	14.7	9.3
2H11	264	11.1	6.1	17.8	4.7	4.3	6.8	14.4	10.0
1H12	270	11.8	6.6	18.0	4.8	3.7	8.1	12.7	9.0
2H12	255	10.9	5.7	17.5	4.7	3.1	7.8	11.4	8.3
1H13	265	10.8	6.5	16.9	4.3	3.4	7.4	10.5	7.1
2H13	249	10.5	6.2	17.1	4.3	4.0	6.5	11.4	7.4
1H14	189	10.3	5.8	17.6	4.6	4.1	6.2	11.1	6.9
Average	222	10.6	5.8	19.3	4.4	5.1	5.5		
2H02-1H08	187	10.4	5.6	20.6	4.2	5.6	4.7		
2H08-1H14	258	10.9	6.1	17.9	4.5	4.5	6.3	13.1	8.5

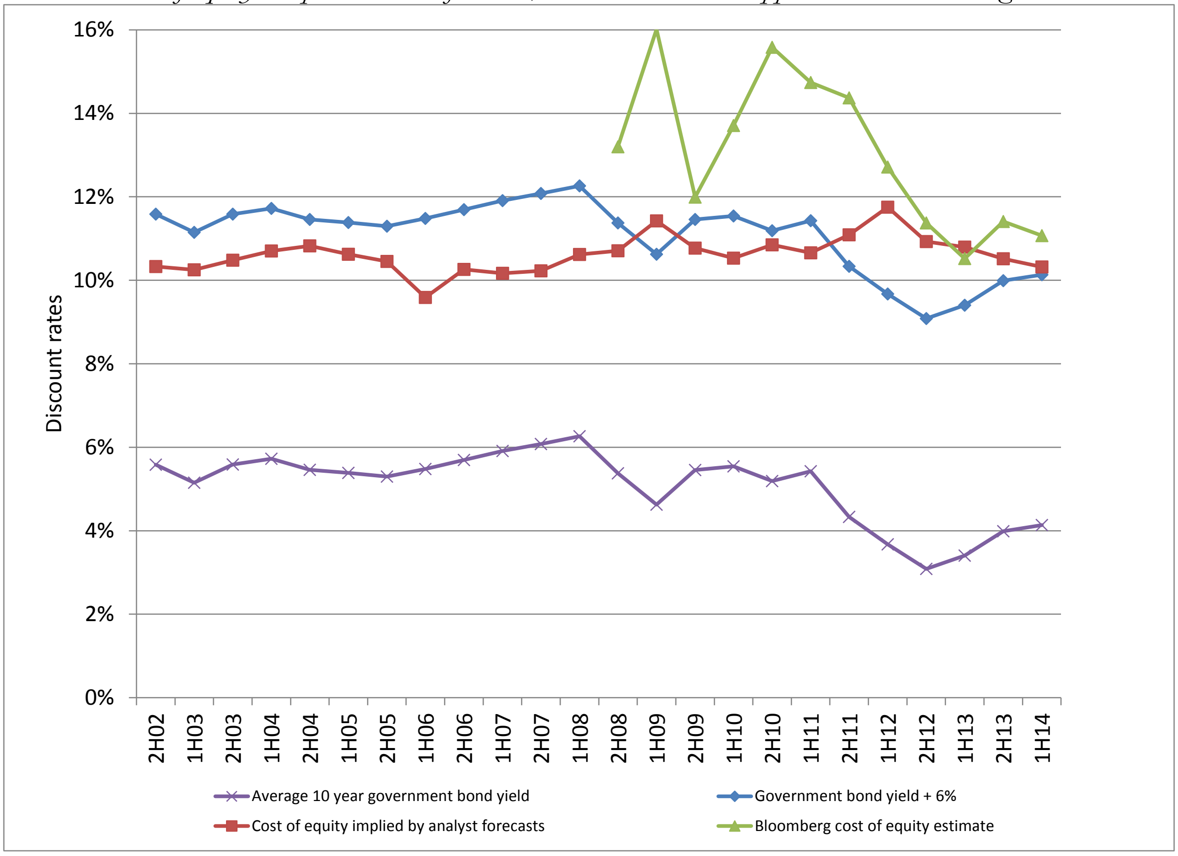
The cost of equity excluding imputation benefits is a market capitalisation-weighted average of the average cost of equity excluding imputation benefits estimates for each firm during the six month period. The risk-free rate is the average of daily annualised yields on 10-year government bonds. The market risk premium is then the difference between the market capitalisation-weighted average cost of equity and the average risk-free rate. The Bloomberg cost of equity is the average of the daily estimates of the cost of equity for Australia provided by Bloomberg, and the Bloomberg equity risk premium is simply the difference between the Bloomberg cost of equity estimate and the risk-free rate reported in the table. The dividend yield is the estimate from the first two forecast years, not the long-term dividend yield. Cost of equity estimates for the most recent period, 1H14, rely upon forecasts made from 1 January 2014 to 20 February 2014.

199. This underpins the need to properly consider the relationship between the risk-free rate and the estimate of the market cost of equity. Whether a reduction in government bond yields implies a *fall* in the expected market return, a *rise* in the market return, or tells us *nothing* about the market return will be specific to the reason for the fall in government bond yields. In a previous report we contended that it does not make sense for the market risk premium to be at a constant level above the risk-free rate. We said that "logically, it cannot" for two reasons. We said that risk premiums on corporate bonds fluctuate substantially over time, so there is no reason to think that the equity risk premium remains constant. We then said that under a constant risk premium, "*if* the market was to sell off equities to transfer funds to government bonds (i.e. flight to quality), required returns on equity must fall – which is clearly illogical."[81]

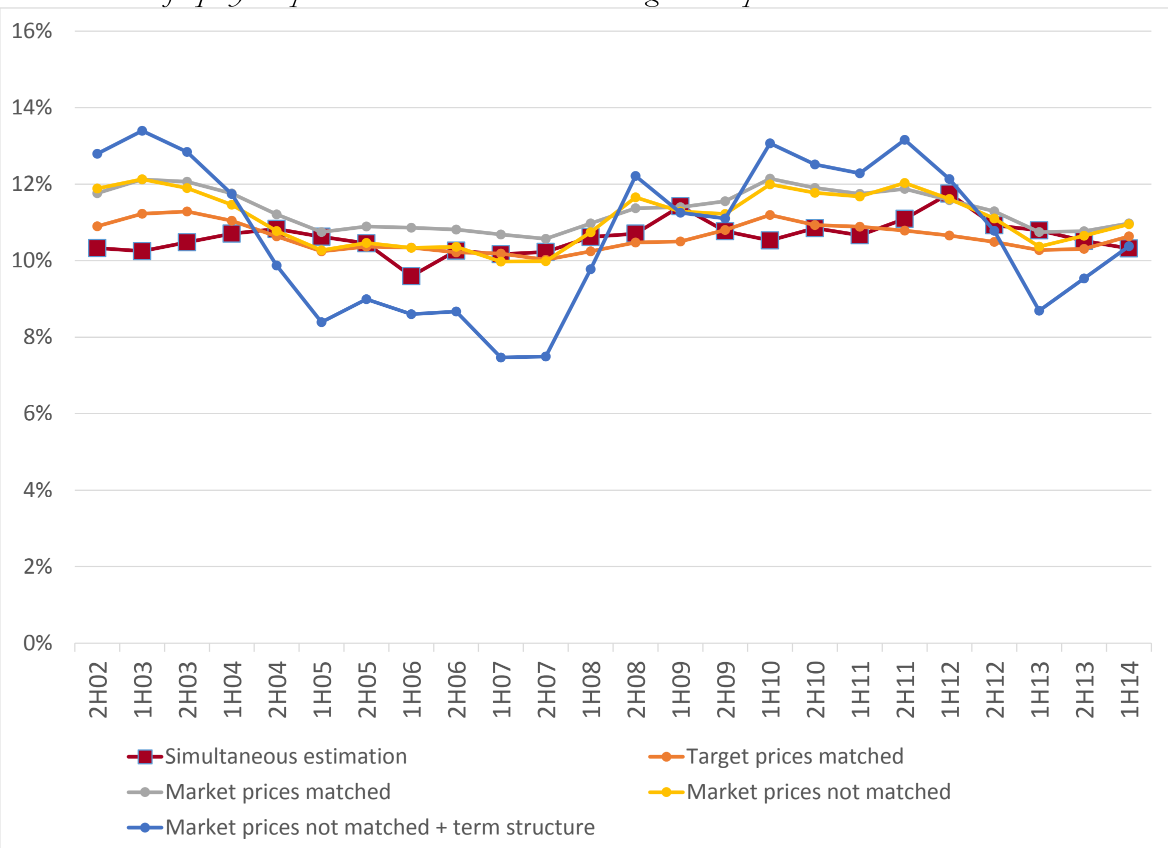
[81] SFG Consulting (2012), Section 4, para. 131.

Figure 7. Market-capitalisation-weighted estimates

Panel A: Cost of equity compared to risk-free rate, the constant MRP approach and Bloomberg estimates



Panel B: Cost of equity compared to methods with a constant growth input



200. We did not say that the *only* reason government bond yields can fall is because of a flight to quality. This distinction is important because the AER has concluded, on the basis of advice from Lally (2013a), that our view is that the risk-free rate and market risk premium *must* be negatively correlated.[82] Both the AER and Lally (2013a) then dismiss our analysis because the risk-free rate fluctuates for reasons other than a flight to quality. Our point was that, in a circumstance in which the debt risk premium rises above 4% and the risk-free rate falls below 3%, it is highly unlikely that the market risk premium remained steady at 6%.

201. The second point to note is that the estimated market cost of equity is relatively stable over time, especially in comparison to the Bloomberg estimate of the cost of equity. This time series stability is a direct result of a number of methodological choices previously documented. The reason the Bloomberg cost of equity estimates increase to 16.0% in 1H09, fall to 12.0% in 2H09, and then rebound to 15.6% by 2H10, is that the cost of equity estimate is impacted by stale earnings and dividend forecasts, and is based upon a combination of market prices and analyst forecasts. These are the same reasons why the cost of equity estimates compiled by the AER lead to market risk premium estimates that lie within the range of approximately 4% to 10%.[83]

202. In Figure 7, Panel B we present a comparison of the cost of equity estimates using the simultaneous estimation technique, compared to estimates that would be derived under a constant growth assumption. We present the same cost of equity estimates, alongside the market risk premium estimates, in Table 13. The datasets for these comparative cost of equity techniques are the same datasets used in the analysis presented in Section 3. However, in this comparison we do not include any benefit from imputation credits and assume a long-term growth rate of 5.81% (the average growth rate from the simultaneous estimation approach, placing one-third weight on the last six month period that lasts for two months). This means that we can compare the variation in the cost of equity estimates over time, on a consistent basis, with those derived from simultaneous estimation.

203. The comparative results confirm that incorporating a term structure assumption results in highly variable estimates of the cost of equity over time. This variation over time is likely to overstate the true variation in the cost of equity over time, because it implies that investors would buy stocks in the expectation of earning returns as low as 7.5% for the first 10 years of their investment (2007), and 11.3% thereafter (the long-term cost of equity assumption used in the term structure comparison). This corresponds to a market risk premium of 1.3% for 10 years and 5.1% thereafter. This is a very large change in risk premium for investors to have incorporated into their prices at the time of investment.

204. Comparing the other four time-series estimates, and beginning with market prices that are not matched in time with earnings forecasts (the yellow line) there is increased stability in the cost of equity estimate over time as (1) prices and earnings forecasts are matched in time (the grey line); and (2) as target prices are incorporated (the orange line). The cost of equity estimates from our simultaneous estimation approach (the maroon line) exhibit about the same variation over time as the cost of equity estimates that use target prices, matched in time with earnings forecasts, and which have a constant long-term growth input.

[82] AER Explanatory Statement to the final guideline, Appendix D.6.3, pp. 104–105. Lally (2012), Sub-section 2.4, pp. 16–17.

[83] AER Explanatory Statement to the final guideline, Appendix E.2, Figure E.1, p. 118.

Table 13. Cost of equity estimates under alternative estimation techniques

Period	Market cost of equity: Varying long-term growth	Long-term growth = 5.81%: Target prices matched	Long-term growth = 5.81%: Market prices matched	Long-term growth = 5.81%: Market prices not matched	Long-term growth = 5.81%: Mkt prices not matched + term structure	Market risk premium: Varying long-term growth	Long-term growth = 5.81%: Target prices matched	Long-term growth = 5.81%: Market prices matched	Long-term growth = 5.81%: Market prices not matched	Long-term growth = 5.81%: Mkt prices not matched + term structure
2H02	10.3	10.9	11.8	11.9	12.8	4.7	5.2	6.1	6.2	7.1
1H03	10.3	11.2	12.1	12.1	13.4	5.0	6.0	6.9	6.9	8.2
2H03	10.5	11.3	12.1	11.9	12.8	4.8	5.6	6.4	6.2	7.2
1H04	10.7	11.0	11.8	11.5	11.7	4.9	5.2	5.9	5.7	5.9
2H04	10.8	10.6	11.2	10.8	9.9	5.3	5.1	5.7	5.2	4.3
1H05	10.6	10.2	10.7	10.3	8.4	5.2	4.8	5.3	4.8	2.9
2H05	10.5	10.4	10.9	10.5	9.0	5.1	5.0	5.5	5.1	3.6
1H06	9.6	10.3	10.9	10.3	8.6	4.0	4.8	5.3	4.8	3.0
2H06	10.3	10.2	10.8	10.4	8.7	4.5	4.4	5.0	4.6	2.9
1H07	10.2	10.2	10.7	10.0	7.5	4.2	4.2	4.7	4.0	1.5
2H07	10.2	10.0	10.6	10.0	7.5	4.1	3.8	4.4	3.8	1.3
1H08	10.6	10.2	11.0	10.7	9.8	4.3	3.9	4.6	4.4	3.4
2H08	10.7	10.5	11.4	11.7	12.2	5.3	5.0	5.9	6.2	6.8
1H09	11.4	10.5	11.4	11.3	11.3	6.7	5.8	6.7	6.6	6.6
2H09	10.8	10.8	11.6	11.2	11.1	5.2	5.3	6.0	5.7	5.6
1H10	10.5	11.2	12.1	12.0	13.1	4.9	5.6	6.5	6.4	7.4
2H10	10.9	10.9	11.9	11.8	12.5	5.6	5.7	6.6	6.5	7.3
1H11	10.7	10.9	11.7	11.7	12.3	5.2	5.4	6.2	6.2	6.8
2H11	11.1	10.8	11.9	12.0	13.2	6.7	6.4	7.5	7.7	8.8
1H12	11.8	10.7	11.6	11.6	12.1	8.0	6.9	7.9	7.9	8.4
2H12	10.9	10.5	11.3	11.1	10.8	7.8	7.4	8.2	8.0	7.7
1H13	10.8	10.3	10.7	10.4	8.7	7.4	6.8	7.3	6.9	5.3
2H13	10.5	10.3	10.8	10.7	9.5	6.5	6.3	6.7	6.6	5.5
1H14	10.3	10.6	11.0	10.9	10.4	6.1	6.4	6.8	6.8	6.2
Average	10.6	10.6	11.3	11.1	10.7	5.5	5.5	6.2	6.0	5.6
2H02-1H08	10.4	10.6	11.2	10.9	10.0	4.7	4.8	5.5	5.1	4.3
2H08-1H14	10.9	10.7	11.4	11.4	11.4	6.3	6.1	6.9	6.8	6.9
StdDev	0.4	0.4	0.5	0.7	1.9	1.2	0.9	1.0	1.2	2.2
2H02-1H08	0.3	0.4	0.6	0.8	2.1	0.5	0.7	0.8	1.0	2.3
2H08-1H14	0.4	0.3	0.4	0.5	1.4	1.1	0.7	0.7	0.7	1.1

205. A final point to note is the return on equity estimates, which average 19.3% and lie within the range of 16.9% to 22.5%. McKenzie and Partington (2013) take issue with a return on equity estimate of this magnitude, and consider it to be implausibly high. They refer to a thesis by Kim (2011) who, for the top quartile of listed firms by market capitalisation, reports mean return on assets of 3.4% and median return on assets of 5.0%.[84] In the paper by Kim, return on assets is computed as net income relative to total assets. So, for example, if liabilities were 40% of assets, a return on assets of 5.0% implies return on equity of 8.3%.[85]

[84] Kim (2011), Sub-section 3.3.4, Table 3–3, Panel E, p. 61.

[85] If liabilities = 0.40 × Assets = 0.40 × (liabilities + equity) then liabilities = 0.67 × equity. If net income ÷ (liabilities + equity) = 0.05 then net income ÷ (1.67 equity) = 0.05, and net income ÷ equity = 0.05 × 1.67 = 8.3%.

206. In previous analysis we documented the return on equity estimates that were actually earned by the sample firms in our dataset, and which are implied by analyst forecasts over years 1 and 2. We stated that:

> The average long-term return on equity estimates are consistent with the return on equity estimates from forecasts years one and two, and with return on equity estimates derived from historical earnings only. Based upon the first two years forecast earnings, the mean and median return on equity values across the sample are 22.6% and 16.9%, respectively. Based upon actual earnings, the mean and median return on equity values are 30.5% and 15.7%, respectively.[86]

207. So we previously documented that the median actual return on equity for sample firms was around 16% and the median forecast return on equity for sample firms was around 17%. We do not think it is reasonable to contend that our estimate of the return on equity is unreasonably high, on the basis of an entirely different sample from one paper. Our sample spans the time period from 2002 to 2014, with analyst earnings per share forecasts and price targets available, which have already paid a dividend, includes financial firms and draws upon earnings per share and book value per share information compiled by IBES. This has been compared to a sample (from Kim, 2011) that spans the time period from 1995 to 2006, which does not require analyst earnings per share and price targets, includes non-dividend paying firms, excludes financial firms and draws upon accounting information from FinAnalysis. All of these criteria are likely to lead to differences in measures of return on investment.

208. Our point is that the return on investment firms are expected to earn at the end of the explicit forecast period is about the same as the return on investment they have previously earned, and which analysts expect them to earn over the next two years. We have also previously made the point that we need to consider the price/earnings ratio that is consistent with the long-term estimates of growth, return on equity and the cost of equity. When a firm is in a constant state of growth, the price/earnings ratio can be computed according to the equations below (which refer to price relative to last actual earnings and price relative to first year forecast earnings).[87]

$$Price = \frac{DPS_0 \times (1+g)}{r_e - g} = \frac{DPS_1}{r_e - g}$$

$$\frac{Price}{EPS_0} = \frac{DPS_0/EPS_0 \times (1+g)}{r_e - g} = \frac{Dividend\ payout\ ratio \times (1+g)}{r_e - g}$$
$$= \frac{Dividend\ payout\ ratio \times (1 + Reinvestment\ rate \times ROE)}{r_e - Reinvestment\ rate \times ROE}$$

$$\frac{Price}{EPS_1} = \frac{DPS_1/EPS_1 \times (1+g)}{r_e - g} = \frac{Dividend\ payout\ ratio}{r_e - Reinvestment\ rate \times ROE}$$

209. According to the average estimates over time for the cost of equity (10.6%), long-term growth (5.8%), and return on equity (19.3%), the estimated reinvestment rate is 30.2%, the estimated Price/EPS_0 is 15.4, and the estimated Price/EPS_1 is 14.5.[88] For the most recent period (1H14) the corresponding price/earnings ratios are Price/EPS_0 = 15.7 and Price/EPS_1 = 14.9. In our previous analysis we noted

[86] SFG Consulting (2013a), Sub-section 4.2.1, footnote 22, p. 20.

[87] Reinvestment rate = 1 – Dividend payout ratio.

[88] Reinvestment rate = growth ÷ return on equity = 0.058 ÷ 0.193 = 0.302. Price/EPS_0 = Dividend payout ratio × (1 + growth) ÷ (Cost of equity – growth) = 0.698 × 1.058 ÷ (0.106 – 0.058) = 15.4. Price/EPS_1 = Dividend payout ratio ÷ (Cost of equity – growth) = 0.698 ÷ (0.106 – 0.058) = 14.5.

that price/earnings ratios of this magnitude are consistent with the price/earnings ratios we observe for the largest and most mature listed firms. Specifically, we wrote that:

> This long-term price/earnings ratio is also broadly consistent with the price/earnings ratios we observe for the largest and most mature listed firms. As a snapshot of the price/earnings ratios observed for very mature firms we compiled the listing dates for the ASX20. We then computed the price/earnings ratios over our sample period for firms listed for longer than 20 years prior to 1 July 2002. There were nine firms in this cohort, which were listed on average for 44 years prior to our sample period. The average price/earnings ratio for these firms over the sample period was 15.8.[89][90]

210. The point of the price/earnings ratio comparison is that the assumptions that underpin the dividend discount model need to be consistent with the market pricing of stocks. Even the stocks that are most likely to be approximating a constant growth state over the next ten years – the large stocks with a long stock trading history – the price/earnings ratios are, on average, 15.8 over the sample period. It cannot simply be stated that high returns on investment will not persist, when that appears to be what is reflected in market prices.

211. For the purposes of the current paper, we extended this analysis to consider real price/earnings ratios over a trailing 10-year period in a constant growth state. This allows us to compare trailing price/earnings ratios to those presented in Figure 5, Panel B. We projected earnings per share and dividends per share over 10 years, assuming constant growth of 5.8%, and converted the figures to real terms assuming an inflation rate of 2.5%. The dividend payout ratio is 30.2%, consistent with the growth rate of 5.8% and the return on equity of 19.3%.

212. Under these assumptions, the price/10-year average trailing EPS in real term is 17.7. Recall that from 1991 to 2013, using aggregate market data, the median price/10-year trailing EPS in real terms was 19.8. We can also compute the real price relative to year 1 and year 2 forecast earnings per share in real terms. Under the assumptions listed above, these price-earnings ratios are 14.9 and 14.4, respectively. These price-earnings ratios can be compared to the ratios implied by analyst earnings forecasts and price targets, which underpin the computations in Sub-section 3.2.2. Across all months from July 2002 to February 2014 the median Price/EPS_1 is 16.3 and the median Price/EPS_2 is 15.0 (both expressed in real terms assuming inflation of 2.5%). If we relied upon market prices rather than target prices the median estimates would be Price/EPS_1 of 15.2 and Price/EPS_2 of 14.0.

213. This means that the price/earnings ratios that result from our long-term estimates of the cost of equity and growth are consistent with the pricing that we observe in the equity market. The equity market comprises a mix of high growth firms and low growth firms, rather than just firms growing at steady state. But as documented previously, there is no indication that the largest, most mature businesses trade on low price/earnings ratios. Recall that the average Price/EPS_1 for the nine businesses listed for more than 20 years, which have average listing history of 44 years, is close to 16.

214. In summary, our best estimate of the required return on the market using the most recent available data is 10.3%, and our best estimate of the average required return on the market across all time periods examined is 10.6%. The corresponding long-term growth estimates are 5.8% at present, and 5.8% on average over the entire sample period.

5.3.4 Listed energy networks

215. Having made an estimate of the required market return, we turn our attention to the required return for listed energy networks. Our approach to this task is to estimate the risk premium for listed energy networks in each six month period, compared to the market risk premium. The average six month risk

[89] The specific firms are BHP (listed 117 years, P/E 14.7), Santos (listed 48 years, P/E 21.9), Origin (listed 41 years; P/E 20.1), Rio Tinto (listed 40 years, P/E 14.5), ANZ (listed 33 years, P/E 12.6), Westpac (listed 32 years, P/E 12.9), Woodside (listed 31 years, P/E 19.5), QBE (listed 29 years, P/E 13.2) and National Australia Bank (listed 28 years, P/E 12.3).
[90] SFG Consulting (2013c), Sub-section 4.2.3, pp. 28–29.

premium ratio across all observations for listed networks can then be used to estimate their cost of equity. The sample of listed energy networks is the same set of nine firms relied upon by the AER to estimate beta in the Sharpe-Lintner CAPM, and which has been detailed in our previous reports. Our cost of equity estimates for listed energy networks are summarised in Table 14.

216. There are 99 observations available for analysis.[91] On average, across all 99 observations, the risk premium ratio is 0.94. The implication of this ratio is that if the market risk premium was estimated at 5.8%, we would estimate the risk premium for listed energy networks at 5.5% (that is, 0.94 × 0.058 = 5.5%). Under the heading *Times series network risk premium* we report the product of 0.94 and the market risk premium for that six month period, and under the heading *Time series network cost of equity* we present the estimate of the network cost of equity from adding the risk free rate to the risk premium. The use of all available data from 2002 to 2014 is analogous to using a long history of stock returns to estimate risk coefficients in a factor model, like the Sharpe-Lintner CAPM or the Fama-French model. We want to mitigate the risks associated with any individual cost of equity estimate.

217. Estimates of the network cost of equity and risk premium ratio are relatively stable over time, despite there being only one to six firms available in any six month period. This can be compared to the substantial spike in network cost of equity estimates in 2008 to 2009 that result from the methodology adopted by the AER.[92]

218. The difference in variation in the estimated cost of equity over time is not an accident. It is the aggregate result of all the methodological choices that are documented in this paper, and in our prior papers. These methodological choices include using target prices, matching prices with forecasts at the same point in time (regardless of whether target prices or market prices are used), linear transition to long-term inputs, joint estimation of the cost of equity and growth, and accounting for new share issues in estimating the initial reinvestment rate.

219. In prior analysis we documented the following results of applying our estimation technique to individual firms.

a) Across all firms, the cost of equity estimates exhibit less dispersion than cost of equity estimates from the Sharpe-Lintner CAPM compiled with regression-based beta estimates;[93] and

b) The cost of equity estimates across all nine listed energy networks is about 5% to 7% lower than the corresponding cost of equity estimates compiled by the AER.[94]

[91] A firm can only appear once in a given six month period. So, for example, if there are six firms for which we have cost of equity estimates in a given six month period, this represents six observations.

[92] AER Explanatory Statement to the final guideline, Appendix E.3, Figure E.2, p. 120.

[93] SFG Consulting (2013a), Sub-section 4.2.1, pp. 18–20; SFG Consulting (2013b), Sub-section 7.2.2, pp. 21–22; and SFG Consulting (2013c), Sub-section 4.2.2, pp. 24–25.

[94] SFG Consulting (2013b), Sub-section 7.2.2, p. 23.

Table 14. Estimation of the cost of equity for a network business over time (%)

Period	N	Market cost of equity	Network cost of equity	Risk-free rate	Market risk premium	Network risk premium	Risk premium ratio	Time series network risk premium	Time series network cost of equity
2H02	2	10.3	12.8	5.6	4.7	7.3	1.53	4.5	10.1
1H03	1	10.3	13.0	5.1	5.1	7.9	1.54	4.8	10.0
2H03	2	10.5	11.6	5.6	4.9	6.0	1.23	4.6	10.2
1H04	3	10.7	12.3	5.7	5.0	6.5	1.31	4.7	10.4
2H04	3	10.8	10.2	5.5	5.4	4.7	0.88	5.1	10.5
1H05	2	10.6	11.2	5.4	5.2	5.8	1.11	4.9	10.3
2H05	2	10.5	9.2	5.3	5.2	3.9	0.75	4.9	10.2
1H06	3	9.6	8.9	5.5	4.1	3.4	0.83	3.9	9.4
2H06	5	10.3	9.2	5.7	4.6	3.5	0.76	4.3	10.0
1H07	3	10.2	9.3	5.9	4.3	3.4	0.81	4.0	9.9
2H07	4	10.2	9.9	6.1	4.1	3.9	0.93	3.9	10.0
1H08	4	10.6	10.3	6.3	4.4	4.0	0.92	4.1	10.4
2H08	5	10.7	10.4	5.4	5.3	5.0	0.94	5.0	10.4
1H09	6	11.4	10.5	4.6	6.8	5.9	0.86	6.4	11.0
2H09	6	10.8	10.1	5.5	5.3	4.7	0.88	5.0	10.5
1H10	6	10.5	10.9	5.5	5.0	5.4	1.08	4.7	10.2
2H10	6	10.9	10.7	5.2	5.7	5.5	0.98	5.3	10.5
1H11	6	10.7	11.0	5.4	5.2	5.6	1.07	4.9	10.4
2H11	6	11.1	9.9	4.3	6.8	5.5	0.82	6.4	10.7
1H12	6	11.8	10.9	3.7	8.1	7.2	0.90	7.6	11.3
2H12	6	10.9	9.7	3.1	7.8	6.6	0.84	7.4	10.5
1H13	5	10.8	9.7	3.4	7.4	6.3	0.85	7.0	10.4
2H13	5	10.5	9.9	4.0	6.5	5.9	0.90	6.2	10.1
1H14	2	10.3	9.9	4.1	6.2	5.7	0.93	5.8	10.0
Average	4	10.6	10.5	5.1	5.5	5.4	0.99	5.2	10.3
2H02-1H08	3	10.4	10.7	5.6	4.7	5.0	1.05	4.5	10.1
2H08-1H14	5	10.9	10.3	4.5	6.3	5.8	0.92	6.0	10.5
All		Average risk premium ratio across all 99 network cases					0.94		

220. The potential usefulness of the dividend discount model on an industry basis has not been adequately addressed by the AER. The AER compiled cost of equity estimates from a dividend discount model using one technique, and those estimates were much higher than estimates of the cost of equity for the market. The AER decided not to rely upon these results because they are considered "implausible given the lower risk profile of service providers."[95] The AER is concerned with both the magnitude of the cost of equity estimates for listed networks, and with their variation over time.[96]

221. The AER has been presented with estimates of the cost of equity for listed energy networks that are much less variable over time, and which are less than the cost of equity for the market. These estimates are given no weight in determining the cost of equity, on the basis that "it is not clear that any real improvement is achieved in the accuracy of the return on equity estimate"[97] with the AER having noted its concern over transparency and complexity.[98]

222. We devoted earlier sections of this report to issues of transparency and complexity, providing more detail about our estimation process and the impact of individual methodological choices on the results. Our intention in those sections is to provide clarity to our method to address the AER's concerns.

[95] AER Explanatory Statement to the final guideline, Appendix A.2.1, p. 15.

[96] AER Explanatory Statement to the final guideline, Appendix A.3, Figure E.2, p. 120 for an illustration of time series variation, and Figure E.3, p. 121 for the level of the cost of equity.

[97] AER Explanatory Statement to the final guideline, Appendix E.3, p. 122, quoting the review by McKenzie and Partington (2013).

[98] AER Explanatory Statement to the final guideline, Appendix E.3, p. 123.

However, we do not consider it reasonable for the AER to simultaneously (1) reject a simple model which produces estimates the AER considers too high and variable to be useful, (2) reject a complex model which produces estimates that cannot be considered too high and variable to be useful, and (3) take no steps towards developing an approach to this issue that it does consider useful.

223. The ultimate objective of this report is to make an estimate of the cost of equity for a benchmark energy business. A useful starting point is to ask, "Is there any information in market prices, dividends and earnings to suggest that the risk of a listed energy network is any different to the average stock in the market?" According to our analysis, there is evidence in this regard – the risk premium for a listed energy network is about 94% of the risk premium for the market. According to the analysis conducted by the AER, we can reach no conclusions about whether a listed energy network is any different to the average stock in the market.

224. The end result of the AER's analysis in the guideline is to adopt a beta estimate in the Sharpe-Lintner CAPM of 0.7, so the AER considers the equity risk in a listed energy network to be 30% below the risk of the average stock in the market. According to the dividend discount model analysis considered here, the conclusion of the AER is inconsistent with prices, earnings and dividends.

5.4 Implication

225. This section of our report is devoted to reaching conclusions on the cost of equity for a benchmark energy network. We start with an estimate of the required return on the market, which is 10.32% excluding any benefit from imputation credits. Our estimate of the risk-free rate is the annualised yield to maturity on 10-year government bonds, averaged over 20 trading days ending on 12 February 2014. This average value is 4.12%. So, excluding any consideration of imputation benefits, the dividend discount model analysis implies a market risk premium of 6.20%.[99]

226. We estimate that a listed energy network has a risk premium that is 0.94 times the risk premium for the market. Excluding any benefit of imputation credits, this implies a risk premium of 5.85% (that is, $0.94 \times 0.0620 = 5.85\%$). Adding the risk-free rate to this premium implies a cost of equity of 9.97%, excluding imputation benefits. This is our estimate of the return equity investors require from dividends and capital gains for investing in the equity of a benchmark energy network.

227. In the following section we document the relationship between equity returns including and excluding imputation benefits that is contained in the AER's post-tax revenue model.[100] We have been asked to compute cost of equity estimates assuming values for imputation credits of 0.50 and 0.25.[101] If the value of imputation credits is estimated at 0.50, and the corporate tax rate is 30%, the return from dividends and capital gains is 0.8235 × the return from dividends, capital gains, and imputation benefits. If the value of imputation credits is estimated at 0.25, the return from dividends and capital gains = 0.9032 × the return from dividends, capital gains and imputation credits.

228. This means that, in order for the benchmark energy business to receive a return from dividends and capital gains of 9.97%, the following cost of equity estimates would need to be incorporated into the AER's post-tax revenue model:

a) If the value of imputation credits is estimated at 0.50, the return input in the post-tax revenue model needs to be 12.10%.[102]

[99] In other work, the market risk premium is estimated using the dividend discount model and other information. For the purposes of this report we want to present our conclusions on a stand-alone basis. So the market return and market risk premium is only presented with respect to information contained in this report.

[100] Our comments also apply to any other model that accounts for tax and imputation credits in the same manner.

[101] In other work, we present analysis of appropriate values for imputation credits. In the current report we simply present outcomes under two alternative assumptions.

[102] That is, $0.0997 \div 0.8235 = 12.10\%$.

b) If the value of imputation credits is estimated at 0.25, the return input in the post-tax revenue model needs to be 11.04%.[103]

[103] That is, 0.0997 ÷ 0.9032 = 11.04%.

6. Imputation tax credits

6.1 Our prior recommendation

229. In our report entitled *Reconciliation of dividend discount model estimates with those compiled by the AER* we made the following recommendation:

> The way in which the AER accounts for imputation benefits in its dividend discount model analysis is inconsistent with the way in which the AER accounts for imputation benefits in its post-tax revenue model. This leads to a material understatement of allowed revenues. There are two ways to resolve this inconsistency.
>
> 1. The AER could make an estimate of returns excluding imputation benefits from the dividend discount model analysis, use the equation presented in Sub-section 9.1 to estimate the cost of equity for regulation and input this value into the post-tax revenue model. Note that this could be done even if the AER incorporates the imputation benefits into the dividend forecasts as it already does. The AER just needs to strip out the benefits of imputation at the end of the process, as illustrated in Table 7.
>
>   For example, suppose the AER determined that its best estimate of the return excluding imputation benefits was 9.82%, as illustrated above. In order to set the allowed revenue stream so that the regulated firm is expected to earn this same return excluding imputation benefits, the input into the AER's post-tax revenue model would be 0.0982 ÷ 0.82 = 11.93%.
>
>   Alternatively, the AER could first compute the cost of equity without incorporating imputation benefits. In the example presented above, the implied return excluding imputation benefits is 9.83%. This is the discount rate which sets the present value of cash dividends equal to the share price. In order to compute the input into the AER's post-tax revenue model, again, this needs to be divided by 0.82.
>
> 2. The AER could adjust the post-tax revenue model so that the assumed benefits from imputation as computed by the model are the same as the assumed benefits of imputation from the dividend discount model analysis.

6.2 Response to the final guideline

230. The key point of our prior recommendation is that the AER sets the prices and revenue streams regulated businesses are allowed to earn by inputting parameter estimates into a spread sheet. Embedded within that spread sheet is the following relationship.[104]

$$Return\ from\ dividends\ \&\ capital\ gains$$
$$= \left[\frac{1 - Tax\ rate}{1 - Tax\ rate\ \times (1 - Value\ of\ imputation\ credits)}\right] \times Cost\ of\ equity$$
$$= \left[\frac{1-\tau}{1-\tau \times (1-\gamma)}\right] \times r_e$$

231. This means that, if the value of imputation credits was estimated at 0.50, and the tax rate was estimated at 0.30, the allowed return from dividends and capital gains would be 0.8235 × the cost of equity; and if the value of imputation credits was estimated at 0.25, and the tax rate was estimated at 0.30, the allowed return from dividends and capital gains would be 0.9032 × the cost of equity.

[104] For a full discussion of this equation, see SFG Consulting (2013a), Section 8, pp. 37–40; SFG Consulting (2013b), Section 9, pp. 28–31; and SFG Consulting (2013c), Sub-section 7.2, pp. 36–39.

232. This relationship between the return from dividends and capital gains and the overall cost of equity is different to that assumed by the AER when it implements its dividend discount model. When the AER estimates the cost of equity from its dividend discount model (this is the cost of equity input on the right hand side of the equation above) it incorporates the value of distributed credits into the dividend stream. So the AER solves for the cost of equity according to the following equation.

$$Price = \sum_{t=1}^{\infty} \frac{Dividend\ per\ share_t \times \left(1 + \%Franked \times Value\ of\ a\ distributed\ credit \times \frac{\tau}{1-\tau}\right)}{(1 + cost\ of\ equity)^t}$$

233. The end result of these two equations is that (1) in estimating the cost of equity using the dividend discount model, the AER assumes that the value of imputation credits is relatively small, but (2) in setting prices and revenues the AER assumes that the value of imputation credits is relatively large. So we made a recommendation that the AER resolve this inconsistency by changing either the method it use to estimate the cost of equity using the dividend discount model, or the method it use to set revenue and prices. If the AER considers that the value of imputation credits is relatively low, it should be low when estimating the cost of equity and setting revenue and prices. If the AER considers the value of imputation credits is relatively high, it should be high when estimating the cost of equity and setting revenue and prices.

234. The AER has received feedback from its advisors about our assessment. McKenzie and Partington (2013) agreed with our position that there is an inconsistency, provided that we have accurately described the post-tax revenue model. They state that:

> If the foregoing is accepted as an accurate description of the AER's proposed practice, then SFG is correct in concluding that there is an inconsistency in the approach that the AER applies in computing the estimated cost of corporate tax and that applied in their DGM imputation adjustment.[105]

235. The AER states that McKenzie and Partington (2013) provide "qualified support" for our position on the basis that, if we have accurately characterised the AER's revenue model then we are correct.[106] We think it reasonable for the AER to either determine whether we have, or have not, accurately characterised the AER post-tax revenue model. If our computations are in error, and the AER explains that in the model there is a different relationship between returns from dividends and capital gains, the cost of equity and imputation credits, then we can revise our position. But it is not reasonable for the AER to make no resolution of an inconsistency, but not provide any explanation of what the correct position is.

236. The AER also states that "Lally [2013b] concurs with [its] formula for adjusting for imputation credits"[107] and both Lally (2013b) and the AER point out that the same dividend discount model equation is used by Brailsford, Handley and Maheswaran (2012).[108] The AER also points out that its dividend discount model equation has been used by industry consultants.[109]

237. We did not object to the AER using either equation separately in its analysis. We raised a concern with the AER using both equations together, with the end result that the dividend discount model analysis reflects a lower return from imputation credits than assumed by the AER in setting prices and revenue.

105 McKenzie and Partington (2013), Section 5, p.23.
106 AER Explanatory Statement to the final guideline, Appendix E.3, p. 125.
107 AER Explanatory Statement to the final guideline, Appendix E.3, p. 125.
108 Lally (2013b), Section 5, p. 14.
109 AER Explanatory Statement to the final guideline, Appendix E.3, p. 125.

6.3 Implication

238. The implication of this section is that inputs into a post-tax revenue model need to be made on a consistent basis with the manner in which tax and imputation credits are treated in the model. If the cost of equity input incorporates a lower value for imputation credits than implied by the model, the allowed return from dividends and capital gains from the model will be understated. This inconsistency can be resolved either by amending the model, or by ensuring inputs into that model are estimated on a basis that is consistent with the model.

7. Conclusion

7.1 Estimation

239. We have been asked to provide estimates of the return on equity of an average firm (that is, an entity with a similar degree of risk as that which applies to the market), and for a benchmark efficient entity with a similar degree of risk which applies to a regulated gas and electricity network in respect of the provision of reference services. For both estimates of the return on equity, the estimate is to be reflective of prevailing conditions in the market for equity funds.

240. The conclusions on estimation are best made by referring to the average firm first. If we made no account of imputation benefits, our estimate of the market cost of equity is 10.32%. This means that we expect that the total return from dividends and capital gains for buying a stock with average risk is 10.32%.

241. In estimating the return for a benchmark efficient entity we consider how risky the benchmark efficient entity is, in comparison to the market. So for both the market and for the benchmark efficient entity we consider the cost of equity relative to an estimate of the risk-free rate of interest.

242. Our estimate of the risk-free rate is the annualised yield to maturity on 10-year government bonds, averaged over 20 trading days ending on 12 February 2014. This average value is 4.12%. So, excluding any consideration of imputation benefits, the dividend discount model analysis implies a market risk premium of 6.20%.

243. We estimate that a listed energy network has a risk premium that is 0.94 times the risk premium for the market. Excluding any benefit of imputation credits, this implies a risk premium of 5.85% (that is, 0.94 × 0.0620 = 5.85%). Adding the risk-free rate to this premium implies a cost of equity of 9.97%, excluding imputation benefits. This is our estimate of the return equity investors require from dividends and capital gains for investing in the equity of a benchmark energy network.

244. In Section 6 we described the relationship between equity returns including and excluding imputation benefits that is contained in the AER's post-tax revenue model and any other post-tax revenue model that treats imputation credits and tax in the same manner. We have been asked to compute cost of equity estimates assuming values for imputation credits (gamma or γ) of 0.50 and 0.25.

a) If the value of imputation credits is estimated at 0.50, and the corporate tax rate is 30%, the return from dividends and capital gains is 0.8235 × the return from dividends, capital gains, and imputation benefits.

b) If the value of imputation credits is estimated at 0.25, the return from dividends and capital gains = 0.9032 × the return from dividends, capital gains and imputation credits.

245. This means that, in order for the benchmark energy business to receive a return from dividends and capital gains of 9.97%, the following cost of equity estimates would need to be incorporated into the AER's post-tax revenue model or any model that treats imputation credits and tax in the same manner:

a) If the value of imputation credits is estimated at 0.50, the cost of equity input in the post-tax revenue model needs to be 12.10%.

b) If the value of imputation credits is estimated at 0.25, the cost of equity input in the post-tax revenue model needs to be 11.04%.

7.2 Theory and application

246. We have been asked to comment on theoretical aspects of the dividend discount model and its application in practice. The equation itself simply says that the price of a stock is equal to the present value of expected dividends, discounted at the cost of equity. The general equation is fairly non-contentious. It is simply the equity version of the equation used to estimate the yield to maturity on bonds. The cost of equity is simply the discount rate which sets the present value of dividends equal to

share price, just as the yield to maturity on debt is the discount rate which sets the present value of cash flows to debt holders equal to the bond price.

247. All of the debate over the application of the dividend discount model is in respect to the estimation of inputs. In contrast to bonds, the series of expected cash flows is much more uncertain because of the risks faced by equity holders. We have short-term forecasts of dividends from equity analysts, but then need to make assumptions about potential dividends outside of that short forecast period.

248. Underpinning our cost of equity estimates is a series of methodological choices that have been made in an effort to achieve the most reliable cost of equity estimate. In this report we have provided additional information about:

a) the impact of using analyst target prices rather than market prices;

b) the impact of ensuring that earnings and dividend forecasts are matched in time with prices (regardless of whether market prices or target prices are used);

c) the impact of assuming a single cost of equity for all forecast years, rather than embedding a term structure assumption; and

d) the joint estimation of estimates of the cost of equity and long-term growth.

249. Our overall point from this analysis is that the estimation techniques we have adopted are specifically designed to mitigate estimation error. The AER has not relied upon our prior cost of equity estimates on the basis that our approach is not transparent enough and too complex. So we have presented more information to improve transparency and alleviate concerns over complexity. The AER has a preference for simple over complex methods *where appropriate*. We contend that the relative increase in complexity is appropriate, because it does generate cost of equity estimates that are useful at both the market and industry level.

250. We also devoted a large section of this report to analysis of the historical growth in earnings per share and GDP, for Australian- and U.S.-listed stocks. In prior analysis we have not explicitly considered this issue, because our analysis was devoted to estimating the long-term growth rate reflected in stock prices, not an assumed long-term growth rate. But in this report we are required to confront this issue because the AER relies upon a GDP growth estimate to estimate the long-term growth in dividends for Australian-listed stocks.

251. The AER makes an assumption that real dividend growth, in the long-term, will be 1% less than real GDP growth. The AER also assumes that real GDP growth is 3% per year, and inflation is 2.5% per year, which implies nominal dividend growth of 4.6% per year. The empirical basis for the *GDP minus 1%* assumption is prior research showing that growth in real dividends per share and real earnings per share fell short of real GDP growth from 1900 to 2000, and 1969 to 2009.

252. We examined the growth in real GDP, real earnings per share, and real dividends per share under recent decades that have been characterised by low inflation and central bank policy specifically devoted to maintaining inflation at moderate levels. In both Australia and the U.S., over the last two to three decades since inflation has declined, real earnings per share has grown at rates which match or exceed GDP growth. The empirical basis for the AER's *GDP minus 1%* growth assumption is confined to the data series prior to this change in realised inflation and central bank policy. The latter regime is also characterised by a material increase in price/earnings ratios. So the AER's cost of equity estimates incorporate:

a) A growth assumption based upon a long time series of historical information, and which is inconsistent with growth over the last 20 to 30 years; and

b) Current stock prices which are trading at materially higher price/earnings ratios than observed in the long time series of historical information.

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9. Appendix 1: Technical issues relating to the dividend discount model estimation

9.1 Introduction

253. In Sections 3 we discuss issues relating to data construction (transition period, market prices and target prices, ensuring no stale forecasts, and term structure for equity) and in Section 4 we discuss the process behind determining estimates for cost of equity, long-term growth, and long-term return on equity. In this section we describe some detailed technical adjustments made to maximise the reliability of the results. Each of these adjustments is useful in mitigating estimation error. This same technical appendix appears as an appendix in the report *Reconciliation of dividend discount model estimates with those compiled by the AER* (SFG, 2013b) and the same information is contained in Section 3 of the report *Dividend discount model estimates of the cost of equity.* (SFG, 2013a).

9.2 Accounting for growth from new share issuance

254. Earnings growth results from the reinvestment of earnings and new share issuance. For this reason, it is possible for a firm to experience growth in earnings per share, even if the firm distributes 100% of its earnings as dividends. However, in this 100% payout situation, there will only be positive earnings per share growth if the firm earns a return on investment that exceeds the cost of equity capital.

255. Our analysis incorporates a gradual transition from the firm's current reinvestment rate to a long-term reinvestment rate. For firms that have issued new shares, if we estimate the firm's reinvestment rate simply with reference to the dividend payout ratio, the total reinvestment rate will be understated. So, in order to have the most reliable estimate of the current reinvestment rate, we performed a computation to estimate what the reinvestment rate would be had the firm issued no new shares but instead funded investments with retained earnings.[110]

256. In our original report we provide an example of a case in which the firm reinvested 20% of earnings ($RR = 0.20$) and made investments that earned a return on equity of 18% ($ROE = 0.18$). In the absence of new share issuance, the estimated growth rate for the firm would be 3.6%, computed as $g = RR \times ROE = 0.20 \times 0.18 = 3.6\%$. If that same firm issued 1% new shares ($C = 0.01$) at a price-earnings ratio of 16 times ($P/E_1 = 16$), this will lead to further earnings per share growth. In the Appendix to our original report we provided the derivation of the equation which shows how growth is computed in this situation. According to the inputs in this example, the estimated growth rate is 5.58% as shown below.

$$g = \frac{(1 + RR \times ROE)/(1 + C)}{1 - \frac{C}{1 + C} \times \frac{P}{E_1} \times ROE} - 1$$

$$= \frac{(1 + 0.20 \times 0.18)/(1.01)}{1 - \frac{0.01}{1.01} \times 16 \times 0.18} - 1$$

$$= \frac{1.0257}{0.9715} - 1$$

$$= 5.58\%$$

257. When incorporating mean-reversion in parameter inputs we decided it simplified the analysis if we did not project that firms issue new shares each year. Instead, for firms that issued new shares we adjusted the initial reinvestment rate. With respect to the example above, we worked out what input for *RR*

[110] SFG Consulting (2013a), Sub-section 3.3 (p.12).

would result in the same growth rate of 5.58% if C was equal to zero. This computation is straightforward. We simply compute:

$$RR = \frac{g}{ROE} = \frac{0.0558}{0.1800} = 31.03\%$$

258. This means that the initial reinvestment rate for the mean-reversion process is 31.03%.

9.3 Constraints on initial values

9.3.1 Earnings per share and dividends per share

259. In our original report we were required to contrast the situation in which growth was assumed to be constant from the first forecast year with the case in which there was mean-reversion in growth. We drew all our conclusions from the mean-reversion case because assuming constant growth from the first forecast year introduces considerable estimation error. Further, in the constant growth case there are two situations in which computations simply cannot be mathematically performed. These situations are (1) when earnings per share are less than or equal to zero; and (2) dividends per share are less than or equal to zero.

260. In 2% of cases earnings per share was less than or equal to zero and in 2% of cases dividends per share was less than or equal to zero. We want to retain these firms in the dataset, because the market is likely pricing these shares on the expectation of positive earnings and dividends at some future point. But if the initial inputs for earnings per share and dividends per share are negative the computations cannot be performed. So the solution is to winsorize the data for these items at the 2nd percentile. This means replacing the earnings yield (earnings per share divided by price) with the value that appears at the 2nd percentile, and replacing the dividend yield (dividend per share divided by price) with the value that appears at the 2nd percentile. We also applied the corresponding winsorization at the upper end of the distribution, replacing the highest values with those at the 98th percentile. The reason this winsorization is conducted at the lower and upper ends is to ensure that the median values in the dataset are not shifted upwards.

261. In the mean-reversion case these cases of earnings per share and dividends per share being less than zero could be retained, because there is a projection towards a case of positive earnings per share and positive dividends per share. But we retained the winsorized dataset to ensure that all our results were compiled using exactly the same data.

262. It is standard procedure in finance research to mitigate the impact of extreme observations by winsorizing data. The AER has stated that models are to be based upon "quantitative modelling which avoids arbitrary filtering or adjusting of data, which does not have a sound rationale."[111] The adjustments used in our analysis are in no way arbitrary and do have a sound rationale. The lower bound constraint is required in order for the observation to be retained, at all, for a constant growth case, and the upper bound constraint is imposed to ensure that the imposition of the lower bound constraint does not bias the earnings yield and the dividend yield upwards.

9.3.2 Initial growth from new share issuance and reinvestment rate

263. In some instances there are large changes in the number of new shares issued in the period prior to the forecast of earnings per share and dividends per share. With respect to the above equation, the input C would be very high, leading to high initial estimates of growth, and consequently, very high initial estimates for the reinvestment rate. There are also instances in which there is a negative change in shares on issue, which can occur in cases of share buybacks, and which could lead to very low or

[111] AER Explanatory Statement, Sub-section 2.2.1 (p.24), Sub-section 2.3.3 (p.29),

negative initial values for the reinvestment rate. Further, these initial cases of high or low changes in shares on issue can also result from errors in the original database.

264. In 10% of cases the growth in new shares was negative, so we winsorized the variable on new share issuance (*C*) at the 10^{th} and 90^{th} percentiles. We also imposed the constraint that the growth in new share issuance cannot be so large that the implied reinvestment rate is more than 100%, which means that the minimum possible initial reinvestment rate is zero and the maximum possible initial reinvestment rate is 100%.

265. The constraints on initial growth from new share issuance and reinvestment rate are not arbitrary and do have a sound rationale. The rationale is to mitigate against the potential extreme instances of very low or high initial reinvestment rates that, if projected over the period of mean-reversion, are likely to lead to extremely low or high projections for earnings and dividends per share. In short, in the absence of constraints on initial new share issuance, there will be an increase in noise in the data without any improvement in the reliability of the cost of equity estimates. The magnitude of the constraints is also not arbitrary as it essentially constrains the reinvestment rate to boundaries in which all or none of earnings is reinvested in new projects. This remains a very wide range for which to begin a process of reverting to a long-term reinvestment rate.

10. Appendix 2: Terms of reference and qualifications

266. This report was prepared by Professor Stephen Gray and Dr Jason Hall. Professor Gray and Dr Hall have made all they enquiries that they believe are desirable and appropriate and that no matters of significance that they regard as relevant have, to their knowledge, been withheld.

267. Professor Gray and Dr Hall have been provided with a copy of the Federal Court of Australia's "Guidelines for Expert Witnesses in Proceeding in the Federal Court of Australia." The Report has been prepared in accordance with those Guidelines, which appear in the terms of reference.