Attachment M.29

Attachment M29_PUBLIC_FRONTIER_ Cost of equity estimates over time

03 July, 2015

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A REPORT PREPARED FOR ERGON ENERGY

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1 Introduction

1 The National Electricity Rules (**the Rules)** require the Australian Energy Regulator (**AER**) to make a decision that sets an allowed rate of return that is commensurate with prevailing market conditions.

2 Ergon Energy is concerned that the AER's approach to setting equity returns is not consistent with the above statement. Ergon Energy is of the view that equity markets are demanding returns that are not materially different from pre-crisis levels. However, the AER's allowance for the return on equity has declined substantially in recent times in lock-step with unprecedented falls in government bond yields.

3 To assist with its submission in response to the Preliminary Determination, we have been engaged by Ergon Energy to provide estimates of the expected market return, and the cost of equity for a benchmark energy network as an historical time series using:

a. the rationale of the AER to estimating the market risk premium and the approach used by the AER to estimate the cost of equity; and

b. the rationale of the network service providers' to estimating the market risk premium and the approach used by the network service providers to estimate the cost of equity.

4 There are two components to this task that must be considered separately. The first component is to compile estimates of the market return using the rationale of the AER versus the rationale of the network service providers. By this we mean making an estimate of the final market return that would flow through to a regulatory decision, given the same information from historical returns, survey evidence and the cost of equity implied by market prices and prospective earnings and dividends.

5 The second component is to compile estimates of the cost of equity for a benchmark energy network that would be estimated by the AER approach (application of the Sharpe-Lintner Capital Asset Pricing Model (CAPM)) versus the approach advocated by Ergon Energy (using cost of equity estimates from a number of models).

6 The reason this time series information is relevant is that we have information from both government bond markets and equity markets that is relevant to estimating the cost of capital. Yet we will see that, under the AER rationale for estimating the market return, information from the equity market is overwhelmed by information from government bond yields in reaching conclusions. Under the network service providers' rationale for making an

estimate of the market return, information from both the equity market and the government bond market is able to be factored into the allowed return.

7 Network service providers have proposed that the expected market return be set as a weighted average of market return estimates compiled in four ways.

a. Adding an historical average excess return to the risk free rate – this has been assigned 20% weight in our report;

b. Incorporating current inflation expectations to an estimate of historical real returns – this has been assigned 20% weight in our report;

c. Adding a survey estimate of the market risk premium to the risk free rate – this has been assigned 10% weight in our report; and

d. Estimating the market return using the dividend discount model, which incorporates analyst forecasts for earnings and dividends – this has been assigned 50% weight in our report.

8 The reason that the four estimates of the market return, listed above, have been used by the network service providers, is that there is estimation error involved in each estimate. The AER also considers these four market return estimates to be relevant information, but considers them in a different way. Effectively, the AER relies almost entirely upon historical excess returns in reaching a conclusion on the market return, and this leads to an allowed return on equity that moves almost one-for-one with government bond yields. This means that information from the equity market about the cost of capital has almost no impact on the allowed return.

9 Ideally, we would know exactly what cost of equity is reflected in the market prices of shares and the expectations for earnings and dividends of investors trading those shares. But we only have proxies for investor expectations so it is prudent to incorporate estimates of the returns we have observed in the past, and survey responses from investors The reason we incorporate both historical average risk premiums, and historical average real returns, is that in different situations we will get a better estimate of the market return using one historical average or another, but it is not necessarily clear which estimate will be best at one particular point in time.

10 The AER has rejected the weighted average approach to estimating the market return. The AER places primary reliance on adding an estimate of historical excess returns to the risk free rate. Then, the AER places second most reliance on market return estimates from the dividend discount model. Finally, the AER

considers survey evidence, and other information – dividend yields, implied volatility, and corporate and state government bond spreads.[1]

11 The AER has only ever made an estimate of the market risk premium of either 6.0% or 6.5%. The AER states that its baseline estimate of the market risk premium is 6.0% on the basis of historical excess returns, and that historical excess returns support a range for the market risk premium of 5.1% to 6.5%.[2] The AER relies upon market return estimates from the dividend discount model to arrive at an estimate of the market risk premium at the upper end of this range based upon historical excess returns. So the AER's most recent estimate of the market risk premium is 6.5%.[3]

12 The AER states that survey evidence supports the AER's baseline market risk premium estimate of 6.0%, and other information (dividend yields, market volatility and corporate and state government bond spreads) is consistent with the AER's baseline estimate.[4] At different points in time the AER has reported substantial variation in its estimates of the market risk premium implied by the dividend discount model, but no variation in the 6.5% estimate of the market risk premium.[5] This means that our best estimate of the market risk premium that the AER would have applied in different circumstances is proxied by the following decision rule.

a. If the AER's dividend discount model estimate of the market risk premium is greater than 6.5% then the market risk premium = 6.5%.

b. If the AER's dividend discount model estimate of the market risk premium is less than 6.5% then the market risk premium = 6.0%.

[1] TransGrid Final Decision, Attachment 3, Table 3-12, pp. 87 to 88.

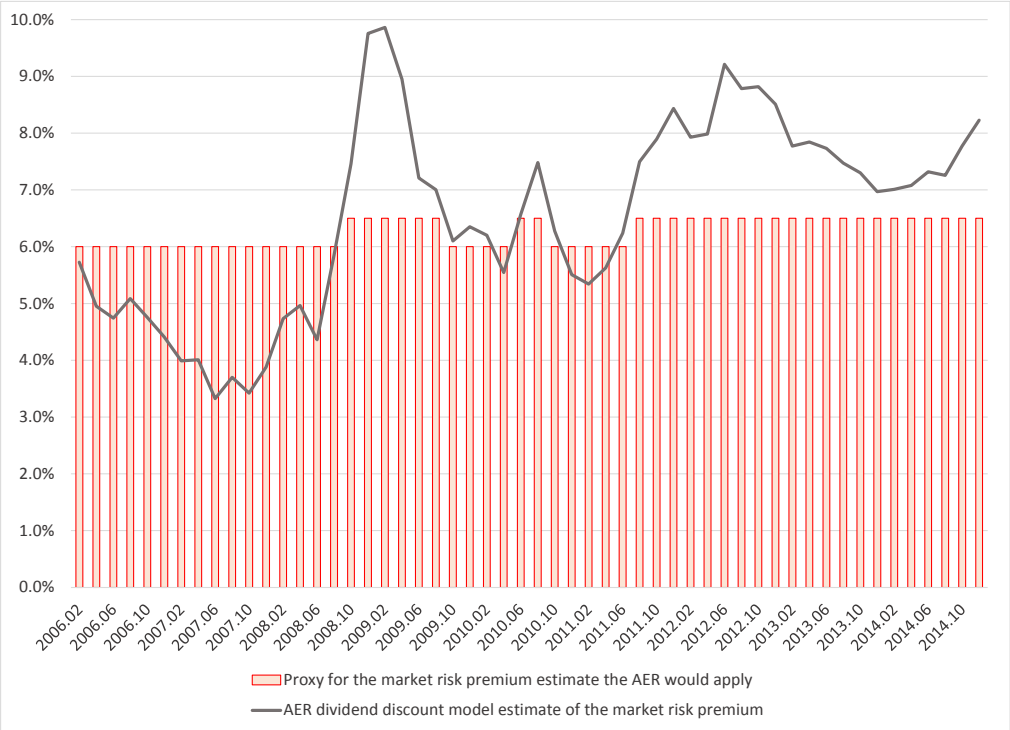
[2] TransGrid Final Decision, Attachment 3, p. 35.

[3] TransGrid Final Decision, Attachment 3, p. 35.

[4] TransGrid Final Decision, Attachment 3, p. 35.

[5] AER conclusions on the market risk premium at different points in time are documented below.

Figure 1. Representation of the decision rule for estimating the market risk premium adopted by the AER from January 2006 to December 2014



13 In Figure 1 we illustrate our decision rule for estimating the market risk premium the AER would estimate, given different estimates of the market risk premium from the dividend discount model. We compiled the dividend discount model estimates using the same ASX200 data relied upon by the AER, and the same estimation approach. This estimation approach includes valuing distributed imputation credits at 60% of face value and assuming long term growth of 4.6% per year.[6] Estimates are compiled as two monthly averages, consistent with the AER approach,[7] and the figure shows market risk premium estimates every two months.

14 This decision rule is consistent with the AER's estimates of the market risk premium at the following points in time.

a. In December 2008 the AER estimated the market risk premium at 6.0%.[8] The AER's conclusion was that estimates of the market risk premium from the dividend discount model supported a

[6] TransGrid Final Decision, Attachment 3, Table 3-36, p. 301.

[7] TransGrid Final Decision, Attachment 3, p. 108, footnote 346.

[8] AER Review of the weighted average cost of capital parameters: Draft Decision – Explanatory statement, 2008, p. 7.

figure of "around or below 6.0%."[9] The AER considered these forward-looking estimates of the market risk premium to be a useful cross-check on the market risk premium, to be used with caution, and stated that the evidence did not warrant a departure from the previously-used figure of 6.0%.[10]

b. In May 2009 the AER estimated the market risk premium at 6.5%.[11] The AER referred to the Bloomberg estimate of the market risk premium of 8.0% at January 2009.[12] For the two month period ending 31 May 2009 the implied dividend discount model estimate from the AER approach was 8.0%.[13] We estimate that, had the AER applied its current method to data for the two months ending 31 January 2009, the estimated market risk premium from the dividend discount model would have been 10.0%.

c. In December 2013 the AER estimated the market risk premium at 6.5%.[14] The AER's estimate of the market risk premium from analyst forecasts, based upon data for the two months ending 31 November 2013, was 7.1%.[15]

d. In November 2014 the AER estimated the market risk premium at 6.5%.[16] The AER's estimate of the market risk premium from analyst forecasts, based upon data for the two months ending 30 September 2014, was 7.4%.[17]

e. In April 2015 the AER estimated the market risk premium at 6.5%.[18] The AER's estimate of the market risk premium, from

[9] AER Review of the weighted average cost of capital parameters: Draft Decision – Explanatory statement, 2008, p. 173.

[10] AER Review of the weighted average cost of capital parameters: Draft Decision – Explanatory statement, 2008, p. 174.

[11] AER Review of the weighted average cost of capital parameters: Final Decision, 2009, p. iii.

[12] AER Review of the weighted average cost of capital parameters: Final Decision, 2009, p. 220.

[13] Note that in May 2009 the AER did not compile its own estimates of the expected market return using the dividend discount model. The AER relied upon Bloomberg estimates of the market risk premium.

[14] AER Rate of Return Guideline – Explanatory Statement, 2013, p. 11.

[15] AER Rate of Return Guideline – Appendices to the Explanatory Statement, 2013, Table E.1, p. 119.

[16] Jemena Gas Networks Draft Decision, Attachment 3, p. 29.

[17] Jemena Gas Networks Draft Decision, Attachment 3, Table 3-41, p. 200.

[18] TransGrid Final Decision, Attachment 3, p. 34.

analyst forecasts, based upon data for the two months ending 28 February 2015, was 8.2%.[19]

[19] TransGrid Final Decision, Attachment 3, Table 3-36, p. 301.

2 Cost of equity estimates

2.1 Expected market return

2.1.1 Estimation approaches

15 In this sub-section we present estimates of the expected market return and market risk premium over time from several approaches. In aggregate there are six estimates of the expected market return and market risk premium, based upon three estimates of the market return from the dividend discount model, and two ways of reaching an overall conclusion on the market risk premium.

16 The terminology we use to explain how the information is used to reach a conclusion on the market risk premium is a *decision rule.*

a. The AER's decision rule on the market risk premium is to adopt a figure of 6.0% or 6.5%, depending on whether or not the dividend discount model estimate of the market risk premium is below, or above, 6.5%.

b. The network service providers' decision rule on the market risk premium is to take a weighted average of the market risk premium estimate from historical excess returns, historical real returns, survey evidence and the dividend discount model.

17 The terminology we use to explain how information is used to estimate the cost of equity for a network service provider is a *cost of equity approach.*

a. The AER's cost of equity approach is to apply the Sharpe-Lintner CAPM with a beta estimate of 0.7.

b. The network service providers' cost of equity approach is to compile a cost of equity from four different models – the Sharpe-Lintner CAPM, the Black CAPM the Fama-French model and the dividend discount model.

18 The estimation of the market risk premium is separate from the estimation of the cost of equity, because the estimate of the market risk premium would be the same, regardless of whether the regulated business was an energy network, a water network, a telecommunications provider, or any other business.

19 With respect to the dividend discount model estimates of the expected market return we have the following three approaches:

a. The AER's application of the dividend discount model;

b. Our application of the dividend discount model, but with imputation accounted for in the dividend component so the estimates can be directly compared to those of the AER.[20] This means that we add the estimate of the long run dividend yield, multiplied by 0.1929.[21]

c. The Bloomberg application of the dividend discount model, but with an adjustment to account for imputation credits being distributed as part of dividends, in the same manner as described immediately above – we add in the long term dividend yield multiplied by 0.1929.

20 With respect to reaching a conclusion on the expected market return and market risk premium we have the following two decision rules:

a. The final estimate of the market risk premium based upon our proxy for the AER decision rule – use either 6.0% or 6.5% depending on whether the market risk premium implied by the dividend discount model is below, or above, 6.5%.

b. The final estimate of the market risk premium is based upon the weighted average decision rule outlined by network service providers. In computing the market risk premium using this decision rule we have assumed the following parameter estimates, consistent with those adopted by the AER – historical excess market returns of 6.0%,[22] historical real market returns of 8.9%,[23] a survey estimate of the market risk premium of 6.0%[24] and an inflation rate of 2.5%.[25] Our objective in this report is not to argue the basis for particular parameter estimates, but rather to

[20] In other work we have made the case that the AER's post-tax revenue model does not account for imputation credits with respect to the distribution of dividends, but rather accounts for imputation as part of corporate tax paid, under the assumption that expected cash flows are a constant perpetuity. We have argued that the AER accounts for imputation using the same equations presented by Officer (1994). So the AER should either amend its post-tax revenue model, or account for the estimate of the market risk premium using the same equations embedded in the AER's post-tax revenue model. We do not want this issue to cloud the issue which is the focus on the current paper, which is the application of decision rules to reach a conclusion. So all adjustments for imputation are accounted for in the dividend stream.

[21] The figure of 0.1929 is based upon an assumed value for a distributed imputation credit of 0.60, corporate tax rate of 30%, and a franking percentage of 75%. So we have, increment to return = dividend yield × franking percentage × corporate tax rate ÷ (1 – corporate tax rate) × value of a distributed credit = dividend yield × 0.75 × 0.30 ÷ 0.70 ×0.60 = dividend yield × 0.1929.

[22] TransGrid Final Decision, Attachment 3, p. 35.

[23] TransGrid Final Decision, Attachment 3, Table 3-56, p. 435.

[24] TransGrid Final Decision, Attachment 3, p. 35.

[25] TransGrid Final Decision, Attachment 3, p. 209, for the long term inflation estimate of 2.5%.

demonstrate the differences in outcomes from different decision rules.

2.1.2 AER dividend discount model estimates

Market cost of equity using the AER's decision rule

21 In Figure 2 we present estimates of the expected market return, based upon the dividend discount model estimates from the AER's estimation approach. The AER relies upon consensus forecasts of earnings per share and dividends per share for analysts covering ASX200 stocks. The AER also assumes that, after a two year explicit forecast period, dividend growth gradually reverts to a long term average estimate of 4.6%.[26]

22 The red line represents estimates of the expected market return under the AER's dividend discount model approach. Estimates vary over time with fluctuations in equity prices. This means that the estimated market return from the dividend discount model peaked in February 2009 at 14.2%. At the same time, government bond yields fell significantly. The yellow line presents annualised yields on 10 year government bonds. In February 2009, government bond yields fell to 4.3%.[27] So the estimated market risk premium from the dividend discount model was 9.9%.

23 The lowest estimate for the expected market return for the nine years for which data is available (2006 to 2014) was 9.6%, which occurred in June 2007. At this time, government bond yields were 6.3% so the estimated market risk premium was 3.3%.

24 Our proxy for the AER's decision rule is represented by the grey line, which is either 6.0% or 6.5% above the government bond yield. This means that as government bond yields rose from January 2006 to June 2007[28], so does the estimate of the expected market return. At the same time, the signal sent from equity prices is that the expected market return was falling during the same time period.

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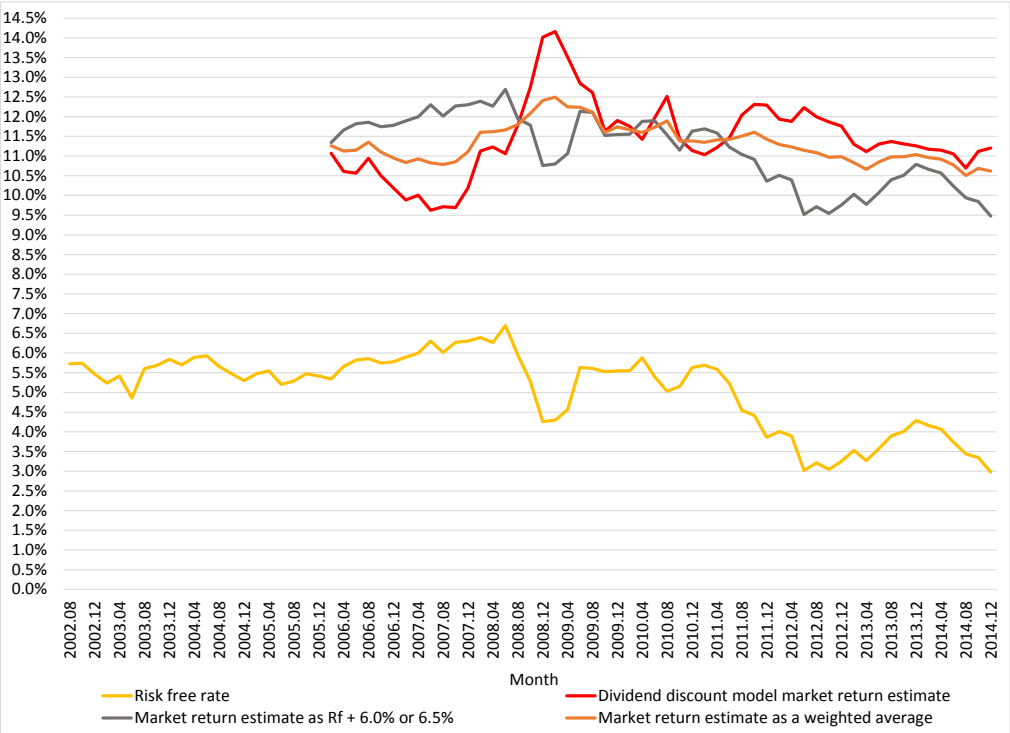
[26] TransGrid Final Decision, Attachment 3, p. 270. The long term growth forecast is based upon real dividend growth of 2.0% (1.0% less than the AER's estimate of real GDP growth) and inflation of 2.5%. So we have nominal dividend growth = (1 + real dividend growth) × (1 + inflation) – 1 = 1.020 × 1.025 – 1 = 4.6%.

[27] The 10 year government bond yield is the annualised yield to maturity, based upon the monthly average yield for February 2009 of 4.25% as reported by the Reserve Bank of Australia (**RBA**). That is, $(1 + 0.0425 \div 2)^2 - 1 = 1.02125^2 - 1 = 4.30\%$.

[28] During February 2006 the annualised yield on government bonds was 5.3%, which increased to 6.3% over June 2007. During the same time period the estimated market return fell from 11.1% to 9.6%.

Figure 2. Market return estimates implied by the AER dividend discount model



25 The expected market return implied by equity prices began rising at the start of 2008 and eventually climbed to 14.2% in February 2009. Government bond yields began to decline in the second half of 2008 and have trended lower over the remaining time period for which data is available. This means that the proxy for the AER's estimate of the market return has continued to trend downwards over the remainder of the sample period.

26 The approach of adding either 6.0% or 6.5% to the government bond yield means that, more often than not, the estimated market return actually incorporated into a decision would move in the **opposite direction** as the market cost of equity implied by share prices. There are 53 two month periods from 2006 to 2014 for which we can compute changes in the estimated market return from the dividend discount model, and changes in the market return resulting from our proxy for the AER's decision rule. In 32 out of 53 cases (60% of the time) the change in the market return that would actually flow through to the allowed return would be in the opposite direction to the change in the market return implied by equity prices.

27 The implication is that the AER decision rule does not simply act to mitigate some noise from dividend discount model estimates of the market return. The AER decision rule means that the signal from the equity market regarding the cost of capital is overwhelmed by changes in government bond yields. More than half the time, when the market return implied by the stock market goes up (or down) the market return that actually flows through to the allowed return would go down (or up).

Cost of equity estimates

28 The reason this occurs is that, more often than not, the expected market return implied by equity prices has moved in the opposite direction to the risk free rate.

a. In 34 out of 53 periods the estimated market return from the dividend discount model changes in the **opposite direction** to the risk free rate (64% of the time). But in applying the proxy for the AER's decision rule, in 51 out of 53 periods the expected market return moves in the **same direction** as the risk free rate (96% of the time).

b. Even if we consider the most recent four year period from 2011 to 2014, applying the AER decision rule to estimating the market risk premium means that in all 24 periods the expected market return moves in the same direction as the risk free rate. But if we consider the dividend discount model estimates of the expected market return, in 10 out of 24 cases they move in the same direction as the risk free rate (42% of the time) and in 14 out of 24 cases they move in the opposite direction to the risk free rate (58%).

29 This means that, adopting a decision rule in which the market risk premium is no higher than 6.5% above the risk free rate smothers the signal received from the equity market about required returns. Ultimately, the final estimate of the market return used in a decision moves up and down with government bond yields, despite the evidence from the equity market that the market return does not move up and down with bond yields. In some periods the risk free rate and the market cost of equity move in the same direction; and in other periods the risk free rate and the market cost of equity move in the opposite direction; but the AER's final estimates of the market return will almost always move in the same direction as the risk free rate.

Market cost of equity using the network service providers' decision rule

30 Our proxy for the network service providers' decision rule is represented by the orange line. At the outset it should be noted that the network service providers' decision rule does not, on average, lead to higher market cost of equity estimates than the AER's decision rule. Over the nine year period examined, the average market cost of equity implied by the AER's decision rule is 11.2%, compared to 11.3% implied by the network service providers' decision rule. The averages for the market risk premium estimates are 6.3% and 6.4%, respectively.

31 This means that there is no reason to think that merely using a weighted average to estimate the market risk premium will result in cost of capital estimates that are systematically too high or too low. What changes with the weighted average decision rule is the estimates of the market risk premium at different points in time.

32 The weighted average approach means that, most of the time, the final estimate of the market return will move in the **same direction** as the market cost of equity implied by share prices. This does not always occur, because of the effect of having 50% weight given to historical excess returns, historical real returns and the survey estimate of the market risk premium. But in 43 out of 53 periods (81% of the time) when we have a signal from the equity market that the cost of equity has gone up (or down), the market return estimate incorporated into the decision will also go up (or down).

33 With respect to the relationship with the risk free rate we have the following statistics:

a. Over all 53 periods, there are 29 periods in which the weighted average market return moves in the same direction as the risk free rate (55% of the time) and 24 periods in which the weighted average market return moves in the opposite direction to the risk free rate (45% of the time).

b. Over the most recent four years, there are 15 periods in which the weighted average market return moves in the same direction as the risk free rate (62% of the time) and 9 periods in which the weighted average market return moves in the opposite direction to the risk free rate (38% of the time).

2.1.3 Frontier Economics' dividend discount model estimates

Market cost of equity using the AER's decision rule

34 In the analysis presented above, we relied upon dividend discount model estimates of the market cost of equity using the AER approach. We have a different approach to estimating the market cost of equity using the dividend discount model. We use price targets rather than market prices, individual analyst forecasts rather than consensus forecasts, we ensure that forecasts for earnings, dividends and prices are made at about the same point in time, and we use an approach in which we solve for long term growth rather than impose a growth estimate.

35 The merits of one approach or the other to estimating the market return are not the focus of the current paper. Our focus here is to illustrate what happens to cost of capital estimates when we change the decision rule about how various estimates actually flow through to the allowed return. So in this sub-section we replicate the analysis presented above, but using our estimates of the market return from the dividend discount model.

36 In Figure 3 we present estimates of the expected market return, based upon the dividend discount model estimates from our estimation approach. These dividend discount model estimates of the expected market return are presented

in the red line. More often than not, our dividend discount model estimates of the expected market return move in the same direction as those of the AER. Out of 53 periods for which both estimates are available, the estimates move in the same direction in 35 periods (66% of the time).

37 The grey line represents the estimates of the expected market return that would flow through to a regulatory decision under the decision rule of adding either 6.0% or 6.5% to the government bond yield. This approach leads to a material divergence in the market return implied by equity prices and the market return actually used in decision-making, during the recent falls in government bond yields. Over the four years from 2011 to 2014, on average, the estimated market return implied by share prices is 1.2% above the market return that would form part of the regulatory decision. The largest gap occurs in June 2012 when the estimated market return from the dividend discount model is 12.1%, compared to the risk free rate of 3.0%. This means that the market risk premium implied by equity prices is 9.1% but the market risk premium that would actually be used in a decision is 6.5%.

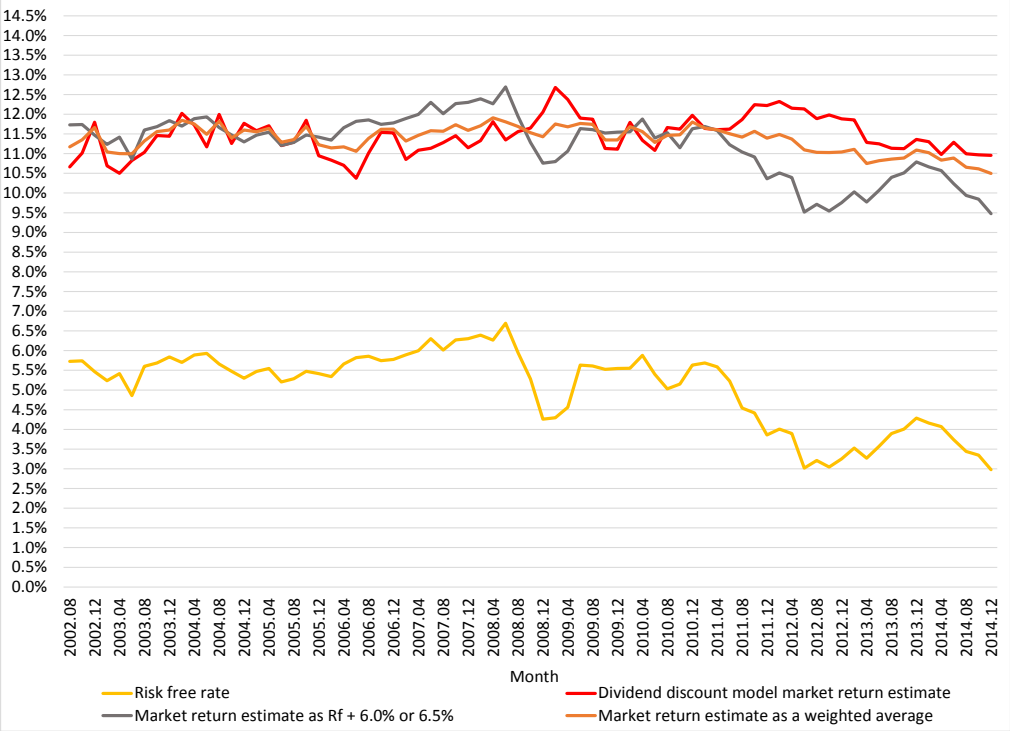
38 Most importantly, the approach of adding either 6.0% or 6.5% to the government bond yield means that changes in the market return actually used in a regulatory decision only move in the same direction as the dividend discount model estimates about half the time. We have 74 two month periods from the second half of 2002 to the end of 2014. Using our proxy for the AER's decision rule, on 37 occasions the dividend discount model estimate of the market return moves in the same direction as the market return used in a decision (50% of the time). In the other 37 occasions, the two market return estimates move in the opposite direction.

39 So regardless of whether we use the AER's dividend discount model approach, or our dividend discount model approach, we have the same basic problem that the AER decision rule overwhelms the signal from the equity market about the cost of capital. In general, the final estimate of the market return will be low when government bond yields are low (for example, 2011 to 2014), and high when government bond yields are high (for example, 2006 to the first half of 2008).

40 The reason this occurs is that, more often than not, the expected market return implied by equity prices has moved in the opposite direction to the risk free rate.

a. In 40 out of 74 periods the estimated market return from the dividend discount model changes in the **opposite direction** to the risk free rate (54% of the time). But in applying the proxy for the AER's decision rule, in 71 out of 74 periods the expected market return moves in the **same direction** as the risk free rate of interest (97% of the time).

Figure 3. Market return estimates implied by the Frontier Economics dividend discount model



b. Even if we consider the most recent four year period from 2011 to 2014, applying the AER approach to estimating the market risk premium means that in all 24 periods the expected market return moves in the same direction as the risk free rate. But if we consider the dividend discount model estimates of the expected market return, in 12 out of 24 cases they move in the same direction as the risk free rate (50% of the time) and in 12 out of 24 cases they move in the opposite direction to the risk free rate (50% of the time).

Market cost of equity using the network service providers' decision rule

41 Our proxy for the network service providers' decision rule is represented by the orange line. We reiterate that computing a weighted average estimate of the market risk premium from different approaches does not systematically lead to higher estimates of the expected market return than the AER decision rule. Over the 12.5 year period examined, on average the market cost of equity implied by the AER decision rule is 11.2%, compared to 11.4% implied by the network service providers' decision rule. The averages for the market risk premium estimates are 6.2% and 6.3%, respectively. So even if we use our dividend discount model approach, there is no reason to think that the weighted average decision rule systematically leads to an overstatement of the cost of capital.

42 What the weighted average decision rule means is that, most of the time, the market return estimate used in the decision will move in the **same direction** as the signal from the equity market. In 56 out of 74 periods (76% of the time) when we have a signal from the equity market that the cost of equity has gone up (or down), the market return estimate incorporated into the allowed return will also go up (or down).

43 With respect to the relationship with the risk free rate we have the following statistics:

a. Over all 74 periods, there are 52 periods in which the weighted average market return moves in the same direction as the risk free rate (70% of the time) and 22 periods in which the weighted average market return moves in the opposite direction to the risk free rate (30% of the time).

b. Over the most recent four years, there are 20 periods in which the weighted average market return moves in the same direction as the risk free rate (83% of the time) and four periods in which the weighted average market return moves in the opposite direction to the risk free rate (17% of the time).

44 This means that if we apply the weighted average decision rule, the market return used in a decision is still, in general, moving in the same direction as the risk free rate. But the final market return estimate is also moving in the same direction as the signal from the equity market. This does not occur using the AER decision rule. Using the AER decision rule, almost all of the movement in the expected market return is determined by movements in government bond yields, and the equity market signal has almost no impact.

2.1.4 Bloomberg's dividend discount model estimates

Market cost of equity using the AER's decision rule

45 We repeated our analysis using estimates of the market risk premium reported by Bloomberg. The Bloomberg estimates of the market return are computed as a market capitalisation weighted average of cost of equity estimates for individual firms. We have adjusted the Bloomberg market return estimates to account for imputation credits by multiplying the long term dividend yield by 0.1929 as described earlier.

46 Bloomberg estimates of the market risk premium are available from the second half of 2008 onwards. The Bloomberg market return estimates are higher than those estimated by the AER. The main reason for this is that Bloomberg allows a longer transition period until long term growth is expected to occur. The Bloomberg estimates of the market return are also more sensitive to equity price changes than those of the AER.

47 Our purpose in this paper is not to make the case that one particular set of dividend discount model estimates of the expected market return should be used. Our purpose is to show that, regardless of whether we use the dividend discount model estimates of the market return based upon the AER approach, our approach, or that of Bloomberg, there are important implications of the decision rule used to reach a conclusion on the market return and market risk premium.

48 In Figure 4 the red line represents Bloomberg estimates of the expected market return from the dividend discount model. The grey line shows how the dividend discount model estimates of the market return would flow through to the final market return estimate from our proxy for the AER's decision rule. In 38 out of 39 periods the Bloomberg implied market risk premium is at least 6.5%, so the final market return estimate is almost always the government bond yield plus 6.5%.

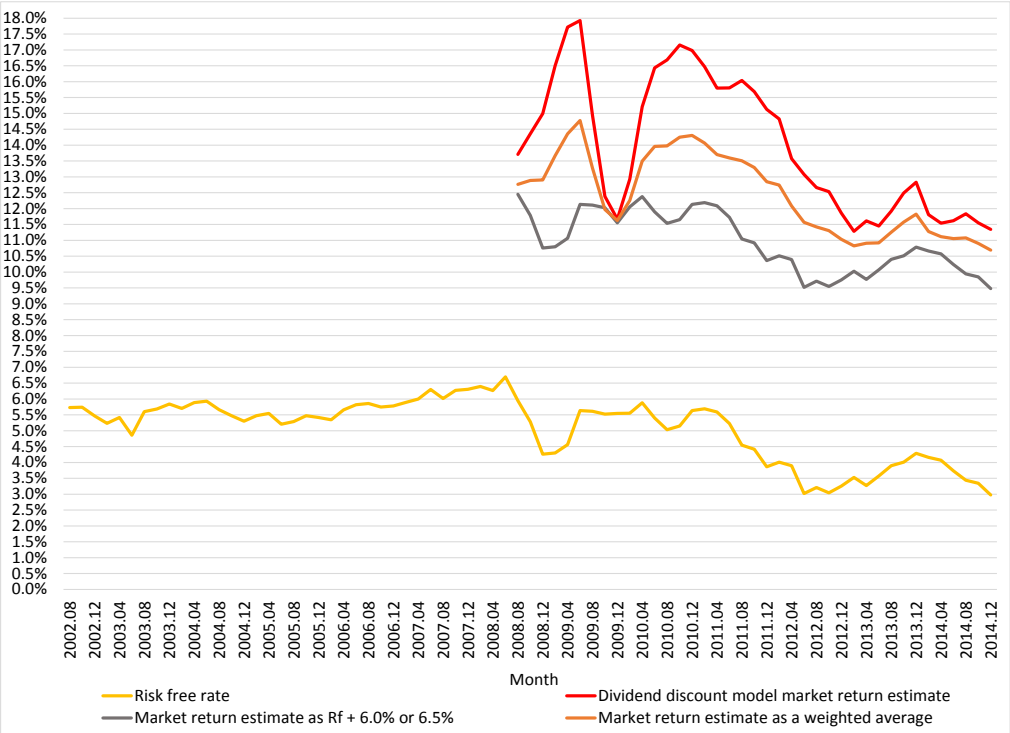
49 This means that, during the global financial crisis the estimate of the expected market return went down when the signal from the equity market was that the cost of capital had increased. Note the sharp divergence between the red and grey lines during 2008.

50 It also means that, over 38 periods of changes in estimates, the final market return estimate moves in the same direction as the Bloomberg market return estimate on 22 occasions (58% of the time). In the other 16 instances, the estimate of the market return that actually flows through to a decision changes in the opposite direction to that implied by equity prices (42% of the time). It remains the case that using the Bloomberg figures, changes in government bond yield overwhelm the signal from the equity market about the cost of capital.

51 As with the earlier analysis, the reason this occurs is because changes in the estimated market return implied by equity prices do not, in general, move in the same direction as the risk free rate.

a. In 17 out of 38 periods the estimated market return from the dividend discount model changes in the **opposite direction** to the risk free rate (45% of the time). But in applying the proxy for the AER's decision rule, in 37 out of 38 periods the expected market return moves in the **same direction** as the risk free rate of (97% of the time).

Figure 4. Market return estimates from Bloomberg adjusted for imputation benefits



b. Even if we consider the most recent four year period from 2011 to 2014, applying the AER approach to estimating the market risk premium means that in all 24 periods the expected market return moves in the same direction as the risk free rate. But if we consider the dividend discount model estimates of the expected market return, in 13 out of 24 cases they move in the same direction as the risk free rate (54% of the time) and in 11 out of 24 cases they move in the opposite direction to the risk free rate (46% of the time).

Market cost of equity using the network service providers' decision rule

52 Our proxy for the network service providers' decision rule is represented by the orange line. Bloomberg makes different assumptions to the AER in applying the dividend discount model, and these assumptions lead to higher estimates of the market return. But the decision rule proposed by the networks does not cause the final estimate of the market return to be above the estimate implied by the AER approach. The decision rule adopted by the networks narrows the gap between the two sets of dividend discount model estimates, and the two sets of final market return estimates.

a. On average from the second half of 2008 to 2014, the Bloomberg estimate of the market return from the dividend discount model is 14.0%.[29] In contrast, the average market return estimate implied by the AER's dividend discount model is 11.8%[30], a difference of 2.1%.

b. When the network service providers' decision rule is applied to reach a final estimate of the market return, the weighted average estimate of the market return is 12.4%.[31] Consideration of historical excess returns, historical real returns, and survey evidence has reduced the estimate of the market return by an average of 1.5%.[32] Had the AER decision rule been applied to the Bloomberg dividend discount model analysis, the average market return estimate over this period would be 10.9%.[33]

53 The impact of the network service providers' decision rule on the Bloomberg market return estimates is substantial. Over the 6.5 years of data, the range of market return estimates from Bloomberg is from 11.3% to 17.9%. But the average market return estimate implied by the four approaches put forward by the networks (historical excess returns, historical real returns, surveys and equity prices) lies within the range of 10.7% to 14.8%.

54 Using the weighted average approach means that, most of the time, the market return estimate used in the decision will move in the **same direction** as the signal from the equity market. In 33 out of 38 periods (87% of the time) when we have a signal from the equity market that the cost of equity has gone up (or down), the market return estimate incorporated into the allowed return will also go up (or down).

55 In contrast, when the AER decision rule is adopted, in 16 out of 38 instances, the final estimate of the market return actually moves in the **opposite direction** to the market return implied by the Bloomberg dividend discount model (42% of the time).

56 With respect to the relationship with the risk free rate we have the following statistics:

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[29] This is the average of the data points shown in the red line of Figure 4.

[30] This is the average of the data points shown in the red line of Figure 2 from the second half of 2008 to 2014.

[31] This is the average of the data points shown in the orange line of Figure 4.

[32] That is, the average market return implied by the Bloomberg dividend discount model is 14.0% but consideration of other information in the weighted average approach lead to an average reduction in the market return of 1.5%, to 12.4%.

[33] This is the average of the data points shown in the grey line of Figure 4.

a. Over all 38 periods, there are 26 periods in which the weighted average market return moves in the same direction as the risk free rate (68% of the time) and 12 periods in which the weighted average market return moves in the opposite direction to the risk free rate (32% of the time).

b. Over the most recent four years, there are 17 periods in which the weighted average market return moves in the same direction as the risk free rate (71% of the time) and seven periods in which the weighted average market return moves in the opposite direction to the risk free rate (29% of the time).

57 The general result we observed with other dividend discount model estimates still holds. If we use the networks' decision rule, the market return actually used in a decision is moving in the same direction as the signal from the equity market. More often than not, it is also moving in the same direction as the risk free rate. But under the AER decision rule, movements in the risk free rate represent the overwhelming determinant of the estimated equity market return.

2.1.5 Summary with respect to the market return

58 In Table 1 we summarise the relationship between dividend discount model estimates of the market return, and the market return that actually results from the two different decision rules. In the upper section of the table we show the average market return implied by equity prices. This is followed by the average market return that would flow through to the allowed return using both the AER's decision rule and the network service providers' decision rule.

59 Then, we shown the proportion of cases in which the final estimate of the market return moves in the same direction as the signal from the equity market. This shows that, regardless of the approach used to compile dividend discount model estimates of the market return, the AER decision rule means that it is basically a coin flip as to whether changes in the equity market signal move in the same direction as the market return actually used in a decision. Using the AER's dividend discount model, and the AER's decision rule, these two estimates of the market return move in the same direction just 40% of the time. In three out of five cases the final estimate of the market return moves in the opposite direction to the market return implied by equity prices.

60 The implication is that changes in government bond yields are the overwhelming determinant of the equity market return using the AER decision rule. Using the network service providers' weighted average decision rule, changes in equity market expectations flow through to the final market return estimate. In four out of every five cases, the market return estimate that would be used in a decision moves in the same direction as the signal from equity prices.

Table 1. Summary of estimates of the expected market return

	AER estimates of market return (1H06-2H14)		SFG estimates of market return (2H02-2H14)		Bloomberg estimates of market return (2H08-2H14)	
	AER 's decision rule	Networks' decision rule	AER's decision rule	Networks' decision rule	AER's decision rule	Networks' decision rule
Average market return implied by equity prices	11.4%		11.5%		14.0%	
Average market return used in a decision	11.2%	11.3%	11.2%	11.4%	10.9%	12.4%
Cases in which the final estimate of Rm moves in the same direction as the signal from the equity market	40% (21/53)	81% (43/53)	50% (37/74)	76% (56/74)	58% (22/38)	87% (33/38)
Cases in which the final estimate of Rm moves in the same direction as the risk free rate	96% (51/53)	55% (29/53)	96% (71/74)	70% (52/74)	97% (37/38)	68% (26/38)

2.2 Cost of equity for a network service provider

2.2.1 Cost of equity estimation approaches

61 In the previous sub-section we documented the implications of six different ways of making an estimate of the market return, comprised of three different approaches to the dividend discount model (the AER approach, our approach, and the Bloomberg approach) and two different decision rules (adding 6.0% or 6.5% to the risk free rate and the weighted average approach). The different market return estimates can be combined with two different approaches to estimating the cost of equity for a network service provider.

a. The AER cost of equity approach, which is to multiply the market risk premium by a beta estimate of 0.7 and adding the risk free rate.

   By way of illustration if the risk free rate was 5.00% and the market risk premium was 6.00% the cost of equity under the AER approach would be 9.2%.[34]

[34] The cost of equity capital is computed as 5.00% + 0.7 × 6.00% = 5.00% + 4.20% = 9.20%.

b. The network service providers' cost of equity approach, which is a weighted average of (1) a cost of equity estimate from the Sharpe-Lintner CAPM, using a beta estimate of 0.82 – to which we have assigned a weight of 12.5%; (2) a cost of equity estimate from the Black CAPM, using a zero beta premium of 3.34% – to which we have assigned a weight of 25.0%; (3) a cost of equity estimate from the Fama-French model, using a beta estimate of 0.78, a size premium ($s \times SMB$) of –0.19% and a book to market premium ($h \times HML$) of 1.15% – to which we have applied a weight of 37.5%; and (4) multiplying the market risk premium by 0.94 and adding the risk free rate, in which the figure of 0.94 was derived from industry dividend discount model analysis over time.

   By way of illustration, if the risk free rate was 5.0% and the market risk premium was 6.0%, the cost of equity under the network service providers' approach would be 10.5%.[35] This represents a premium of 1.3% over the AER approach. It gives a cost of equity that is equivalent to using a beta estimate of 0.92 in the Sharpe-Lintner CAPM.

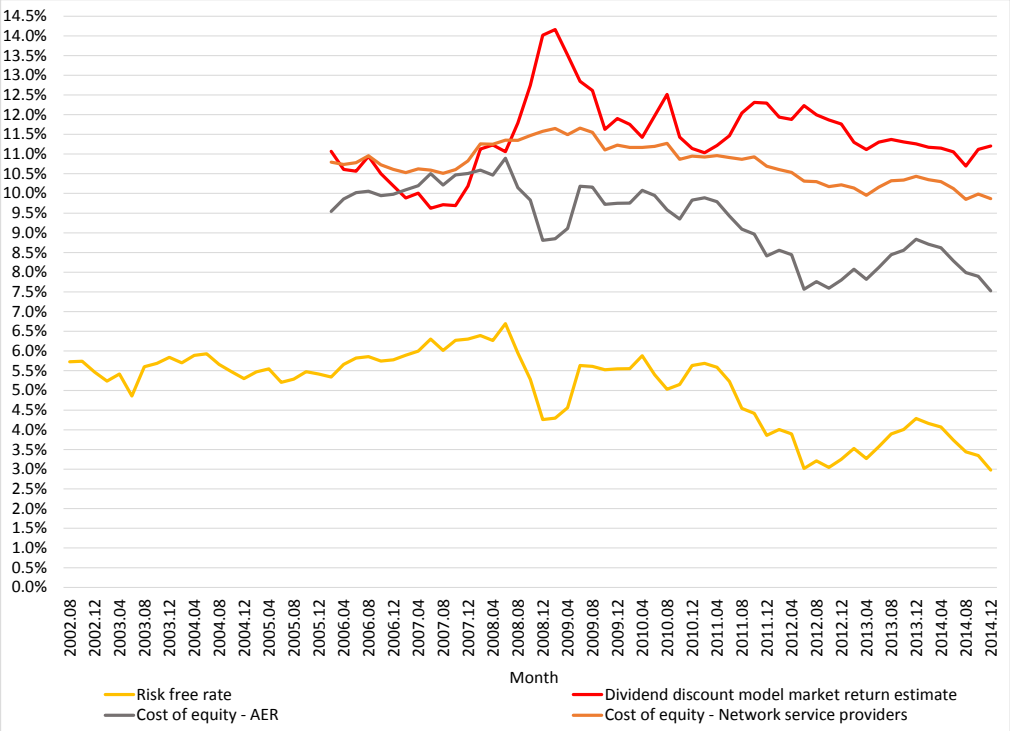
2.2.2 Cost of equity using the AER's dividend discount model

62 In Figure 5 we illustrate the cost of equity estimates that would be generated from the AER's decision rule on the market return and the AER's approach to estimating the cost of equity (the grey line) and the network service providers' decision rule on the market return and the network service providers' approach to estimating the cost of equity (the orange line). In all cases the dividend discount model estimate of the market return is based upon the AER's approach to the dividend discount model (the red line).

63 The figure shows that, using the AER MRP decision rule and cost of equity approach, the cost of equity for the network service provider moves almost in lock step with government bond yields. In 52 out of 53 cases the cost of equity moves in the same direction as government bond yields (98% of the time). But the movements in the red line show that the overall market cost of equity implied by equity prices only moves in the same direction as government bond yields in 19 out of 53 cases (36% of the time).

[35] The cost of equity implied by the Sharpe-Lintner CAPM = 5.00% + 0.82 × 6.00% = 5.00% + 4.92% = 9.92%. The cost of equity implied by the Black CAPM = (5.00% + 3.34%) + 0.82 × (6.00% – 3.34%) = 8.34% + 2.18% = 10.52%. The cost of equity implied by the Fama-French model = 5.00% + 0.78 × 6.00% − 0.19% + 1.15% = 5.00% + 4.68% − 0.19% + 1.15% = 10.64%. The cost of equity implied by the dividend discount model = 5.00% + 0.94 × 6.00% = 5.00% + 5.64% = 10.64%. The weighted average cost of equity estimate = 0.125 × 9.92% + 0.250 × 10.52% + 0.375 × 10.64% + 0.25 × 10.64% = 1.24% + 2.63% + 3.99% + 2.66% = 10.52%.

Figure 5. Cost of equity estimates implied by the AER's dividend discount model



64 Over the last four years, the estimated cost of equity fell from 9.9% in February 2011 to 7.6% in June 2012, rose to 8.8% in December 2013 and then fell again to 7.5% in December 2014. We consider it unlikely that the cost of equity for a network service provider fluctuated to such a degree during this four year period. Clearly, government bond yields varied over the same time period – they were 5.6% in February 2011, 3.0% in June 2012, 4.3% in December 2013 and 3.0% in December 2014. But the AER MRP decision rule and cost of equity approach incorporate the assumption that whatever influences the yields on government bonds has the same influence on the required return to equity investors in an energy network. Yet this is not the implication of share price movements, as captured by the AER's dividend discount model analysis.

65 If we consider the cost of equity implied by energy networks' MRP decision rule and cost of equity approach, the cost of equity has decreased from a peak of 11.7% in December 2009, to 9.9% in December 2014. But we do not observe the same substantial shifts in the cost of equity from one period to the next, based upon fluctuations in government bond yields.

66 What we observe in the cost of equity implied by the energy networks' approach is information from the prices of both government bond yields and listed shares both having an influence on the allowed return to equity holders. When we observed a signal from the equity market that the cost of capital rose substantially then the cost of equity increased, from 10.6% in June 2007 to 11.7% in February 2009. When we observed a signal from the equity market that the cost of capital

had decreased again then the cost of equity also decreased, and at December 2014 it is estimated at 9.9%.

67 Movements in the risk free rate remain part of the computational process for estimating the cost of equity. In 34 out of 53 periods (64% of the time) the cost of equity from the networks' decision rule and approach moves in the same direction as the risk free rate (compared to 52 out of 53 periods under the AER decision rule and approach). But equity prices also matter. In 38 out of 53 periods (72% of the time) the cost of equity from the networks' MRP decision rule and cost of equity approach moves in the same direction as the expected market return from the dividend discount model (compared to 20 out or 53 periods, or 38% of the time, under the AER decision rule and approach).

2.2.3 Cost of equity using Frontier Economics' dividend discount model

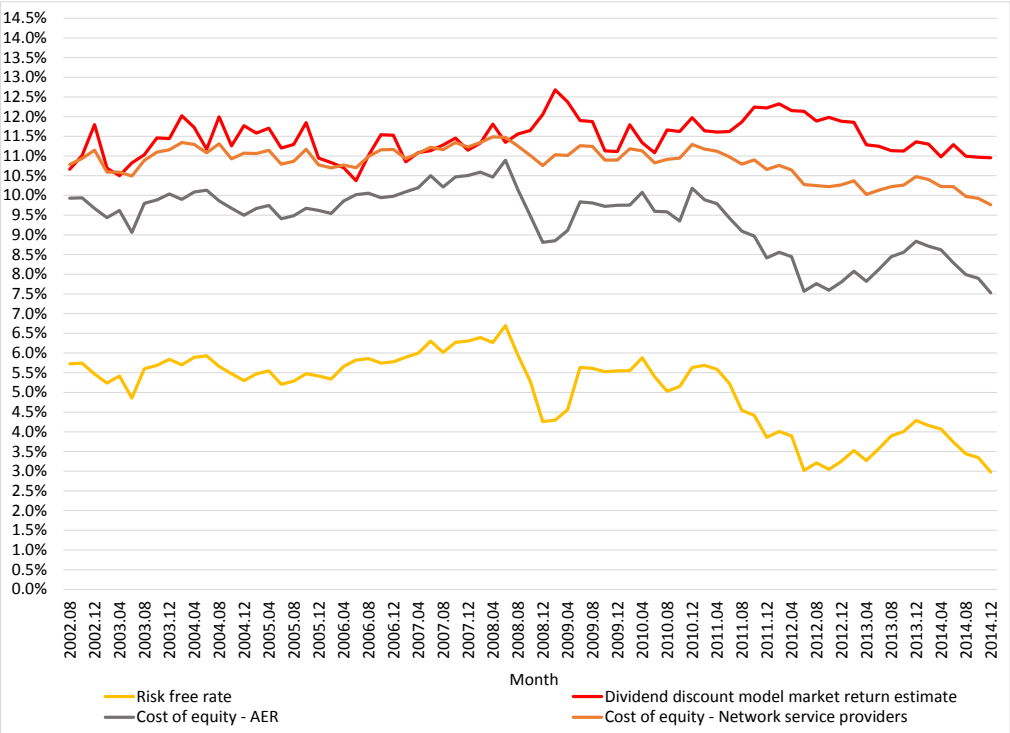
68 In Figure 6 we repeat our analysis using our estimates of the market return using the dividend discount model. The grey line still represents the estimate of the cost of equity that would be generated by the AER's decision rule on the market return and the AER's approach to estimating the cost of equity. The orange line still represents the estimate of the cost of equity that would result from a weighted average estimate of the market return and the network service providers' approach to estimating the cost of equity.

69 Under the AER's MRP decision rule and cost of equity approach, there remains a one-for-one association with government bond yields and the allowed return to equity holders. The implication is that at the most recent government bond yields of 3.0%, the cost of equity is at its lowest point over the 12.5 years for which data is available. This will only be true in a market in which the prices of government bonds move in line with equity prices. But this is not the case, because equity prices relative to earnings and dividend expectations have not moved in line with government bond prices. As discussed earlier, there are some time periods in which the signal from the equity market moves in the same direction as government bond yields, and other times in which the signal from the equity market moves in the opposite direction to government bond yields.

70 Some particular points to note are:

a. Had a regulated energy network been handed a decision in June 2008, when government bond yields were high and equity prices had not yet fallen dramatically, under the AER MRP decision rule and cost of equity approach the cost of equity would have been 10.9%. Using the network service providers' MRP decision rule and cost of equity approach the cost of equity would have been 11.5%.

Figure 6. Cost of equity estimates implied by our dividend discount model



b. Six months later in December 2008, when government bond yields were low and equity prices had fallen, under the AER MRP decision rule and cost of equity approach the cost of equity would have been 8.8%. Using the network service providers' MRP decision rule and cost of equity approach the cost of equity would have been 10.8%. The cost of equity would still have fallen (because in estimating the market return there is still 50% weight on market risk premium estimates implied by historical excess returns, historical real returns and surveys). But we do not observe the sharp collapse in the allowed return implied by the AER MRP decision rule and cost of equity approach.

c. If the same business happened to have a decision handed down in June 2009 the cost of equity under the AER MRP decision rule and cost of equity approach would have been 9.8%, compared to 11.3% under the network service providers' MRP decision rule and cost of equity approach.

d. In December 2010, under the AER MRP decision rule and cost of equity approach the allowed cost of equity would be 10.2%, compared to 11.3% under the network service providers' decision rule and approach.

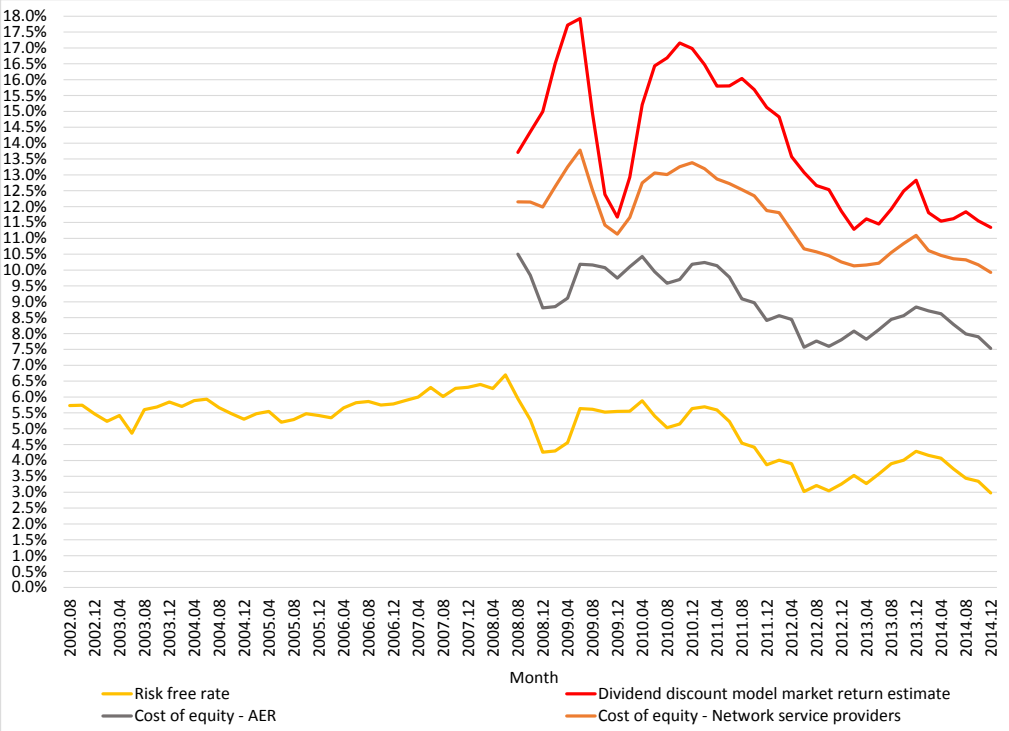
e. Four years later, in December 2014, according to the AER MRP decision rule and cost of equity approach, the cost of equity has

fallen substantially, to 7.5%. This is due to the fall in government bond yields, from 5.6% to 3.0%. So if the discount rate reflected in equity prices follows a very close association with the discount rate reflected in government bonds, this would make sense. But there is no indication from equity prices that this very close association holds. In contrast the cost of equity implied by the network service providers' MRP decision rule and cost of equity approach fell from 11.3% to 9.8%. There is still a 1.5% reduction in the cost of equity over this time period. But the fall is lower because the network service providers' decision rule and approach allows signals from equity prices to flow through to the allowed discount rate.

2.2.4 Cost of equity using Bloomberg's dividend discount model

71 In Figure 7 we repeat our analysis using Bloomberg estimates of the market return using the dividend discount model. The implications remains the same. Using the AER MRP decision rule and cost of equity approach (represented by the grey line) the cost of equity allowed for a network service provider is almost entirely determined by movements in government bond yields. Using the network service providers' MRP decision rule and cost of equity approach the cost of equity is determined by both equity prices (the influence of the red line) and government bond yields (the influence of the yellow line).

Figure 7. Cost of equity estimates implied by the Bloomberg dividend discount model



2.2.5 Summary with respect to the cost of equity

72 In Table 2 we summarise the relationship between dividend discount model estimates of the market return, and the allowed cost of equity that actually results from the two different decision rules for the market return and approaches to estimating the cost of equity. In the upper section of the table we show the average market return implied by equity prices. This is followed by the average cost of equity that would flow through to the allowed return using both the AER's MRP decision rule and cost of equity approach, and the network service providers' MRP decision rule and cost of equity approach.

73 Then, we shown the proportion of cases in which the final estimates of the cost of equity move in the same direction as the signal from the equity market. The table shows that, using the AER decision rule on the market return and the AER cost of equity approach, the movement in government bond yields has the overwhelming impact on movements in allowed returns (the figures of 98%, 97% and 97%). The movement in the allowed return to equity holders is in the same direction as the signal from the equity market about half the time (the figures of 38%, 49% and 58%).

Table 2. Summary of estimates of the allowed cost of equity

	AER estimates of market return (1H06-2H14)		SFG estimates of market return (2H02-2H14)		Bloomberg estimates of market return (2H08-2H14)	
	AER 's decision rule	Networks' decision rule	AER's decision rule	Networks' decision rule	AER's decision rule	Networks' decision rule
Average market return implied by equity prices	11.4%		11.5%		14.0%	
Average allowed cost of equity in a decision	9.3%	10.8%	9.4%	10.8%	9.0%	11.6%
Cases in which the final estimate of Re moves in the same direction as the signal from the equity market	38% (20/53)	72% (38/53)	49% (36/74)	73% (54/74)	58% (22/38)	76% (29/38)
Cases in which the final estimate of Re moves in the same direction as the risk free rate	98% (52/53)	64% (34/53)	97% (72/74)	73% (54/74)	97% (37/38)	79% (30/38)

74 In contrast, under the network service providers' MRP decision rule and cost of equity approach, the table shows that the prices of government bonds and the prices of stocks both have an influence on the allowed return to equity holders. In about three quarters of cases the allowed equity return moves in the same direction as the equity market signal (the figures of 72%, 73% and 76%), and in about three quarters of cases the allowed return moves in the same direction as the risk free rate (the figures of 64%, 73% and 79%).

3 Conclusion

75 In this paper we document what the cost of equity estimates would have been, over an extended period, using different approaches to estimating the market return from equity prices (the dividend discount models), different ways this market return estimate could be factored into a decision (the MRP decision rules), and different ways of arriving at a final estimate of the cost of equity for a network service provider (the cost of equity approaches).

76 We adopted a proxy for the AER's decision rule on the market return, which is to add either 6.0% or 6.5% to the yield on 10 year government bonds, depending on the magnitude of the market risk premium implied by equity prices. This is the best decision rule we can adopt using the information available to us. It is consistent with all draft and final decisions, and guideline documents, of which we are aware, from 2008 onwards. While the AER states that it incorporates other information into its decision on the market risk premium (dividend yields, bond spreads and implied volatility), we do not know how this would affect the AER's MRP decision rule. The comparison estimate of the expected market return is based upon a weighted average of four market risk premium estimates, which has been advocated by network service providers'.

77 The clear indication from this analysis is that, under the AER MRP decision rule and cost of equity approach, all that really matters for estimating the cost of equity over time is movements in the government bond yield. This would generate reliable estimates of the cost of equity if, in fact, the cost of equity implied by stock prices moved in the same direction as government bond yields. But this is not the case. Under all three dividend discount model approaches – that of the AER, us, and Bloomberg – there is not a one-for-one relationship between movements in government bond yields and the cost of equity. Sometimes the risk free rate and the market return move in the same direction; sometimes they move in the opposite direction.

78 Our view is that both government bond yields and equity prices should both be influential in estimating the allowed equity return to a network service provider. Under the network service providers' decision rule on the market return, and cost of equity approach, this is the case. Using the weighted average approach, most of the time the final estimate of the cost of equity will move in the same direction as the signal from the equity market; and most of the time the final estimate of the cost of equity will move in the same direction as government bond yields.

79 In contrast, under the AER MRP decision rule and cost of equity approach, if government bond yields fall then allowed returns fall; and if government bond yields rise then allowed returns rise. Allowed returns move in the same direction as the signal from the equity market only about half the time. This means that if one business happens to have a decision handed down when government bond

yields are low, then that business earns a low return (even if equity prices suggest the cost of capital is high); and if another business happens to have a decision handed down when government bond yields are high, then that business earns a high return (even if equity prices suggest that the cost of capita is low).

80 Our view is that movements in government bond yields have an unreasonably high impact on movements in allowed returns, because of the AER decision rule on the market risk premium. This can be alleviated by adopting the alternative decision rule that has been proposed by network service providers, which is simply to take a weighted average of market risk premium estimates from different approaches. Market risk premium estimates using these approaches have already been compiled by the AER and by network service providers.

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Frontier Economics Pty Ltd 395 Collins Street Melbourne Victoria 3000
Tel: +61 (0)3 9620 4488 Fax: +61 (0)3 9620 4499 www.frontier-economics.com.au
ACN: 087 553 124 ABN: 13 087 553 124