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A calibrated dividend growth estimate of the market risk premium

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1 Overview

1. This paper performs three key functions:

   a It provides a brief history of how the AER has used DGM evidence to inform its estimates of the MRP, with a particular focus on the problems raised by the AER in its 2018 review;

   b It explains how our proposed calibrated DGM addresses the problems raised by the AER in 2018, it provides some details about how our approach is implemented and estimated, and it demonstrates the robustness of the resulting estimates; and

   c It sets out two tests that we think should be applied in determining the merits of any specific specification of the DGM that is considered by the AER.

2 A brief regulatory history of DGM estimates of the MRP

2.1 The AER's 2013 Rate of Return Guideline

2. In its 2013 Guideline materials, the AER stated that the DGM:

   a Has a strong theoretical basis;

   b Provides an estimate of the forward-looking MRP, commensurate with the prevailing conditions in financial markets (in contrast to a long-run historical average); and

   c Is appropriate for use in the regulatory setting, being already commonly used by other regulators.

3. The AER's 2013 Guideline materials stated that:

   DGMs are recognised financial models that are commonly used in practice[1]

   and that:

   DGM estimates have strong theoretical grounding and are more likely to reflect prevailing market conditions than other approaches[2]

   and that:

   DGMs are suited to the estimation of the rate of return from current market information, as demonstrated by US regulators using them for this purpose.[3]

4. Consequently, in the 2013 Guideline review, the AER considered the evidence in relation to the DGM in considerable detail. The AER noted the benefits of DGM evidence (summarised above) but also identified a number of "issues in applying the models."[4] For example, the AER stated that:

   …the outcomes are sensitive to the model assumptions, especially the assumed long term growth in dividends and the transition from current dividends to the long term growth path.[5]

5. This led the AER to weigh up the strengths and weaknesses of the various different DGM specifications and to develop its own preferred specification that it considered to be robust enough to receive more weight:

   In the past our starting point for DGM estimates of the MRP has been the specifications presented to us by the regulated businesses. Of which, there have been various specifications

[1] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

[2] AER, 2013, Rate of Return Guideline: Explanatory Statement, Appendices, p. 85.

[3] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

[4] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

[5] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

over time. These specifications have differed from decision to decision. In conducting our analysis, our approach has been to adjust these estimates to reflect our consideration of the evidence.

In this guideline process we have taken a different, bottom-up approach. We have considered the available evidence on the DGM and proposed our preferred construction of the model. We have consulted with stakeholders on our preferred construction and engaged consultants to review our proposal. As a result, in this explanatory statement we propose our preferred DGM estimates. Consequently, we have greater confidence in the symmetry of this information through time and give these estimates greater consideration than we have in the past.[6]

6. In setting out its preferred specification of the DGM, the AER recognised that:

   a The DGM might be estimated at different times during the year; and

   b Dividends are paid throughout a year, not in a lump sum at the end of each year.

7. This led the AER to adopt a specific implementation as follows: [7]

$$P_C = \frac{m \times E(D_C)}{(1+k)^{\frac{m}{2}}} + \sum_{t=1}^{N} \frac{E(D_t)}{(1+k)^{m+t-0.5}} + \frac{\frac{E(D_N)(1+g)}{k-g}}{(1+k)^{m+N-0.5}}$$

where:

- P_C is the current price of equity;
- $E(D_C)$ is the current expectation of dividends per share for the current financial year;
- $E(D_t)$ is the current expectation of dividends per share for the financial year t years after the current financial year;
- m is the fraction of the current financial year remaining, expressed as a decimal point;
- N is the time period after which dividend growth reverts to its long-term rate (for the two-stage model, $N = 2$, for the three-stage model $N = 9$);
- g is the long-term growth rate in nominal dividends per share; and
- k is the discount rate—that is, the return on equity. [8]

8. The AER also noted that dividends must be 'grossed up' to reflect the assumed value of dividend imputation franking credits:[9]

$$D_{Grossed-up} = D_{Cash}\left(1 + \frac{T}{1-T} \times \eta \times \theta\right)$$

where:

- T is the corporate tax rate, so $\frac{T}{1-T}$ is the amount of credits attached to every dollar of fully-franked cash dividends;

[6] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

[7] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 116.

[8] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 116.

[9] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 117.

- η is the proportion of dividends that are franked; and
- θ is the assumed value of every dollar of franking credits.

9. Having set out this preferred specification, the AER then explained that it would give:

> *significant consideration to DGM estimates of the MRP*[10]

alongside the HER evidence.

2.2 The AER's 2018 Rate of Return Instrument

10. In its draft 2018 Rate of Return Instrument, the AER proposed a material change in view of DGM evidence. The AER's proposed new approach was to first construct a preliminary estimate of the MRP based exclusively on the long-run average of historical excess returns, and to then consider whether any other evidence (including DGM estimates) warranted any revision to the preliminary estimate. The AER concluded, in both its draft and final instruments, that no other evidence warranted any revision and the MRP was set equal to the AER's preferred (HER) estimate of long-run average historical excess returns.

11. For example, the AER explained in its Draft Explanatory Statement that:

> *Having reviewed submissions, the expert evidence session and further analysis, our view is to not move the market risk premium estimate based on DGM. We acknowledge that this places less reliance on the DGM than the 2013 Guidelines. This is because since 2013 our concerns about biases of the model and the divergent results from alternative versions of the model have increased.*[11]

12. In its 2018 Final Decision, the AER drew specific attention to two concerns about the implementation of the DGM:

    a The selection of an appropriate long-run growth rate:

    > *There are numerous issues surrounding the estimation of dividend growth rates selection and there is a wide variety of potentially acceptable growth rates which could be used in the DGM;*[12]

    and

    b The potential for an upward bias in consensus analyst dividend forecasts:

    > *Analyst forecasts are an essential component of the DGM. However, upward bias in analyst forecasts is well-acknowledged. This impacts the credibility and accuracy of such data.*[13]

13. The AER confirmed the centrality of these two issues – estimation of the long-run growth rate and the potential for a systematic upward bias – in a more recent summary of its 2018 approach:

> *We acknowledge that the Dividend Growth Models can be used to inform the MRP, but we are aware of, and are concerned about the limitations of using this model. In the 2018 rate of return*

[10] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[11] AER, 2018, Draft Rate of Return Instrument, Explanatory Statement, p. 119.

[12] AER, 2018, Rate of Return Instrument, Explanatory Statement, p. 92.

[13] AER, 2018, Rate of Return Instrument, Explanatory Statement, p. 92.

review, we have identified precision, accuracy and bias issues that detract from its potential use in a regulatory setting.

A significant issue surrounding DGMs is that they are highly sensitive to input assumptions regarding short and long-term dividend growth rates. There are a wide range of potential dividend growth rates deemed appropriate for use in the DGM, which provide an equally wide range of results.

We have also previously noted that the DGMs could be upwardly biased.[14]

14. In summary, between its 2013 and 2018 reviews, due to the two key AER concerns above, the AER's approach changed from:

    a Using the DGM evidence alongside the HER evidence to form a combined range from which the MRP point estimate was selected; to

    b Adopting an MRP point estimate that was not influenced by the DGM evidence in any way.

2.3 The consultation process for the AER's 2022 Rate of Return Instrument

15. Throughout the consultation process for the 2022 RoRI, the AER has commissioned a number of consultant reports that have advised on the importance of considering DGM evidence – that being the only available estimate that is conditional on prevailing market conditions (i.e., an estimate of the 'conditional MRP').

16. For example, Brattle has advised the AER that:

    The CAPM using a historical MRP relies on backward-looking information, while the Dividend Growth Model (DGM) uses forward-looking information. During periods of changes in financial markets, it becomes important to consider both historical (stable) and forward-looking (contemporaneous) information. [15]

17. And also that:

    Thus, these models look at different parts of the total information available in the market and contribute different insights. The DGM is predominantly forward-looking and the CAPM (with a historic MRP) relies predominantly on historic data that are used to infer the expected return. Both contribute to the understanding of investors required return but from different angles.[16]

18. Similarly, CEPA has advised the AER that the DGM approach is widely used by comparable regulators and that it produces a forward-looking estimate of the MRP, concluding that:

    Our assessment is that (i) there is acceptance that MRP is not stable and (ii) it is possible that there is an inverse relationship between the forward looking MRP and the RfR, and (iii) there is no good evidence that the MRP should be assumed to be independent of the RfR, the current

[14] AER, July 2021, Equity Omnibus paper, pp. 25-26.

[15] Brattle, June 2020, *A review of international approaches to regulated rates of return*, p. 35.

[16] Brattle, June 2020, *A review of international approaches to regulated rates of return*, pp. 59-60.

> *implicit assumption of the AER's approach, and (iv) there is no conclusive theoretical basis for an assumption of independence or dependence.*[17]

19. The AER has recognised this advice as part of its 2022 RoRI consultation process:

> *In the International regulatory approaches to rate of return working paper, we have received expert advice from the Brattle Group that the dividend growth model could be used to estimate a more forward looking MRP. Brattle's report also identified other regulators that used the dividend growth models to estimate the MRP.*[18]

20. And the AER has sought comment on the approach that it might best adopt for using DGM evidence to inform its estimate of the MRP.

> *We are interested in stakeholders' proposals on whether and how our estimate of the MRP could be improved by employing dividend growth models. We have not formed a view on this topic and would like to hear specific proposals on whether the dividend growth model can be made suitable for our MRP estimation.*[19]

21. It is within this context that the ENA has proposed the 'calibrated DGM' approach that is set out in the remainder of this paper.

[17] CEPA, June 2021, *Relationship between RFR and MRP*, p. 4.

[18] AER, July 2021, *Equity Omnibus*, p. 24.

[19] AER, July 2021, *Equity Omnibus*, p. 25.

3 The calibrated DGM approach

3.1 Issues to be addressed

22. The previous section notes that the AER has documented two key concerns about the DGM evidence:

    a There is no single objective means for determining the long-run perpetuity growth rate, and estimates are sensitive to the choice of growth rate; and

    b There are concerns that the DGM approach might produce estimates that are systematically upwardly biased – higher, on average, than observed MRP outcomes.

23. We have sought to construct a version of the DGM that addresses both of these concerns. This is done by selecting the unique long-run growth figure that results in the average DGM estimate over an historical period equalling the observed historical excess returns (HER) estimate over that same historical period. That is, we select the long-run growth figure to ensure that there is an equality between:

    a The average MRP produced by the DGM approach over an historical period; and

    b The average observed MRP (the HER estimate) over that same historical period.

24. This approach addresses both of the above concerns because:

    a The long-run growth rate is no longer an exogenous input to the model, but is determined endogenously as part of the estimation process; and

    b Any systematic bias (such that the average DGM estimate differs from the corresponding HER estimate) is eliminated by the calibration process.

3.2 The statistical basis of the calibrated DGM approach

25. The calibrated DGM approach is based on the Law of Iterated Expectations.

    a The DGM estimate of the MRP is a conditional estimate – being conditional on the market information available at the time of the estimate. It can be written as $E[MRP_t|I_t]$ where I_t represents the information set available at time t; and

    b The HER estimate of the MRP is an unconditional estimate – being a long-run average over a whole range of different market conditions. It can be written as $E[MRP]$.

26. The Law of Iterated Expectations holds that the expected value (average) of the conditional estimates equals the unconditional estimate:

$$E\big[E[MRP_t|I_t]\big] = E[MRP].$$

27. Thus, the average of the (conditional) DGM estimates should equal the (unconditional average) HER estimate over a period that is long enough to produce reliable estimates of the unconditional MRP.

3.3 A brief overview of the calibrated DGM approach

28. The calibrated DGM estimate is constructed in the following manner:

    a We start with the AER's preferred specification of the three-stage DGM;

    b We adopt the same consensus dividend forecasts (obtained from Bloomberg) and timing conventions as the AER has used in its decisions since 2013;

    c We adopt the AER's 2018 estimate of theta, and make the same adjustment for imputation credits that the AER has used in its past decisions; and

    d We then solve for the (unique) long-run growth rate that equates the mean DGM estimate over the historical period beginning in 1988 with the AER's preferred estimate of the historical average MRP over the same period.

3.4 Selection of the historical period and HER estimate

29. The analysis in this paper is centred around the historical period from 1988 to 2021. We focus on the period beginning in 1988 because that period received the greatest prominence in the AER's 2018 RoRI. In particular, in its 2018 materials, the AER stated that:

> *We have calculated HER over multiple time periods including both 100 year and 30 year periods. However, we consider data from the most recent period is the most relevant to our estimation of a forward looking MRP as it is most representative of recent market trends including the introduction of imputation credits and higher levels of integration with international markets.* [20]

30. The 2018 RoRI noted that the most recent period – from 1988 to 2017 – generated a mean estimate of 6.1% at that time:

> *The most recent, 30 year, period produces an estimate of 6.1 per cent and is most likely to reflect current prevailing conditions.* [21]

31. The AER then concluded that:

> *We derive a point estimate of 6.1 per cent from HER evidence.* [22]

32. We have updated the HER estimate using the same approach followed by the AER to now include data from 1988 to 2021. Adopting the same approach as applied by the AER in 2018, and updating the data through to the end of 2021, produces an HER estimate of 6.51%. Thus, the DGM is calibrated to ensure that it produces an average MRP estimate (over the 1988 to 2021 period) of 6.51%.

33. It is important to note two points:

    a Firstly, it is important that the averaging period applied to obtain an HER estimate is sufficiently long to derive a reliable estimate of the unconditional MRP. That is, the averaging period should be long enough to encompass a wide enough range of possible market conditions such that the resulting HER estimate can be interpreted as a truly

[20] AER, December 2018, *Final Rate of Return Instrument: Explanatory Statement*, pp. 90-91.

[21] AER, December 2018, *Final Rate of Return Instrument: Explanatory Statement*, p. 94.

[22] AER, December 2018, *Final Rate of Return Instrument: Explanatory Statement*, p. 94.

unconditional estimate of the MRP. In our view, the averaging period used should be at least 30 years.

b Secondly, it is important that historical period over which the DGM is calibrated is the same historical period used to estimate the HER estimate of the MRP. The purpose of the calibration exercise is to ensure that, on average, the DGM (i.e., conditional) estimates of the MRP are equal to the HER (i.e., unconditional) estimate of the MRP used by the AER. This is necessary to ensure that the DGM estimates are unbiased (i.e., the average of the conditional estimates of the MRP is equal to the unconditional estimate of the MRP). Hence, it would not be appropriate, for instance, to solve for the long-term growth rate g that equalises the monthly DGM estimates over the period 1996 to 2022 to the HER MRP estimate derived using excess returns over the period 1988 to 2022. Doing so would not ensure the DGM estimates are unbiased.

3.5 Compilation of index and dividend forecast data

34. Our approach is based on the AER's preferred specification of the DGM. Under that approach, the data required for each of the monthly DGM estimates consists of the current value of a broad stock market index and consensus forecasts of the total amount of dividends to be paid on that index over the current year and each of the two subsequent years. We compile this information for different sub-periods, depending on data availability, as set out below.

March 2006 – December 2021: Bloomberg analyst forecasts

35. For the 2006 to 2021 period, we obtain information about the prevailing level of the ASX200 index and consensus dividend forecasts for that index from Bloomberg. For this period, we follow the approach that the AER has adopted since setting out its preferred specification in 2013.[23]

January 1996 – February 2006: Refinitiv analyst forecasts

36. Since the Bloomberg data is only available from March 2006, we construct our own market index and dividend forecast data for earlier periods.

37. For the period January 1996 to February 2006, we use the Refinitiv data service to construct a broad stock market index and the consensus analyst dividend forecasts for that index. The Refinitiv data service contains information about the price, market capitalisation, and consensus dividend forecasts for each stock on the ASX.

38. Our first step is to identify the constituents of a broad market index. We do this in two stages:

    a From September 2000 we are able to identify the ASX200 constituents directly using Refinitiv; and

    b Prior to September 2000 we construct a market index by identifying the 200 largest firms at the end of the previous month by market capitalisation as reported by Refinitiv.

39. For each month, we then obtain the daily price, market capitalisation, and dividend forecast data for every company that was identified in the first step as being in the market index for that month. For each of these variables, we take the average of the daily observations over each month.

[23] Within each month, we average over all days for which all three dividend forecasts and the price index are available.

40. We note that Refinitiv reports five series of analyst dividend forecasts labelled DPS0, DPS1, DPS2, DPS3 and DPS4 along with information about the time periods to which each forecast pertains. Because the time horizons of the forecast series do not align with calendar years (as required for the AER's preferred DGM specification) we reconstruct one-year ahead, two-ahead and three-year ahead dividend forecasts on a calendar year basis.

41. For each stock, and for each month, we then compute three years of dividend yield forecasts by dividing the forecast by the average price over that month. To eliminate outliers, we removed any company with a yield exceeding the 96th percentile for either the one-year ahead, two-ahead and three-year ahead dividend yield forecasts.

42. The dividend yield for the market index is then calculated by weighting the dividend yield for each stock by its market capitalisation as at the end of the previous month.[24]

January 1988 – December 1995: Modelled analyst forecasts

43. Refinitiv analyst dividend forecasts are only available from January 1996. Consequently, for the period January 1988 to December 1995 we rely on actual dividends of ASX200 firms to form fitted values of analyst forecast dividend yields.

44. Using Share Price and Price Relative (SPPR) data obtained from the Centre for Research in Finance (CRIF) at UNSW, we obtain month-end prices, market capitalisations and dividend pay-outs for all firms listed on the ASX between January 1988 and December 2007,

45. For each month we determine the largest 200 stocks by month-end market capitalisation, taking that as our broad market index. We then observe the actual dividend pay-outs of each of those companies over the following calendar year. Any stock that is de-listed during that following calendar year is omitted from the analysis. For the remaining stocks, we weight by market capitalisation to obtain the observed market index yield from dividends over the following calendar year.

46. We then use data from the Refinitiv and Bloomberg datasets to fit the following regression model:

$$dy_{forecast,t} = \beta_0 + \beta_1 dy_{actual,t} + \beta_2 r_{f,t} + \epsilon_t$$

where:

- $dy_{forecast,t}$ is the forecasted dividend yield over the following calendar year;
- $dy_{actual,t}$ is the yield from actual dividends paid over the following calendar year; and
- $r_{f,t}$ is the yield on 10-year government bonds at the time of the forecast.

47. That is, we try to predict the analyst forecast given information about the government bond yield at the time of the forecast and information about the actual dividends that were paid over the forecast period.

[24] The three calendar year ahead forecast series was deemed to be unreliable until May 1998 and is not used either in the DGM or in the back-casting as set out later in this section. Instead, the fitted third year forecasts are applied for this period.

48. We parameterise this model using Refinitiv data from 1996 to 2006. For that period, we have consensus analyst forecasts from Refinitiv as well as actual dividends paid. Our model accurately predicts analyst forecasts, the R-squared statistic being in excess of 98%.

49. We then apply this fitted model to the earlier period to produce a series of estimates of what the consensus analyst forecast would have been if it had been available for this earlier period. The sensitivity analysis below demonstrates that our current MRP estimates are robust to this 'back-casting' approach to modelling forecasted dividends.

50. We repeat the same process for dividends in the second and third future calendar years.

3.6 DGM model features

51. We adopt the three-stage dividend growth model set out in the AER's 2013 Rate of Return Guideline. The only difference is that instead of using a long-term growth rate of 4.6% we allow the growth rate g to be determined endogenously.

52. In this section, we provide a brief overview of how the model derives the MRP for a month, given the one, two and three year forecast yields, the long-term growth rate g, the risk-free rate, and parameters related imputation credits.

53. The model seeks to find the required return on equity that equates the discounted value of the stream of future dividend payments to the current 'price' of the broad stock market index. This can be written as:

$$P_0 = \frac{E[D_1]}{(1+r)^1} + \frac{E[D_2]}{(1+r)^2} + \frac{E[D_3]}{(1+r)^3} + \cdots$$

54. Dividing throughout by the current price gives an equivalent expression in terms of dividend yields:

$$1 = \frac{\frac{E[D_1]}{P_0}}{(1+r)^1} + \frac{\frac{E[D_2]}{P_0}}{(1+r)^2} + \frac{\frac{E[D_3]}{P_0}}{(1+r)^3} + \cdots = \frac{dy_1}{(1+r)^1} + \frac{dy_2}{(1+r)^2} + \frac{dy_3}{(1+r)^3} + \cdots$$

55. Thus, the raw data can be provided in terms of the current index level and dividend forecasts or in terms of dividend yield forecasts.

56. While forecasts of the dividends for the first three years are provided, dividends from year four onwards must be inferred, based on a prescribed pattern of growth. Observing the forecast growth between years one and three, there is a linear transition from that growth rate to the long-term growth rate g that will apply from year ten onwards. That is, if the annual growth from years one to three were 10%, and g were 5%, the growth from year three to year four would be 9.375%, the growth from year four to five would be 8.75% and so on.

57. Adjustments are then made for the value of imputation credits associated with the dividend payments, based on the distribution and utilisation rate according to the 2018 RORI and the statutory tax rate.

58. The discounted value of the dividends to be paid over the first ten years, and the perpetuity that applies from then on, are then derived using a candidate cost of equity.[25] If the net present value

[25] Adjustments are also made reflecting that dividend payments have been specified in calendar year terms, for example that only one twelfth of the first calendar year dividend is expected to be received by the stock holder as at December – most has already been paid.

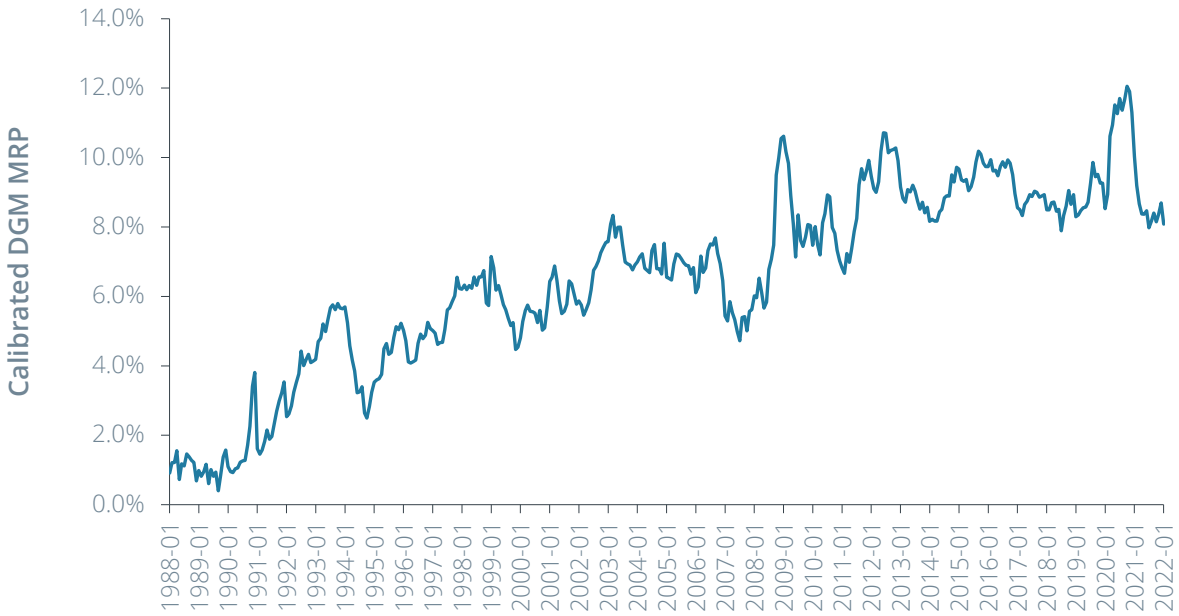
is equal to the price, then we have solved for the cost of equity that reconciles the price with expectations of future dividends. If not, the cost of equity must be raised (if the price is lower than the NPV) or lowered (if the price is higher than the NPV). Finally, the MRP estimate is derived by subtracting the contemporaneous risk-free rate from the estimate of the required return on equity.

3.7 Calibration results

59. Having identified an appropriate HER estimate of 6.51% over the period 1988-2021, we determine the unique long-term growth rate g that produces an average MRP of 6.51% over the period January 1988 – December 2021 when used in the DGM model outlined in section 3.6. We start with an initial candidate g, for example 4.6%. If the average DGM MRP is higher than 6.51%, we must decrease the MRP by reducing g: a higher g leads to higher dividend payments in the DGM and therefore a higher cost of equity and MRP to equate the NPV of dividend payments with the price.

60. This approach produces the MRP series presented in **Figure 1** below.

Figure 1: Calibrated DGM MRP



Source: Frontier Economics analysis of BVAL, Refinitive, SPPR and RBA data.

61. This approach produces an average of 6.51% over the period January 1988 – December 2021.

3.8 Calibration sensitivity

62. In this section, we consider the sensitivity of the calibrated DGM MRP to the back-cast approach used to construct dividend forecasts for 1988-1995, and to the assumption of a constant long-term growth rate g.

3.8.1 Back-cast approach

63. We note that our calibration approach requires a back-casting exercise to obtain estimates of the forecasts of future dividends that would have been provided by analysts at that time. To test the sensitivity of our estimates to the back-casting approach, we perform a sensitivity analysis by using two different approaches for obtaining dividend forecasts for the 1996-2009 period. For that period, we have data that enables us to obtain dividend forecasts in two ways:

    a Forecasts of future dividends are taken directly from consensus analyst forecasts; and

    b Forecasts of future dividends are constructed from our back-casting approach whereby the forecast is modelled as a function of the contemporaneous risk-free rate and subsequent observed dividends.

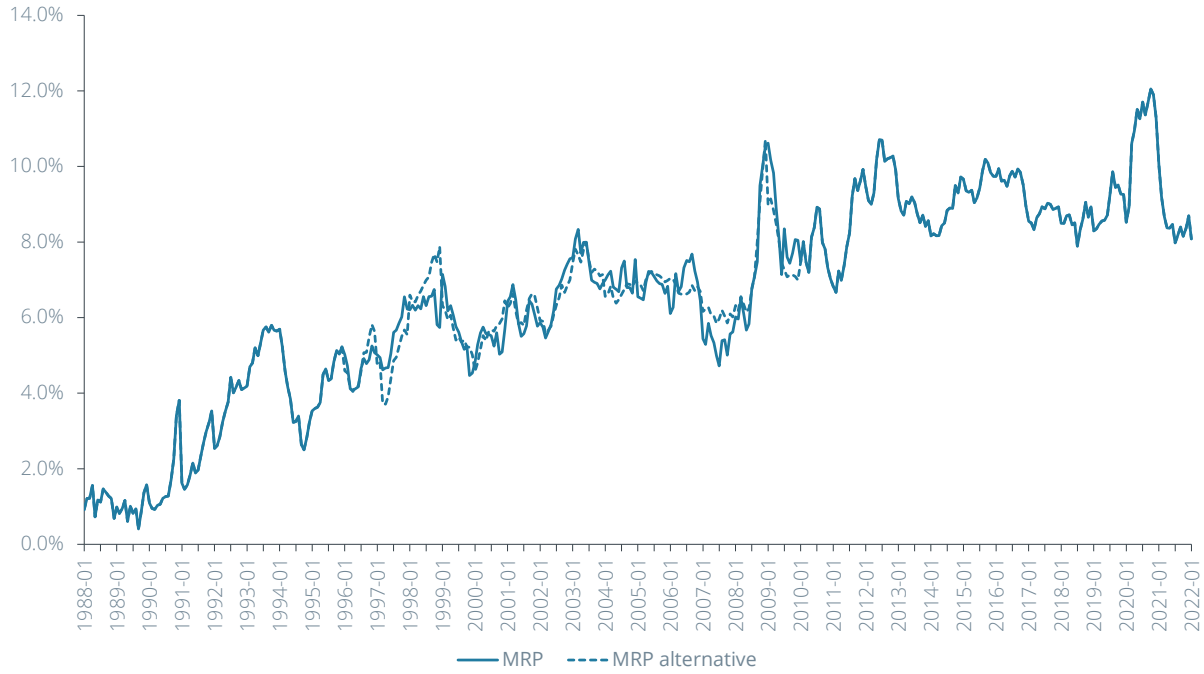
64. The results of using these two different approaches to determine dividend forecasts are shown in **Figure 2** below. That figure shows that:

    a The two approaches produce estimates that are indistinguishable for the 1988-1995 and 2010-2021 periods. This is because the mean MRP estimates over the 1996-2009 periods are not materially different. That is, although there is some divergence in the month-to-month estimates over the period 1996-2009, the mean estimate over that period is not materially different under the two approaches, such that the MRP estimates for other periods are unaffected; and

    b The two approaches produce broadly similar MRP estimates for each month over 1996-2009 period.

65. Of course, when performing the calibration we have direct estimates of consensus dividend forecasts available from 1996 and we use those direct estimates in our analysis. Our back-casting is only applied to data from 1988-1995. Our current estimates of MRP are sensitive only to the mean estimate from this earlier period, not to any month-to-month variation in estimates during that period. The sensitivity analysis performed above provides some confidence that the back-casting approach produces reasonable estimates of the mean MRP over such a period. Thus, we conclude that our current estimates of the MRP are robust to the back-casting exercise.

Figure 2: Sensitivity to the back-cast approach



Source: Frontier Economics analysis of BVAL, Refinitive, SPPR and RBA data.

3.8.2 Constant long-term growth rate

66. We have noted above that our calibrated DGM model is based on the AER's preferred three-stage DGM specification. This requires an estimate of the annual growth rate of dividends that applies from year 11 and onwards in perpetuity. The AER's base case specification ties this long-run perpetual growth rate to the long-run growth rate in the broad economy (GDP growth). The AER's approach has been to adopt the same long-run perpetual growth rate regardless of the current state of the economy from time to time. We consider this approach to be sensible and reasonable – the current state of the economy is unlikely to have any bearing on the long-run perpetuity estimate of growth. For example, the fact that economic growth might have been low in the current quarter does not lead to a downward revision of average economic growth for the perpetual future starting in year 11. Rather, periods of high and low growth cycle through time but have little impact on the best estimate of very long-run growth in perpetuity. For this reason, our base case estimates use a single long-term growth rate that applies to all months used in the calibration exercise.

67. To our knowledge, there is no data source that contains long-term perpetuity forecasts of dividend growth. However, there are forecasts available of very long-term nominal GDP growth. Such forecasts are jointly compiled by the Commonwealth Treasury and Reserve Bank of Australia and are published in the Intergenerational Reports (IGRs) commissioned by the Commonwealth Government from time to time. **Table 1** below present the forecasts of nominal GDP growth from the three IGRs that have been produced to date.

Table 1: Intergenerational Report Nominal GDP growth forecasts

Year	2002	2010	2021
10 to 20	4.8%	5.2%	5.4%
20 to 30	4.5%	5.1%	5.0%
30 to 40	4.4%	5.0%	4.8%

Source: Frontier Economics analysis of Intergenerational Reports. Forecasts for 2010 apply midpoint inflation to real GDP forecasts.

68. **Table 1** has a number of interesting features:

    a The nominal GDP growth forecasts are uniformly higher in 2021 than in 2002. That is, Treasury and the RBA increased their forecasts of nominal GDP growth between 2002 and 2021;

    b Each IGR forecasts a reduction in GDP growth over future decades. That is, the forecast for years 30-40 is lower than the corresponding forecast for years 20-30 which is lower than the corresponding forecast for years 10-20; and

    c The forecasts for future periods have been increased by subsequent IGRs. For example:

        i The 2002 IGR forecasted growth of 4.4% in years 30-40;

        ii The 2010 IGR forecasted growth of 5.1% in years 20-30 (which is largely the same 10-year period); and

        iii The 2021 IGR forecasted growth of 5.4% in ears 10-20 (which is largely the same 10-yaer period).

69. These features taken together imply that:

    a There is some evidence of conservatism in the more distant forecasts – the forecast for each 10-year period tends to be increased by each subsequent IGR; and

    b There is some evidence of generally higher growth forecasts in 2021 than in 2002.

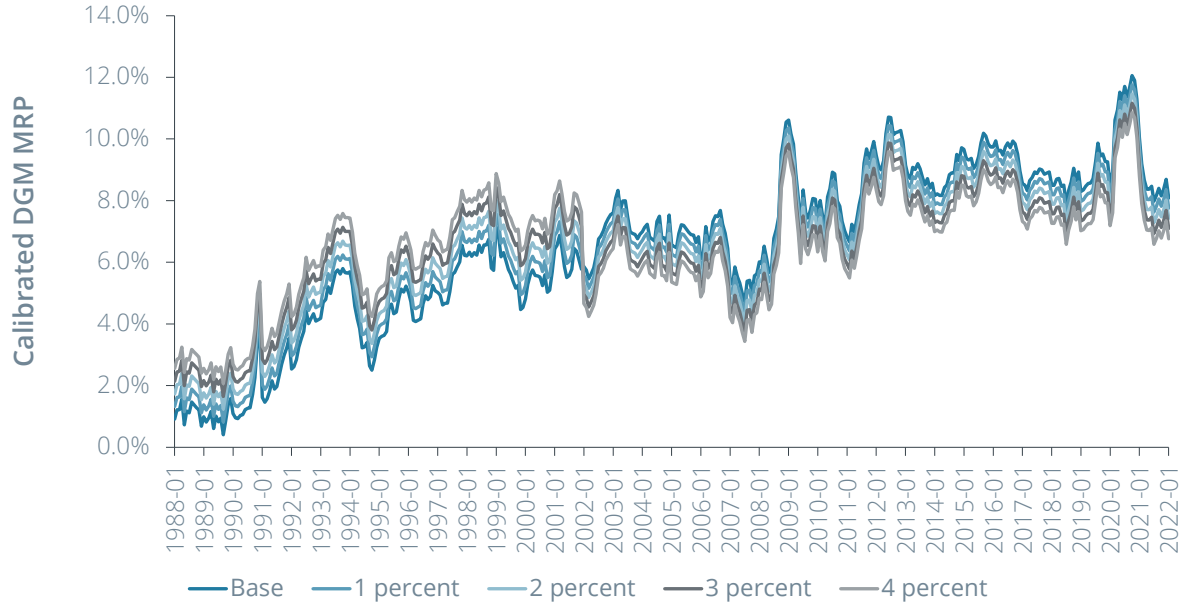
70. For these reasons, we consider our approach of fixing a constant expected perpetuity growth rate over the 2001 to 2021 period to be conservative. It seems more likely that the expected perpetuity growth rate in nominal GDP (which is likely to be highly correlated with, or a proxy for long-run growth in dividends) is higher in 2021 than in 2001.

71. This leaves open the question of expected perpetuity growth from 1988 to 2001. There is no IGR from that earlier period to provide very long-term GDP forecasts. Consequently, we test the sensitivity of our calibrated DGM estimates to various different forecast growth rates.

72. We do this by letting the forecasted perpetuity growth rate for the 1988-2001 period take various values of 1% p.a. to 4% p.a. higher than the remaining 2001-2021 period. That is, when performing the calibration process, we set the forecast perpetuity growth rate to g% for 2001-2021 and to $(g + x)$% for the earlier period, where x takes the value 1%, 2%, 3% or 4%. The results are shown in **Figure 3** below.

Figure 3: Sensitivity to long-term growth differential

For the



Source: Frontier Economics analysis of BVAL, Refinitive, SPPR and RBA data.

73. **Figure 3** shows that an increase in the forecasted perpetuity growth for the earlier (1988-2001) period has the effect of:

    a Increasing the MRP estimates for that earlier (1988-2001) period; and

    b Decreasing the MRP estimates for the later (2001-2021) period

    in order to preserve the average MRP estimate consistent with the HER estimate over the same period.

74. Changing the growth forecast for the earlier period has a less than one-for-one effect on the estimate of the MRP as at December 2021. For example, **Table 2** below shows that even a 4% addition to the perpetuity growth estimate for the earlier period leads to a reduction of only 1.35% as at December 2021.

Table 2: Sensitivity to long-term growth forecast for 1988-2001 period

Addition to growth forecast for 1988-2001	December 2021Calibrated DGM MRP
0%	8.69%
1%	8.36%
2%	8.02%
3%	7.68%
4%	7.34%

Source: Frontier Economics analysis of BVAL, Refinitive, SPPR and RBA data.

4 Tests to be applied to proposed DGM approaches

75. As explained in section 2, the AER has identified two concerns about the implementation (rather than theory) of the DGM that led it to give no weight to DGM evidence in the 2018 RORI. If the AER continues to hold those concerns about the DGM approach, in our view, there are two tests that should be performed to assess any alternative specifications of the DGM that might be considered by the AER:

    a Whether the estimates are economically plausible. Prevailing estimates of the forward-looking MRP are economically plausible if they are uniformly positive, higher during financial crises and recessions, and lower during periods of sustained economic growth and rising equity markets; and

    b Whether the estimates are consistent with the AER's HER estimates. A DGM specification that produces estimates that are materially higher or lower than the observed average MRP would likely introduce a systematic bias into the analysis.

76. These tests should, obviously, be applied to the specific DGM specification being considered and not applied generally to the possible range of DGM specifications.

77. Our view is that the calibrated DGM performs well on both of these metrics.

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