Australian Gas Infrastructure Group

Submission on the ERA's draft rate of return guideline

September 2018

Contents

1. Executive summary

Australian Gas Infrastructure Group (AGIG) appreciates the opportunity to make a submission on the ERA's draft rate of return guideline. As owners and operators of the Dampier to Bunbury Natural Gas Pipeline (DBNGP), the methodology for estimating the regulated return on investment has a direct impact on our ability to attract capital, invest in our assets and provide services that are in the long term interest of our Western Australian customers. We therefore recognise the importance of ensuring the rate of return is fair and reasonable.

The rate of return for regulated gas and electricity network businesses has historically been one of the most contentious aspects of economic regulation, both in Western Australia and on the east coast. We see this review as being more pragmatic, focusing less on theoretical debate and more on an incremental review updating the available evidence. This reflects the fact that a guideline already exists, there has been considerable review of that guideline and there have been few changes in theory since it was implemented in 2013.

We note that given the likelihood the rate of return guideline will become binding, the ERA is seeking constructive input from network businesses on key parameters such as the market risk premium (MRP), with a view to understanding what the most appropriate estimating approach would be under such constraints. We commend the ERA for this reasoned approach and submit our recommendations accordingly

We are aligned on many aspects of the ERA's draft approach, such as on the cost of debt, gearing and inflation. Where our view of the most appropriate method for estimating a particular parameter varies from the ERA, we have sought to clearly explain our reasons and provide an alternative method or advise what additional matters should be taken into consideration.

In summary, our advice is as follows:

- **Market risk premium** – in its draft explanatory statement the ERA has raised two questions regarding MRP; what form a binding MRP should take and what evidence should be considered. Regarding the form of the MRP, we think the ERA should apply a fixed MRP for the whole period, rather than adopting a mechanistic or historical approach that sets a different MRP estimate at each decision. This is because we agree with the ERA that the MRP is not observed or mechanistic, but rather requires careful consideration of disparate evidence and use of some discretion.

  In respect of evidence, we accept the use of historical returns (albeit with some adjustments), however, we recommend greater weight be placed on the dividend growth model (DGM) given that it is the only forward-looking measure the ERA considers. We consider the recent Western Power Final Decision was a step backwards in this respect, and we explain this further in our submission below. In particular, the significant drop in MRP from the DBP Final Decision to the Western Power Final Decision which flowed primarily from less weight being given to the DGM is not supported by the evidence the ERA cites; most of which is not in fact new.

  We also request the ERA uses the final rate of return guideline to provide greater clarity on its approach to estimating the MRP. Historically, the ERA's explanations of its estimating methodology for the rate of return parameters have been reasonably clear and unambiguous. We have used the ERA's reasoning in its 2016 DBNGP Final Decision as an example of good regulatory practice in our discussions with stakeholders

However, we note that the recent Western Power Final Decision is far less transparent, and in many cases the ERA's reasoning for arriving at a point estimate is unclear. We therefore request the ERA returns to a similar approach as in its DBNGP review when preparing its final guideline

- **Equity risk-free rate** – we propose a ten-year term to maturity should be used to estimate the risk free rate of return on equity. We support the ERA's assessment that Commonwealth Government Security (CGS) bonds – as reported daily by the Reserve Bank of Australia (RBA) – are the best proxy for risk free assets in Australia. However, given the different nature of equity compared to debt investment, we consider there is no reason to limit the equity risk-free rate estimate to the length of a regulatory period. Unlike debt (where a company will have a set date by which it has to return capital), equity has no set term. This is also more consistent with the long term nature of investment in the DBNGP. Equity should therefore be valued based on the longest available interest rate instruments, which in Australia is limited to those around ten years.[1]
- **Beta estimation** – we broadly support the way in which the ERA undertakes its estimation of beta. We suggest only a few changes, being to re-introduce some aspects of the ERA's process from the DBNGP Final Decision in 2016 that are not present in the draft guidelines but add important clarity for stakeholders.
- **Low beta bias** – like the ERA, we consider low beta bias is a separate issue from the estimation of beta itself. We recognise that low beta bias is inherent in the Sharpe Lintner Capital Assert Pricing Model (SL CAPM) and consider it needs to be considered and accounted for in the rate of return.

  However, the ERA's draft guideline does not discuss low beta bias at all, and the ERA appears to have chosen not to make an adjustment for it in its estimate of the return on equity. The absence of any consideration of low beta bias is one of the most significant changes compared to the ERA's 2013 guideline.

  We accept the ERA is entitled to hold the view that actual returns and expected returns are different and that investors do not inform themselves using actual returns. We do not subscribe to this view, but we appreciate that the Australian Competition Tribunal allowed that this view was open to the ERA in making its DBNGP determination.[2]

  In its 2016 DBNGP Final Decision the ERA found that the evidence before it (based on actual returns) was not compelling enough, at the time, to enable it to make an adjustment for low beta bias. We therefore present new evidence of low beta bias based on expected returns. This evidence, which is based on expected, not actual returns, makes it clear that, when investor expectations are explicitly considered, the SL CAPM remains susceptible to bias. This means the ERA should not move from the position it held in 2013, where it did consider low beta bias to be an issue for consideration when making its return on equity determination.

  Note we are not necessarily proposing the ERA adjusts its return on equity (or beta) allowance at this time. We simply want to highlight that low beta bias in the SL CAPM exists and request that the ERA demonstrates how it has factored bias into its decision in this and future iterations of its rate of return guideline.

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1 Longer term instruments exist, but liquidity issues mean instruments around the ten-year tenor give more reliable pricing and so are used in practice.

2 Application by DBNGP (WA) Transmission Pty Ltd [2018] ACompT 1, [141-296], available from: http://www.judgments.fedcourt.gov.au/judgments/Judgments/tribunals/acompt/2018/2018acompt0001.

- **Cost of debt** – we accept the ERA's proposed method to estimating the cost of debt. We would, however, encourage the ERA to provide further clarity in its guideline on its bespoke indexing approach and how the annual update of the debt risk premium (DRP) can be replicated. We understand the ERA is in the process of doing this, and will release more information in October. We look forward to the opportunity of commenting on this in due course. There are also some subtle improvements to the debt methodology the ERA may wish to consider, which we summarise later in this paper.
- **Gamma** – we submit that the value of imputation credits (gamma) should be maintained at 0.4. We have examined the new information the ERA has considered recently, and do not think the case for change is strong. We are keen to avoid the ongoing debate and related resources expended on gamma. To this end, we note the substantial review, including legal review, in determining the current gamma of 0.4. We consider this requirement for change from this value has not been met.
- **Gearing** – we accept the ERA's gearing of 55 per cent. We agree with the ERA's view that although gearing has historically been valued at 60 per cent, it does not automatically follow that gearing must be held constant at this value, particularly if the updated evidence strongly suggests otherwise.[3] Incorporating new information on gearing as it becomes available is a prudent approach and as the ERA suggests, assists in avoiding a number of well documented analytical biases specific to gearing.[4] We commend this approach and recommend the ERA adopts similar pragmatism and judgement when estimating other WACC parameters.
- **Inflation** – we support the ERA's use of the Treasury bond implied inflation approach. We conclude the ERA's method is more robust than alternate approaches.

All of these recommendations are discussed in more detail later in this paper.

In making these recommendations, we encourage the ERA to be mindful of the criticality of the rate of return to the way in which businesses invest in and operate their assets in the long term interests of consumers. Achieving a fair rate of return is essential to attract the required funding from investors so we can continue to operate, invest and provide the services that our customers value.

We would welcome the opportunity to discuss any or all of the matters raised in this paper with the ERA at time that is convenient.

Yours sincerely

[redacted]

Craig de Laine

General Manager People and Strategy

Australian Gas Infrastructure Group

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3 ERA, 2018, *Draft Explanatory Statement for the Rate of Return Guidelines*, June 2018, Paragraph 207.

4 Ibid.

2. AGIG's recommendations on WACC parameters

The following sections detail our recommendations in response to the ERA's draft position on each of the key rate of return parameters outlined in its draft guideline.

2.1. Market risk premium

In expectation that the rate of return guideline will become binding, the ERA is seeking advice on what form the binding MRP should take. The options the ERA presents are:

- *initial regulatory discretion and then fixed for the period;*
- *a mechanical approach; and*
- *a historic approach.*[5]

We welcome the ERA's considered approach to determining what form the MRP should take, and submit that the MRP should be set at the outset of the period using regulatory discretion and then fixed for the period.

The reason for this is fairly straightforward. As the ERA points out, the MRP cannot be directly observed[6] and is not mechanistic, therefore it would not be appropriate to take a mechanical or historical approach to estimating it. The MRP is an example where it is important well-reasoned regulatory discretion is maintained, and we commend the ERA for recognising as such.

In respect of evidence, our view is that the MRP for this 2018 guideline is best estimated by:

- estimating the historical MRP from the arithmetic average of historical excess returns, affording no weight to the geometric mean, and using this to form the lower bound of the range for MRP;[7]
- estimating the forward-looking MRP by using DGM estimates to form the upper bound of the range; and
- determining the MRP point estimate using a suitable and well-justified mix of the historical MRP and the forward-looking MRP.

We consider the ERA's draft MRP point estimate is not appropriate because:

- the ERA relies on the geometric mean to estimate the historical MRP, in contrast to the view of most experts. Lally has also derived a mathematical proof that confirms the arithmetic mean should be applied;[8]
- the ERA relies on Brailsford Handley Maheswaran (BHM) calculations of historical excess returns. Recent evidence from Credit Suisse data indicates that the NERA data provides a more robust estimate; and
- the ERA places too little weight on DGM estimates. While we do not necessarily consider it should be afforded equal weight to historical returns, the DGM introduces the required

5 Ibid, paragraph 515.

6 Ibid, paragraph 534.

7 Noting that it need not always be the case that the DGM produces results above the historical average. More generally, these two calculations will form the boundaries of the relevant range,

8 Lally, M, 2012, *The Cost of Equity and the Market Risk Premium*, 25 July 2012, pp 31-2.

forward-looking evidence that helps balance what would otherwise be a purely historical approach.

We are also concerned that the ERA has modified its position on the use of DGM in its recent Western Power Final Decision, citing diminished confidence in the model following the publication of the AER draft Guideline has led the ERA to place even less weight on the DGM. We consider the AER's review process has not introduced any new information compared to what the ERA considered in its own draft guideline, or the DBNGP Final Decision from June 2016. We therefore do not believe there is any reason supporting the change in the ERA's position.

We note also that, since the ERA calculates its MRP above the five-year risk-free rate and the AER does so above the ten-year risk-free rate, though both regulators estimate an MRP of 6.0 per cent, the ERA decision for Western Power is some 30-40 bps lower than that proposed by the AER.

These points are discussed in the following sections.

2.1.1. Use of geometric mean

Several experts have produced clear evidence that demonstrates sole weight should be placed on the arithmetic mean of historical returns, and that the geometric mean is of limited value (there is certainly no basis for increasing the weighting on geometric means).

Berk and DeMarzo consider the application of the arithmetic and geometric means in MRP estimation, stating:

> *Because we are interested in the expected return, the correct average to use is the arithmetic average.*[9]

Lally has previously considered whether an arithmetic or geometric mean should be applied to the historical data. He evaluates whether each form of average is consistent with the NPV=0 principle and concludes that:

> *The geometric mean fails this test whilst the arithmetic mean will satisfy it if annual returns are independent and drawn from the same distribution. So, if historical average returns are used, they should be arithmetic rather than geometric.*[10]

Lally has also derived a mathematical proof that confirms the arithmetic mean should be applied.[11]

However, rather than accepting this expert advice, the ERA has chosen the mid-point of the lowest arithmetic and highest geometric means as the lower bound of its MRP range, to account for the fact that both measures are biased.

This adjustment appears to be based solely on the assertions of Partington and Satchell,[12] who suggest investors may consider compound returns if they have long investment horizons, and therefore there is a need to include information from geometric means.

Notwithstanding the fact that the ERA appears to be placing greater weight on a supposition than on a mathematic proof, the ERA's adjustment is not valid. The mathematical proofs

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9 Berk, J, & DeMarzo, P, 2017, *Corporate Finance,* Pearson, p406.

10 Lally, M, 2013, *Review of the AER's Methodology for the Risk Free Rate and the Market Risk Premium*, 4 March 2013, page 40.

11 Lally, M, 2012, *The Cost of Equity and the Market Risk Premium*, 25 July 2012, pp 31-2.

12 Partington, G & Satchell, S, 2018, *Report to the AER: Allowed rate of return 2018 Guideline Review*, May 2018.

already account for long investment horizons, therefore there is no need to make a further adjustment on this basis.

Further, although it is clear that, in the context of the ERA's regulatory task, there is no role for the use of geometric means, to the extent that the ERA ignores the evidence above and continues to use geometric means, choosing the mid-point of the difference between the lowest arithmetic and highest geometric mean is incorrect. The ERA's rationale for using both pieces of information is that the geometric mean is biased downwards and the arithmetic mean is biased upwards.[13] One of the sources the ERA uses to justify this view in the Western Power Final Decision (which Lally shows is not true in the context of the way regulation works in Australia) is a paper by Indro and Lee (1997).[14]

In the same paper, Indro and Lee also show how to minimise that bias (equation 22 in the paper). However, rather than apply the Indro and Lee solution, the ERA has used an arbitrary mix of arithmetic and geometric means.

We replicate the Indro and Lee equation 22 in the table below. The table is adapted from the ERA's data[15] and implements the Indro and Lee equation for each of the time periods, giving the unbiased combination of the arithmetic and geomean for that time period. This is then simply averaged, to weight each time period equally.[16]

Table 1: Minimum bias mix of arithmetic and geometric means compared with ERA arbitrary approach

Sample period start	Sample period end	T	Arithmetic average	Geometric average	Indro & Lee Weighting
1883	2017	134	6.64	5.29	6.60
1937	2017	80	6.21	4.41	6.12
1958	2017	59	6.73	4.4	6.57
1980	2017	37	6.5	4.24	6.25
1988	2017	29	6.08	4.47	5.85
				Average	6.28
			ERA Results	Highest Geomean	5.29
				Lowest Arithmetic mean	6.08
				Average	5.7

Source: ERA Final Decision for Western Power, Appendix 5, Table 10, page 57.

13 ERA, 2018, *Final Decision of Proposed Revisions to the Access Arrangement for the Western Power Network*, September 2018, Appendix 5 Table 10, pp 55-6.

14 Indro DC & Lee WY, 1997, "Biases in Arithmetic and Geometric Averages as Estimates of Long-Run Expected Returns and Risk Premia", *Financial Management*, 26, pp 81-90.

15 ERA, 2018, *Final Decision of Proposed Revisions to the Access Arrangement for the Western Power Network*, September 2018, Appendix 5 Table 10, p 57.

16 Note that this depends upon using five years as the relevant time horizon for investors; but this is exactly what the ERA assumes and indeed is the basis for setting the risk free rate at five years (if one uses 10 years, then the lower bound number below is 6.1 per cent; still above the ERA's 5.7 per cent).

The analysis shows that if the ERA is going to use arithmetic and geometric means (which Lally shows is incorrect), the lower bound of its estimates must be 6.3 percent, not 5.7 percent; the latter has no connection to minimising bias. If the ERA uses just arithmetic averages, which we consider to be appropriate, the lower bound would be the average of the arithmetic means, which is 6.43 percent (6.47 percent if only the NERA data is used).

2.1.2. Use of BHM data

We also submit that NERA data provides a more robust estimate than the BHM data on which the ERA solely relies.

In a submission to the AER in June 2013, NERA (2013)[17] identified and corrected a number of inaccuracies in the adjustments that were made in the BHM (2008, 2012)[18] calculations of historical excess returns. The improved quality of the NERA data has been recognised by leading experts, most notably Dimson, Marsh and Staunton, who switched to using the NERA data in 2016, highlighting in the 2018 Credit Suisse Global Investment Returns Yearbook that the NERA data provides a superior estimate of historical rates of return.[19]

The superiority of NERA data over BHM data was also recognised by experts during the AER's current review process, with the CEPA Joint Expert Report documenting that no expert disagreed with the proposition that:

> *The HER [historical excess returns] data should use the "NERA" adjustments that Dimson, Marsh and Staunton employ in recent Credit Suisse Global Investment Returns Yearbooks.*[20]

Given this clear expert advice, coupled with the new evidence from Credit Suisse that NERA data are the new standard, we submit the ERA should afford no weight to BHM data and use solely NERA data instead.

2.1.3. Western Power decision evidence for a lower MRP estimate

The ERA provided an estimate of 6.2 percent in the Western Power Draft Decision and, subsequently, an estimate of 6 percent in the Western Power Final Decision. This gives rise to an MRP allowance some 30-40 basis points lower even than the AER.

As a justification for choosing a lower MRP, the ERA notes:

> *These estimates suggest a downward trend in the market risk premium. The AER has also found evidence that suggests a downward trend in realised market risk premium.*[21]

However, if we compare Table 8 and Table 10 from the ERA's Final Decision Appendix 5, all the ERA's historical estimates have increased. These tables are reproduced below.

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17 NERA, 2013, *The Market, Size and Value Premiums*, June 2013.

18 Brailsford, T, Handley, JC & Maheswaran, K, 2008, "Re-examination of the Historical Equity Risk Premium in Australia", *Accounting and Finance* 48, pp 73-97; Brailsford, T, Handley, JC & Maheswaran, K, 2012, "The Historical Equity Risk Premium in Australia: Post-GFC and 128 years of data", *Accounting and Finance*, 52(1), pp 237-47.

19 Credit Suisse, 2018, *Global Investment Returns Yearbook 2018*, p 87.

20 Cambridge Economic Policy Associates (CEPA), 2018, *AER Rate of Return Guideline Expert Joint Report,* 21 April 2018, p 59.

21 ERA, 2018, *Final Decision of Proposed Revisions to the Access Arrangement for the Western Power Network*, September 2018, Appendix 5 Table 10, p 57.

Figure 1 Comparison of historical MRP values from ERA Western Power Draft and Final Decisions

Table 8 Estimates of the historic market risk premium

	Arithmetic			Geometric		
	NERA	BHM	Average	NERA	BHM	Average
1883-2017	6.79%	6.44%	**6.61%**	5.43%	5.08%	**5.26%**
1937-2017	6.19%	6.23%	**6.21%**	4.34%	4.39%	**4.36%**
1958-2017	6.67%	6.67%	**6.67%**	4.34%	4.34%	**4.34%**
1980-2017	6.40%	6.40%	**6.40%**	4.14%	4.14%	**4.14%**
1988-2017	5.95%	5.95%	**5.95%**	4.34%	4.34%	**4.34%**

Source: ERA analysis

Table 10 Updated estimates of the historic market risk premium

	Arithmetic			Geometric		
	BHM	NERA	Average	BHM	NERA	Average
1883-2017	6.46%	6.82%	**6.64%**	5.11%	5.46%	**5.29%**
1937-2017	6.28%	6.23%	**6.26%**	4.44%	4.39%	**4.41%**
1958-2017	6.73%	6.73%	**6.73%**	4.40%	4.40%	**4.40%**
1980-2017	6.50%	6.50%	**6.50%**	4.24%	4.24%	**4.24%**
1988-2017	6.08%	6.08%	**6.08%**	4.47%	4.47%	**4.47%**

Source: ERA Analysis

The ERA's data shows that the lower bound for the MRP (by its calculation) has increased from 5.6 to 5.7 per cent, and all of the historical estimates have likewise increased, but the ERA has decreased its MRP estimate. This seems incongruous with the evidence presented. We consider this requires further review, and if this position is maintained, clear reasoning is needed in the final guideline.

2.1.4. DGM weighting

Regarding the DGM, we submit it remains an important consideration because it produces a forward-looking estimate of the MRP. Like most models used to estimate the theoretical regulated rate of return, the DGM is not without its flaws, and we do not necessarily consider it should be afforded any more or less weight than historical returns. However, the DGM introduces the required forward-looking evidence that helps balance what would otherwise be a purely historical approach. It is broadly accepted that the DGM provides valuable information and its use in combination with historical market risk premia contributes to a robust MRP estimate.

However, we are most concerned by the backwards step the ERA appears to have taken with regard to the DGM since producing its draft guideline and the Western Power Draft Decision. The ERA suggests in the Western Power Final Decision[22] that it was influenced by the recent AER draft guideline which, it says, provides new information that causes the ERA to have less confidence in the DGM than it had at the time of the Western Power Draft Decision.

[22] Ibid, p 53.

However the reasons the ERA raises for this reduced confidence (which are similar to those raised in the draft guideline[23]), are similar to the issues the ERA found with the DGM in the DBNGP Final Decision (Appendix 4, page 117):

> *The Authority notes that DGM estimates are recognised to have shortcomings, including that:*
>
> - *analyst forecasts (which underpin some of the studies reported in Table 6 and which will be incorporated in the 'consensus' estimates) have a tendency to be upwardly biased, as they are based on over-optimistic expectations for target prices and earnings;*
> - *DGMs may not fully reflect market conditions if firms follow a stable dividend policy;*
> - *DGMs do not capture non-dividend cash flows, such as share repurchases or dividend re-investment plans.*
>
> *Furthermore, the DGM estimates reported here provide a single discount rate, which equates the present value of the future infinite dividend stream with the observed share price. The estimate therefore looks out beyond the 5 year period for which the Authority is seeking to estimate the MRP. If a lower nominal GDP estimate is expected than assumed – say for the two years beyond the three actual dividend growth rate forecasts incorporated in the model – then the estimates of the DGM should be lower than that reported here. The implication would be that the 5 year forward looking MRP would also be lower.*
>
> *The Authority notes that there is no clear agreement among experts as to the best form for the DGM, or its input assumptions. For that reason, the Authority adopts a wide range, informed by a spectrum of recent studies.*

In the DBNGP Final Decision, the range for the MRP was 5.4 to 8.8 percent with an allowance of 7.4 percent, which implies a weighting of 60 percent for the DGM.[24] In the Western Power Draft Decision, the range was 5.6 to 7.6 percent, which implies a weighting of 30 per cent for the DGM. Then, in the Western Power Final Decision, the range was 5.7 to 7.6 percent with a final estimate of 6 percent, which implies a weight of 16 per cent on the DGM. It is not clear how the ERA can justify the scale of this reduction in reliance on the DGM, when the evidence between the DBP Final Decision and the Western Power Final Decision has barely changed.

The reasons the ERA provides for its low reliance on the DGM in the Western Power Final Decision[25] are not compelling. As indicated by the extract from the DBNGP Final Decision, they are also not new. They are summarised in the table below, along with notes on each.

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23 ERA, 2018, *Draft Explanatory Statement for the Rate of Return Guidelines (2018)*, June 2018, pp 107-9.

24 The ERA was not explicit as to what weighting was given to the DGM, but it is implicit in the position of the point estimate. Moreover, the ERA was explicit about weightings in ERA, 2016, Revised decision of the Economic Regulation Authority's access arrangement for the Mid-West and South-West Gas Distribution Systems p11 (available from https://www.erawa.com.au/cproot/14523/2/GDS%20-%20ATCO%20-%20AA4%20-%20Revised%20Access%20Arrangement%20Decision%20-%20PURUSANT%20TO%20ORDERS%20BY%20THE%20ACT.PDF), wherein the ERA noted a 62 per cent weight on the DGM in the original ATCO Final Decision (which followed the same methodology as for DBNGP) and the revised decision further to the orders given by the Australian Competition Tribunal, which was made immediately following the DBNGP Final Decision.

25 ERA, 2018, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network, Appendix 5*, September 2018, paragraph 356.

Table 2: ERA objections to the DGM

ERA issues with DGM[26]	Notes
There is no clear agreement among experts as to the best form for the dividend growth model, or its inputs.	We recognise this is an issue, however, it can be resolved by both parties adopting an accepted form of the DGM, which we are happy to agree with the ERA.
The dividend growth model is sensitive to its assumptions.	All models are sensitive to their assumptions. The SL CAPM has highly restrictive assumptions. As per Hong and Sraer (2016),[27] if just one assumption is changed and one allows investors to have different beliefs, the whole security market line changes shape. Moreover, the sensitivity lies in dividend per share forecasts, which can be addressed. An expert report by Simon Wheatley[28] shows that it is possible, with confidence, to put a range of roughly one hundred basis points around a central estimate of the growth of dividends per share, obviating the ERA's main concern with the DGM.
Forecasts of future earnings and dividends are fairly inaccurate over more than two years.	Historical MRP figures are not proven to be any more accurate than forecasts. In the ERA's 2013 guideline[29] the ERA cites evidence that the DGM does in fact produce good forecasts out beyond four years; evidence which it has not subsequently revised.
The dividend growth model is subject to upward bias from the smoothed or sticky nature of dividends.	Frontier, in its 2018 report to the AER, submit that because the RBA data shows earnings forecasts have not fallen as much as expected in recent years that sticky dividend concerns should not be considered.[30]
Biases in analyst forecasts can lead to biased dividend growth model forecasts of the market risk premium.	We are not clear on what the ERA considers the forecasts are biased against. If the forecasts are biased against actual outcomes, then it would be inconsistent to make an adjustment downwards to account for bias in the DGM but not make an adjustment upwards to account for similar bias against actual returns in the SL CAPM.
The dividend growth model is likely to be upwardly biased when interest rates are low.	The model is not biased, the model is just reflecting market prices. Further, the ERA signals that interest rates are not abnormally low at present,[31] so this should not be a concern.
The dividend growth model estimates provide a single discount rate, which equates the present value of the future infinite dividend stream with the observed share price. Therefore, the estimate looks out beyond the five-year period for which the ERA is seeking to estimate the market risk premium.	This DGM does produce a long run estimate, however, equity holders have a long-run exposure to risk, particularly to interest rate risk, which is not extinguished at the end of each AA period. This is discussed in more detail in our discussion on the risk-free rate allowance, where a similar issue arises.

26 Ibid.

27 Hong, H & Sraer, DA, 2016, "Speculative Betas", *Journal of Finance*, 71 (5), pp 2095-2144

28 See Appendix 3 of the ENA submission to the AER rate of return guideline process, which is a report by HoustonKemp detailing how the dividend growth forecast in the DGM can be determined reliably, and with some precision.

29 ERA, 2013, *Explanatory Statement for the Rate of Return Guidelines,* December 2013, paragraph 723.

30 Frontier, 2018, *Rate of Return for Ausgrid 2018*, April 2018, pp 152-4.

31 ERA, 2018, *Final Decision of Proposed Revisions to the Access Arrangement for the Western Power Network, Appendix 5*, September 2018, p 46.

2.1.4.1. Cross checks

We would also like to comment on the MRP cross checks provided in the ERA's Western Power Draft Decision and subsequently responded to by Western Power. In Western Power's response to the ERA's Draft Decision, it highlighted that all of the ERA's cross checks are at almost exactly the same position as they were in the ERA's 2016 DBNGP Final Decision, and yet the ERA made a significant reduction in MRP. However, the ERA has not addressed Western Power's points in its Final Decision.

The issue is one of clarity. In the DBNGP Final Decision[32] the ERA makes it clear that it is using the forward indicators to determine a point on the historical range (then 5.4 to 8.5 percent) for the final MRP allowance, and that its starting point is the mid-point of this historic range. This is clear and unequivocal because the Ibbotson and Wright approaches (the upper and lower bounds of the historical range) can be mechanistically and transparently calculated for any time period, as can their mid-point.

However, the Western Power Final Decision is different. In the first instance, the range is undefined, as the DGM does not appear to have been calculated for the Final Decision (in the Draft Decision, it was 7.6 percent). When the ERA concludes the MRP is likely to be towards the bottom end of the range,[33] it is not clear to what range the ERA is referring. Moreover, for several of the indicators,[34] the ERA concludes the MRP is likely to be around or below its average value. However, the concept of the average MRP is undefined.

The ERA calculates 30 historical averages, but its decision is also informed by the DGM. In this context, it is unclear what the average means. It is not as clear as the mid-point of the historical range used for DBNGP.

Finally, there is the issue of the way the ERA draws conclusions from the various indicator variables. In the DBNGP Final Decision,[35] most of the indicator variables were slightly above their relevant long run averages. The ERA concluded that this supported an MRP allowance slightly higher than the mid-point of the historical range. This is a conclusion we regard as reasonable.

In the Western Power Draft Decision,[36] the ERA found that most indicators were within one standard deviation of the mean. However, this motivated a choice at the bottom end of the range for the MRP. Similar conclusions were drawn in the Final Decision (see pages 61 - 63 of the Western Power Final Decision).[37] It is not clear how small movements around the mean of

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32 ERA, 2016, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020*, Appendix 4, June 2016, p120.

33 ERA, 2018, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network, Appendix 5*, September 2018, p 60.

34 Ibid, pp 61 - 63.

35 ERA,2016, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020*, Appendix 4, June 2016, pp 120-25.

36 ERA, 2018, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network, Appendix 5*, September 2018, pp 42-5.

37 The ERA does not provide standard deviations for the Final Decision, but most of the relevant figures appear to have moved upwards slightly between draft and final decisions. This is not the case for dividend yields, which have declined. However, interestingly, they are at a lower level at the time of the DBNGP Final Decision than the Western Power Final Decision, and the ERA decided this should give rise to an allowance slightly above the historical mid-point for DBNGP and around whatever average it has in mind for Western Power.

these indicator variables can lead to such different conclusions; a point also made by Western Power and dismissed by the ERA without explanation.[38]

We are not opposed to the ERA making use of indicator variables to inform some aspects of its judgement when determining the MRP. However, that use needs to be clear. We consider that it was in respect of DBNGP, but it was not in the case of Western Power. We suggest the ERA re-examine how these indicator variables are used to provide more clarity to stakeholders.

We also recommend the ERA further considers whether, based on the evidence available to it, the market conditions have changed significantly from the DBNGP Final Decision to the present to merit a significant change in the MRP as provided to Western Power.

2.1.4.2. Recommended MRP approach

We recognise that there are flaws in the DGM, and we accept the view of Partington in that one might not use an equal weight of the DGM and historical numbers. However, we consider the issues the ERA flags with the DGM are over-stated and do not warrant giving the DGM the 16 percent weight it gave in the Western Power Final Decision.

We maintain that because the MRP is a forward-looking estimate, regard should be given to forward-looking evidence and that the DGM has value in this context. We submit that a pragmatic solution could be to adopt the weighting the ERA gave the DGM in its Western Power Draft Decision (30 per cent). This is half the weighting the ERA placed on the DGM in its DBNGP Final Decision, and we suggest represents a suitable compromise for all parties. We suggest this compromise only in the context of appropriate changes being made to the formation of the historical estimates, to remove their downward bias.

With regard to historical estimates, for the final guideline we submit that

- the ERA should ignore the most recent 17 years (as it did in the Western Power Final Decision);[39]
- the ERA should only use arithmetic means;
- the ERA should only use the NERA numbers.

Based on the ERA data in the Western Power Final Decision, the average of the NERA arithmetic mean is 6.47 per cent. There is no revised DGM estimate in the Western Power Final Decision, therefore we assume the upper bound remains at 7.6 per cent. If we then adopt a 30 per cent weighting to the DGM, this results in an MRP estimate of 6.8 per cent.

In the event the ERA chooses to make continued use of geometric means, it must do so in a way that minimises bias, rather than using an arbitrary mix. As per the Indro and Lee equation, this would give a lower bound of 6.28 per cent which, when coupled with the DGM estimate of 7.6 per cent and the 30 percent weighting from the Western Power Draft Decision, gives an MRP of 6.7 percent.

2.2. Equity risk-free rate

We propose a ten-year term to maturity should be used to estimate the risk-free rate of return on equity. In the absence of any truly risk-free assets, we support the ERA's view that CGS

[38] ERA, 2018, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network, Appendix 5*, September 2018, p 60.

[39] Note that the expert conclave (see CEPA, 2018, *AER Rate of Return Guideline Expert Joint Report,* 21 April 2018 p 59) agreed that longer time periods are necessary, and the AER has dropped the 2000-2017 time period from its set of historical averages in its draft guideline. We presume the ERA, which has dropped this shorter time period in the Western Power Final Decision, has done so for similar reasons.

bonds reported daily by the RBA are an appropriate proxy and proposed they should continue to be used to approximate the risk-free rate. However, where our view differs from the ERA is the term to proxy the risk-free rate.

The ERA currently uses a five-year term based on the CGS bonds to estimate the risk-free rate for both equity and debt. The rationale for the five-year term is that because the risk-free rate is rest at the end of a regulatory period (typically five years long), the network business' exposure to changes in interest rates is limited to five years at a time.

We agree that this approach is suitable for estimating the risk-free rate for debt. Unlike equity, debt typically has a term over which the loan is fully repaid and therefore can be subject to this form of interest rate risk analysis. However, this same form of interest rate risk analysis is not appropriate for estimating the risk associated with equity.

Interest rate risk is the risk that at an investment's value will change, for better or worse, due to changes in the prevailing interest rate in that economy. The regulatory regime bases revenue on prices that incorporate a five-year interest rate term. Debt and equity costs are still exposed to interest rate movements during the five-year regulatory period, but at the end of the period (at the next regulatory reset) the interest rate is reset to the prevailing rate. Then the process starts again.

This regulatory process is suitable for debt because interest rate risk exposure for debt is managed using interest rate swaps over the term of the debt. For equity, however, the interest rate exposure is interminable.

Equity is virtually always valued as a going concern.[40] Unlike debt, there is no set date on which the company is obliged to return the capital initially invested, meaning equity has no term. For this reason, equity valuation is undertaken based on the longest available interest rate instruments, which in practical terms in Australia is limited to those around ten years.[41] Using a ten-year term rather than five years compensates for equity's longer exposure to interest rate risk.

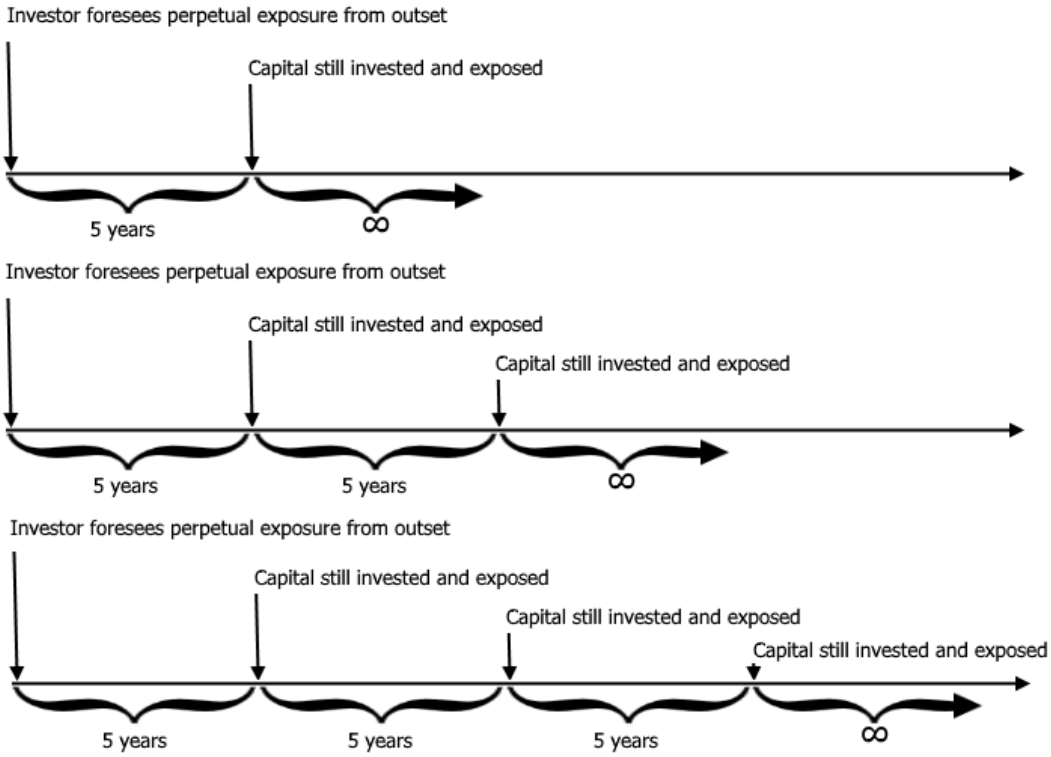
It may be argued that the five-yearly reset in the regulatory regime limits exposure to interest rate movement to within the coming five years. However, not all the capital is returned to the investor after five years and remains invested in the asset. After the five-year regulatory period has ended the investment remains exposed to interest rate risk thereafter.

Figure 2 illustrates the indefinite nature of interest rate risk. The diagram is limited to three regulatory resets, but perpetual exposure applies under any number of regulatory resets.

Figure 2 Capital still exposed after each five-year regulatory reset

40 Pratt, SP & Grabowski, RJ, 2008, *Cost of Capital,* John Wiley & Sons, pp 71-72.

41 Longer term instruments exist, but liquidity issues mean instruments around the ten-year tenor give more reliable pricing and so are used in practice.



For this reason, investors valuing equity do not differ between regulated firms with a five yearly reset and unregulated firms. Equity valuation involves discounting all cash flows including the expected proceeds from future sale. Even if the equity is sold after just one year, the valuation at the point of sale after one year is still based on a perpetuity setting. This means the five-year term interest rate gives insufficient compensation for the infinite term of equity's interest rate exposure.

We submit that a longer tenor is more likely to yield an estimate that better reflects the actual equity risk faced by the benchmark efficient firm. Greater accuracy of estimates is particularly important given the rate of return guideline is likely to become binding, therefore we consider adopting a ten-year period is a more prudent approach.

2.3. Beta estimation

We accept the ERA's beta best statistical estimate of 0.7 and are comfortable with the estimating approach. We support the ERA's use of a five-year observation period and agree that this provides a reasonable compromise between statistical robustness and the potential for structural breaks, as well as being consistent with the requirement to set a return on equity based on prevailing market conditions.

The firms the ERA uses to inform the five-year estimate; APA, DUET, Spark Infrastructure and AusNet Services are appropriate comparators, and we also endorse the ERA's approach of limiting the number of regressions to manageable levels. However, we have one small issue of clarity we would like to bring to the ERA's attention.

This relates to the differences in the beta estimation method shown in the draft guideline and that in the DBNGP Final Decision (which the ERA notes is the basis for the guideline).

In the draft guideline, the ERA creates an average across firms, then across two portfolios, then an average across portfolios and firms (see the ERA's Explanatory Statement Table 18 reproduced below).

Figure 3 ERA's beta estimation approach in draft guideline

Table 18 Estimates of equity beta for individual firms and the two weighted portfolios in 2018 for different estimation methods

	APA	AST	DUE	SKI	Mean of firms	Equally weighted mean[271]	Value weighted mean	Mean of portfolios	Mean of firms & portfolios
Gearing	0.489	0.564	0.608	0.557	**0.554**	0.554	0.544	**0.549**	**0.553**
OLS	0.883	0.786	0.449	0.662	**0.695**	0.618	0.759	**0.689**	**0.693**
LAD	0.947	0.813	0.423	0.698	**0.720**	0.699	0.804	**0.752**	**0.731**
MM	0.939	0.791	0.458	0.738	**0.732**	0.669	0.807	**0.738**	**0.734**
T-S	0.916	0.775	0.445	0.718	**0.714**	0.650	0.779	**0.714**	**0.714**
Mean of techniques (OLS, LAD, MM, T-S)	**0.921**	**0.791**	**0.444**	**0.704**	**0.715**	**0.659**	**0.787**	**0.723**	**0.718**

This latter step (the average across portfolios and firms) is a double-counting of the firm results, which are already in the portfolios. It is only necessary to consider averages of the portfolios, as the ERA did in the DBNGP Final Decision (see Appendix 4 page 101). We therefore recommend the ERA reverts to its method in the DBNGP Final Decision and corrects for this double count in the final guideline.

We also submit that the ERA's description of how it proposes to select the beta point estimate in the draft guideline is less clear than it was in the DBNGP Final Decision (see Appendix 4 page 102 for the beta answer and Appendix 4 page 195 Table 22 for the confidence interval). We believe a return to the transparent and explicit method in the DBNGP Final Decision would be preferred by stakeholders as it provides a better explanation of how the ERA uses empirical evidence. We have also commended the ERA's DBNGP Final Decision approach to the AER as part of the submission made by APGA, and remain hopeful that the AER will follow the ERA's lead in this regard.

2.4. Low beta bias

This is the issue which represents perhaps the greatest change from the 2013 guideline, but it receives almost no discussion at all in the draft guideline.

The ERA notes no change in the beta estimation method since 2013.[42] While this is true in the sense the ERA uses the same regression methods and the same data sources, in 2013 the ERA chose the top end of the range produced by the method it uses to determine beta, specifically to adjust for bias:

> *The Authority will exercise judgement in order to determine the point estimate of the beta, with a view to ensuring the estimate best reflects the systematic risk associated the benchmark efficient entity. The Authority*

[42] ERA, 2018, *Draft Explanatory Statement for the Rate of Return Guidelines,* June 2018, p 166.

> *considers that relevant empirical evidence supports a view that there is some downward bias in equity beta estimates that are less than one, and upward bias in equity beta estimates that are greater than one. The Authority intends to undertake more work to quantify the extent of this potential bias. This work would then inform the degree to which the Authority might adjust up the point estimate of the equity beta within the estimated range, so as to account for the potential beta bias.*[43]

By the time of the DBNGP Final Decision in 2016, the ERA had changed its position on this issue. The ERA considered low beta bias was an issue associated with actual returns, not expected returns, and one which could be safely ignored. It therefore formed the view that the best result for the beta allowance was the best statistical estimate of beta; that is its mean value, which makes no allowance for low beta bias. The ERA continues to hold this view in the draft guideline.

Although the binding guideline legislation has not yet been enacted, it requires the regulator to clearly explain any changes between guideline and the rationale for those changes, as per section 15:

> *(c) if the instrument replaces another instrument—*
>
> *(i) the differences (if any) between the instrument and the replaced instrument; and*
>
> *(ii) the reasons for any differences; and,*
>
> *(d) why the AER is satisfied the instrument will, or is most likely to, contribute to the achievement of the national gas objective to the greatest degree; and….*

The absence of discussion on the issue of low beta bias in the draft guideline would mean that the draft guideline would not meet this requirement.

With regard to the issue of low beta bias, we submit that it should be considered by regulators. With this submission we present new evidence that demonstrates low beta bias is a material issue and suggests that, whatever view the ERA had at the time of the DBNGP Final Decision, it cannot be supported in the forthcoming guideline once the new evidence has been considered.

In the DBNGP Final Decision, the ERA suggests:

> *The Authority has concluded that, if any adjustment could be justified, it should apply to the intercept term in the SL-CAPM, thereby taking account of the alpha term arising in ex post tests of the model. However, the Authority is not convinced there is adequate evidence, at the current time, to justify making such an adjustment.*[44]

The evidence put before the ERA in the DBNGP review process was associated with actual returns. We therefore do not present any new evidence associated with actual returns. Instead, we provide new evidence, drawn from expected returns. The new evidence, produced by Frontier Economics (S. Gray), is provided with this paper.

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43 ERA, 2013, *Explanatory Statement for the Rate of Return Guidelines*, December 2013, paragraph 748.

44 ERA, 2016, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020, Appendix 4*, June 2016, paragraph 436. As an aside, we agree with the ERA that the adjustment is better made as some kind of "alpha" adjustment than in beta, and note that the independent panel appointed by the AER appears to hold a similar view.

The Frontier report follows a methodology developed in a seminal paper by Brav et al (2005),[45] and adapts that methodology to Australian data. Frontier finds, consistent with Brav et al, that low beta bias, is even more strongly observed when one uses investor expectations compared to the predictions of the SL CAPM. In simple terms, whatever investors are using to form their expectations, it cannot be the textbook SL CAPM (that the ERA now uses), because data on those expectations are systematically inconsistent with the results obtained using the SL CAPM.

The particular data on investor expectations that Frontier (and Brav et al 2005) uses are analyst forecasts. Frontier provides evidence from a wide range of literature that makes clear analyst forecasts are a material part of the formation of investor expectations. Moreover, although some researchers have found evidence of bias in analyst forecasts, this evidence of bias is almost always linked to actual returns; and as Frontier points out:

> *it would be illogical to hold the view that analyst forecasts do not represent market expectations because they diverge from outcome observed returns, if one also considered that observed returns do not reflect market expectations.*[46]

There is therefore clear evidence based upon genuine expectations that low beta bias is an issue regulators must consider. It is not simply an issue of random shocks associated with actual returns, or even actual and expected returns being somehow different things; low beta bias appears whether one looks at actual or expected returns.

The question then becomes one of what the ERA can do in response. We do not think the ERA needs to change its overall framework of considering expected equilibrium returns; as Frontier points out, this is an appropriate way in which to consider the allowed return on equity. Rather, we request the ERA needs to recognises that although the SL CAPM is *a* model of expected returns, it is not *the only* model of expected returns. Moreover, all models are based upon assumptions and are therefore subject to imprecision and bias.

Other equilibrium asset pricing models, such as the Black CAPM model or the model by Hong and Sraer (2016) deliver predictions about equilibria that overcome the low beta bias inherent in the SL CAPM. The ERA could replace its core model with one of these. However, this is not necessary, and may not even be the best response if there are concerns with those models. Acting pragmatically, all the ERA needs to do is make some adjustment for the imperfections of the CAPM. This is precisely what it did in 2013; albeit in a way (adjusting the beta allowance) that it now considers sub-optimal.

We therefore recommend the ERA explains in its final guideline how it has factored low beta bias into its judgment associated with the appropriate return on equity allowance. To our minds, the consideration of low beta bias is a key reason why the beta estimate of 0.7 in the draft guideline ought to be considered a minimum in respect of a beta allowance. In making its judgement, the ERA should consider the following factors:

- The evidence provided by Frontier makes it clear the bias is statistically significantly different from zero. This suggests a large adjustment from any best statistical estimate.
- That it is generally agreed that regulated utilities are relatively low risk, which would suggest some caution in making large adjustments if the empirical estimates of beta are already moving closer to one.

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45 Brav, A, Lehavy, R, Michaely, R, 2005, "Using Expectations to Test Asset Pricing Models," *Financial Management*, 34(3), pp31-64.

46 Frontier Economics, 2018, *Low-beta bias and the Black CAPM*, September 2018, p 23.

Over time, as estimates of beta increase towards one as they have done since 2013, particularly within a small sample set, any adjustment for issues such as low beta bias may be relatively small. With this in mind we are not proposing a significant change to the beta allowance (or to the overall return on equity if the adjustment is made elsewhere). However, we consider it vital the issue remains on the table and in the mix of regulatory considerations when determining an appropriate return on equity allowance.

2.5. Cost of debt

In broad terms we accept the ERA's approach to estimating the cost of debt. The ERA's approach has been generally accepted in its final form post the ERA's 2013 rate of return guideline process, and we see no compelling evidence or change in market conditions to justify a dramatic change in approach at this time.

We would like to make the following observations on the ERA's method.

2.5.1. Automatic application under the binding legislation

While we are not opposed to the ERA's debt method, we recommend the ERA carefully considers whether its approach meets the requirements under the binding rate of return legislation currently before SA Parliament in respect of automatic application.

In particular, the ERA needs to assure itself that it satisfies 30(E), which states:

> *(1) If a rate of return instrument states the value of imputation credits, the instrument must state a single value to apply in relation to all covered pipeline service providers.*
>
> *(2) If a rate of return instrument states a way to calculate the rate of return on capital or the value of imputation credits, the instrument must—*
>
> *(a) provide for the same methodology to apply in relation to all covered pipeline service providers in calculating the rate or value; and*
>
> *(b) provide for the methodology to apply automatically without the exercise of any discretion by the AER*

We are specifically referring to the ERA's bespoke indexing approach. It would be detrimental to all parties if the ERA's approach was found to be untenable on these grounds.

The ERA process at present requires the ERA to first collect the relevant data (within 24 hours of the end of the averaging period) and then provide an estimate of the new DRP within ten business days of the end of the relevant period. The businesses then have ten days to respond before both parties deal with any inconsistencies together.

This is a valuable part of the process because the ERA bespoke index provides no other opportunity for independent scrutiny of results. Even though we are not aware of any business disputing the ERA's DRP estimate to date, the ability to clearly understand parties' estimates is an important part of the regulatory process. We are concerned that it might be difficult to retain these checks and balances under the binding guideline process.

We recommend the ERA considers this issue and makes any necessary modifications that might be required to its final guidelines.

2.5.2. Clarity of method

We request ERA provides explicit instructions on how to replicate its approach to estimating the cost of debt, particularly the annual update of the debt risk premium (DRP). The draft guideline only refer to a worked example from the 2016 DBNGP Final Decision, noting that whatever instruction the ERA provides would need to be self-contained in the final guideline. We note that the ERA is planning to release more information on this topic in October, and we look forward to providing further input then.

Presuming the ERA plans to use the 2016 DBNGP Final Decision DRP update method as the template for its final guideline, we note there are some missing steps in the DBNGP example. To our knowledge, no party following the steps as set out in the DBNGP decision has been able to exactly replicate the ERA's DRP calculation.

For example, to get the same set of results as the ERA, the network business would need to use the same version of the Bloomberg terminal and apply the same settings. However, the ERA's Bloomberg version and settings are not provided.

We would encourage the ERA to make use of this opportunity of the final, binding guideline to develop a set of instructions that enable anyone with access to the relevant Bloomberg terminal to replicate the ERA's results exactly. We would be happy to assist the ERA in this respect by acting as a test case so that it can refine its steps accordingly.

Having clarity on the DRP update and WACC estimation methods generally, allows third parties such as investors, financiers and network businesses to replicate parameters and therefore predict returns with greater accuracy. Given the importance of the rate of return when making investment decisions, greater certainty in its forward-looking application better promotes the *efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas.*[47]

2.5.3. Credit rating

The ERA's evidence on credit ratings is presented in Table 9 of the explanatory statement (reproduced below).

Figure 4 ERA categorisation of credit ratings in the draft guideline

Table 9 Median credit rating approach results

	2013	2014	2015	2016	2017	Number of firms
Sample 1 - All firms	BBB	BBB+	BBB+	BBB+	BBB+	13
Sample 2 - excluding government ownership	BBB	BBB+	BBB+	BBB+	BBB+	7
Sample 3 - excluding government ownership and parent control	BBB	BBB	BBB	BBB	BBB	1

As can be seen, the ERA concludes the credit rating across all firms is BBB+, and the ERA segregates the evidence based on ownership.

We suggest the ERA considers providing evidence on an individual firm basis, as the AER does in its Explanatory Statement for its 2018 rate of return guideline. Table 42 in the AER's Explanatory Statement presents the historical credit rating of all electricity and gas service

[47] National Gas Objective, *National Gas (South Australia) Act 2008*, clause 23.

providers considered in its sample. The gas firms from the AER's Table 42 are reproduced below.

Figure 5 AER data on individual firm credit ratings from its draft guideline

Table 42 Historical credit ratings of service providers

Issuer	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
APT Pipelines Ltd	NR	NR	BBB	BBB	BBB	BBB	BBB	BBB	BBB	BBB	BBB	BBB
ATCO Gas Australia LP	NR	NR	NR	NR	BBB	BBB	A-	A-	A-	A-	BBB+	BBB+
DBNGP Trust	BBB	BBB	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB	BBB
DBNGP Finance Co P/L	BBB	BBB	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB	BBB
DUET Group	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	NR	NR	NR	NR	NR	NR
ElectraNet P/L	BBB+	BBB+	BBB	BBB	BBB	BBB	BBB	BBB+	BBB+	BBB+	BBB+	BBB+
Energy Partnership (Gas) P/L	BBB	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB+	BBB+
Australian Gas Networks Ltd	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB	BBB+	BBB+	BBB+	BBB+	BBB+

Source: AER Rate of Return Guidelines Explanatory Statement page 341.

Based on the evidence of individual firms, while all energy firms together may well result in a BBB+ credit rating, the rating for gas transmission firms appears to be BBB (and BBB+ for distribution). This may be because of market perceptions of different levels of risk, for example, associated with decarbonisation of energy supply.

In its WACC guideline for rail, the ERA uses a different credit rating for each of the three railways, recognising some key differences in risk between them. We therefore request, based on evidence that the credit rating of gas transmission businesses is different to distribution, that the ERA considers taking a similar approach as it does in rail and applies different credit ratings where appropriate to different parts of the gas industry.

We also request the ERA considers adopting its rail approach with regard to the intersect between the credit rating and the DRP estimation process. To the extent the ERA is estimating a DRP for a BBB+ firm, the sample size is too small to provide robust results. In rail, the ERA has adopted a pragmatic response to this issue, namely:[48]

- it first adds broad BBB bonds to the BBB+ sample, and then does three estimations (high medium and low) with just BBB+ and three (high, medium and low) with the augmented sample, which includes broad BBB;
- it then assesses the likely direction of bias (upward in this instance); and

[48] See ERA, 2018, *Method for Determining the Weighted Average Cost of Capital for Railway Networks: Consultation Paper*, May 2018, pp12-13.

- it then takes the lowest yield estimate from the BBB+ and averages it with the lowest of the broad BBB index.

We consider this is a pragmatic response to a key issue, and recommend the ERA applies a similar method for the energy businesses.

2.6. Gamma

The value of imputation credits (gamma) has been the subject of considerable focus by stakeholders in recent years. After being one of the historically more stable (and certain) inputs to the rate of return estimate, since 2013 industry, regulators and economic experts have reached varying conclusions on the appropriate gamma estimate (typically 0.25 or 0.4), and the issue was also debated through several Australian Competition Tribunal decisions, whereby different Tribunals reached different conclusions using essentially the same data.

This is symptomatic of the difficulty in producing an accurate gamma estimate. Estimates of 0.25 and 0.4 both have merit; highlighting the degree of subjectivity and interpretation that can be applied to the data used to determine the distribution and utilisation rates that comprise gamma. particularly when there is no theoretical grounding to the approach.[49]

In January 2018, the Full Federal Court upheld the AER's decision on gamma for a value of 0.4.[50] We accept this estimate and submit that a gamma of approximately 0.4 is reasonably reflective of a benchmark efficient entity at this time. Perhaps more significantly, we welcome a return to some degree of consistency and certainty in the gamma estimate.

Where we disagree with the ERA's approach in its draft guideline is both in its production of yet more information which it suggests might be relevant to gamma, and also in the need to vary from the 0.4 estimate that has been established

In its draft guideline the ERA has revisited the gamma debate using new information made available by the AER, *with a view to creating a more robust and reliable approach to estimating gamma*.[51] The outcome is that the ERA considers gamma is now 0.5 - the product of a distribution rate of 0.83 and a utilisation rate of 0.6. However, we submit that the new information from Lally and the ATO that the AER has made available is no more conclusive than the information that preceded it.

Given the time and energy exhausted in recent years on determining that gamma is 0.4, we question whether varying from this estimate is necessary or is actually a more robust estimate. We submit that a more pragmatic approach would be to maintain the currently accepted position that gamma is 0.4. In simple terms, we do not think the information is sufficient to warrant any change to the recently determined position on gamma.

Further, we advise caution when determining a fixed gamma value for the next five years. As highlighted by the Electricity Networks Association on pages 149-150 of its submission to the AER's rate of return guideline review, as part of its current policy the Commonwealth Government Opposition proposes a tax change that would compromise the robustness of the equity share approach to estimating the gamma utilisation rate. We therefore suggest the ERA retains a degree of flexibility in its gamma estimation method to accommodate this tax change if it were to occur following the next general election.

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49 As experts have agreed is the case for the current AER framework. See CEPA, 2018, *AER Rate of Return Guideline Expert Joint Report,* 21 April 2018, pp 69-70.

50 Federal Court of Australia, *SA Power Networks v Australian Competition Tribunal (No 2) [2018] FCAFC 3,* Jan 2018.

51 ERA, 2018, *Draft Explanatory Statement for the Rate of Return Guidelines (2018)*, July 2018, paragraph 831.

With regard to the new evidence relied upon by the ERA to estimate the distribution and utilisation rates, we submit that there are significant flaws with both, and are certainly not reliable enough to merit a move away from the status quo. Our observations on the ERA's utilisation rate and distribution rate estimates are described below.

2.6.1. Utilisation rate

In the draft guideline, the ERA has moved from its previous approach of using three weighted methods to estimate the utilisation rate (the equity share approach, the taxation statistics approach and the dividend drop off method), to using solely the equity share approach based on Australian Bureau of Statistics (ABS) data. The use of dividend drop off studies has been debated at length during recent regulatory and merits reviews, therefore we do not intend to revisit that debate. However, the dismissal of taxation statistics is worth further investigation.

Our understanding is that the primary cause for excluding tax statistics from the utilisation rate estimate is a statement provided by the Australian Taxation Office (ATO) in a note to the AER in May 2018, saying:

> *The ATO would not recommend using Taxation Statistics data as the basis of a more detailed macro analysis of Australia's imputation system.*[52]

We understand a statement of this nature would give cause to challenge the value of taxation statistics as an input to estimating gamma, however, the ATO has since clarified its meaning.

On 21 June 2018, the AER and Electricity Networks Association (ENA) met with the ATO to understand what the ATO's above quote means. In that meeting, ATO staff explained that their concerns related primarily to the problems with franking account balance (FAB) data. It was subsequently agreed that the FAB data should not be used and that the dividend data should be used to estimate credits distributed. That is, there is agreement that the problematic FAB data should not be used for any purpose.

FAB data is not required to provide a utilisation estimate of gamma. The inaccuracy of FAB data is therefore not a valid reason to discount broader taxation statistics from gamma estimates.

We do not propose the use of taxation statistics provides the perfect answer. Like all datasets used to estimate gamma - including ABS data - the ATO data is not without its issues. However, as Hathaway (2018)[53] concludes, there are no outstanding questions on the quality of the ATO's data on credits created and credits redeemed and that these provide a reliable estimate of the utilisation or cash flow gamma, albeit one that includes unlisted firms.

We also note that in its recent Western Power Final Decision, the ERA suggests:

> *The data quality of this ATO information on the distribution rate is good and its use is consistent with current regulatory practice in Australia. Therefore, the ERA considers that the use of the ATO data on credit yields is a valid approach to adjust market returns for tax imputation.* [54]

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52 ATO note to the AER regarding imputation. Available at: https://www.aer.gov.au/system/files/ATO%20Note%20to%20AER%20regarding%20imputation%20-%209%20May%202018.pdf

53 See https://www.aer.gov.au/system/files/ENA%20-%20Capital%20Research%20Memorandum%20-%2028%20June%202018.pdf.

54 ERA, 2018, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network, Appendix 5*, September 2018, p 29.

We find it inconsistent that the ERA holds this view on taxation statistics when adjusting the MRP, but disputes the reliability of ATO data when estimating gamma.

We therefore submit that taxation statistics should be considered in the ERA's gamma estimate and should be weighted no lower than other, complementary datasets. On that point we note in the revised guideline the ERA now places a 100 per cent weighting on the use of ABS data used to construct equity ownership estimates of theta.

Given the ERA has discredited ATO data based on quality concerns, it follows that the ABS data should be approached with similar caution. The ABS itself has expressed the poor quality of the data used to construct equity ownership estimates:

> *The estimated market value of equity issued by some sectors is considered to be of poor quality. In particular, estimates of the market value of the amount issued by private corporate trading enterprises are considered poor because they are largely built up from counterpart and other information obtained from ABS Surveys of Foreign Investment and Balance Sheet Information. This sector covers equity issued by both listed and unlisted private corporate trading enterprises, of which there are over half a million.*
>
> *In terms of the analysis undertaken here, errors in the estimated market value of equity on issue will impact on the accuracy of estimates of the proportion of that equity owned by non-residents.*
>
> *A further concern relates to valuation. While both financial accounts and international investment statistics (from which the rest of the world data are sourced) are on a market value basis in principle, collection and estimation methods differ between the two sets of statistics…Because of the differences in the methodologies used, it is possible that there could be more variability in the market value estimates of equity held by the rest of the world than in the estimated market value of the equity on issue, thus causing some variation in the foreign ownership series derived from these data.*[55]

Based on this advice, combined with the recent clarification on the veracity of the ATO data, we recommend the ERA reconsiders whether it is prudent to rely solely on the equity ownership approach and dismiss the taxation statistics. Moreover, in recent advice to the ERA, Lally concurs that the ABS data should be assessed.[56] While Lally believes ABS data are preferable to ATO data, he recognises that ABS data require more scrutiny and challenge. This has not occurred.

Both the ABS and ATO datasets provide useful information but both are imperfect. This supports the approach whereby both datasets are considered to provide greater confidence in the estimate, but one should not necessarily be given significantly greater weight than the other.

Most importantly, we consider the new evidence the ERA is relying upon to justify moving away from the tax statistics approach is not robust enough to merit such a dramatic change in the utilisation estimating method as is being proposed.

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55 See the ABS feature article that first explains the foreign ownership calculations at http://www.abs.gov.au/AUSSTATS/abs@.nsf/Previousproducts/5306.0Feature%20Article150Jun%201992?opendocument&tabname=Summary&prodno=5306.0&issue=Jun%201992&num=&view=.

56 Lally, M, 2018, *Review of Gamma Submissions and the ERAWA's Views On Gamma*, 2018, p 17.

2.6.2. Distribution rate

In the draft guideline, the ERA proposes 100 per cent reliance on the Lally top 20 ASX-listed firms estimate of the distribution rate. We observe two issues with this approach.

Firstly, the Lally estimates are derived from franking account balances - a comparison of the change in FABs over a period to dividends paid over the corresponding period. The 20-firms approach assumes all reductions in the FAB relate to credits being distributed to shareholders. However, material reductions occur for other reasons; for example, tax refunds. Consequently, this approach should only be used as an upper bound and not a point estimate. Allied with the advice provided by the ATO on the unreliability of FAB data generally, this suggests it would not be prudent to solely rely on the Lally 20-firms approach.

Secondly, we submit that the top 20 ASX-listed firms are not appropriate comparators for the benchmark efficient entity. Many of the 20 firms are banks and most of the firms have material foreign profits. The benchmark efficient entity is assumed to operate wholly within Australia and has no foreign profits. It may be that, within the 20-firms sample, removing the one or two firms with the highest proportion of foreign profits leads to a higher estimate of the distribution rate, but this simplistic response ignores the fact that all of the firms in the sample have high levels of foreign profits and the BEE does not. The appropriate response, if an approach like this is to be used is to choose a sample designed to be like the BEE, rather than make changes to a sample which is clearly not.

We consider the unreliability of the data sample does not support the ERA moving away from its current practice and placing sole weight on the 20-firms approach.

In conclusion, we see insufficient evidence to support a change in the ERA's overall gamma estimating method at this time, and question the reasonableness of doing so. As the ERA quotes in its draft guideline, the Australian Competition Tribunal views the estimate of gamma as an *ongoing intellectual and empirical endeavour*.[57] Expert opinions and evidence on the reliability (or rather the degree of unreliability) of the various approaches to estimating gamma rate are fluid, and even the ERA's latest estimating method can just as easily result in a gamma estimate greater or less than 0.4.

We therefore propose the pragmatic solution is to retain gamma at 0.4, rather than develop another an alternate approach until further work and more compelling evidence (from either side) that justifies a diversion from this point estimate is merited.

2.7. Gearing

We accept the ERA's gearing of 55 per cent, and recognise the pragmatic approach the ERA has adopted to determine this parameter. The ERA has observed, quite rightly, that although gearing has historically been valued at 60 per cent, it does not automatically follow that gearing must be held constant at this value, particularly if evidence strongly suggests otherwise.[58] The ERA has observed the steady decline in the market value gearing measure since 2008 and has made an appropriate incremental adjustment that should help avoid larger changes or shocks in the future should the market value continue to decline.

Incorporating new information on gearing as it becomes available is a prudent approach and as the ERA suggests; assists in avoiding a number of well documented analytical biases specific to gearing such as anchoring and adjustment, conservatism, availability, confirmation

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57 Australian Competition Tribunal, *Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9, 12 May 2011*, paragraph 45.

58 ERA,2018, *Draft Explanatory Statement for the Rate of Return Guidelines (2018)*, June 2018, paragraph 207.

and status quo.[59] We also recognise that the adjustments made by the ERA in its guideline to account for the characteristics of debt (as distinct from equity), appear to be aligned with what experts participating in the AER's rate of return guideline review process suggest is best practice.[60]

We endorse the ERA's gearing approach in its draft guidelines and urge a similar degree of pragmatism and reason be applied in the estimating approach for certain other parameters (as discussed in this submission).

2.8. Inflation

The ERA uses the Treasury bond implied inflation approach to estimate the prevailing inflation rate over the course of a regulatory period. We consider the ERA's method has proven robust and there is no compelling reason to move away from it for the next round of Western Australian regulatory determinations.

[59] Epley N & Gilovich,T, 2001, "Putting Adjustment Back in the Anchoring and Adjustment Heuristic: Differential processing of self-generated and experimenter-provided anchors", *Psychological Science*, 12(5), pp 391-6.

[60] CEPA, 2018, *AER Rate of Return Guideline Expert Joint Report,* 21 April 2018, pp30-32.

Low-beta bias and the Black CAPM

REPORT PREPARED FOR AUSTRALIAN GAS INFRASTRUCTURE GROUP AND APA GROUP

September 2018

Low-beta bias and the Black CAPM

Contents

Contents

Low-beta bias and the Black CAPM

Figures

Tables

1 Executive summary

1.1 Instructions

1 Frontier Economics has been engaged by Australian Gas Infrastructure Group (AGIG) and APA Group to provide expert advice in relation to the issue of the role of low-beta bias and the Black CAPM when estimating the equity beta as part of the implementation of the Sharpe-Lintner CAPM (SL-CAPM) in the context of the Foundation Model approach to setting the allowed return on equity.

2 Specifically, we have been asked to:

a. Consider the context of the ERA's approach to the evidence of low-beta bias and the Black CAPM – informed by recent decisions and merits review processes.

b. Review the empirical evidence which shows that the relationship between beta and observed returns has a higher intercept and a flatter slope than the SL-CAPM suggests.

c. Review approaches that have been proposed to test whether the same relationship between beta and *ex post* observed returns also holds in relation to *ex ante* expected returns, and examine the relationship between beta and expected returns in the Australian data.

d. Review the concept of an 'expected equilibrium return' and comment upon (a) whether the SL-CAPM is the only viable equilibrium model and (b) whether the observed data is relevant to informing the implementation of an expected equilibrium model.

1.2 Background and context

Empirical and theoretical evidence of bias in SL-CAPM return estimates

3 Over several decades, the empirical finance literature has consistently reported that the relationship between beta and observed returns has a higher intercept and a flatter slope than the SL-CAPM suggests. Thus, the SL-CAPM systematically under-states the returns on stocks with beta estimates less than one. That is, low-beta stocks systematically earn higher returns than the SL-CAPM would predict – the model does not fit the observable data. This empirical evidence is known by Australian regulators as 'low-beta bias.'

4 Black (1972) has developed a theoretical model that produces output that is more consistent with the empirical evidence. The 'Black CAPM' replaces one of the strong assumptions of the SL-CAPM and it produces a relationship between beta and returns that has a higher intercept and a flatter slope – consistent with the

evidence. Subsequent models have modified other SL-CAPM assumptions in deriving equilibrium models that also fit the observed data better than the SL-CAPM.

5 Thus, there are two sides of the coin in relation to this evidence:

a. There is an *empirical* aspect of this body of evidence – the relationship between beta and observed returns has a higher intercept and a flatter slope than the SL-CAPM suggests; and

b. There is a *theoretical* aspect of this body of evidence – the Black CAPM and subsequent models demonstrate that a change to SL-CAPM assumptions produces a higher intercept and a flatter slope, consistent with the empirical evidence.

The ERA's consideration of low-beta bias

6 In its 2013 Guideline, and in a number of subsequent decisions, the ERA accepted the empirical evidence of low-beta bias and gave effect to that evidence by using it to inform the selection of its equity beta point estimate:

> The Authority recognises that typical empirical applications of the Sharpe Lintner CAPM may under-estimate equity beta for low beta stocks, with the potential to lead to a downwards bias in the estimate of the return on equity. As a practical response, the Authority will take this into account when determining the point estimate of the equity beta for use in the Sharpe Lintner CAPM.[1]

7 The ERA maintained this approach in its December 2015 DBP Draft Decision, but changed approach in its June 2016 DBP Final Decision. In that decision, the ERA determined that the evidence of low-beta bias or the Black CAPM would no longer be given any effect when selecting the beta point estimate.

8 In its DBP Final Decision, the ERA determined that:

a. The evidence of low-beta bias does not imply that beta estimates are biased, but rather that the SL-CAPM produces downwardly biased estimates of the required return for low-beta stocks. Consequently, the evidence should not be accounted for via an adjustment to its beta estimate, but via an adjustment to the model – by using a higher intercept (or 'alpha'); and

b. The evidence was insufficient to warrant any such adjustment being made at the time. This was because the evidence in question was drawn from observed (*ex post)* returns whereas the SL-CAPM relates to (*ex ante*) expected returns.

9 In the DBP limited merits review proceedings, the Tribunal held that the approach adopted in the DBP Final Decision was open to the ERA.

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[1] ERA, December 2013, Rate of Return Guideline, Explanatory Statement, Appendices, Paragraph 27.

10 In its recent Draft Rate of Return Guideline, the ERA has maintained the approach of giving no weight to the empirical evidence of low-beta bias or the theoretical evidence of the Black CAPM.

11 In this report, we take the ERA's current position as the starting point:

a. That any problem to be remedied relates to the model itself and not to the empirical estimates of beta; and

b. That there is insufficient evidence of a low beta-bias in *expected* returns, because the evidence focuses on *observed* returns and it may be the case that actual returns have systematically differed from what investors required or expected.

1.3 Primary conclusions

12 Our primary conclusions are set out below.

The evidence of low-beta bias in expected returns

13 In Section 3 below, we demonstrate that the literature contains a number of approaches for estimating expected returns directly, rather than using observed returns as a proxy. These expected returns are estimated using information from current stock prices, dividend forecasts, and analyst target prices.

14 The literature demonstrates that the *ex ante* required returns produce the same result that has been documented for *ex post* observed returns – the relationship between beta and required returns has a higher intercept and a flatter slope than the SL-CAPM would suggest.

We have applied this methodology to Australian data and we also find the same result – the relationship between beta and *expected* returns has a higher intercept and a flatter slope than the SL-CAPM would suggest. We have followed Brav et al (2005) in analysing and reporting *excess* returns – in excess of the prevailing risk-free rate. In the parlance of the ERA the SL-CAPM posits an 'alpha' of zero. By contrast, Table 1 below reports a statistically significant positive intercept in expected returns – the same relationship that has been identified in observed returns.

Table 1: Results for Australian sample compared with the results of Brav et al. (2005) and with values adopted by the ERA

	ERA	Brav – Value Line	Brav – First Call	Individual Firm Level	Portfolio Level Decile	Portfolio Level Quintile
		US data		Australian data		
Intercept (Alpha)	0	0.07	0.20	0.07	0.07	0.07
(*t*-statistic)		(3.2)	(5.8)	(12.66)	(12.09)	(12.11)
Slope	0.062	0.07	0.07	0.01	0.01	0.01
(*t*-statistic)		(5.1)	(4.3)	(2.08)	(1.81)	(2.5)

Source: AER, Brav et al (2005), Datastream, Frontier Economics calculations. ERA allowances taken from Western Power Final Decision.

What can be made of the empirical evidence from observed returns?

15 Even if the market *is* in equilibrium (i.e., investors have priced stocks such that they expect to receive a return equal to that which they require) it is still theoretically possible that *observed* returns over a period might turn out to be different from what was required/expected.

16 If one of the available equilibrium models is selected (the ERA has selected the SL-CAPM) and we observe that actual returns are systematically inconsistent with that model in some respect (e.g., higher intercept and flatter slope), there are two potential explanations:

a. The selected model does not perfectly describe the process by which the aggregate market determines required returns; or

b. The selected model *does* perfectly describe the process by which the aggregate market determines required returns, but the actual returns over the period that was examined happened to deviate from the return that investors required/expected due to random chance.

17 The ERA has, to date, concluded in favour of the second explanation. The ERA's current approach is to implement the SL-CAPM (among the set of equilibrium asset pricing models) without regard to the empirical evidence that is systematically inconsistent with that model.

18 When assessing the reasonableness of the ERA's approach of placing 100% faith in the SL-CAPM and applying 0% weight to the empirical evidence, the relevant considerations include:

a. The empirical evidence of low-beta bias is the most consistent, compelling and well-accepted empirical evidence in the field of

asset pricing. The contributors to this literature include two Nobel Prize winners and the studies documenting low-beta bias have been published in the very top finance journals over several decades, and the empirical evidence of low-beta bias is so well-accepted that it appears in the standard finance textbooks; and

b. The literature since the documentation of low-beta bias has not questioned whether or not the empirical evidence is a real reflection of the returns that investors require/expect. Rather, the literature has focused on identifying and modifying the components of the SL-CAPM that lead to it systematically understating the returns on low-beta stocks.

The evidence is relevant and robust and should not be disregarded

19 We have been asked to provide a view on the binary qualitative question of whether the empirical evidence of low-beta bias should have a real role in the process for estimating the required return on equity. In our view, there are compelling reasons to have real regard to that evidence if the goal is to produce the best possible estimate of the required return on equity.

1.4 Author of report

20 This report has been authored by Professor Stephen Gray, Professor of Finance at the UQ Business School, University of Queensland and Director of Frontier Economics, a specialist economics and corporate finance consultancy. I have Honours degrees in Commerce and Law from the University of Queensland and a PhD in Financial Economics from Stanford University. I teach graduate level courses with a focus on cost of capital issues, I have published widely in high-level academic journals, and I have more than 20 years' experience advising regulators, government agencies and regulated businesses on cost of capital issues. I have published a number of papers that specifically address beta estimation issues. A copy of my curriculum vitae is attached as an appendix to this report.

21 My opinions set out in this report are based on the specialist knowledge acquired from my training and experience set out above. I have been provided with a copy of the Federal Court's Expert Evidence Practice Note GPN-EXPT, which comprises the guidelines for expert witnesses in the Federal Court of Australia. I have read, understood and complied with the Practice Note and the Harmonised Expert Witness Code of Conduct that is attached to it.

2 Background and context

2.1 The evidence of low-beta bias

22 Soon after the publication of the Sharpe-Lintner CAPM, researchers began testing whether the predictions (or, more precisely, the empirical implications) of the model were supported in real-world data. The conclusion from this evidence is that the empirical implementation of the SL-CAPM provides a poor fit to the observed data. In particular, the actual returns on low-beta stocks systematically and materially exceed the SL-CAPM estimates; a result that is known as low-beta bias. The feasible implementation of the SL-CAPM does not fit the observed data.

23 The literature documenting low-beta bias has been performed by the very top echelon of finance researchers, including two Nobel prize winners. Low beta bias has been consistently documented across a number of markets and is documented in the standard finance textbooks.

24 There is currently no real debate about this empirical evidence from observed stock returns. The relationship between beta and returns has a higher intercept and a flatter slope than the SL-CAPM suggests. For example, the AER's recent Draft Guideline Explanatory Statement states that:

> We acknowledge that ex-post return data can indicate that actual returns exceed expected returns for low beta stocks. [2]

25 Also, most of the experts in the AER's concurrent evidence sessions agreed with the proposition that:

> There is sound evidence that low-beta stocks have exhibited higher returns than the S-L CAPM predicts.[3]

26 The relevant evidence is depicted in Figure 1 below and some it is summarised in Appendix 1 to this report.

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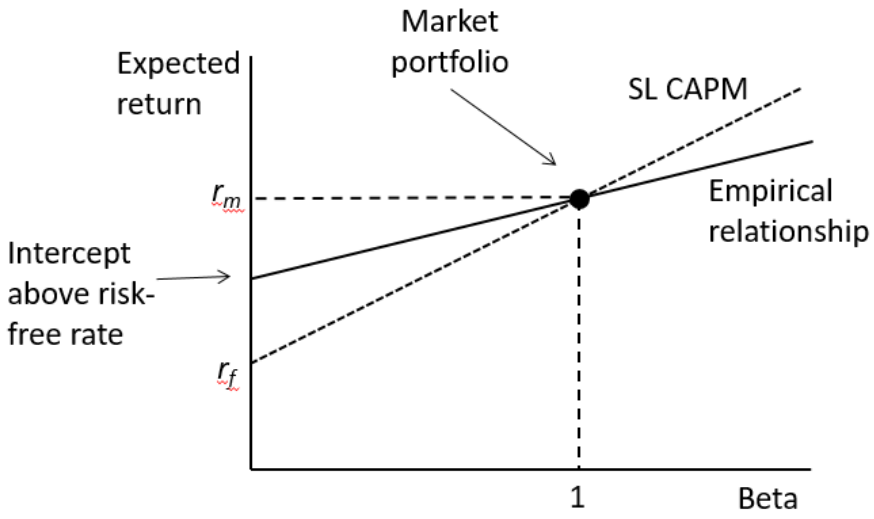
[2] AER, July 2018, Draft Rate of Return Guideline, Explanatory Statement, p. 277.

[3] Joint Experts' Report, Proposition 5.21, p. 52. No experts disputed the existence of the empirical evidence, but instead stated that the size of the bias is difficult to reliably quantify.

Figure 1: Sharpe-Lintner CAPM vs. observed empirical relationship.



2.2 The ERA's treatment of low-beta bias in the 2013 Guideline

27 In its 2013 Rate of Return Guideline, the ERA concluded that it should have regard to the empirical evidence of low-beta bias and the theoretical evidence of the Black CAPM. The ERA considered that there was no sufficiently reliable estimate of the quantum of the bias, in which case it would give effect to that evidence when selecting the beta point estimate to be used in the SL-CAPM:

> The Authority recognises that typical empirical applications of the Sharpe Lintner CAPM may under-estimate equity beta for low beta stocks, with the potential to lead to a downwards bias in the estimate of the return on equity. As a practical response, the Authority will take this into account when determining the point estimate of the equity beta for use in the Sharpe Lintner CAPM.[4]

and:

> the Authority intends to account for empirical evidence relating to potential bias in the estimates of the equity beta, that are used in applying the Sharpe Lintner CAPM. The Authority considers that such an approach would account for much of the evidence supporting the use of the Empirical and Black CAPM models.[5]

2.3 The ERA's 2015 Draft Decision for DBP

28 In its 2015 submission to the ERA, DBP proposed an empirical technique for quantifying the extent of the bias and submitted that the informal adjustment the ERA had made to its beta estimate in the 2013 Guideline was inadequate.

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[4] ERA, December 2013, Rate of Return Guideline, Explanatory Statement, Appendices, Paragraph 27.

[5] ERA, December 2013, Rate of Return Guideline, Explanatory Statement, Appendices, Paragraph 50.

However, in its December 2015 Draft Decision, the ERA concluded that DBP's proposed adjustment was too high.[6]

29 The ERA concluded that it would continue to give effect to this evidence when selecting the beta point estimate:

> None of the estimates of a return on equity that are made using the Black CAPM are sufficiently robust. The Authority considers that it is therefore impractical to utilise the Black CAPM to determine the return on equity directly.
>
> However, the Authority will recognise the theoretical insight from the Black CAPM when estimating a return on equity with the Sharpe Lintner CAPM. The Authority will have regard to these outcomes when estimating the equity beta from within the estimated range.[7]

30 This led the ERA to select a point estimate 'towards the top' of the empirical range. Specifically, the ERA considered the appropriate empirical range to be 0.3 to 0.8, with a best statistical estimate of 0.5.[8] In having regard to the "potential for the use of the Sharpe Lintner CAPM to underestimate returns,"[9] the ERA adopted a beta of 0.7.

2.4 The ERA's 2016 Final Decision for DBP

No effect given to low-beta bias or the Black CAPM

31 The ERA updated its empirical beta estimates for its June 2016 Final Decision for DBP. The updated analysis indicated a material increase in beta estimates. The ERA concluded that the best statistical estimate had increased from 0.5 (in the Draft Decision) to 0.7. However, the ERA determined that the evidence of low-beta bias or the Black CAPM would no longer be given any effect when selecting the beta point estimate, in which case the allowed beta remained at 0.7.[10]

Interpretation of 'low beta bias'

32 The DBP Final Decision draws a distinction between two possible interpretations of the term 'low beta bias' that is used to describe the empirical evidence that low-beta stocks systematically generate higher returns than the SL-CAPM would suggest:

a. **Interpretation 1: The problem lies in the empirical estimation of beta**

   One possible explanation is that the betas are under-estimated. That is, the true beta is above the empirical estimate. In this case,

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[6] ERA, December 2015, DBP Draft Decision, Paragraph 188.

[7] ERA, December 2015, DBP Draft Decision, Paragraph 746-747.

[8] ERA, December 2015, DBP Draft Decision, Paragraph 249, 255.

[9] ERA, December 2015, DBP Draft Decision, Paragraph 256.

[10] ERA, December 2015, DBP Final Decision, Paragraph 474.

if the return is consistent with the true (higher) beta, there will appear to be out-performance relative to the (lower) empirical estimate of beta.

b. **Interpretation 2: The problem lies in the SL-CAPM being inconsistent with real-world required returns**

The alternative explanation is that the SL-CAPM (which is a very simple theoretical economic model) may not fully capture the returns that investors require. Thus, even if betas can be perfectly estimated, the model (that converts beta into expected returns) may be inadequate.

33 When DBP has raised the issue of low-beta bias it has been in the context of the second explanation – the SL-CAPM produces downwardly biased estimates of the required return on low-beta stocks. That is, the problem, is not with the estimates of beta, but with the model in which those estimates are used. This is obvious in Figure 1 above.

34 Although the problem is with the model itself, the ERA has previously given effect to this evidence via an adjustment to the equity beta. By way of analogy, consider a watch that runs slow and loses two minutes over the course of a week. One remedy would be to fix the mechanism so that it keeps time more accurately. An alternative is to wind the minute hand forward a little at the end of each week. The second remedy of moving the minute hand forward would be adequate, even though there is no problem with the minute hand itself (it is not bent or loose).

35 In its DBP Final Decision, the ERA notes that there is no problem with the minute hand (beta estimate) and that the problem is with the mechanism itself (the SL-CAPM). However, the Final Decision concludes that, because there is no problem with the beta estimate it should make no adjustment to the beta estimate. Thus, the ERA concludes that, if any effect is to be given to this evidence, it would have to be by an adjustment to the model. As shown in Figure 1 above, this would involve using a higher intercept, which the ERA refers to as 'alpha.' However, the ERA concludes that the evidence 'at the current time' does not support such an adjustment to the model:

> The Authority has concluded that, if any adjustment could be justified, it should apply to the intercept term in the SL-CAPM, thereby taking account of the alpha term arising in ex post tests of the model. However, the Authority is not convinced there is adequate evidence, at the current time, to justify making such an adjustment.[11]

Ex ante vs ex post returns

36 To support its conclusion that the evidence at the current time does not support any adjustment to the SL-CAPM, the ERA identifies the difference between ex ante required returns and ex post observed returns.[12] The ERA noted that it is

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[11] ERA, December 2015, DBP Final Decision, Paragraph 436.

[12] This point can be explained via a simple example. Suppose investors expect a particular asset to produce a payoff of $110 one year from now, and they consider that a 10% return would be appropriate. In this

seeking an estimate of *ex ante* required returns, whereas the evidence of low-beta bias is based on *ex post* observed returns:

> It follows that this conceptual difference between expectations and outcomes is a major problem for ex post tests of asset pricing models, such as that proposed by DBP. Rational investors do not take on the additional risk of equity expecting it to deliver less than less risky debt, yet this has been an actual outcome in the market over recent times. DBP is not actually testing the return on equity models against investors' *expectations* for the return, ex ante, as it needs to do in order to determine whether the outputs of the asset pricing models are biased. Rather, it is testing those models against *actual outcomes, realised ex post*. DBP has not recognised this distinction, which constitutes an error.[13]

37 DBP has submitted that actual (*ex post*) stock returns might differ from investors' (*ex ante*) required return over a short period. But over time, investors will continue to price assets on the basis of their required return. In some cases, the actual return will turn out to be higher than they expected/required and in some cases it will be lower – for a host of different reasons. But over a period of time, the average observed return will reflect the expected/required return that investors used when pricing the asset. That is, if investors price assets to generate an expected return of 10%, we would expect to observe a realised return of 10% on average over time. Thus, the average observed return over a period of time reflects the return that investors expect/require. Indeed, this is the whole basis for using observed market data for *any* parameter estimation purpose.

2.5 The Australian Competition Tribunal

38 When considering the ERA's departure from its Guideline approach to estimating beta, the Tribunal drew attention to the ex ante/ex post distinction in the ERA's reasoning, citing a number of passages from the Final Decision, including:

> At the same time, the Authority is not convinced there is any empirical evidence at the current time to justify an adjustment to the SL-CAPM for expected alpha for the benchmark efficient entity.[14]

and:

> The Authority now considers, given these insights, that there is inadequate evidence, at this time, to justify departure from an ex-ante alpha estimate of zero in its implementation of the SL-CAPM.[15]

39 The Tribunal concluded that:

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case, investors would price that asset at $100, expecting to receive their (ex ante) required return of 10%. Suppose that at the end of the year the actual payoff from the investment is $105. In this case, the (ex post) observed return is 5%. Thus, there is a difference between the ex post observed return and the ex ante required return.

[13] ERA, December 2015, DBP Final Decision, Paragraph 267.

[14] Application by DBNGP (WA) Transmission Pty Ltd [2018] ACompT 1, 16 July, p. 94.

[15] Application by DBNGP (WA) Transmission Pty Ltd [2018] ACompT 1, 16 July, p. 94.

> …the ERA noted (correctly) that this conceptual difference between expectations and outcome is a major problem for *ex post* tests of asset pricing models, such as that proposed by the owners in the present case. The ERA said (correctly) that rational investors do not take on the additional risk of equity expecting it to deliver less than risky debt, yet this has been an actual outcome in the market over recent times. The ERA noted that the approach of the owners did not actually test the return on equity models against investors' expectations for that return, *ex ante*, as it would need to do in order to determine whether the outputs of the asset pricing models are biased. Rather, so the ERA said, the owners are testing those models against actual outcomes, realised in *ex post*. [16]

2.6 The role of this report

40 Our understanding of the current position in relation to low-beta bias and Black CAPM, within the ERA's regulatory process, is as follows:

a. There is broad acceptance of the empirical evidence that the relationship between observed stock returns and beta estimates has a higher intercept and flatter slope than the SL-CAPM suggests;

b. There is also broad agreement that the market will generally be in equilibrium, where investors have priced stocks such that the expected return is equal to their required return. Thus, there is an equivalence between expected and required returns;[17]

c. The ERA considers that there may be a difference between *ex post* observed returns and *ex ante* expected/required returns. Thus, it is theoretically possible that the expected/required return of investors is consistent with the SL-CAPM even though the empirical evidence from actual stock returns is not; and

d. If the ERA was convinced that there was evidence that the relationship between *expected* returns and beta estimates has a higher intercept and flatter slope than the SL-CAPM suggests (consistent with the empirical evidence from observed stock returns) the ERA would give effect to that evidence via an adjustment to the intercept (which the ERA calls 'alpha') rather than an adjustment to the beta estimate.

41 In this report, we note that the standard approach in empirical finance is based on the notion that investors are unlikely to generate systematically biased expectations, on average. For example, if a particular stock consistently generated a return in excess of the market's expectation, it seems unlikely that the market would maintain the same expectation and continue to be surprised year after year. This is the basis for using observed returns (on average over a period of time) as a proxy for expected/required returns.

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[16] Application by DBNGP (WA) Transmission Pty Ltd [2018] ACompT 1, 16 July, p. 124.

[17] This point is addressed in more detail in Section 4.6 below.

42 However, given that the ERA remains concerned about the possibility of a difference between *ex post* observed returns and *ex ante* expected/required returns, we consider approaches for estimating expected returns directly, rather than using observed returns as a proxy.

43 We show that the relationship between *expected* returns and beta estimates has a higher intercept and flatter slope than the SL-CAPM suggests (consistent with the empirical evidence from observed stock returns).

44 We also consider the conditions under which observed returns provide relevant information about required/expected returns. We demonstrate the widespread acceptance of the view that observed returns do indeed provide relevant information about required/expected returns.

3 Analysis of *expected* returns

3.1 Overview

45 We have noted above that the ERA remains concerned about the possibility of a difference between *ex post* observed returns and *ex ante* expected/required returns.

46 In this section, we briefly explain why the standard approach throughout the empirical finance literature is to use observed returns (on average over a period of time) as a proxy for expected/required returns.

47 We then demonstrate that there are techniques for estimating *expected* returns directly. We review the evidence in relation to those techniques and we implement them using the Australian data. We show that the relationship between *expected* returns and beta estimates has a higher intercept and flatter slope than the SL-CAPM suggests (consistent with the empirical evidence from observed stock returns).

3.2 Using observed returns as a proxy for expected returns

48 The most common approach for estimating (*ex ante*) expected returns in the finance literature is to use average (*ex post*) observed returns as a proxy. The logic for this approach is straightforward – it is unlikely that investors in aggregate would consistently and systematically mis-estimate expected returns. Developed stock markets are deep, liquid and competitive with many participants investing material resources in estimating expected returns. As we have noted above, if a particular stock consistently generated a return in excess of the market's expectation, it seems unlikely that the market would maintain the same expectation and continue to be surprised year after year. The more likely outcome is that the market would revise its expectation to take the market evidence into account.

49 Another way of looking at this issue is in terms of investors setting the price of an asset to reflect their required return. This point can be explained via a simple example. Suppose investors expect a particular asset to produce a payoff of $110 one year from now, and they consider that a 10% return would be appropriate. In this case, investors would price that asset at $100, expecting to receive their (ex ante) required return of 10%. Suppose that at the end of the year the actual payoff from the investment is $105. In this case, the (ex post) observed return is 5%. Thus, there is a difference between the ex post observed return and the ex ante required return.

50 Over time, investors will continue to price assets on the basis of their required return. In some cases, the actual return will turn out to be higher than they expected/required and in some cases it will be lower – for a host of different reasons. But over a period of time, the average observed return will reflect the expected/required return that investors used when pricing the asset. That is, if investors price assets to generate an expected return of 10%, we would expect to

observe a realised return of 10% on average over time. Thus, the average observed return over a period of time reflects the return that investors expect/require.

51 Indeed, this is the whole basis for using observed market data for *any* parameter estimation purpose. For example, the ERA estimates equity beta and the market risk premium using observed stock returns – on the basis that those observed returns reflect the required return of investors.

52 If observed returns cannot be relied upon to reflect investors' required/expected returns for the purposes of assessing low-beta bias, they cannot be relied upon for any other purpose. That is, it would be illogical to rely on observed stock returns to estimate beta and MRP (on the basis that returns reflect investor expectations) but to then conclude that the same returns are unreliable (on the basis that they do not, or may not, reflect investor expectations) when considering low-beta bias.

3.3 Direct estimation of expected returns

53 Section 2 above explains that the ERA does not rely on observed stock returns when assessing the evidence that the observed relationship between beta and returns has a higher intercept and a flatter slope than the SL-CAPM would suggest. The ERA relies on the potential difference between *ex ante* required returns and *ex post* observed returns to justify disregarding this evidence.

54 Whether low-beta bias is also present in *expected* returns can be examined using direct estimates of *ex ante* expected returns rather than *ex post* observed returns as a proxy. The seminal paper in this area is Brav, Lehavey and Michaely (2005)[18] who replace observed *ex post* returns with *ex ante* expected/required returns in the empirical tests that have been developed in this area over some decades. Their estimate of expected/required returns is extracted from analyst estimates, as explained below. The use of implied returns extracted from analyst reports is motivated by the fact that there is a rich literature documenting the value-relevance of analyst forecasts. Section 3.6 below documents some of the research that shows how stock prices are sensitive to analyst forecast information.

55 Brav et al (2005) report that the *ex ante* expected returns produce the same result that has been documented for *ex post* observed returns – the relationship between beta and required returns has a higher intercept and a flatter slope than the SL-CAPM would suggest.

56 We have applied the Brav et al (2005) methodology to Australian data and we also find the same result – the relationship between beta and expected returns has a higher intercept and a flatter slope than the SL-CAPM would suggest.

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[18] Brav, A., R. Lehavy, and R. Michaely, 2005. "Using expectations to test asset pricing models," *Financial Management*, Autumn, 31–64.

3.4 The Brav et al (2005) methodology

3.4.1 Approach

57 Brav, Lehavy and Michaely (2005), use Value-Line and First Call analyst forecasts to proxy expected/required returns. Their motivation for using these data sources to obtain estimates of *ex ante* expected/required returns is as follows:

> Although market expectations are unobservable, there are several reasons to believe that our measures of expected return represent a significant portion of the market's expectations. First, the Value Line and First Call estimates that we use impact market prices (Affleck-Graves and Mendenhall, 1992 and Womack, 1996). Second, researchers and practitioners have been using analysts' earnings and growth forecasts as a proxy for the market's estimates of these variables. Third, subscribers to both databases (which include individual investors, brokerage and asset management firms, and corporations) have been paying for these services (directly or indirectly) and it is likely that they would adopt these expectations (Ang and Peterson, 1985). Fourth, coverage is wide for both databases. Finally, Value Line expectations are unlikely to suffer from incentives-related biases. Therefore, we use these expectations in our main tests.[19]

58 Brav et al (2005) collect expected return data primarily from Value Line, an independent research provider that covers approximately 3,800 US stocks. They analyse results for the period 1975-2001. Their sample comprises 92% of the NYSE, AMEX, and Nasdaq in terms of market value. They also use First Call as an additional source of analysts' expectations to create a large sample of analysts' expected returns. These expected returns are obtained from sell-side analysts for more than 7,000 firms during the period 1997 through 2001.

59 Their general approach is to infer the expected return from analyst forecasts of future dividends and target prices. Effectively, the expected return is estimated by solving for r_e in the following equation:

$$P_0 = \sum_{i=1}^{N} \frac{d_i}{(1+r_e)^{t_i}} + \frac{TP}{(1+r_e)^{t_{TP}}}$$

where:

- P_0 represents the current observable stock price;
- TP represents the analyst forecast of the stock price at some future time t_{TP}; and
- d_i represents the analyst forecast of the dividend to be paid at time t_i.

3.4.1 Key findings

60 Brav et al (2005) report that the same result that has been documented for observed *ex post* returns also holds with *ex ante* expected returns – the relationship

[19] Brav et al (2005), p. 32.

between beta and expected returns has a higher intercept and a flatter slope than the SL-CAPM would suggest. Indeed, Brav et al report that the result is even more pronounced with expected returns – the intercept is even higher than is the case with observed stock returns.

3.5 Analysis of *ex ante* returns in Australia

3.5.1 Data source and methodology

61 Since Value Line data is not available for Australia, we use the I/B/E/S analyst forecast database, which is comparable to the First Call data used by Brav et al (2005). Our sample covers the period March 2002 through to August 2017. All the data is collected via Thomson Reuters Datastream.

62 Analyst coverage increases significantly over this period, with 100 sample firms in March 2002 and 316 firms in August 2017. In total we have 1,199 firms over our 15-year sample period.

63 We follow the Brav et al (2005) methodology in analysing the Australian data, with the details of our approach set out in Appendix 2 to this report. This effectively involves the following cross-sectional regression specification being applied each month over the sample period:

$$\left(\hat{r}_e - r_f\right)_t = \alpha + \delta\hat{\beta}_t + \epsilon_t$$

where:

- $\left(\hat{r}_e - r_f\right)_t$ represents the analysts' expected excess return estimated at time t; and
- $\hat{\beta}_t$ represents the estimate of the firm's beta at time t.

64 Under the SL-CAPM, the regression intercept (α) would be zero and the slope coefficient (δ) would be equal to the market risk premium.

3.5.2 Results

65 Table 2 below documents the results from the regression described above performed on both an individual firm basis and a portfolio basis. These are estimates of expected excess returns and do not involve any realised returns. We have followed Brav et al (2005) in analysing and reporting *excess* returns – in excess of the prevailing risk-free rate. Thus, in the parlance of the ERA, the SL-CAPM posits an 'alpha' of zero and a slope equal to the market risk premium.

Table 2: Results for Australian sample compared with the results of Brav et al. (2005) and with values adopted by the ERA

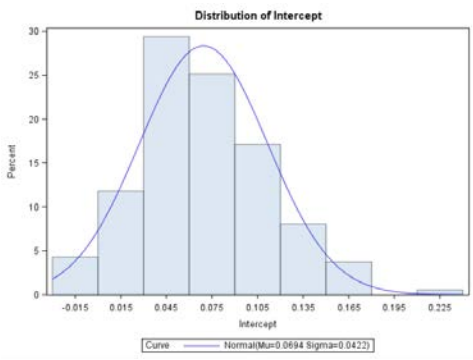
	ERA	Brav – Value Line	Brav – First Call	Individual Firm Level	Portfolio Level Decile	Portfolio Level Quintile
		US data		Australian data		
Intercept (Alpha)	0	0.07	0.20	0.07	0.07	0.07
(*t*-statistic)		(3.2)	(5.8)	(12.66)	(11.76)	(11.47)
Slope	0.06	0.07	0.07	0.01	0.01	0.01
(*t*-statistic)		(5.1)	(4.3)	(2.08)	(1.91)	(2.40)

Source: AER, Brav et al (2005), Datastream, Frontier Economics calculations. ERA allowances taken from Western Power Final Decision.

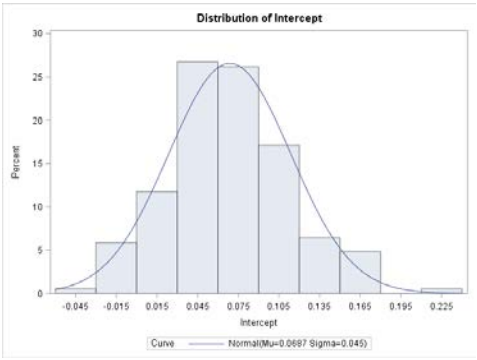
66 Table 2 demonstrates that the intercept terms (alpha) are positive and statistically significant (at more than the 1% level) in all cases. That is, the relationship between the expected return and beta estimates has a higher intercept than the SL-CAPM suggests (i.e., a positive 'alpha').

67 To ensure that the results are not driven by outliers, we examine the distribution of intercepts over time (an intercept is produced for the cross-sectional regression that is produced each month). The distributions of intercept terms for the various individual and portfolio specifications are set out in Figure 2 below. The intercept is consistently positive for almost every firm-year analysis, and the mean intercept (reported above) is highly statistically significant. That is, the distributions in Figure 2 show the intercept (alpha) terms for each of the analyses and Table 2 above shows that the mean of these intercept terms is highly statistically significant.

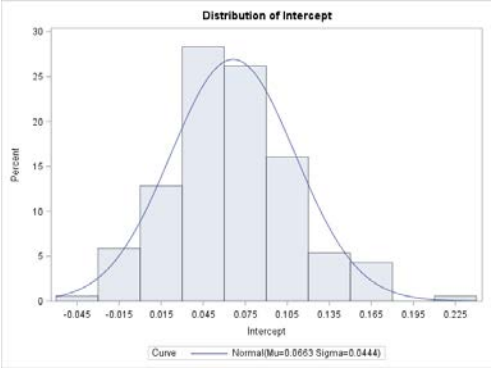
Figure 2: Distribution of intercepts for individual firm-level and portfolio time-series regressions for Australian data



Firm-level alphas



Portfolio alphas (deciles)



Portfolio alphas (quintiles)

Source: Frontier Economics calculations. These figures show the distribution of intercept estimates for each implementation of the regression in Paragraph 51 above. The bars represent the empirical distribution and the curve represents a normal distribution with mean and variance set equal to the empirical estimates from the distribution of intercepts. The figure shows that, in almost every case, the intercept is positive such that the expected return on low-beta stocks is higher than the SL-CAPM suggests.

3.5.3 Summary and conclusions from the Australian analysis

68 Testing of Australian data using the methodology employed by Brav et al. (2005) reveals a consistent and statistically significant intercept (alpha) term. This is consistent with the empirical evidence from observed returns. Both sets of evidence are inconsistent with the SL-CAPM.

69 In particular, we find that the intercept in the relationship between beta and *expected* stock returns is higher than the SL-CAPM would suggest. Thus, the expected return on low-beta stocks is higher than the SL-CAPM estimates.

70 These findings are consistent with the empirical evidence in relation to observed stock returns. They are also consistent with the US results for expected stock returns provided by the earlier study of Brav et al (2005).

3.6 The relevance of analyst forecasts

71 One of the key reasons for estimating *ex ante* expected returns using analyst forecasts and target prices is because that information has been shown to be strongly linked to value. Specifically, there is strong empirical evidence which shows that analysts' opinions affect prices (Womack, 1996, Barber, Lehavy, McNichols, and Trueman, 2001, and Brav and Lehavy, 2003).

72 Analysts, as a form of information intermediaries, are expected to mitigate information asymmetry and/or reveal mispricing. With access to a wide range of information, including public signals such as stock prices, industry news, and macroeconomic factors, as well as private signals about firm-specific financial and operating situation, analysts' outputs – for example, coverage decisions, earnings forecasts, and recommendations should contain valuable information for the capital markets and therefore have real economic consequences.

73 Kelly and Ljungqvist (2012) show that exogenous shocks to analyst coverage terminations through closures and/or brokerage mergers and acquisitions increase

firm expected returns by exacerbating adverse selection risk. Analyst coverage affects firm cost of capital and thus induces managers to change investment, and financing decisions (Derrien and Kecskés, 2013). Loh and Stulz (2018) show that analyst coverage decisions and recommendations become much more valuable in bad times.

74 The information content of analyst outputs increase with industry competition and becomes much more important to the functionality of the capital markets (Merkley, Michael and Pacelli, 2017). Das, Guo and Zhang (2006) show that analyst selective coverage decisions can predict future performances of newly listed firms. Lee and So (2017) extend the idea from Das, Guo and Zhang (2006) by applying a characteristic-based decomposition method to a large cross-section of firms find that the coverage signal related to analyst expectations about firm future performances, and show that the signal strongly predicts firm future returns and operating performances.

75 Asquith, Mikhail and Au (2005), Frankel, Kothari and Weber (2006), and Loh and Stulz (2011) show that analyst earnings revisions incorporate both publicly observed signals and new information to investors. Consequently, prices, trading activity, and liquidity all change around analysts' forecast revisions. Institutional investors trade more during the recommendation changes to capture the short-lived private information (Kadan, Michaely and Moulton, 2017). Studying intraday data, Bradley, Clarke, Lee and Ornthanalai (2014) find that the market reacts most strongly to analyst recommendation changes. Although analysts forecasts are known to exhibit inherent biases, So (2013) finds that investors in fact overweight them and the predictable biases influence the information content of prices. Hilary and Hsu (2013) find evidence that consistent analyst errors are more informative and more likely to affect prices than unbiased forecasts.

76 In summary, the literature on analyst forecasts indicates that there is some evidence of some biases in analyst forecasts, but those forecasts have a material impact on stock prices nevertheless. Thus, the analyst forecasts are relevant to market values.

77 Of course, when papers report some form of bias in analyst forecasts, that bias is relative to observed outcomes. Consequently, it would be illogical to hold the view that analyst forecasts do not represent market expectations because they diverge from outcome observed returns, if one also considered that observed returns do not reflect market expectations.

78 In other words, if one held the view that observed returns (on average) *do* reflect expected/required returns, we would not need analyst forecast data at all – we would use the more standard approach of using those observed returns as a proxy for expected/required returns.

79 Thus, if one considers that observed returns do reflect expected returns, we would just use observed returns and analyst forecasts would be irrelevant. If one considers that observed returns do not reflect expected returns, it would be illogical to compare analyst forecasts with those observed returns – because they don't reflect anything that is relevant.

4 What use can be made of the empirical evidence from observed stock returns?

4.1 The empirical evidence is well documented

80 The empirical evidence set out in Appendix 1 to this report, clearly establishes that the actual returns on low-beta stocks systematically and materially exceed the SL-CAPM estimates; a result that is known as low-beta bias. The feasible implementation of the SL-CAPM does not fit the observed data.

81 The literature documenting low-beta bias has been performed by the very top echelon of finance researchers, including two Nobel prize winners. Low beta bias has been consistently documented over several decades and across a number of markets and is documented in the standard finance textbooks.

4.2 The empirical evidence is well accepted

82 In the Australian regulatory setting, there is no debate about the empirical evidence of low-beta bias – it is agreed that the relationship between beta and observed returns has a higher intercept and a flatter slope than the SL-CAPM suggests. That is, there is broad agreement that the evidence shows that actual returns on low-beta stocks are systematically higher than the SL-CAPM would suggest.

83 For example, the ERA has recognised the empirical evidence:

> The Authority recognises that typical empirical applications of the Sharpe Lintner CAPM may under-estimate equity beta for low beta stocks, with the potential to lead to a downwards bias in the estimate of the return on equity.[20]

and:

> This evidence suggests that the [SL-CAPM] model tends to underestimate (overestimate) a return on equity for low-beta (high-beta) assets.[21]

4.3 Potential interpretation of the evidence

84 There are three ways of interpreting the evidence of low beta bias:

a. **Observed data can be used to estimate required returns**

One possibility is that real-world investors price low-beta stocks to earn expected returns that are higher than the SL-CAPM predicts, and that is reflected in the data. That is, the observed market data reflects the returns that investors actually require. This

[20] ERA, December 2013, Rate of return guideline: Explanatory statement: Appendices, p. 63.

[21] ERA, December 2013, Rate of return guideline: Explanatory statement: Appendices, p. 214.

interpretation would seem to be consistent with regulatory reliance on observed market data to estimate other parameters such as beta and MRP.

b. **Statistical problems with the econometric tests**

A second possibility is that the low-beta bias is only documented due to statistical problems with the econometric tests that have been applied. This explanation seems highly unlikely given the quality of the researchers involved (Black, Jensen, Scholes, Fama, MacBeth, etc.), the fact that the evidence has been documented in papers published in top journals spanning several decades, and the fact that the result is so well-accepted that it appears in standard textbooks.

c. **Random chance**

A third possibility is that real-world investors actually require a return in accordance with the SL-CAPM and price assets to yield that return in expectation, but that the actual returns have been higher than expected due to random chance. That is, investors in low-beta stocks require and expect a SL-CAPM return, but have received a higher return due to random chance. This explanation also seems highly unlikely given the persistence of the evidence over many decades and many different markets.

4.4 Regulatory interpretation of the empirical evidence

Interpretation of the evidence in the 2013 Guideline

85 In its 2013 Rate of Return Guideline, the ERA concluded in favour of the first interpretation above – that the observed data contains relevant information that the ERA should consider when setting the allowed return on equity. The ERA determined that this evidence would inform its selection of the allowed equity beta:

> …the Authority intends to account for empirical evidence relating to potential bias in the estimates of the equity beta, that are used in applying the Sharpe Lintner CAPM. The Authority considers that such an approach would account for much of the evidence supporting the use of the Empirical and Black CAPM models.[22]

86 The 'empirical CAPM' estimates the required return on equity based on the observed empirical relationship between beta and stock returns, rather than imposing the theoretical relationship. It is commonly used in US regulatory determinations. The Black CAPM is a theoretical model that has been derived to explain the systematic bias in the SL-CAPM.

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[22] ERA, December 2013, Rate of return guideline: Explanatory statement: Appendices, p. 69.

87 The ERA also stated that:

> …the Authority will take into account other relevant material when estimating the equity beta, such as insights from the empirical performance of the Sharpe Lintner CAPM. This evidence suggests that the model tends to underestimate (overestimate) a return on equity for low-beta (high-beta) assets.[23]

Interpretation of the evidence in the current Draft Guideline

88 As set out above, in its 2016 DBP Final Decision the ERA has changed its interpretation of the evidence in favour of the 'random chance' explanation – that investors may set their *ex ante* required returns on low-beta stocks exactly in accordance with the SL-CAPM, and that the *ex post* observed returns may have been systematically higher due to random chance.

89 In its recent Draft Guideline, the ERA has no regard to low-beta bias, so the statement in the DBP Final Decision in relation to *ex ante* versus *ex post* returns remains the ERA's latest statement on this issue.

4.5 Summary of regulatory positions

90 The position adopted by the ERA in its recent Draft Guideline is that the theoretical evidence from the Black CAPM and the empirical evidence of low-beta bias now have no role at all in the regulatory process. The main reasons for this position are:

a. The empirical evidence of low-beta bias uses observed (*ex post*) returns, which may differ from the *ex ante* expected return. That is, investors may have been expecting return on low-beta stocks to be consistent with the SL-CAPM and been surprised when actual returns have turned out to be systematically higher; and

b. The formal Black CAPM is not used explicitly in industry practice.

91 We examine the implications of this reasoning in the following sections of this report.

4.6 Equilibrium considerations

Three types of returns

92 The recent regulatory consideration of low-beta bias distinguishes between three different concepts of return:

a. The *required* return is the rate of return that investors require in order to provide capital;

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[23] ERA, December 2013, Rate of return guideline: Explanatory statement: Appendices, p. 216.

b. The *expected* return is the return that investors expect an investment to generate; and

c. The *observed* return is the return that an investment actually generates over a particular period.

Equilibrium and required vs expected returns

93 If the required return is equal to the expected return, the market is said to be 'in equilibrium' and investors will provide capital expecting to be properly compensated. Partington and Satchell (2017), correctly in our view, illustrate this point by drawing a distinction between expected returns and required returns. They note that disequilibrium is characterised by a situation in which the expected return differs from the required return. If investors are expecting an asset to deliver a return that is different from what they (in aggregate) require, the market is in disequilibrium and there will be a strong incentive for investors to trade. Partington and Satchell illustrate this point with an example:

> The equilibrium condition is reached by the adjustment of prices such that expected and required returns are equal. In Houston Kemp's example the required return on the stock is 10% and the expected return is 15%. This looks like a great deal for investors, they only require 10% but they expect to get 15%. Consequently, buying pressure is likely to push up the price of the stock until it has risen to a level where at the higher price it now offers a 10% return. It is, thus, the required return that determines equilibrium expected returns and the cost of capital.[24]

94 Partington and Satchell (2017) conclude that:

> We agree that in the absence of barriers to arbitrage there are strong forces that will equalise expected and required returns[25]

and we also agree with that conclusion for the reasons set out by Partington and Satchell. That is, there appears to be broad agreement that the market will generally be in equilibrium, where investors have priced stocks such that the expected return is equal to their required return.

95 Consequently, we agree with Partington and Satchell (2017) that it is appropriate to consider the *expected* return to be equal to the *required* return – that investors have priced stocks such that they expect to receive a return equal to that which they require.

Expected vs observed returns

96 Partington and Satchell (2017) go on to draw the same distinction between *ex ante* expected/required returns and *ex post* observed returns as the ERA has raised above:

> We agree that in the absence of barriers to arbitrage there are strong forces that will equalise expected and required returns. We do not however agree with the implication

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[24] Partington and Satchell (2017), p. 28.

[25] Partington and Satchell (2017), p. 27.

> that given equality between expected and required returns all will be well in using realised returns to measure expected returns period by period. Even if expected and required returns are equal, there can be persistent differences between realised returns and equilibrium expected returns.[26]

97 That is, even when a market *is* in equilibrium (so that investors expect to receive the return they require) it is still possible that the observed return over some period may differ from the required/expected return.

98 There are a number of economic models that characterise the returns that investors require/expect in equilibrium. One of these is the SL-CAPM, but there are others, such as Black (1972) and Hong and Sraer (2016), that produce estimates of the required/expected return that differ from the SL-CAPM estimates.

99 Now suppose that we select one of the available equilibrium models (the ERA has selected the SL-CAPM) and we observe that actual returns are systematically inconsistent with the expected returns produced by that model in some respect (e.g., higher intercept and flatter slope). There are two potential explanations:

a. The selected model does not perfectly describe the process by which the aggregate market determines required returns; or

b. The selected model *does* perfectly describe the process by which the aggregate market determines required returns, but the actual returns over the period that was examined happened to deviate from the return that investors required/expected due to random chance.

Consideration of alternative explanations

100 We noted above that the difference between the modelled expected returns and observed returns is either:

a. because the model is not a perfect description of expected returns; or

b. because the data does not properly reflect expected returns.

101 Partington and Satchell (2017) observe that the relative weight to be applied to the selected model versus the observed data will depend on a number of factors. For example:

a. A model is more likely to properly describe the process by which the aggregate market determines required returns if it is rigorously derived from a set of plausible assumptions; and

b. One would have more confidence that an empirical result is a real effect, and not due to random chance, if it was consistently documented over a long period of time, and in different markets,

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[26] Partington and Satchell (2017), p. 27.

by leading researchers, in the very top journals, and appeared in the standard textbooks.

102 In the case at hand, the SL-CAPM is the simplest of all equilibrium asset pricing models – the expected return is modelled by adding one parameter to the product of two others. Since the SL-CAPM was developed in the 1960s, the literature has moved on and there is now a rich collection of models that have been designed to expand upon the simple starting point.

103 By contrast, the empirical evidence in Appendix 1 is the most consistent, compelling and well-accepted empirical evidence in the field of asset pricing. The contributors to this literature include two Nobel Prize winners and the studies documenting low-beta bias have been published in the very top finance journals over several decades, and the empirical evidence of low-beta bias is so well-accepted that it appears in the standard finance textbooks.

104 It is, of course, theoretically possible that investors set required/expected returns exactly in line with the 1960s SL-CAPM (and exactly in line with the way the ERA implements it) and that the decades of empirical evidence of low-beta bias has occurred by random chance. However, the consistency, strength and quality of the evidence of low-beta bias, and the fact that it is so well-accepted that it appears in the standard finance textbooks, suggests that it would be quite unreasonable to conclude that it has occurred by random chance.

105 The literature since the documentation of low-beta bias has not questioned whether or not the empirical evidence is a real reflection of the returns that investors require/expect. Rather, the literature has focused on identifying what it is about the simple SL-CAPM, and the assumptions that underpin it, that leads to it systematically understating the returns on low-beta stocks.

4.7 The development of the relevant academic literature

4.7.1 Black (1972)

106 Over the years since low-beta bias was first documented, the finance literature has continued to confirm the existence of low-beta bias and has focussed on identifying why the SL-CAPM systematically understates the returns on low-beta stocks. For example, Black (1972) summarises some of this literature as follows:

> …several recent studies have suggested that the returns on securities do not behave as the simple capital asset pricing model described above predicts they should. Pratt analyzes the relation between risk and return in common stocks in the 1926-60 period and concludes that high-risk stocks do not give the extra returns that the theory predicts they should give.
>
> Friend and Blume use a cross-sectional regression between risk-adjusted performance and risk for the 1960-68 period and observe that high-risk portfolios seem to have poor performance, while low-risk portfolios have good performance.

> …Black, Jensen, and Scholes analyze the returns on portfolios of stocks at different levels of β_i in the 1926-66 period. They find that the average returns on these portfolios are not consistent with equation (1) [the Sharpe-Lintner CAPM], especially in the postwar period 1946-66. Their estimates of the expected returns on portfolios of stocks at low levels of β_i are consistently higher than predicted by equation (1), and their estimates of the expected returns on portfolios of stocks at high levels of β_i are consistently lower than predicted by equation (1).[27]

107 In trying to develop a conceptual rationale for this consistent empirical finding, Black (1972) focuses on one of the assumptions that underpins the derivation of the SL-CAPM – that all investors can borrow or lend as much as they like at the risk-free rate. He states that:

> One possible explanation for these empirical results is that assumption (d) of the capital asset pricing model does not hold. What we will show below is that the relaxation of assumption (d) [all investors can borrow or lend as much as they like at the risk-free rate] can give models that are consistent with the empirical results obtained by Pratt, Friend and Blume, Miller and Scholes, and Black, Jensen and Scholes.[28]

108 That is, Black (1972):

a. Notes that there is consistent evidence about the empirical failings of the SL-CAPM – the empirical evidence suggests that the relationship between beta and returns has a higher intercept and a flatter slope than the SL-CAPM would suggest; and

b. Considers what it is about the SL-CAPM that causes it to produce estimates that are systematically different from the observed data. Black (1972) concludes that a driving problem is the SL-CAPM assumption that all investors can borrow and lend unlimited amounts at the same risk-free rate.

4.7.2 Fama and French (1996)

109 More recent papers continue to document the existence of low-beta bias and to develop models that better fit the observed stock returns. The literature accepts that the empirical evidence is a real reflection of the returns that investors require/expect. It then notes that this evidence presents a problem for the SL-CAPM.

110 For example, Fama and French (1996) examine the relationship between beta and observed stock returns in extensive empirical tests spanning decades. They document that the data is unable to reject the null hypothesis that beta is unrelated to stock returns.[29] They go on to document other problems with the SL-CAPM and conclude that:

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[27] Black (1972), p. 445.

[28] Black (1972), p. 445.

[29] Fama and French (1996), Table 1, Panel B, p. 1951.

> In our view, the evidence that β does not suffice to explain expected return is compelling. The average return anomalies of the CAPM are serious enough to infer that the model is not a useful approximation.[30]

4.7.3 Frazzini and Pederson (2014)

111 The more recent literature has focused on identifying and correcting the aspects of the SL-CAPM that causes it to systematically understate the returns on low-beta stocks.

112 For example, Frazzini and Pederson (2014) also note the body of evidence:

> Indeed, the security market line for U.S. stocks is too flat relative to the CAPM (Black, Jensen, and Scholes, 1972) and is better explained by the CAPM with restricted borrowing than the standard CAPM (Black, 1972, 1993, Brennan, 1971). See Mehrling (2005) for an excellent historical perspective. [31]

113 They then focus on the real-world leverage restrictions that investors face that impinge on the theoretical premise of the SL-CAPM – that all agents invest in the portfolio with the highest expected excess return per unit of risk and leverage or de-leverage this portfolio to suit their risk preferences. They rule out the possibility that the empirical relationship is caused by the market pricing idiosyncratic risk, preferring the 'constrained borrowing' explanation:

> Our results shed new light on the relation between risk and expected returns. This central issue in financial economics has naturally received much attention. The standard CAPM beta cannot explain the cross section of unconditional stock returns (Fama and French, 1992) or conditional stock returns (Lewellen and Nagel, 2006). Stocks with high beta have been found to deliver low risk-adjusted returns (Black et al., 1972, Baker et al., 2011); thus, the constrained-borrowing CAPM has a better fit (Gibbons, 1982, Kandel, 1984, Shanken, 1985). Stocks with high idiosyncratic volatility have realized low returns (Falkenstein, 1994, Ang et al., 2006, Ang et al., 2009), but we find that the beta effect holds even when controlling for idiosyncratic risk.

4.7.4 Liu, Stambaugh and Yuan (2018)

114 Liu, Stambaugh and Yuan (2018) also start by noting the large and well-accepted body of evidence:

> The beta anomaly [low-beta bias] is perhaps the longest-standing empirical challenge to the Capital Asset Pricing Model (CAPM) of Sharpe (1964) and Lintner (1965) and asset-pricing models that followed. Beginning with the studies of Black et al. (1972) and Fama and MacBeth (1973), the evidence shows that high-beta stocks earn too little compared to low-beta stocks. In other words, stocks with high (low) betas have negative (positive) alphas. [32]

115 They then examine the possible cause of mispricing under the SL-CAPM, with a focus on omitted factors.

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[30] Fama and French (1996), p. 1957.

[31] Frazzini and Pederson (2014), "Betting against beta," *Journal of Financial Economics* 111, 1-25, p.2.

[32] Liu, Stambaugh and Yuan, 2018, "Absolving beta of volatility's effects," *Journal of Financial Economics*, 128, 1-15 at p. 1.

4.7.5 Hong and Sraer (2016)

116 The recent literature has also extended to the development of new equilibrium asset pricing models that relax certain restrictive assumptions of the SL-CAPM and derive an equilibrium that is more consistent with the observed data. For example, Hong and Sraer (2016) also begin by confirming the large body of empirical evidence:

> There is compelling evidence that high-risk assets often deliver lower expected returns than low-risk assets. This is contrary to the risk-return trade-off at the heart of neoclassical asset pricing theory. The high-risk, low-return puzzle literature, which dates back to Black (1972) and Black, Jensen, and Scholes (1972), shows that low-risk stocks, as measured by a stock's comovement with the stock market or Sharpe's (1964) capital asset pricing model (CAPM) beta, have significantly outperformed high-risk stocks over the last 30 years. Baker, Bradley, and Wurgler (2011) further show that since January 1968 the cumulative performance of stocks has actually been declining with beta.[33]

117 Their focus is on relaxing two unrealistic assumptions that underpin the SL-CAPM. First, rather than assuming, as the SL-CAPM does, that investors face no constraints to trading, they assume some investors face short-sale constraints. Second, rather than assuming, as the SL-CAPM does, that investors all have the same beliefs, they assume that investors hold differing beliefs. They conclude that it may be these SL-CAPM assumptions that cause it to systematically understate the returns on low-beta stocks.

118 The AER briefly considers Hong and Sraer (2016) in its 2018 Draft Guideline Explanatory Statement.[34] The AER appears to recognise that the Hong and Sraer model is an equilibrium asset pricing model that does produce outcomes that are more consistent with the observed data – it is empirically superior to the SL-CAPM.

119 The AER's Explanatory Statement then focuses on the question of whether the Hong and Sraer model should replace the SL-CAPM as the AER's 'foundation model.' The AER concludes that the Hong and Sraer should not be used as the foundation model because there is no evidence of it being used by market practitioners and because the AER has some concerns about the econometric analysis.

120 Both of these issues are debatable,[35] but are beside the point. The key point is that the Hong and Sraer model has not been proposed as an alternative to the SL-

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[33] Hong, H. and D. Sraer, 2016, "Speculative Betas," *Journal of Finance*, 71(5), 2095-2144, p. 2095.

[34] AER, July 2018, Draft Rate of Return Guideline, pp. 286-287.

[35] For example, whereas there is no evidence of practitioners citing Hong and Sraer (2016) specifically, there is extensive evidence of practitioners using an intercept (or alpha) above that of the SL-CAPM, as set out in Section 4.8 below. Certainly, there is very little evidence of practitioners implementing the SL-CAPM in the way the AER and ERA implement it. In relation to the econometric analysis, we note that the AER cites that Hong and Sraer remove very small and very low-priced stocks from their data set. This is a common practice in the relevant literature. The AER does not explain *why* this standard practice is of concern to them. We note that the paper has gone through the peer review process and been published in the world's leading finance journal.

CAPM. Rather, it is cited as an example of an equilibrium model that *is* consistent with the observed data in a way that the SL-CAPM is not. It is a clear example of how the literature has moved on since the SL-CAPM was developed in the 1960s. It shows that the evidence of low-beta bias is accepted as a given fact and researchers are no longer questioning whether or not it is real, but are seeking to determine what it is about the SL-CAPM that causes it to systematically understate the returns on low-beta stocks and to correct those deficiencies.

4.7.6 Asness et al (2018)

121 In an even more recent paper, Asness, Frazzini, Gormsen and Pedersen (2018) also begin by confirming the systematic empirical evidence:

> One of the major stylized facts on the risk-return relation, indeed in empirical asset pricing more broadly, is the observation that assets with low risk have high alpha, the so-called "low-risk effect" (Black, Jensen, and Scholes, 1972).
>
> Hence, the systematic low-risk effect is based on a rigorous economic theory and has survived more than 40 years of out of sample evidence.[36]

122 They focus on identifying which limitations of the SL-CAPM are responsible for the effect. For instance, whether the constraints on leverage, which exist in the real world but not in the SL-CAPM, are driving the effect or whether it is idiosyncratic risk (again ignored in the SL-CAPM) driving the effect.

123 We note that this issue is of more than mere academic interest. Asness and Pedersen are principals of AQR Capital Management that are responsible for investing more than $200 billion of investors' funds.

4.7.7 Australian evidence

124 SFG (2013)[37] evaluate Australian data and document a higher intercept and flatter slope than the SL-CAPM suggests. Specifically, the intercept in the relationship between beta and returns is shown to be approximately 3% above the SL-CAPM intercept.

125 Truong and Partington (2007)[38] also evaluate the CAPM, and variations of the dividend growth model, using Australian data. They conduct a range of analyses whereby actual returns are compared with the SL-CAPM estimate.[39] In every analysis the intercept is significantly positive and the slope is flatter than the SL-CAPM suggests. They also begin by noting the consensus that has developed in the literature:

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[36] Asness, Frazzini, Gormsen and Pedersen 2018, "Betting Against Correlation: Testing Theories of the Low-Risk Effect" CEPR Discussion Paper No. DP12686, p.2.

[37] SFG, 2013, Beta and the Black Capital Asset Pricing Model, 13 February.

[38] Truong, G. and G. Partington, 2007, Alternative estimates of the cost of equity capital for Australian firms, University of Sydney.

[39] Truong and Partington (2007), Tables 4 and 5, pp. 43-45.

> Although the CAPM emerges as the most popular model among practitioners, empirical tests show evidence of its disappointing performance. The cost of capital estimated using the CAPM does a poor job in explaining the variation of future stock returns (Fama and French, 1992, 1993).[40]

126 They go on to note that their results show that the SL-CAPM performs particularly poorly when assessed against the Australian data:

> The estimates from the CAPM are negatively correlated with one year ahead returns but demonstrate no significant association with two and three year ahead returns as shown in Panels A and B of Table 4. This finding is consistent with evidence of the poor performance of the CAPM generally found in previous empirical examinations of the model.[41]

127 They conclude that the vanilla SL-CAPM has no useful role in producing cost of capital estimates that have any relationship to actual stock returns, and that the DGM approach is superior:

> However, in this study, as in previous studies, the CAPM produces cost of capital estimates that have little ability to explain cross-sectional variations in future stock returns. There is a growing literature on the use of valuation models to estimate the implied cost of capital. This study using data from the Australian market contributes further empirical evidence to the literature in this area. Using both the CAPM and four valuation models, the cost of capital for a sample of Australian firms is estimated for the period from 1995 to 2004. Estimates from the models are evaluated based on their ability to explain the variation of future stock returns and their association with firm characteristics. The CAPM fails dismally in regard to the same criterion.[42]

4.7.8 Summary of developments in the academic literature

128 The key points made in this section of the report are that:

a. The empirical evidence of low-beta bias has been consistently confirmed over a number of decades. The literature continues to show that the relationship between beta and observed returns has a higher intercept and a flatter slope than the SL-CAPM suggests.

b. The literature considers the effect to be real and has moved on to identifying what it is about the SL-CAPM, and the assumptions that underpin it, that leads to it systematically understating the returns on low-beta stocks.

c. The issue is of real interest to leading investment managers.

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[40] Truong and Partington (2007), p. 2.

[41] Truong and Partington (2007), p. 25.

[42] Truong and Partington (2007), p. 33.

4.8 Evidence of market practice

4.8.1 Overview

129 We have noted above that there is consistent empirical evidence that the relationship between beta and observed returns has a higher intercept and a flatter slope than the SL-CAPM suggests. One question that then arises is whether market practitioners, when estimating required returns, adopt a higher intercept (and therefore a flatter slope) to be consistent with the observed evidence. The raw SL-CAPM sets the intercept equal to the prevailing risk-free rate, which is usually estimated as the yield on government bonds.

130 Thus, the question is whether there is evidence of market practitioners implementing the CAPM using an intercept above the prevailing government bond yield. In this section, we demonstrate that there is evidence that independent experts and market practitioners commonly use an intercept above the prevailing government bond yield.

4.8.2 Independent experts

131 In its recent Guideline materials, the AER has noted the evidence that it is common for independent expert valuation reports to adopt an intercept above the prevailing government bond yield – consistent with the empirical evidence.[43]

132 For example, a recent KPMG report explains that:

> The risk free rate of return is the return on a risk free security, typically for a long-term period. In practice, long dated Government bonds are accepted as a benchmark for a risk free security. In Australia, the 10 year Commonwealth Government bond yield is commonly referenced, of which the spot yield was 2.63% as at 30 June 2018.
>
> However, since the global financial crisis in 2008, Government bond yields have remained low compared to long-term averages. Combined with market evidence which indicates that bond yields and the market risk premium are strongly inversely correlated, it is important that any assessment of the risk free rate should be made with respect to the position adopted in deriving the market risk premium. In this regard, KPMG Corporate Finance has adopted a long-term historical market risk premium as a proxy for the expected market risk premium and applied a higher risk free rate than the spot yield of the 10 year Commonwealth Government bond yield.
>
> We have adopted 3.9% as an appropriate risk free rate, which represents a blend of the spot rate and a forecast long-term bond yield of 4.15%.[44]

133 As another example, a recent Grant Thornton report explains that:

> We note that the current spot yield is approximately 2.9%. However, given that the US Federal Reserve has raised the cash rates five times in the last 18 months, including on 14 June 2018 to between 1.75% to 2.00% and has signalled further increases over

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[43] AER, July 2018, Draft rate of return Guidelines: Explanatory Statement, pp. 206-207.

[44] KPMG, Independent Expert Report for Oroton Group Ltd, 5 July 2018, p.84.

> the next two years we have assessed a long-term risk free rate of c.3.5%. This is also consistent with forward rates and future yield curve.[45]

134 The KPMG Valuation Practice survey reports that 82% of respondents 'always' or 'often' apply an intercept above the prevailing risk-free rate.[46]

4.8.3 Survey respondents

135 The most recent surveys cited in the AER's Draft Guideline are those of Fernandez (2017, 2018) and KPMG (2017). In all cases, the relevant practitioners report using an intercept above the prevailing government bond yield – consistent with the empirical evidence.

136 For example:

a. Fernandez (2017, p. 4) reports that the median respondent adopts an intercept of 3.1% at a time when the prevailing 10-year government bond yield was 2.6%.

b. Fernandez (2018, p. 4) reports that the median respondent adopts an intercept of 3.0% at a time when the prevailing 10-year government bond yield was 2.7%.

c. KPMG (2017, p. 10) reports that the median respondent adopts an intercept in the range of 3.0% to 3.5% at a time when the prevailing 10-year government bond yield was 2.6%.

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[45] Grant Thornton, Independent Expert Report for Sino Gas & Energy Holdings Ltd, 26 July 2018, p.75.

[46] KPMG, 2017, KPMG valuation practices survey, p. 13.

5 Conclusions

Framework

137 In this report, we take the ERA's current position as the starting point:

a. That any problem to be remedied relates to the model itself and not to the empirical estimates of beta; and

b. That there is insufficient evidence of a low beta-bias in *expected* returns, because the evidence focuses on *observed* returns and it may be the case that actual returns have systematically different from what investors required or expected.

Ex ante expected returns

138 The literature demonstrates that the *ex ante* required returns produce the same result that has been documented for *ex post* observed returns – the relationship between beta and required returns has a higher intercept and a flatter slope than the SL-CAPM would suggest.

139 We have applied this methodology to Australian data and we also find the same result – the relationship between beta and *ex ante* expected returns has a higher intercept and a flatter slope than the SL-CAPM would suggest.

Observed returns

140 There are two potential explanations for the fact that observed returns on low-beta stocks are systematically higher than the SL-CAPM suggests:

a. The selected model does not perfectly describe the process by which the aggregate market determines required returns; or

b. The selected model *does* perfectly describe the process by which the aggregate market determines required returns, but the actual returns over the period that was examined happened to deviate from the return that investors required/expected due to random chance.

141 When assessing the reasonableness of the ERA's approach of placing 100% faith in the SL-CAPM and applying 0% weight to the empirical evidence, the relevant considerations include:

a. The empirical evidence of low-beta bias is the most consistent, compelling and well-accepted empirical evidence in the field of asset pricing. The contributors to this literature include two Nobel Prize winners and the studies documenting low-beta bias have been published in the very top finance journals over several decades, and the empirical evidence of low-beta bias is so well-accepted that it appears in the standard finance textbooks; and

b. The literature since the documentation of low-beta bias has not questioned whether or not the empirical evidence is a real

reflection of the returns that investors require/expect. Rather, the literature has focused on identifying and modifying the components of the SL-CAPM that lead to it systematically understating the returns on low-beta stocks.

Market practice

142 There is evidence that independent experts and market practitioners commonly use an intercept above the prevailing government bond yield.

The evidence is relevant and robust and should not be disregarded

143 We have been asked to provide a view on the binary qualitative question of whether the empirical evidence of low-beta bias and the theoretical evidence of the Black CAPM should have a real role in the process for estimating the required return on equity. In our view, there are compelling reasons to have real regard to that evidence if the goal is to produce the best possible estimate of the required return on equity.

6 References

Asness, C. S., Frazzini, A., Gormsen, N. J., Pedersen, L. H. "Betting against correlation: Testing theories of the low-risk effect." *CEPR Discussion Paper No. DP12686* (2018).

Asquith, P., Mikhail, M. B., Au, A. S. "Information content of equity analyst reports." *Journal of Financial Economics* 75 (2005), 245-282.

Barber, B., Lehavy, R., McNichols, M., Trueman, B. "Can Investors Profit from the Prophets? Security Analyst Recommendations and Stock Returns." *The Journal of Finance* 56 (2001), 531-563.

Berk, J., DeMarzo, P. *Corporate Finance*: Pearson (2014).

Black, F. "Capital Market Equilibrium with Restricted Borrowing." *Journal of Business* 45 (1972), 444-455.

Black, F., Jensen, M. C., Scholes, M. "The Capital Asset Pricing Model: Some Empirical Tests." (1972).

Bradley, D., Clarke, J., Lee, S., Ornthanalai, C. "Are analysts' recommendations informative? Intraday evidence on the impact of time stamp delays." *The Journal of Finance* 69 (2014), 645-673.

Brav, A., Lehavy, R. "An Empirical Analysis of Analysts' Target Prices: Short-term Informativeness and Long-term Dynamics." *The Journal of Finance* 58 (2003), 1933-1967.

Brav, A., Lehavy, R., Michaely, R. "Using expectations to test asset pricing models." *Financial management* 34 (2005), 31-64.

Brealey, R. A., Myers, S. C., Allen, F. *Principles of Corporate Finance*: McGraw-Hill/Irwin (2011).

Das, S., Guo, R.-j., Zhang, H. "Analysts' Selective Coverage and Subsequent Performance of Newly Public Firms." *The Journal of Finance* 61 (2006), 1159-1185.

Derrien, F., Kecskés, A. "The real effects of financial shocks: Evidence from exogenous changes in analyst coverage." *The Journal of Finance* 68 (2013), 1407-1440.

Fama, E. F., French, K. R. "Multifactor Explanations of Asset Pricing Anomalies." *The Journal of Finance* 51 (1996), 55-84.

Fama, E. F., French, K. R. "The capital asset pricing model: Theory and evidence." *Journal of Economic Perspectives* 18 (2004), 25-46.

Fama, E. F., MacBeth, J. D. "Risk, return, and equilibrium: Empirical tests." *Journal of Political Economy* 81 (1973), 607-636.

Frankel, R., Kothari, S. P., Weber, J. "Determinants of the informativeness of analyst research." *Journal of Accounting and Economics* 41 (2006), 29-54.

Frazzini, A., Pedersen, L. H. "Betting against beta." *Journal of Financial Economics* 111 (2014), 1-25.

Friend, I., Blume, M. "Measurement of portfolio performance under uncertainty." *The American Economic Review* 60 (1970), 561-575.

Grant Thornton, Independent Expert Report for Sino Gas & Energy Holdings Ltd, 26 July 2018, p.75.

Hilary, G., Hsu, C. "Analyst Forecast Consistency." *The Journal of Finance* 68 (2013), 271-297.

Hong, H., Sraer, D. A. "Speculative betas." *The Journal of Finance* 71 (2016), 2095-2144.

Kadan, O., Michaely, R., Moulton, P. C. "Trading in the presence of short-lived private information: Evidence from analyst recommendation changes." *Journal of Financial and Quantitative Analysis (Forthcoming)* (2017).

Kelly, B., Ljungqvist, A. "Testing Asymmetric-Information Asset Pricing Models." *The Review of Financial Studies* 25 (2012), 1366-1413.

KPMG, Independent Expert Report for Oroton Group Ltd, 5 July 2018, p.84.

KPMG, 2017, KPMG valuation practices survey.

Lee, C. M. C., So, E. C. "Uncovering expected returns: Information in analyst coverage proxies." *Journal of Financial Economics* 124 (2017), 331-348.

Liu, J., Stambaugh, R. F., Yuan, Y. "Absolving beta of volatility's effects." *Journal of Financial Economics* 128 (2018), 1-15.

Loh, R. K., Stulz, R. M. "When Are Analyst Recommendation Changes Influential?" *The Review of Financial Studies* (2011), 593-627.

Loh, R. K., Stulz, R. M. "Is Sell-Side Research More Valuable in Bad Times?" *The Journal of Finance* 73 (2018), 959-1013.

Merkley, K., Michael, R., Pacelli, J. "Does the Scope of the Sell-Side Analyst Industry Matter? An Examination of Bias, Accuracy, and Information Content of Analyst Reports." *The Journal of Finance* 72 (2017), 1285-1334.

Newey, W. K., West, K. D. "A simple, positive semi-definite, heteroskedasticity and autocorrelationconsistent covariance matrix." *Econometrica (1986-1998)* 55 (1987), 703.

Partington, G., Robinson, D., Brealey, R. A., Myers, S. C. *Principles of Corporate Finance*: McGraw Hill, Australia (2000).

Partington, G. and S. Satchell, 2017, Report to the AER: Discussion of submissions on the cost of equity, June.

Pratt, S. P., Grabowski, R. J. *Cost of capital: Applications and examples*: Wiley (2014).

SFG, 2013, Beta and the Black Capital Asset Pricing Model, 13 February.

So, E. C. "A new approach to predicting analyst forecast errors: Do investors overweight analyst forecasts?" *Journal of Financial Economics* 108 (2013), 615-640.

Truong, G. and G. Partington, 2007, Alternative estimates of the cost of equity capital for Australian firms, University of Sydney.

7 Appendix 1: The empirical evidence of low-beta bias

7.1 Overview

144 Soon after the publication of the Sharpe-Lintner CAPM, researchers began testing whether the predictions (or, more precisely, the empirical implications) of the model were supported in real-world data. The conclusion from this evidence is that the empirical implementation of the SL-CAPM provides a poor fit to the observed data. In particular, the actual returns on low-beta stocks systematically and materially exceed the SL-CAPM estimates; a result that is known as low-beta bias. The feasible implementation of the SL-CAPM does not fit the observed data.

145 The literature documenting low-beta bias has been performed by the very top echelon of finance researchers, including two Nobel prize winners. Low beta bias has been consistently documented across a number of markets and is documented in the standard finance textbooks. The relationship between beta and returns has a higher intercept and a flatter slope than the SL-CAPM suggests.

146 The remainder of this section summarises some of the relevant body of evidence.

7.2 Black, Jensen and Scholes (1972)[47]

147 A number of empirical tests are based on the following rearranged version of the SL-CAPM equation:

$$r_e - r_f = (r_m - r_f)\beta_e .$$

148 For example, Black, Jensen and Scholes (1972) construct tests of the model in the form of the following regression specification:[48]

$$r_{e,j} - r_{f,j} = \gamma_0 + \gamma_1 \beta_{e,j} + u_j .$$

149 The SL-CAPM implies that $\gamma_0 = 0$ and $\gamma_1 = r_m - r_f$. However, a series of studies including Black, Jensen and Scholes (1972) report that the intercept of this regression model is higher than the SL-CAPM would suggest $(\gamma_0 > 0)$ and the slope is flatter than the SL-CAPM would suggest $(\gamma_1 < r_m - r_f)$. For example, Black Jensen and Scholes (1972) state that:

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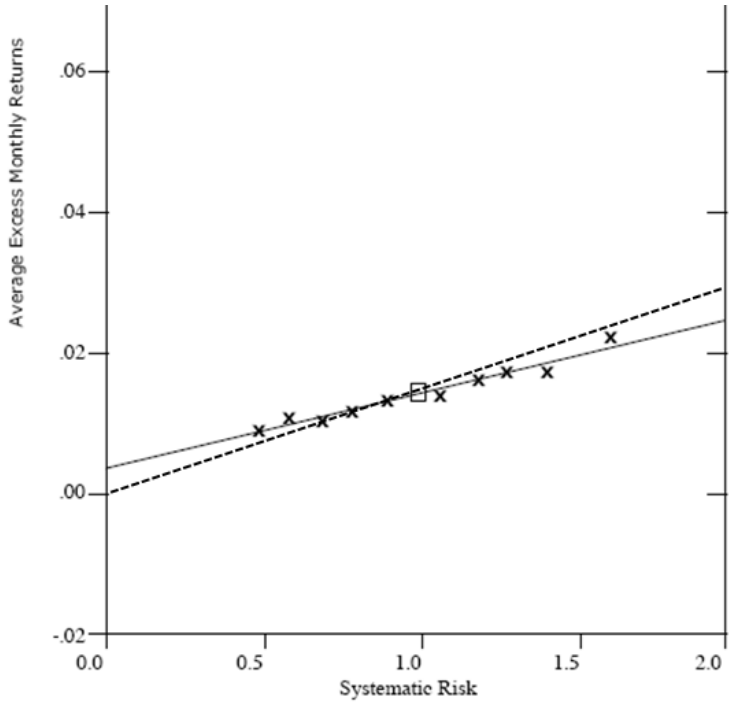
[47] Black, F., M.C. Jensen, and M. Scholes, 1972, "The Capital Asset Pricing Model: Some empirical tests," in *Studies in the Theory of Capital Markets,* Michael C. Jensen, ed., New York: Praeger, 79–121.

[48] See, for example, Black, Jensen and Scholes (1972), p. 3.

> The tests indicate that the expected excess returns on high beta assets are lower than (1) [the Sharpe-Lintner CAPM equation] suggests and that the expected excess returns on low-beta assets are higher than (1) suggests.[49]

150 The main result of Black, Jensen and Scholes (1972) is summarised in Figure 3 below. In that figure, the dashed line represents the security market line[50] that is implied by the SL-CAPM and the grey line represents the best fit to the empirical data. The data suggests that the intercept is too high and the slope is too flat to be consistent with the SL-CAPM.

Figure 3: Results of Black, Jensen and Scholes (1972)



Source: Black, Jensen and Scholes (1972), Figure 1, p. 21. Dashed line for Sharpe-Linter CAPM has been added.

151 Black, Jensen and Scholes (1972) go on to define the intercept of the empirical regression line to be R_z. They report that the intercept over their sample period of 1931 to 1965 was approximately 4% above the theoretical SL-CAPM intercept.[51] They go on to conclude that:

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[49] Black, Jensen and Scholes (1972), p. 4.

[50] The term "security market line" refers to the linear relationship between beta and expected returns for individual assets or portfolios of assets. In empirical analysis this is typically measured as the line of best fit between beta estimates and realised returns for individual assets or portfolios of assets.

[51] Table 5, p. 38 reports a monthly zero beta premium of 0.338% per month, which is approximately equivalent to 4% per year.

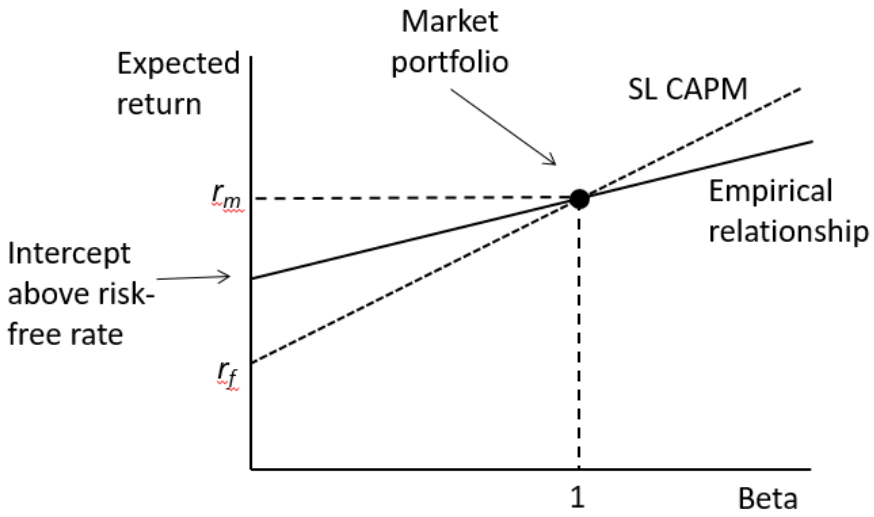
> These results seem to us to be strong evidence favoring rejection of the traditional form of the asset pricing model which says that Rz should be insignificantly different from zero.[52]

and that:

> These results indicate that the usual form of the asset pricing model as given by (1) [the SL-CAPM] does not provide an accurate description of the structure of security returns.[53]

152 The empirical relationship and the implications of the SL-CAPM are contrasted in Figure 4, which shows the SL-CAPM in its usual form. (Note that in Figure 3 Black, Jensen and Scholes (1972) show *excess* returns, after subtracting the risk-free rate.)

Figure 4: Sharpe-Lintner CAPM vs. observed empirical relationship.



7.3 Friend and Blume (1970)[54]

153 Friend and Blume (1970) define the abnormal return (the Greek letter "eta" or η) to be the observed excess return of a stock (or portfolio) less the expected return from the SL-CAPM:[55]

$$\eta_i = (r_e - r_f) - (r_m - r_f)\beta_e .$$

154 Under the SL-CAPM, η_i should be zero on average and it should be independent of beta. However, Friend and Blume (1970) report a systematic relationship between the abnormal return and beta – *low-beta* stocks generate *higher* returns than

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[52] Black, Jensen and Scholes (1972), p. 39.

[53] Black, Jensen and Scholes (1972), pp. 3–4.

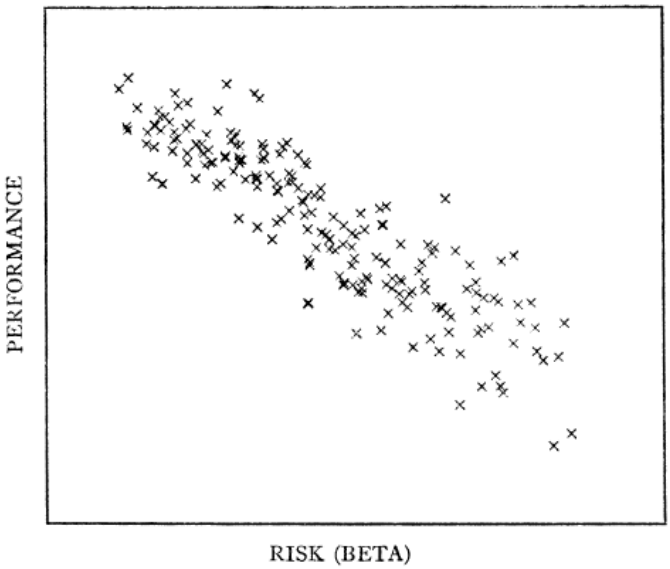
[54] Friend, I., and M. Blume, 1970, "Measurement of portfolio performance under uncertainty," *American Economic Review*, 60, 561–75.

[55] Friend and Blume (1970), p. 563.

the SL-CAPM would suggest and *high-beta* stocks tend to generate *lower* returns than the SL-CAPM would suggest. This relationship is shown clearly in Figure 5 below. Friend and Blume note that:

> The absolute values of the performance measures are in excess of market expectations for funds with Beta coefficients below one and below expectations for higher coefficients. [56]

Figure 5: The relationship between abnormal returns and beta



Source: Friend and Blume (1970), p. 567.

155 Friend and Blume (1970) go on to consider what it is about the SL-CAPM that results in it providing such a poor fit to the observed data. They conclude that the most likely source of the problem is the assumption that all investors can borrow or lend as much as they like at the risk-free rate:

> Of the key assumptions underlying the market theory leading to one-parameter measures of performance, the one which most clearly introduces a bias against risky portfolios is the assumption that the borrowing and lending rates are equal and the same for all investors. Since the borrowing rate for an investor is typically higher than the lending rate, the assumption of equality might be expected to bias the one-parameter measures of performance against risky portfolios because, for such portfolios, investors do not have the same option of increasing their return for given risk by moving from an all stock portfolio to an investment with additional stock financed with borrowings at the lending rate.[57]

[56] Friend and Blume (1970), p. 569.

[57] Friend and Blume (1970), p. 569.

7.4 Fama and MacBeth (1973)[58]

156 Fama and MacBeth (1973) use the following regression specification:[59]

$$r_{e,j} = \gamma_0 + \gamma_1 \beta_{e,j} + u_j .$$

157 Under this specification, the SL-CAPM implies that $\gamma_0 = r_f$ and $\gamma_1 = r_m - r_f$. Fama and Macbeth (1973) note that previous empirical work has demonstrated violations of both of these implications of the SL-CAPM:

> The work of Friend and Blume (1970) and Black, Jensen, and Scholes (1972) suggests that the S-L hypothesis is not upheld by the data. At least in the post-World War II period, estimates of $E[\tilde{\gamma}_{0t}]$ seem to be significantly greater than R_{ft}.[60]

158 Fama and Macbeth (1973) then test the hypothesis that $\gamma_0 - r_f = 0$ on average. They reject that hypothesis in their data and conclude that:

> Thus, the results in panel A, table 3, support the negative conclusions of Friend and Blume (1970) and Black, Jensen, and Scholes (1972) with respect to the S-L hypothesis.[61]

7.5 Fama and French (2004)[62]

159 The consistent results in the studies reviewed above are not unique to the data from the periods examined in those studies. Rather, the results have proven to be consistent through time – low-beta stocks generate higher returns than the SL-CAPM would imply and high-beta stocks earn lower returns than the SL-CAPM would imply. With respect to the early tests of the SL-CAPM, Fama and French (2004) summarise the state of play as:

> The early tests firmly reject the Sharpe-Lintner version of the CAPM. There is a positive relation between beta and average return, but it is too "flat."

160 Fama and French (2004) then provide an updated example of the evidence using monthly returns on U.S.-listed stocks over 76 years from 1928 to 2003. This analysis is summarised in Figure 6 below. Consistent with the early evidence, realised returns on low-beta stocks are higher than predicted by the SL-CAPM, and realised returns on high-beta stocks are lower than predicted by the SL-CAPM. Stocks with the lowest beta estimates (approximately 0.6) had average returns of 11.1% per year, whereas the SL-CAPM estimate of the expected return was only

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[58] Fama, E.F., and J.D. MacBeth, 1973, "Risk, return, and equilibrium: Empirical tests," *Journal of Political Economy*, 81, 607–636.

[59] See Fama and MacBeth (1973), p. 611.

[60] Fama and MacBeth (1973), p. 630.

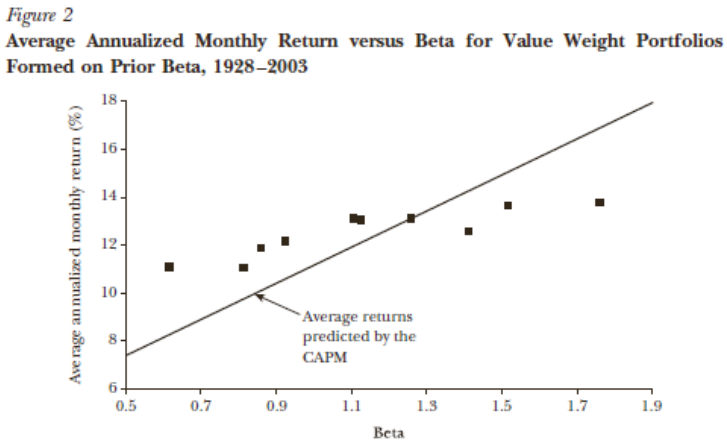
[61] Fama and MacBeth (1973), p. 632.

[62] Fama, E.F., and K. French, 2004, "The Capital Asset Pricing Model: Theory and evidence," *Journal of Economic Perspectives*, 18, 25–46.

8.3% per year. Stocks with the highest beta estimates (approximately 1.8) had average returns of 13.7% per year, whereas the SL-CAPM estimate of the expected return was 16.8% per year.

161 Again the actual relationship between beta and returns has a higher intercept and a flatter slope than the SL-CAPM suggests.

Figure 6. Average returns versus beta over an extended time period



Source: Fama and French (2004), p. 33.

7.6 Brealey, Myers and Allen (2011)[63]

162 The evidence of low-beta bias has been so consistent and well-accepted that it is now discussed in standard finance courses and textbooks. For example, Brealey, Myers and Allen (2011), one of the leading finance textbooks, extend the previous analysis another four years to the end of 2008, and provide a similar chart to that presented by Fama and French (2004), but with excess returns on the vertical axis. This chart is presented Figure 7 below. The line represents the relationship between beta and excess return that is implied by the SL-CAPM and each dot represents the observed return for a particular portfolio. Consistent with all of the evidence set out above, the low-beta portfolios still earn higher returns than the SL-CAPM would imply.

163 The pattern of a higher intercept and a flatter slope than the SL-CAPM suggests is again obvious.

[63] Brealey, R.A., S.C. Myers, and F. Allen, 2011, *Principles of Corporate Finance,* 10th ed., McGraw-Hill Irwin.

Figure 7: The relationship between excess returns and beta

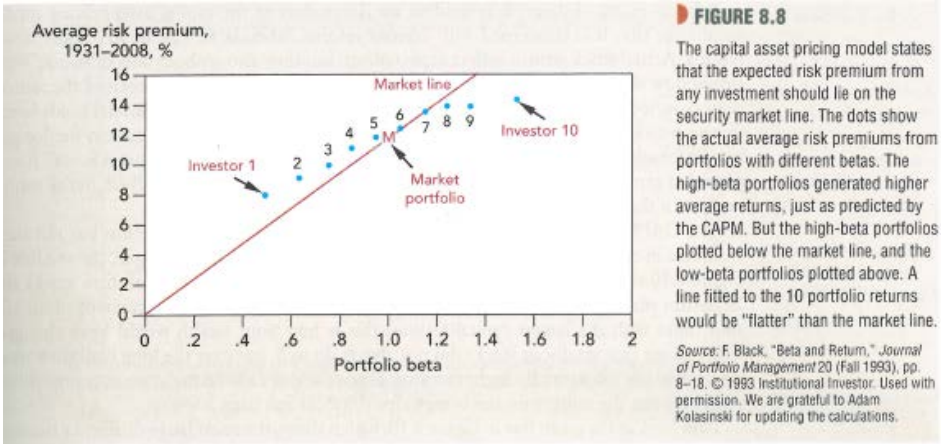


FIGURE 8.8

The capital asset pricing model states that the expected risk premium from any investment should lie on the security market line. The dots show the actual average risk premiums from portfolios with different betas. The high-beta portfolios generated higher average returns, just as predicted by the CAPM. But the high-beta portfolios plotted below the market line, and the low-beta portfolios plotted above. A line fitted to the 10 portfolio returns would be "flatter" than the market line.

Source: F. Black, "Beta and Return," *Journal of Portfolio Management* 20 (Fall 1993), pp. 8–18. © 1993 Institutional Investor. Used with permission. We are grateful to Adam Kolasinski for updating the calculations.

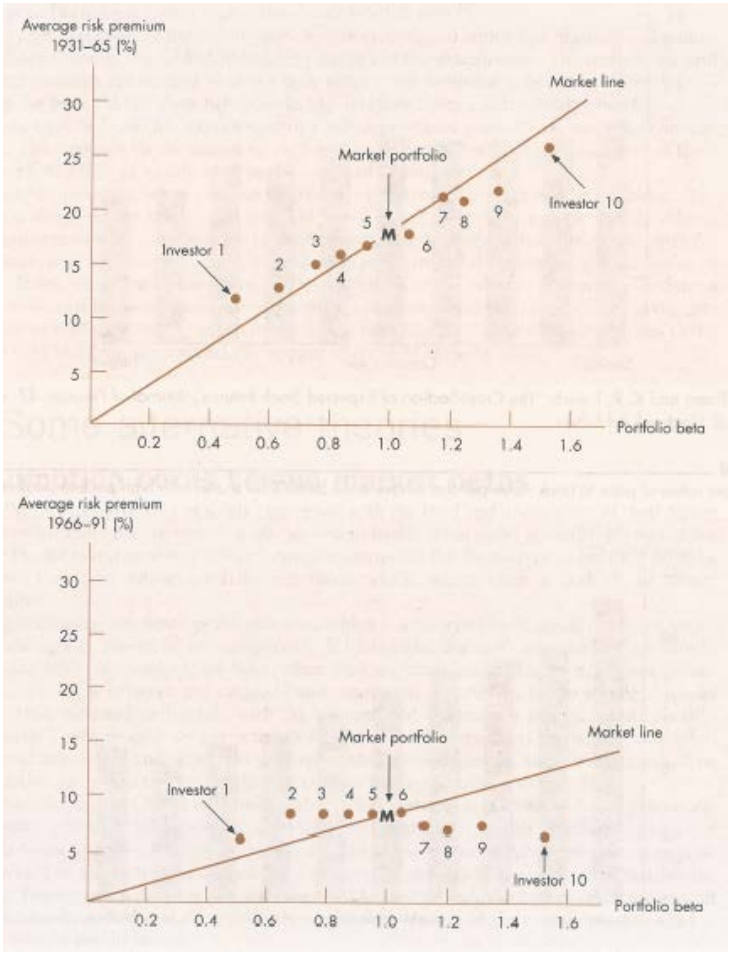
Source: Brealey, Myers, and Allen (2011), p. 197.

7.7 Partington et al (2000)[64]

164 Partington et al (2000) note that the evidence of low-beta bias has become more material in the more recent data, as summarised in Figure 8 below – the intercept has become even higher and the slope even flatter.

[64] Berk, J. and P. DeMarzo, 2014, *Corporate Finance,* 3rd global ed., Pearson.

Figure 8: The relationship between excess returns and beta



Source: Partington, G., D. Robinson, R. Brealey and S. Myers, 2000, Principles of Corporate Finance: Australian Edition, p. 211.

7.8 Berk and DeMarzo (2014)[65]

165 Another leading corporate finance textbook is Berk and DeMarzo (2014). They too consider violations of the SL-CAPM and also the explanations for those violations. They specifically note that if investors are unable to borrow unlimited amounts at the risk-free rate, the empirical relationship that has been documented in the data would be expected to occur. They also note that the result is a relationship between beta and expected returns that has a higher intercept (at r^*) and a flatter slope than the SL-CAPM would imply. They conclude that:

> Because our determination of the security market line depends only on the market portfolio being tangent for some interest rate, the SML still holds in the following form:
>
> $$E[R_i] = r^* + \beta_i\left(E[R_{Mkt}] - r^*\right)$$

[65] Berk, J. and P. DeMarzo, 2014, *Corporate Finance,* 3rd global ed., Pearson.

> That is, the SML holds with some rate r^* in place of r_f .[66]

7.9 Pratt and Grabowski (2014)[67]

166 Pratt and Grabowski (2014) is an applied valuation text that is commonly used by practitioners. Pratt and Grabowski note that concerns about the SL-CAPM have been raised by academics and practitioners:

> Despite its wide adoption, academics and practitioners alike have questioned the usefulness of CAPM in accurately estimating the cost of equity capital and the use of beta as a reliable measure of risk.[68]

167 They go on to note that one of the reasons for concern about the usefulness of the SL-CAPM is the empirical evidence of low-beta bias:

> The CAPM cost of equity estimates for high-beta stocks are too high, and estimates for low- beta stocks are too low, relative to historical returns.[69]

168 They conclude that the theoretical basis for the SL-CAPM:

> does not negate the results of empirical studies that show that beta alone is not a reliable measure of risk and realized future returns (at least not using betas drawn from realized excess returns).[70]

and they recommend the use of modified versions of the CAPM that produce estimates that are more consistent with the observed data – to correct for the empirical failings of the SL-CAPM.

7.10 Summary of the empirical evidence

169 The analysis documented above, compiled over four decades of research and using 80 years of stock returns, all reaches the same conclusion. The researchers uniformly reject the SL-CAPM on the basis that, in the observable data, the relationship between estimated betas and observed stock returns:

a. Has an intercept that is economically and statistically significantly greater than the intercept that is implied by the SL-CAPM; and

b. Has a slope that is economically and statistically significantly less than the slope that is implied by the SL-CAPM.

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[66] Berk and DeMarzo (2014), p. 399.

[67] Pratt, S. and R. Grabowski, 2014, *Cost of capital: Applications and examples,* 5th ed., Wiley.

[68] Pratt and Grabowski (2014), p. 269.

[69] Pratt and Grabowski (2014), p. 281.

[70] Pratt and Grabowski (2014), pp. 284-285.

8 Appendix 1: The Brav et al (2005) methodology for direct estimation of expected returns

8.1 Value Line data and methodology

Data source

170 Brav et al. (2005) construct estimates of expected returns using analysts' target prices. They source the majority of their data on target prices from Value Line (hereafter, VL). VL publishes weekly research reports for individual companies. It analyzes each company on a quarterly cycle such that a typical firm receives four reports per year.

171 Brav et al (2005) point out that since VL is an independent research service with no affiliation to any investment banking activity, the VL expected return is less likely to be affected by optimism bias or conflict of interest bias. Further, there are as many reports with negative recommendations as with positive, so there is no reason to suspect positive or negative bias. The VL estimates cover approximately 90% of US traded firms in terms of their market value.

Step-by-step guide to the analysis

172 The approach to estimating the relationship between beta and expected returns using the Value Line data is as follows:

- Step 1: Collect price target reports from the Value Line database for the period 1975 through 2001. This collection is restricted to firms with common shares (CRSP share codes 10 and 11)
- Step 2: Collect the market capitalization of each sample firm, calculated at the end of the prior month.
- Step 3: Collect data on the annual common shareholders' equity (Compustat item #60) for each firm.
- Step 4: Calculate the book-to-market ratio for each firm as the ratio of annual common shareholders' equity to market capitalisation at the end of the fiscal year. Apply this ratio to the 12 month period beginning six months subsequent to the end of the fiscal year
- Step 5: Calculate price momentum for each firm for each month as the buy-and-hold return for the 11 month period ending one month prior to the relevant month.
- Step 6: Construct size decile portfolios – this is based on NYSE capitalization cut-offs.

- Step 7: Construct book-to-market ratio decile portfolios. This is based on the universe of available firms on CRSP (excluding those with non-common shares).
- Step 8: Construct momentum decile portfolios. This is based on the universe of available firms on CRSP (excluding those with non-common shares).
- Step 9: Report the decile portfolio statistics for the size, book-to-market and momentum characteristics respectively for both the universe and the Value Line population.
- Step 10: Take the average of the high and low range of expected prices from each Value Line report and divide by the firm's market price outstanding prior to the Value Line report date (convert all prices to the same split-adjusted basis).
- Step 11: For the sample period prior to 1987, for each firm in the sample calculate estimates of the annual dividend yield and growth rates of dividends immediately prior to the calculation of the expected return. Calculate dividends as the sum of the dividends paid in the fiscal year before the price target is issued (Compustat data item #21). Calculate dividend growth rate as the ratio of current to prior year dividend per share (as found in Compustat data item #26), adjusted for stock splits. Calculate the dividend yield as the estimated dividend for the next year relative to the end-of-year stock price.
- Step 12: Calculate the following expression for the expected return: (assumes that dividends will continue to grow at the same historical rate, g_H, in the following four years):

$$(1 + ER_t^{VL})^4 = \frac{TP_t}{P_{t-9}} + \left(\frac{D}{P}\right)_H \cdot (1 + g_H) \cdot \left[\frac{(1+ER^{VL})^4 - (1+g_H)^4}{ER^{VL} - g_H}\right] \quad (1)$$

where $\frac{TP_t}{P_{t-9}}$ is the expected return without the dividends. Solve for the annualized expected return ER_t^{VL} that satisfies this equality.

- Step 13: For the period 1987 through 2001, obtain VL analysts' forecasts for both dividend growth rates and the next-year dividends. Use those estimates in calculating prospective dividend yield:

$$(1 + ER_t^{VL})^4 = \frac{TP_t}{P_{t-9}} + \frac{Div_{next\ year} \cdot \left[\frac{(1+ER^{VL})^4 - (1+g)^4}{ER^{VL} - g}\right]}{P_{t-9}} \quad (2)$$

where g is the VL forecasted dividend growth rate, $Div_{next\ year}$ is the VL forecast of next year dividends. Solve for the annualized expected return ER_t^{VL} as in Equation (1) above.

- Step 14: Compute expected return for each firm for each quarter.
- Step 15: Calculate time series of the sample annual expected returns based on equal weighting of individual firm forecasts.

- Step 16: Calculate time series of the sample annual expected returns based on value weighting of individual firm forecasts. For each period, value-weight all firms' expected return by their prior period market value of equity.
- Step 17: For each firm on a monthly basis, calculate firm-specific factor loadings on size and book-to-market factors using the preceding 60 months. Minimum requirement is 24 months of valid data.
- Step 18: Use the Value Line firm-specific market beta provided in each report.
- Step 19: Construct a monthly time series of one-year expected excess returns - equal to the difference between the Value Line expected return estimate and the one-year risk free rate obtained from the Fama-Bliss files on CRSP.
- Step 20: Run month-by-month regressions of the one-year excess return on the estimated factor loadings.
- Step 21: Compute the time-series average of the intercept and slope coefficients.
- Step 22: Winsorize monthly observations at the 1st and 99th percentiles to mitigate the possible effect of extreme observations. The *t*-statistics adjusted for the overlapping nature of the data are the ratio of the time-series average divided by the estimated time-series standard error.

8.2 First Call data and methodology

Data source

173 In addition to the Value Line data, Brav et al (2005) also construct an expected return measure based on the First Call database (hereafter, FC), which gathers target prices issued by sell-side analysts. They use the FC one-year-ahead target price forecasts for over 7,000 firms during the period 1997 through 2001. By using these target price forecasts, they calculate analysts' annual expected returns for each stocks. The information provided by FC is widely disseminated to all major institutional investors as well as many other investors, including individuals.

174 A key strength of the FC data is that there are forecasts from multiple analysts:

> Another advantage of this set of expectations is that a typical stock receives a target price from more than one analyst (on average, there is a target price from eight analysts per stock). As a result, the average (or the median) FC target price is likely to be less noisy and thus better reflect the consensus opinion.

175 Brav et al (2005) do note the potential concern with optimistic bias in analyst forecasts:

> On the other hand, a potential concern with sell-side analysts' expectations and recommendations is that they are biased (e.g., Rajan and Servaes, 1997, Michaely and Womack, 1999, and Barber, Lehavy, and Trueman, 2005) and that their forecasts may not accurately represent market expectations.

however, they note that this is attenuated by the fact that the same analysts are used to provide earnings forecasts and target prices. Thus any bias would be

expected to materially cancel out as it appears on both sides of the equation – in earnings forecasts and target prices.

176 Brav et al (2005) conclude that sell-side analysts' expectations are likely to be correlated with those of investors. They cite Vissing-Jorgensen (2003) who reports a similar time series pattern in individuals' expected market returns (using a UBS/Gallup monthly telephone survey of individual investors over the period 1998 through 2002).

177 The coverage of the FC data base increases over time from about 49,000 price target reports in 1997 to about 92,000 reports in 2001. The average number of price targets per covered firm also increases from 11 in 1997 to 23 in 2001. The target price database includes reports for 7,073 firms with, on average, eight brokerage houses covering each firm.

Step-by-step guide to the analysis

178 The approach to estimating the relationship between beta and expected returns using the First Call data is as follows:

- Step 1: Collect price target reports from the First Call database for the period 1997 through 2001. This collection is restricted to firms with common shares (CRSP share codes 10 and 11)
- Step 2: Collect the market capitalization of each sample firm, calculated at the end of the prior month.
- Step 3: Collect data on the annual common shareholders' equity (Compustat item #60) for each firm.
- Step 4: Calculate the book-to-market ratio for each firm as the ratio of annual common shareholders' equity to market capitalisation at the end of the fiscal year. Apply this ratio to the 12 month period beginning six months subsequent to the end of the fiscal year
- Step 5: Calculate price momentum for each firm for each month as the buy-and-hold return for the 11 month period ending one month prior to the relevant month.
- Step 6: Construct size decile portfolios – this is based on NYSE capitalization cut-offs.
- Step 7: Construct book-to-market ratio decile portfolios. This is based on the universe of available firms on CRSP (excluding those with non-common shares).
- Step 8: Construct momentum decile portfolios. This is based on the universe of available firms on CRSP (excluding those with non-common shares).
- Step 9: Report the decile portfolio statistics for the size, book-to-market and momentum characteristics respectively for both the universe and the Value Line population.

- Step 10: Exclude individual target prices outstanding for more than 30 days. In any given month over the period 1997 through 2001 calculate the ratio of each individual analyst target price to the stock price outstanding two days prior to the announcement of the individual target price (Convert all prices to the same split-adjusted basis.) For any given month, average the individual analysts' expectations to obtain the consensus expected return.
- Step 11: For the sample period prior to 1987, for each firm in the sample calculate estimates of the annual dividend yield and growth rates of dividends immediately prior to the calculation of the expected return. Calculate dividends as the sum of the dividends paid in the fiscal year before the price target is issued (Compustat data item #21). Calculate dividend growth rate as the ratio of current to prior year dividend per share (as found in Compustat data item #26), adjusted for stock splits. Calculate the dividend yield as the estimated dividend for the next year relative to the end-of-year stock price.
- Step 12: Calculate the dividend yield as the estimated dividend next year relative to the price two days prior to the issuance date of the price target. The adjustment to the expected return is then the product of the dividend yield and (one plus) the growth rate, g, of dividends:

$$1 + ER_t^{FC} = \frac{TP_t}{P_{t-2}} + \frac{Div_{current}(1+g)}{P_{t-2}} \qquad (3)$$

  where TPt /Pt-2 is the stock's consensus expected return without the dividends.
- Step 13:Compute expected return for each firm for each month.
- Step 14: Calculate time series of the sample annual expected returns based on equal weighting of individual firm forecasts.
- Step 15: Calculate time series of the sample annual expected returns based on value weighting of individual firm forecasts. For each period, value-weight all firms' expected return by their prior period market value of equity.
- Step 16: For each firm on a monthly basis, calculate firm-specific factor loadings on size and book-to-market factors using the preceding 60 months. Minimum requirement is 24 months of valid data.
- Step 17: Do the same for the market beta factor.
- Step 18: Construct a monthly time series of one-year expected excess returns, equal to the difference between the expected return estimate and the one-year risk free rate obtained from the Fama-Bliss files on CRSP.
- Step 19: Run month-by-month regressions of the one-year excess return on the estimated factor loadings.
- Step 20: Compute the time-series average of the intercept and slope coefficients.
- Step 21: Winsorize monthly observations at the 1st and 99th percentiles to mitigate the possible effect of extreme observations. The t-statistics adjusted

for the overlapping nature of the data are the ratio of the time-series average divided by the estimated time-series standard error.

8.3 Australian data and methodology

Data source

179 Since Value Line data is not available for Australia, we use the I/B/E/S analyst forecast database, which is comparable to the First Call data used by Brav et al (2005). Our sample covers the period March 2002 through to August 2017. All the data is collected via Thomson Reuters Datastream.

180 Analyst coverage increases significantly over this period, with 100 sample firms in March 2002 and 316 firms in August 2017. In total we have 1,199 firms over our 15-year sample period.

Step-by-step guide to the analysis

181 The approach to estimating the relationship between beta and expected returns using the Australian data is as follows:

- Step 1: Collect the 12-month price targets and median one-year-ahead dividend forecasts for all available firms in the IBES analyst forecast database.
- Step 2: For each firm in our sample, we collect end-of-month price and return data, adjusted for corporate events e.g. share bonuses, right offerings, stock splits and spin-off. We also collect market value for individual firms.
- Step 3: We collect the 10-year Australian Government Bond Yield to proxy for the risk free rate from Thomson Reuters.
- Step 4: We use the Total Returns Index (including dividends) to calculate the market returns.
- Step 5: Unlike Brav et al. (2005), we do not have data on the staleness of target prices, so we aren't in a position to exclude individual targe prices outstanding for more than 30 days. We also use the consensus forecast to calculate our expected returns rather than taking the average of individual expected returns. Our main tests rely primarily on the median values to alleviate the optimism bias in analyst forecasts.
- Step 6: Instead of estimating a dividend growth rate using current and prior period dividends, we use the one-year ahead dividend forecast directly, because we wish to utilize market expectations as closely as possible. Again, our main tests utilize median values to reduce the potential optimism bias.
- Step 7: This allows us to estimate the one-year expected return by solving for the following:

$$1 + ER_t = \frac{TP_t + E_t(D_{t+1})}{P_t} \qquad (4)$$

where ER_t is the expected return over the next 12 months, TP_t is the one-year target price, $E_t(D_{t+1})$ is the one-year ahead dividend forecast and P_t is the current share price.

- Step 8: Compute expected return for each firm for each month. To prevent the effect of outliers, we remove from our sample observations with an estimated cost of capital of greater 20% or less than 0%. Similarly. we restrict our analysis to the largest 100 firms by market capitalisation.
- Step 9: We use the market model to estimate individual firm beta for each month as below:

$$R_{i,t} = \alpha_i + \beta R_{m,t} + \varepsilon_{i,t} \quad (5)$$

where $R_{i,t}$ is the firm realised returns at time *t*, α_i is the intercept of the regression, β is the coefficient estimate, and $R_{m,t}$ is the market return at time *t*. In month t, we run the a time series regression using 60-month data preceding that month to obtain the beta estimate i.e. We also require a minimum of 24 valid monthly returns.

- Step 10: After obtaining the expected return and beta estimates for each firm-month, we perform the individual Capital Asset Pricing Test (Individual CAPM) using the Fama-MacBeth (1973) method. Specifically, for each month, we run a cross-sectional regression of the ex-ante expected returns excess returns on the beta estimates:

$$ER_i - R_f = \alpha + \beta_i \gamma + \epsilon_i \quad (6)$$

where ER_i is the firm ex-ante expected returns, α_t is the intercept of the regression, γ is the coefficient estimate, and β_i is the firm i's systematic risk estimated from equation (2).

- Step 11: Calculate the time series averages of the cross-sectional regressions estimates α and γ. To judge the statistical significance of the estimates, we use the Newey-West (1987) t-statistics corrected for auto-correlation.
- If the CAPM fails to explain expected returns, we would expect the mispricing error i.e. intercept α is statistically different from 0. The coefficient γ can be interpreted as the market risk premium.
- Step 12: We test the CAPM on the portfolio level. We form ranked-beta decile portfolios. In particular, in December each year, we allocate firms into deciles based on their historical betas. For example, Decile 1 contains firms with the 10% lowest betas, while the top 10% highest beta firms are in Decile 10. We then calculate the portfolios' equal-weighted returns for the next 12 months. We reform the portfolios annually in December.
- Step 13: With the sample of portfolio returns, we estimate portfolio betas using equation (2). We use 24-month rolling regression to estimate the portfolio betas.
- Step 14: We repeat the CAPM test as in (3) on the portfolio level. We again use Newey-West (1987) *t*-statistic to correct for the autocorrelation.

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