2026 Rate of Return Instrument review

Eligible Experts' joint report

23 November 2025

Contents

1 Introduction 1
1.1 Background 1
1.2 Authors of this report 1
1.3 Summary of opinions 2
2 Equity beta 9
2.1 What is the issue? 9
2.2 Professor Johnstone's opinion 9
2.3 Mr Kumareswaran's opinion 19
2.4 Associate Professor Partington's opinion 29
2.5 Professor Johnstone's commentary on the opinions of the other experts 44
2.6 Mr Kumareswaran's commentary on the opinions of the other experts 45
2.7 Associate Professor Partington's commentary on the opinions of the other experts 55
3 Weighted trailing average return on debt 58
3.1 What is the issue? 58
3.2 Professor Johnstone's opinion 59
3.3 Mr Kumareswaran's opinion 61
3.4 Associate Professor Partington's opinion 69
3.5 Professor Johnstone's commentary on the opinions of the other experts 82
3.6 Mr Kumareswaran's commentary on the opinions of the other experts 83
3.7 Associate Professor Partington's commentary on the opinions of the other experts 91
4 Third party yield curve data 93
4.1 What is the issue? 93
4.2 Opinion of the Eligible Experts 93
A Response to consultation questions 94

B Derivation of de-levering and re-levering formulas with constant gearing 107

Tables

Table 1: Examples of risks and their effects on an NSP 17
Table 2: Domestic comparators used by the AER and their period of listing 29
Table 3: Recent regulatory determinations on debt beta 51
Table 4: Eligible Experts' responses to Discussion Paper consultation questions 94

Figures

Figure 1: Rolling equity beta plots for domestic comparator firms 20
Figure 2: Changes in the composition of the Australian market index over time 28
Figure 3: Example of beta estimates for bond ETFs 39
Figure 4: Average nominal regulated return on equity of NSPs (2014-23) 47
Figure 5: Average nominal return on assets of NSPs (2014-23) 48
Figure 6: 10-year bond yield 70
Figure 7: Analysis of sources outperformance for the return on equity in 2021 74
Figure 8: Contributions to real returns on regulated equity – NSP simple average 75
Figure 9: Detailed contributions to real RoRE - electricity NSPs - 2023 75

Boxes

Box 1 : AI summary of the reasonableness tests used by American regulators 82

1 Introduction

1.1 Background

1. The three authors of this report were selected by the Australian Energy Regulator (AER) as Eligible Experts for the 2026 Rate of Return Instrument review. We have been asked to provide an expert response to the AER's August 2025 *Rate of Return Instrument Review Discussion Paper* (Discussion Paper), addressing issues related to the estimation of equity beta, the potential use of a weighted trailing average cost of debt and the proposal to again utilise yield curve data as published by the Reserve Bank of Australia (RBA).
2. We were instructed by the AER to provide our own, independent views on these issues. The AER informed us that it is seeking our advice on practical solutions to the problems and issues it has raised in the Discussion Paper, rather than theoretically perfect solutions that are impractical or too complex to implement. However, the AER was also at pains to emphasise that we were free to comment on other issues that we considered relevant to 2026 Rate of Return Instrument review.
3. In this report we first present our individual views and then discuss our areas of agreement or disagreement.
4. In addition to this joint report, one of the Eligible Experts, Professor Johnstone, has provided a separate paper that sets out in more detail some of the ideas referenced herein.[1] The Eligible Experts have asked the AER to publish that paper along with this joint report, so that the two documents may be read in conjunction with one another.
5. Before proceeding to the content of our report we would like to thank the AER staff for providing us with data and answering questions in response to our requests for clarifications.

1.2 Authors of this report

6. This report has been prepared by Professor David Johnstone, Dinesh Kumareswaran and Associate Professor Graham Partington.
    a. David is currently Senior Professor in the Faculty of Business and Law at the University of Wollongong and an Honorary Professor at the University of Sydney Business School. He was a Visiting Assistant Professor at the University of California Berkeley in 1987-1989 and was the National Australia Bank Professor of Finance at the University of Sydney during 2007-2017. He held a British Commonwealth Postdoctoral Fellowship at the University of Lancaster for the year 1985-6. David has published widely in international peer-reviewed journals on financial economics topics, including the cost of capital. He holds BA (Econometrics), BCom (Accounting and Finance) and PhD (Economics) degrees. David has been engaged in major consulting activities by various regulatory agencies in Australia. He was a member of the expert panel that participated in the concurrent evidence sessions during the AER's 2018 Rate of Return Instrument review.
    b. Dinesh is a Director and Board member of Frontier Economics Pty Ltd. He has over 22 years of experience advising clients on competition and network regulation issues. He has advised regulators, regulated businesses and access seekers on the allowed rate of return in Australia, New Zealand, Asia, Europe, the United Kingdom and Middle East. Before joining Frontier Economics, Dinesh was a Senior Economist at the New Zealand Commerce Commission. He holds BCA (Economics, Econometrics, Finance), BCA

[1] Johnstone, D., Regulated rate of return: Beta and its drivers, 13 November 2025.

(Hons)(Economics) and MA (Economics) degrees. Dinesh was a member of the expert panel that participated in the concurrent evidence sessions during the AER's 2022 Rate of Return Instrument review.

c. Graham has extensive experience as a senior finance academic, researcher and consultant. He is now retired from an associate professorship in finance at the University of Sydney. He has previously been Chair of the Finance Discipline at the University of Sydney, head of the postgraduate research program in Finance, and Education Director for the Capital Markets Co-operative Research Centre PhD program. Graham has also held Associate Professorships in Finance at The University of Technology Sydney and The University of British Columbia, as well as academic positions at Macquarie University and the University of Bangor. He has published books, book chapters, and many research papers on finance and accounting and has won prizes for his research work. He also has extensive consulting experience, including work covering the cost of capital and valuation. Graham holds BSc (Hons) (Economics and Forestry) and MEc (Hons) degrees. He was a member of the expert panel that participated in the concurrent evidence sessions during the AER's 2018 and 2022 Rate of Return Instrument reviews.

1.3 Summary of opinions

1.3.1 Professor Johnstone

7. *Portfolio theory versus regulation.* Much of the regulatory framework rests on traditional finance theory and particularly the Capital Asset Pricing Model (CAPM). The CAPM derives from portfolio theory and the perspective of a well-diversified investor who spreads their equity investment across hundreds of stocks. From that idealized investor's perspective, most of the regulators' truly important concerns matter little, because even if a network failed financially that would be a relatively tiny loss and hardly noticeable to an investor who holds say 0.5% of her wealth in that firm. Therein lies a mismatch because regulators are only indirectly concerned with diversified investors, and only because they must regulate networks in a way where the networks can attract capital, whether from investors who are diversified or not. Regulators have statutory responsibility to focus on networks *of themselves*, regulating their operations and investments to achieve cost effective services that satisfy consumers, while also rewarding network owners sufficiently for their risks. Ultimately, the networks exist for consumers, not for investors, they are the means rather than the end.

8. *CAPM mistakes.* CAPM, while not sufficient of itself for regulation purposes, has unstated yet useful implications. It has been shown in finance theory, but largely overlooked, that network-specific risks are in fact priced, meaning that they affect the network's beta and fair return on capital. Under CAPM, so-called "non-systematic" or firm-specific cash flows are discounted at the risk-free rate, so if we add one of these to the business then the cost of capital is a weighted average of the two and shifts either towards or further away from the risk-free rate, that direction depending on whether the risk is one of a windfall gain or one of a loss. Similarly, the new beta is the weighted average of the old beta and zero. For a risk of loss, say one from asset stranding, the new beta is higher and the risk must be priced.

9. *Post hoc tailoring of cash flows versus CAPM.* Rather than trying to identify everything ex ante that can go right or wrong for the network, hoping to foresee and allow for each possible risk or chance event in a correctly forward-looking beta, regulators wait till after the event and may make post hoc "pass through" type adjustments. For example, if construction costs turn out higher than forecast, the regulator will often make an allowance that effectively returns the cost overrun or a large part of it to the network. That does not happen in a free market, where firms wear unforeseen losses and investors look back at their own costly forecasting mistakes. The regulatory

regime cannot be understood as emulating free market conditions, it leaves some risks for Network Service Providers (NSPs) but ultimately leaves them with a highly predictable cash flow stream that is easily simulated by NSPs and thus seen in its statistical probability distribution well in advance. Few private sector entities apart from casinos have such a predictable statistical cash flow distribution.

10. *Regulators cause beta, as much as observe it.* When regulators commit ex ante to making fair adjustments ex post, the networks' cash flows are buffered or constrained from being "too bad" or "too good". From a forward-looking perspective, at the start of a regulatory period, that inbuilt protection affects the statistical distribution of cash flow and therefore alters the network's beta. Such pre-commitments are like de facto insurance contracts, which from an investor's perspective tend to reduce network risk and beta. More generally, they reveal a further conceptual problem preventing CAPM from doing more than merely "informing" regulation. The problem is that regulation and the chosen settings (i.e., the regulated ROE, WACC, beta, etc.) are the underlying drivers of the networks' cash flow distributions, so, frustratingly, regulators can observe network betas in stock market returns, but what they see is largely what they created. Put another way, the networks' most underlying cash flow risk is "regulation risk" or even more so the political risk of a wholly different regulatory regime.

11. *Regulation risk is the most fundamental risk facing networks and should be compensated*. Regulation risk affecting the networks' cash flows is usually understood as "unsystematic" and hence not a risk to be rewarded. However, by a correct CAPM interpretation, it is a priced cash flow risk and should be rewarded. Regulators have said the opposite in their pronouncements, but they have avoided what would otherwise have been a real problem – to wit, why would anyone invest unrewarded for taking regulation risk – by their pre-commitments to iron out issues such as reasonable cost overruns when and after they occur. That post hoc approach is essentially the only pragmatic way. It has an underlying "cost of service" rather than ex ante CAPM justification, but to be practical regulators naturally apply some of both.

12. *It's a "cost of service" model*. The regulatory model rewards NSPs for the "cost of service" where the cost of equity capital is measured at the current market rate (using CAPM) and the cost of debt capital is measured by a trailing average and thus more like an actual cost. The market rate is used for equity, necessarily, otherwise equity providers would see that they are not recovering their opportunity cost and potentially withdraw capital. Equally, however, if the CAPM method used to set WACC is too generous, equity investors earn more than they can elsewhere at the same (low) risk, motivating over-investment. This is a delicate balance.

13. *Thankyou*. I would like to note with appreciation the intellectual encouragement and openness of Dinesh Kumareswaran that I have enjoyed while considering and writing this report.

1.3.2 Mr Kumareswaran

14. Before summarising my views on the key issues addressed in this report, I would like to thank my co-authors for the collegial way in which they have worked with me to prepare this joint report. We have not agreed on all issues—far from it. We each have different perspectives on many of the topics covered in this report. However, I appreciate the way that Professor Johnstone and Associate Professor Partington have engaged in our discussions sincerely and in the spirit of helping the AER develop a Rate of Return Instrument that would promote the long term interests of consumers.

Equity beta

15. The sample of domestic comparators that the AER has historically used to estimate beta has now reduced to just one listed firm, and the AER has noted that this remaining firm is not an optimal

comparator to the NSPs it regulates. In these circumstances, I think it would be untenable for the AER to continue to rely exclusively on domestic comparators to estimate beta.

16. I agree with the AER that the only viable alternative may be to use listed energy networks overseas to inform its estimate of beta for the NSPs. Such an approach would be entirely consistent with the approach taken by many other regulators that face a similar dearth of domestic comparators.

17. The AER proposes to identify relevant comparators by identifying listed energy networks in other developed economies that pass certain liquidity and data sufficiency requirements. I agree with this proposed approach and have suggested only very minor improvements to the liquidity and data sufficiency criteria proposed by the AER.

18. I recommend that the AER follow a similar approach to the Economic Regulation Authority of Western Australia (ERA) and the New Zealand Commerce Commission and develop the broadest and largest possible comparator sample that meets the liquidity and data sufficiency requirements. Adoption of a large comparator sample would dampen the influence of individual firms that differ significantly from the Australian NSPs in terms of the factors that drive beta. A large sample will also tend to yield more statistically reliable estimates of the asset beta.

19. I recognise that international energy networks may be imperfect comparators to the NSPs regulated by the AER, due to differences in the environment in which they operate. In addition, differences in the composition of stock market indexes, between countries and within countries over time, can affect beta estimates. However, in my view, it is impractical to adjust reliably for these differences.

20. The AER is in a second-best world, where the data available to inform beta estimates is imperfect. In these circumstances, the AER must be pragmatic and make the best of the international evidence it has available, rather than eschew that evidence altogether.

21. The AER should not simply assume that the existing estimate of 0.6 is a good reflection of the true equity beta of the NSPs it regulates, because that estimate was itself determined using very limited empirical evidence. In my view, the current estimate of 0.6 should not be treated as a reliable prior or anchor point for the equity beta allowance.

22. If the AER wishes to have regard to evidence on beta from domestic comparators as well as international comparators, I recommend that the AER pool together into a single sample the estimates from the domestic comparators and the international comparators. This would reflect the reality that most of the available evidence is international rather than Australian, while still allowing the estimates for the domestic comparators to have some influence on the overall estimate. This would also allow all stakeholders to understand transparently the weight that is applied by the AER to the domestic evidence vis-à-vis the international evidence. If the AER is not transparent about these relative weights, the resulting perceived subjectivity may undermine confidence in the regulatory process.

23. The AER's current approach is to assume that the debt beta is zero, when de-levering and re-levering betas. I agree with the AER that, under this assumption, the re-levered estimates of NSPs' equity beta will be upwardly biased if the average gearing of the international comparators is lower than the benchmark gearing level (and vice versa).

24. In my opinion, the AER could address this problem by adopting a positive debt beta when de-levering and re-levering. It is reasonable to a assume that the true debt beta is positive because it is likely that the risk of debt defaults increases as market risk increases

25. However, debt betas are notoriously difficult to estimate reliably. Furthermore, adopting an overestimate of the true debt beta would produce downwardly biased estimates of NSPs' equity beta. Therefore, I recommend that the AER undertake a review of empirical evidence in recent published academic literature and recent regulatory precedent on debt beta estimates, and err

towards the lower bound of the estimated debt beta range, to reduce the risk of underestimating NSPs' true equity beta.

Weighted trailing average return on debt

26. The AER has clarified to the Eligible Experts that when setting the allowed rate of return, its objective is to ensure that NSPs are provided with a reasonable opportunity to recover at least their efficient debt financing costs, to incentivise NSPs to invest prudently and efficiently. I agree with the AER that the simple trailing average may not achieve this objective in circumstances where an NSP is undertaking a significant capital investment program that necessitates the raising of large quantities of debt within a short period of time.

    a. If the prevailing market cost of debt is higher than the simple trailing average allowance, then the NSP would expect to recover *less* than its prudent and efficient financing costs under the simple trailing average approach. This may incentivise the NSP to invest less than the prudent and efficient amount; and

    b. If the prevailing market cost of debt is lower than the simple trailing average allowance, then the NSP would expect to recover *more* than its prudent and efficient financing costs under the simple trailing average approach. This may incentivise the NSP to invest more than the prudent and efficient amount.

27. Neither of these outcomes (i.e., under- or over-investment) would promote the long term interests of consumers.

28. I also agree with the AER that a weighted trailing average approach would address this problem by recognising that any new capital expenditure must be financed at the prevailing market rate, while allowing NSPs' existing RAB to continue to earn the simple trailing average allowance.

29. I make the following recommendations regarding the implementation of the weighted trailing average approach:

    a. I agree with the AER's proposal to apply a transition from the rate-on-the-day allowance for new capital expenditure to the simple trailing average over a 10-year period. However, in my view, the debt transition proposed in the Discussion Paper is far too complex. It is difficult to see how any NSP would, in practice, enter into the complicated financing arrangements that are implied by the AER's proposed transition. Instead, I recommend that the AER apply the transition that it adopted when it switched from the rate-on-the-day approach to the 10-year trailing average approach. That transition is well-understood by all stakeholders, and would be simple to implement.

    b. Since the weighted trailing average approach can be implemented simply and with little administrative cost, I see no reason why it should not be applied to all NSPs. This would avoid the need to set arbitrary thresholds that determine which NSPs the weighted trailing average approach would apply to, and would also remove the incentive for gaming.

    c. I support the application of a true-up for the return on debt allowance, to account for NSPs' actual, rather than forecast, capital expenditure. This would better ensure that NSPs' revenue allowances permit the recovery of efficient interest expenses, and would preserve incentives for efficient investment. I note that the true-up could be implemented through relatively minor modifications to the existing AER model for calculating rewards and penalties under the Capital Expenditure Sharing Scheme (CESS). If implemented properly, the true-up would support, rather than undermine, the incentives created by the CESS.

Third-party yield curves data

30. The AER's proposal to reinstate the use of yield curve data published by the RBA, for the purposes of setting the allowed return on debt, by using spread to swap data obtained from either Bloomberg or Refinitiv to extrapolate the corporate bond yields published by the RBA to 10-year tenor yields, is sensible. This would reduce the risk of shocks to any one of the individual curves, and would mitigate against the risk that any one of the curves may cease to be published. I therefore support the AER's proposal on this issue.

1.3.3 Associate Professor Partington

Introductory comments

31. In the separate sections below, I address the main issues raised by the AER. In addressing each of the issues I begin with a broad discussion and analysis of the issue. This discussion provides important background and context, raises important considerations that might otherwise be overlooked, and suggests further alternatives for resolution of the issues the AER wishes us to address.

32. Some of my comments are critical of choices made by the AER. Before I begin, therefore, I would like to make it clear that these criticisms should not be interpreted as criticisms of the AER in general. In the fifteen or so years that I have provided advice to the AER I have developed a high regard for both the institution and individual staff members. The AER has a very difficult task to do in balancing the needs and interests of the stakeholders, complying with the relevant NEO and NGO objectives and various regulations, analysing data and applying economic and financial reasoning to the regulatory task. It is a task that has been undertaken with patience, care, and consultation. In my opinion it has been done well.

33. I would also like to take this opportunity to thank Mr. Kumareswaran for taking on more than his fair share of the administrative tasks involving the experts. I would particularly like to thank him for his organisation with respect to producing our report and for his unfailing good humour.

Beta estimation and selection of comparators

34. In the body of my report, I explain how it is possible to evaluate the AER's beta estimate without recourse to comparators and estimate an average value of 0.59. While this is the average, reliably estimating beta either theoretically, or empirically, to a second decimal place degree of accuracy is wishful thinking. So, a range of 0.55 to 0.65 would be entirely plausible.

35. There are many problems in using international comparators. The first one is selecting comparators that are good matches. For this purpose, I suggest a range of additional filters. The objective, using the Glenn Boyle analogy, is to get a well matched sample of spaniels, rather than poorly matched spaniels and great Danes.

36. Unfortunately, even if the samples are well matched, there will be differences between the Australian NSPs and overseas comparators due to differences in standard deviations across equity markets and differences in the sets of firms comprising such markets. Additionally, Australia has an imputation tax system that is fundamentally different to the classical tax system applying elsewhere.

37. I do not recommend the use of the international CAPM to address differences in market composition. It will create more difficulties than it solves.

38. There is an inverse relation between asset beta and leverage. The AER reports that overseas comparators have lower leverage than domestic NSPs. Ceteris paribus, this means that overseas

comparators have higher asset betas. Therefore, it is no surprise to find that the AER reports that overseas comparators have higher betas.

39. I suggest a validation study to inform the relation between the betas of overseas comparators and domestic NSPs.

40. I will not be surprised if the AER feels pressure to use international comparators, even though it is not self-evident that this is useful. However, because of the many difficulties that I identify in using international comparators it will be necessary for the AER to exercise judgement when using such comparators to inform the AER's estimate of the equity beta for Australian NSPs.

Unlevering and relevering

41. The fundamental assumption underlying unlevering and relevering is that the asset beta is the same for the two companies involved. However, differences in leverage indicate that the asset betas are different because of the inverse relation between asset beta and leverage. Therefore, the whole process is fundamentally flawed. Given this and the many other pitfalls that I explain in my report I question whether unlevering and relevering is a useful thing to do.

42. Despite my warnings I expect unlevering and relevering may proceed. If so, then I recommend allowing for the effect of debt betas.

43. The AER suggest a method to avoid the leverage adjustment that effectively assumes the firms all have the same level of leverage. This would clearly remove the problem of differences in leverage. However, in reality firms do have differences in leverage and this matters. Thus, I do not support this solution.

Trailing average cost of debt

44. The main problems with using the equally weighted trailing average cost of debt to compute the WACC are entirely predictable and depend upon the interest rate regimes. There are two main regimes, interest rates are lower than previous rates (regime A) and interest rates are higher than previous rates (regime B). In regime A, the equally weighted trailing average gives an allowance for the cost of debt above the current cost of debt and a WACC that is above the opportunity cost of capital. As a result:

    a. The benchmark for debt costs is too slack to promote efficiency and are easily beaten.

    b. There is an incentive to increase debt finance, and to use this to expand investment in capital projects.

    c. The allowed ROI is too high and so:

        (i) Consumers pay too much

        (ii) There is an increase in the market value of the RAB

        (iii) There is an incentive for overinvestment

        (iv) The AER's WACC is not appropriate for use as a discount rate in present value calculations.

45. In regime B, the equally weighted trailing average gives an allowance for the cost of debt below the current cost of debt and a WACC that is below the opportunity cost of capital. As a result:

    a. The benchmark for debt costs is likely to be so tight as to be unreasonable, or impossible for NSPs to meet it.

    b. There is an incentive not to raise debt finance, and this constrains investment in capital projects

c. The allowed ROI is too low and so:

   (i) NSPs are not fully compensated for their costs

   (ii) There is a reduction in the market value of the RAB

   (iii) There is an incentive for underinvestment

   (iv) Credit ratings may be threatened

   (v) The AER's WACC is not appropriate for use as a discount rate in present value calculations.

46. It is also almost certain that in regime B that there will be significant lobbying for change by the NSPs.

47. We recently entered regime B and there is currently concern about the risk of underinvestment and credit ratings. The suggested solutions involve reweighting the current cost of debt in the trailing weighted average. The possible weights for the current cost of debt range from 10% (equally weighted) to 100% (return to on the day). There is also the issue of how to transition back to the status quo, subsequent to a weighting change.

48. Since I have a low opinion of the equally weighted trailing average, I do not favour a transition back to it. My natural preference is to return to the on the day approach. This is because it resolves all the problems that I identify above. However, given a desire for regulatory stability, this would require a transition process.

49. Of my four suggested solutions, returning to the on the day approach, or just using asset betas, are likely to prove too challenging to the status quo. The two remaining solutions are using the existing trailing average cost of debt for the RAB and the current cost of debt for new capital investment. This is a reweighting scheme that increasingly gives greater weight to the current cost of debt as new investment grows.

50. My other solution is to reimburse actual costs of debt subject to a reasonableness test. This is the approach widely adopted by US utility regulators. The current trailing average method for the cost of debt is an approximation for cost of service, supposedly with an "efficiency" incentive that does not really work. It is a method that will lead to recurring underinvestment and overinvestment problems, and one that creates service costs mismatches. So why not go the full cost of service model with controls on cost?

51. Given the foregoing, of the options presented by the AER, their alternative approach is closer to an actual cost of service model and avoids the reversion back to an equally weighted trailing average. So, it is the option that I prefer of the ones offered by the AER.

52. If the AER does decide to follow a cost of service model it could put the interest payments in the cash flow. Then it would only need to use the cost of equity for the ROI.

2 Equity beta

2.1 What is the issue?

53. The Discussion Paper explains that the AER has historically relied on a sample of nine domestic comparator firms to estimate the allowed equity beta. However, all but one of those firms has now been de-listed due to mergers and takeovers. The Discussion Paper notes that the only member of the comparator set that remains listed, APA Group, is not an optimal comparator to regulated NSPs because over 90% of its revenue is unregulated.[2]

54. The diminishing sample of listed comparators means that the AER will have little to no new information, going forward, with which to update its beta estimates. If the AER continues to rely exclusively on its sample of nine domestic comparators, its equity beta estimates will essentially be 'frozen in time'.

55. Having considered a number of options for addressing this problem, the Discussion Paper concludes that expanding the existing sample to include listed international energy firms appears to be the only potentially viable option.

56. However, the Discussion Paper identifies three challenges associated with adopting that option:[3]

    a. There may be fundamental differences in the (systematic) risk exposure between energy networks in Australia and overseas that make international energy firms poor comparators for Australian NSPs (Challenge 1);

    b. If the average gearing of the international energy firms is lower than the current benchmark gearing ratio, then the AER's current process for de-levering and re-levering betas would likely result in an upward bias in the equity beta estimate for regulated NSPs (Challenge 2); and

    c. Differences in the composition of the home market indices of international comparator firms may result in asset beta estimates for the international comparators that are not reflective of the asset beta of Australian NSPs (Challenge 3).

2.2 Professor Johnstone's opinion

2.2.1 The options

57. Two options are described, which can be summed up as (i) rely on the equity beta estimate established previously using nine ASX listed companies, taking that estimate as still relevant and applicable, (ii) using data from an appropriately culled list of international firms and re-levering their betas based on assumptions about (a) the beta of debt in the country involved and the firm's D/E ratio.

58. Both approaches are pragmatic responses to an estimation problem for which there is unfortunately no objectively true answer. Even if there existed a large sample of relevant listed Australian firms, empirical betas change stochastically over even short periods of time, so picking out a point estimate is inherently contentious. An acceptable point for beta has been found in past determinations and any significant shift from that will cause insecurity in NSP capital investment

[2] Discussion Paper, p. 15.

[3] Discussion Paper, pp. 16-18.

decisions and consumer prices and will attract heavy criticism from whichever "side" (NSPs vs consumers) is left financially worse off.

59. The adoption of observed empirical betas from matching regulated companies in markets such as the US or UK looks plausible superficially but is questionable in CAPM theory. There is much to be learned in general from deliberations about utility regulation and associated betas in markets like the US but like other market-based parameters they can't be taken as "Australian" betas, for the same reason that characteristics like market volatility and the market risk premium don't carry across. See the following technical discussion of the same issue.

2.2.2 Using international betas

60. While they can "inform" Australian considerations, CAPM theory makes it clear that betas do not transport unchanged across markets. Beta as conventionally defined is a property of one firm within the context of a given set of firms. If you leave the single firm's operations unchanged but plant it in a different reference set or economy, you get a different beta for the very same business. So if you go to a different market where stocks are involved in different activities at different scales in a different physical and social environment, the same activity will have a different beta. There is straightforward CAPM algebra to prove this point, as follows.

61. The expected return on a business depends on its payoff mean as well its payoff covariance. Writing the CAPM in pricing rather than returns form,

$$P_j = \frac{E[V_j] - c\,\mathrm{cov}(V_j, V_M)}{R_f}, \quad (R_f \equiv 1 + r_f) \tag{1}$$

where P_j is the price of asset j, $E[Vj\,]$ is its expected payoff, $\mathrm{cov}(V_j; V_M)$ is its payoff covariance with the market aggregate payoff $V_M(\equiv \sum V = V_1 + V_2 + \cdots)$, r_f is the risk-free interest rate and c is an exogenous constant capturing the market's aversion to payoff variance. Everything that follows is a simple consequence of (1).

62. Under forward-looking estimates of the exogenous primitives $E[V_M]$ and $\mathrm{var}(V_M) = \sum_j \mathrm{cov}(V_j, V_M)$ the effect of the market's innate risk aversion c surfaces in the endogenous market price of the aggregate of all assets, $P_M \equiv \sum P = P_1 + P_2 + \cdots$, since it can be seen mathematically from (1) that $c = \frac{E[V_M] - P_M R_f}{\mathrm{var}(V_M)}$, merely by treating the market as an asset of itself, just like single asset j. Thus, exogenous market risk aversion c drives endogenous asset price P_M, and is therefore the driver of the market parameter $\frac{(E[V_M] - P_M R_f)}{\mathrm{var}(V_M)}$, often called the "price of risk."

63. By definition, the forward-looking expected return on asset j is:

$$E[R_j] = \frac{E[V_j]}{P_j} = \frac{E[V_j]\,R_f}{E[V_j] - c\,\mathrm{cov}(V_j, V_M)} = R_f\left[1 - c\left(\frac{\mathrm{cov}(V_j, V_M)}{E[V_j]}\right)\right]^{-1}. \tag{2}$$

64. For typical assets with positive payoff mean and covariance parameters, the firm's expected return or "cost of capital" $E[R_j]$ is: (i) increasing in its payoff covariance, as is well known, and (ii) decreasing in its mean payoff, as is widely unknown.

65. From (2) it follows that assets (including whole firms) belong into the same CAPM "risk class", and have the same cost of capital, if and only if they have the same "Lintner ratio":

$$\Lambda_j = \frac{\mathrm{cov}(V_j, V_M)}{E[V_j]}.$$

66. This is "Lintner's ratio" because it was first explained, although subsequently not absorbed into mainstream CAPM expositions, in Lintner's original derivation of CAPM.

67. The much better known, and also correct, explanation is that assets are in the same risk class when they have the same returns $\beta_j = \text{cov}(r_j, r_M)/\text{var}(r_M)$. Both rules are correct. Their only difference is that one is stated in terms of asset cash payoffs and the other in terms of asset rates of return. To show their mathematical equivalence, we can write asset beta as a function of the asset's Lintner ratio. Using just the statistical laws of variance and covariance, the returns beta of firm j is:

$$\begin{aligned}\beta_j &= \frac{\text{cov}(r_j, r_M)}{\text{var}(r_M)} \\ &= \frac{\text{cov}(V_j, V_M)/P_j P_M}{\text{var}(V_M)/(P_M)^2} \\ &= \frac{\text{cov}(V_j, V_M)}{P_j}\left[\frac{P_M}{\text{var}(V_M)}\right]\end{aligned} \tag{3}$$

68. Substituting for Pj from (1) and rearranging gives:

$$\beta_j = R_f\left(\frac{\Lambda_j}{1 - c\Lambda_j}\right)\left(\frac{P_M}{\text{var}(V_M)}\right),$$

where P_M and $\text{var}(V_M)$ are market level quantities that by the usual assumption are too large to be affected materially by any one single asset. Note that for any asset with $P_j > 0$, it follows from (1) that $c\Lambda_j < 1$. Note also that assets with zero payoff covariance with the market have zero Lintner ratio and hence zero beta.

69. In statistical language, CAPM "beta" is a sufficient statistic but the "minimal sufficient" statistic or most reduced yet sufficient index of an asset's risk class under the CAPM is its Lintner ratio Λ_j. Assets with equal Λ_j necessarily have equal beta and expected return in any mean-variance efficient market, regardless of the local exogenous market parameters $E[V_M]$, $\text{var}(V_M)$ and c.

70. Hence, coming now to the issue of whether betas transport across markets, we can see that an asset's beta is a function of its own Lintner ratio and also the market's Lintner ratio.

71. Rewriting (2) as:

$$E[R_j] = R_f[1 - c\,\Lambda_j]^{-1} \quad (R \equiv 1 + r_j) \tag{4}$$

and taking the whole market as itself an asset,

$$E[R_M] = R_f[1 - c\,\Lambda_M]^{-1}, \tag{5}$$

where:

$$\Lambda_M = \frac{\text{cov}(V_M, V_M)}{E[V_M]} = \frac{\text{var}(V_M)}{E[V_M]}$$

is the Lintner ratio of the market.

72. Now the returns beta of firm j, defined conventionally by (3), is:

$$\begin{aligned}\beta_j &= \frac{\text{cov}(V_j, V_M)}{\text{var}(V_M)}\frac{P_M}{P_j} \\ &= \frac{\text{cov}(V_j, V_M)}{E(V_j)}\frac{E[V_M]}{\text{var}(V_M)}\frac{E[R_j]}{E[R_M]}.\end{aligned}$$

73. Substituting for $E[R_j]$ and $E[R_M]$ from (4) and (5), gives:

$$\beta_j = \left(\frac{\Lambda_j}{\Lambda_M}\right)\left(\frac{1 - c\,\Lambda_M}{1 - c\,\Lambda_j}\right), \tag{6}$$

from which it follows that $\beta_M = 1$. This insightful formula shows that beta is determined fundamentally by just three parameters: the market's payoff variance aversion c, the market's

Lintner ratio and the firm's own Lintner ratio, all of which are exogenous and independent parameters "from nature". It should be noted that apart from papers that I have published, the equation for beta (6) is entirely new, and is deeply insightful because it shows the theoretical determinants of beta, of which there is just one that is a characteristic of the asset or firm, namely its Lintner ratio. The other parameters in the equation are market parameters.

74. All three parameters differ between countries. The distribution of betas (around one) changes from one country to another, depending on what activities, industries or sectors dominate the stock market in each country. So, taking an extreme case, one business activity can have positive beta in one country and near zero (or even negative) beta in another. This CAPM insight tells us that we would need to remap the betas lifted from say US regulated utilities to allow for their reference set before assuming those same betas might proxy in Australia.

75. When we go to another market like the US, we need to account for not only the different composition of activities of the firms in that economy but potentially also for the different risk aversions (and market premia) across markets of investors. Suppose for example that in the US there are many more companies whose profits and returns are highly correlated with consumer demand and consumer sentiment. That would have two effects: (i) the variance of the market aggregate profit or payoff variance would be higher, and (ii) the covariance of the regulated utility's profit or payoff with the market would be lower. Those effects together or individually point to lower beta.

76. Looking for a way to implant foreign betas into our own setting, some guidance is implied by CAPM fundamentals. A CAPM analysis that hinges around Lintner's ratio can be extended to provide a transformation connecting utility betas across different markets of countries. From an earlier result we have:

$$\beta = \frac{R_f}{\mathrm{var}(r_M)}\left[\frac{\Lambda}{1-\lambda\Lambda}\right].$$

77. Hence, if we were to assume that the Lintner ratios of utilities are the same in different markets, and (ii) the market risk aversions are equal, the beta of a utility in Australia β_{Aust} can be found from the beta of a utility in the US by the transformation:

$$\beta_{Aust} = \frac{R_{f\ Aust}}{\mathrm{var}_{Aust}(r_M)}\left(\frac{\mathrm{var}_{US}(r_M)}{R_{f\ US}}\beta_{US}\right).$$

78. This is much like delevering and relevering because we first remove the US market parameters to reduce the US beta to just the component that is "international" (that is done in the bracketed expression) and then apply the Australian element $\frac{R_{f\ Aust}}{\mathrm{var}_{Aust}(r_M)}$ to obtain the beta of the same entity placed in an Australian market. Thus, the constants used in the transformation are just the ratio of the two countries' risk-free rates and the ratio of their market returns variances, both of which are easily observable. The closer these ratios to one, the more valid the use of US betas to proxy for Australian betas.

79. Note that the parameters used to do this transformation, namely the market returns variances and risk-free rates, are observable and can be found empirically for both countries. The approach involves obviously strong assumptions, particularly the assumption that utilities' Lintner ratios are similar in different countries. Since regulation affects the utilities cash flow distributions and correlation with the market, that assumption would require that the regulation regimes are similar, at least in effect.

80. There is further evidence from finance theory that should be taken into account. The very problem raised by the AER of how to identify an international stock that can proxy for an Australian regulated NSP is the same problem precisely as exists in the real options literature under the heading of "finding a twin security". In real options we need to find the risk-related discount rate applicable to an option and the approach is to identify a firm or cash flow, usually in a similar

activity, although not necessarily, that has the same ratio of cash flow covariance (with the market) to cash flow mean.[4] It turns out that this is also the CAPM's implicit rule for what defines an entity with the same beta as the one in consideration. Under CAPM, and more generally under the principle of "no arbitrage" in a mean-variance setting, we will always come back to the same definition of an equivalent entity. Two firms or two entities have the same CAPM beta (in the same market) if and only if they have the same "Lintner ratio" of cash flow mean (i.e. statistical expected value, based on the probabilities of different possible cash flows) to variance. Thus, they must have strictly proportional cash flows (the cash flow from one asset must be a positive constant times the cash flow from the other). Perfect linear correlation is thus implied but is of itself not sufficient. If the cash flow from asset A is X_A and that of asset B is $X_B = a + bX_A$, the constant term a upsets the proportionality and has to be allowed for. Specifically, a is risk-free cash, so the rate of return on asset B is a weighted average of the return on bX_A (which is the same rate of return as on X_A) and the risk-free rate.

2.2.3 Filters for international betas

81. The Discussion Paper 5.1.2.1 provides plausible but ultimately ad hoc criteria by which international firms might be matched to Australian NSPs so as to make their betas economically and cross-culturally exchangeable. While the individual firm's characteristics are essential to matching firm-for-firm, there is obviously no objective list of filters and the problem is not only one of matching firms but also of matching markets, meaning that we would need a two dimensional array of matching criteria.

82. Different past empirical surveys have found that nominal betas are higher or lower than previously measured Australian betas, depending on the study. Opening up this wider source of beta estimates is therefore bound to gain support from either NSPs or consumer groups depending on which way the AER matched sample is narrowed down (and whether that tends towards a higher or lower beta). The possible firm matching criteria are arguable in validity and relative importance. The principle that we need more data appears as if it is coming from a scientific foundation but is likely to be motivated by the thought it will re-open the argument about beta and hence present new opportunities for gaming.

83. There are clearly broad comparisons across the international regulated utilities sectors that can help any nation's regulators better understand the nature of these entities and the overall regulation debate. For example, if we find that US utilities betas are typically lower, or higher, than the current AER setting of beta, we can ask why that is and what can be learned from it. For example, how tight is the US firm's local regulation relative to other firms across the US and relative to the AER's regulation settings, and what is about the market's profile of different industries and firms that leaves utilities in such a market with their observed betas. While such comparisons are informative, they are open to wide disagreement, which of itself is unproductive and undesirable. My view is that betas of relatively stable and constant activities such as regulated NSPs will transport more easily across time within one market than across fundamentally different markets. Introducing a smorgasbord of subjectively related and often contradictory filters for picking "twin securities" from international markets is likely to generate more friction than accuracy and progress. To sense the fragility of this approach, we need only ask what weight we would put on the answer if it happens to be greatly different to the current AER setting and whether we would make a big shift on "scientific" (more data) grounds. Perhaps the most thorough and honest approach is to go ahead with the matching exercise as best as possible, to obtain a range of answers depending on the filtering criteria tried, and then to ask using the regulator's allowable judgement whether there is or has surfaced good reason in those observations to move the current setting some way towards a new number. There can be no harm apart from cost in

[4] See Trigeorgis, L. (1996), Real Options: Managerial Flexibility and Strategy in Resource Allocation, MIT Press, p. 10.

conducting that survey provided that its results are not taken as objective or conceptually better based than what we already have in place.

2.2.4 Relevering assumptions

84. I believe that the way this issue is expressed conflates two separable sources of bias, which should be handled separately. These are from (i) assuming that the international comparator firm's debt beta is zero, when it might be positive, and (ii) relying on a "benchmark" gearing ratio when relevering the asset beta found in (i) to calculate the local firm's levered equity beta. The basic Harris-Pringle relationship says that the beta of the firm's assets is the weighted average of the debt beta and the equity beta. To get the international firm's asset beta, we would ideally use its weights $G = D/(D + E)$ and $(1 - G) = E/(D + E)$ in weighting its debt and equity betas. Then, using that asset beta we apply the local firm's weights and its debt beta in the same weighted average equation.

85. If the foreign firm's debt beta is greater than 0, it should be used. For example, it seems to me that US debt betas would be higher than those in Australia, and that is borne out by there having been defaults in the US. I suggest that NSP debt in Australia is close enough to risk-free that it can be taken as zero beta, in the second step above.

86. If debt beta greater than zero is to be allowed for Australian NSPs, the easiest way is to find some low point like 0.1 and use it for unlevering the foreign stocks asset's beta.

87. For the second source of bias, I can see that assuming the current benchmark level of debt is pragmatic and generally representative but if a more tailored equity beta is needed, then would it not make sense to assume actual debt levels close to the comparator firm (in the delevering step) and then apply the NSP's current debt ratio (in the relevering step).

88. This problem shows more of the difficulty faced when trying to obtain equity betas from international firms. Even if we can take it that the asset betas are the same across countries, the different levels of debt and the different debt betas across countries make use of rules of thumb or benchmarks very questionable.

2.2.5 Different indices in different countries

89. The issue here, as in the issues discussed in section 2.2.2, is whether betas can be transported across different markets. The answer is clearly no in principle, essentially because different economies have different market sectors in different weights each with different statistical patterns of variance and covariance. Utilities are likely similar in betas across countries just because they are regulated industries so they tend to have low covariances with any other sector. However, a lot depends on the profitability that different regulators allow. If we take two cash flow streams, both with very low positive covariance with their own economy but one with a much higher mean, the one with the high mean will lower beta (or at least it would if the two market have the same risk aversion). This is explained in the earlier discussion.

2.2.6 Other suggestions on equity beta

90. I raise a fundamental problem that surfaces in any consideration of beta and the regulated return on equity. I raise this because it is ultimately insoluble and leads me in my responses to the AER questions to generally prefer pragmatic (fixed by negotiated agreement) settings, so as to leave debate less open to gaming and being swayed by rhetoric rather than principle.

91. Here is the problem. Suppose that ROE has been set at say 4%. But then the regulator switches a setting that removes some of the NSP's risk by adding what investors in the stock market see as a virtually certain $1 "windfall" to the cash flow. The new discount rate must therefore be an average

of the existing discount rate and the risk-free rate, so it must be lower, merely because the regulator changed a setting in favour or the NSPs cash flow/profits.

92. By this example we see the intrinsic circularity that utilities regulators all over the world encounter. Their fundamental question, the one we are trying to answer, is "what rate of return should the regulator grant to compensate the NSP for risks that the regulator subjects on the NSP"? This would be less of a problem in a capital market where many NSP stocks trade freely. The market's stock traders would study and anticipate the regulator's habits and re-price the NSP each day on a combination of what cash flow is expected to equity holders from its activities and any perceived cash flow risks, including the risk that the regulator will in some way alter its settings. In that idealized setting, by observing the stock price and an empirical sample of stock returns, the regulator would have some objective evidence of the risks that investors associate with regulated NSPs. Ultimately however the regulator makes the decisions and the stock market and stock price responds to those. Hence, the fact can't be escaped that stock market betas of regulated entities are largely what the regulator's regulations make them.

93. Once this problem of circularity is noted, it makes sense to (i) accept that the problem is intrinsically difficult and best addressed with a theory assisted but ultimately pragmatic approach. Theory assistance is available. Not being able to easily measure NSP beta empirically, the regulator can delve a step deeper by considering what it is fundamentally that beta is about and how it has become so pivotal. Each of the NSP's risks (forward-looking uncertainties about future cash flow) can be classified as (i) systematic or (ii) unsystematic, meaning that the cash flow (cost or revenue) is (i) correlated with market factors and hence with the market index, or (ii) independent of the market and hence idiosyncratic.

94. For example, storm damage is an idiosyncratic risk whereas input price increases are correlated with the market. But having classified a cash flow risk as either market-related or (largely) independent of the market, it does not follow that the same classification holds once the risk is described in terms of equity returns rather than cash flows. For example, a firm starts with current market value $X = \frac{E[V]}{(1-r)}$ based on an expected cash flow $E[V]$ and a discount rate of r. But then the market learns that the firm has probability p of incurring a cost overrun due perhaps to engineering unknowns (assume that this is a cost that is not compensated by the regulator ex post). Such losses (like those that have occurred in transport infrastructure projects where demand was overestimated) would usually be seen as independent of market conditions. Now suppose that a cost overrun will subtract $\$X$ of the NSP's cash flow if it occurs, and otherwise leave no effect. So essentially the NSP is carrying "a new asset" with expected cash payoff $-pX$ and zero market covariance. The CAPM discount rate on the new asset is the risk-free rate r_f because it has zero correlation with the market. Hence, the new asset has market value $-pX$. The NSP is now the sum of its existing business and the newly recognized "asset", so its overall discount rate is the weighted average of the rate on its pre-existing business r and the risk-free rate r_f . Since the new "asset" has negative value, the firm's weighted average discount rate is increased to a point above its pre-existing discount rate r.

95. For example, say the pre-existing asset has market value 100 and cost of capital $r = 10\%$, and the new asset has value -20. If the risk free rate is $r = 5\%$, the new discount rate on the firm is:

$$\frac{100(0.1) - 20(-0.05)}{100 - 20} = 11.25\%$$

96. Taking CAPM further, the beta of the new firm is the weighted average of the betas of its two assets. The new asset has zero covariance with the market, so it is a zero-beta asset. If the firm's pre-existing beta was say 0.5, its new beta is:

$$\frac{100(0.5) - 20(0)}{100 - 20} = 0.625$$

97. This is why a cash flow risk that is completely independent of the market can add to the firm's cost of capital, and manifest itself as a "systematic returns risk". The result of this CAPM analysis is that every random (i.e. uncertain or risky) cash flow alters the firm's returns beta or systematic risk unless it is both (i) zero covariance with the market, and (ii) zero mean.

98. The general form of this argument can be expressed quickly in CAPM algebra as follows. Imagine that the NSP expects cash C and like any random future cash flow it has a price P, so its return is $\frac{c}{P} - 1$. Its returns covariance with the market is therefore:

$$\begin{aligned} cov[R, M] &= \text{cov}\left[\frac{C}{p}, M\right] \\ &= \frac{1}{P} cov[C, M]. \end{aligned}$$

99. Now its CAPM price is by the standard CAPM pricing formula $P = \frac{1}{R_f}(E[C] - k\,\text{cov}[C, M])$, where $R_f = 1 + r_f$ is the risk-free return factor and k is the market's risk aversion. So the asset's returns covariance, which is the kernel of beta, is:

$$\begin{aligned} \text{cov}[R, M] &= R_f \frac{\text{cov}(C, M)}{E[C] - \text{cov}[C, M]} \\ &= R_f \left[\frac{E[C]}{\text{cov}[C, M]} - k\right]^{-1}, \end{aligned}$$

100. Thus by simple proof we find that the NSP's returns covariance and thus beta is increasing in its Lintner ratio of payoff covariance to payoff mean:

$$\frac{\text{cov}[C, M]}{E[C]}.$$

101. It follows therefore, and must be of great interest to regulatory agencies that determine the NSP's cash flow parameters that any reduction in expected cash flow, or any increase in market covariance, will of itself add to beta. Conversely, a higher mean or lower covariance brings a lower cost of capital. This CAPM corollary reveals inescapable circularity, changing the regulated beta changes the true beta of NSP cash flow, meaning that the regulated beta needs to change again, and so on and on recursively.

102. So how do we make use of this CAPM insight in regulation, especially in considerations about the NSPs beta? I suggest the following approach. The regulator articulates specifically, one by one, the cash flow risks that NSPs face, and then works through them by how in principle they affect the NSP's underlying cash flow beta (i.e. the cash flow mean and covariance because they drive beta). Some risks or elements of uncertainty in the NSP's projected cash flows will have a positive effect on firm level beta and some will have a negative effect on firm beta. It is easily proved that the sign of that effect depends on how the risk affects the firm's Lintner ratio of payoff covariance to mean.[5] For typical firms with positive payoff covariance, any risk that reduces the firm's mean payoff tends to add to its beta and cost of capital, and any risk that adds to the firm's mean cash flow reduces its beta or cost of capital. Thus, there are good risks and bad risks in terms of the direction in which they shift the cost of capital.

103. This is long known but long ignored. See the following quote:

> *… if regulation ceteris paribus increases the firm's expected cash flows, the value of the firm increases and beta decreases.*[6]

104. The risks mentioned in Table 1 below are merely illustrations.

---

5 See Johnstone, D., Regulated rate of return: Beta and its drivers, 13 November 2025.

6 Binder and Norton, Regulation, profit variability and beta. *Journal of Regulatory Economics*, vol.15 2015. p.251

Table 1: **Examples of risks and their effects on an NSP**

CAPM risks are events that might possibly occur in the future.

The CAPM is a forward-looking asset pricing formula.

Risk probability > 0 of occurring	Firm's cash mean	Firm's cash covariance	NSP beta
Regulator sets lower beta	Down	No change	Up
Windfall profits	Up	No change	Down
New regulatory obligations	Down	No effect	Up
Consumers default	Down	Up	Up
Engineering mistakes	Down	No effect	Up
Stranded asset risk	Down	No effect	Up
Political change to regulation regime	Up or down	Unsure effect	Down or up

Source: Professor Johnstone.

105. In a strict CAPM model, the forward-looking market beta of the NSP incorporates cost overrun risk or any idiosyncratic risk. It can be argued therefore that the regulator should reward the firm for its risk ex ante by a higher WACC setting and then leave the firm to bear any randomly occurring construction cost. However, since many NSP risks cannot be identified ex ante, and there is no stock market to do the forecasting for us, there is a regulatory practice of making ex post reimbursements so that such unexpected costs are not borne entirely by the NSP. Where such arrangements exist, the risk either disappears or is greatly reduced, in which case any such risk should not be seen as increasing beta. To the contrary, the NSP's cash flow becomes more and more constrained, generally from above and below, by the regulator, making investment in the NSP more like investing in debt than in equity.

106. In summary, these additional comments and the suggestions that accompany them are necessary for reasons that are not common CAPM knowledge and are not applied in previous discussions:

107. Firstly, many NSP risks are idiosyncratic cash flow risks (i.e. independent of the market). However, any idiosyncratic risk of loss reduces the NSP's cash flow mean and therefore it adds to beta. Conversely, if the risk is an upside risk leaving a higher cash flow mean, beta decreases.

108. Secondly, although the cash flow risks faced by NSPs are very largely regulatory risks and not correlated with the market, they are nonetheless significant risks that are correctly rewarded under CAPM. Any threat of a change in regulation settings that would leave NSP cash flow lower increases beta.

109. Thirdly, previous ACCC considerations have been misled on beta. To emphasise this mistake and how vital it is if the ACCC is to make sensible deliberations on beta, I focus on the straightforward example of stranded asset risk. This risk was specifically raised by ACCC and a report was commissioned in which Allen Consulting laid out in clear terms the usual but incorrect interpretation of CAPM. This interpretation must be corrected. It is so wrong as to cause not only conceptual errors but also to defeat the validity of any regulator's work in which it is upheld. I first quote the Allen Group report:

> *The Commission requested that a comment be made as to whether stranded asset risk is an event that would be expected to contribute to the non-diversifiable risk associated with a particular project. The term stranded asset risk is interpreted to refer to the market value of the assets used to provide regulated services falling below the regulatory value of those assets at sometime in the future. This may occur because of a fall in market demand (and where the revenue loss associated with that fall cannot be made up elsewhere), or where the regulator writes down the regulatory value of the assets without permitting the amount written-o¤ from being recovered from customers (that is, the reduction in the regulatory value of the assets between two points in time exceeds the depreciation allowance factored into regulated charges over that period). In principle, there may be a systematic component to asset stranding, although for the most part, such events are likely to be largely unique to a particular asset. That is, to the extent that the reduction in demand that leads to the fall in the market value of the assets is related to market wide events such as national income, or real interest rates then such an event may imply greater beta risk. However, if the event that would cause asset stranding is largely to the customers served by the network, or if the stranding is regulator-driven, then it would not affect beta risk.*[7]

110. This well worded statement is simply incorrect. When an asset is stranded for reasons independent of market conditions, the NSP's expected cash flow falls and the covariance of its cash flow is unchanged. Hence the NSP's Lintner ratio is higher, making its beta and CAPM cost of capital higher.

111. The same argument applies to many risks that the AER has deemed firm-specific or industry-specific and hence "unsystematic", and this has prompted counter-argument by NSPs. For example, in a 2015 report,[8] Frontier Economics disagreed with the AER claim that the threat of disruptive technologies was "unsystematic" and hence should go unrewarded in beta. The counterargument put by Frontier Economics is that (i) all risks are somewhat systematic and somewhat unsystematic, and (ii) disruptive technologies are part of fundamental market forces and hence any business affected by their threat bears some systematic risk. Both points are correct but the stronger CAPM argument in favour of the Frontier Economics view is that the risk to cash flow posed by disruptive technologies equates to a lower mean cash flow with little effect on cash flow covariance, and hence ipso facto by CAPM must be priced.

112. The AER argued that empirical betas pick up whatever part of the risk is systematic but Frontier Economics countered that historical betas were formed historically, long before the recently emerged threat became obvious, and hence can't be relied upon to impound today's perceived risk. I agree with that position. Betas are forward-looking—based on what is known at the time when the asset prices are formed—and in a strict CAPM model any threat emerging today of a reduction in cash flow mean without a proportionate reduction in covariance should be impounded in today's price and beta (and therefore be measurable empirically in data arising now and in the next few months or so, not data from two or more years ago).

113. Ultimately threats like that of asset stranding and disruptive technologies are idiosyncratic cash flow risks that add to Lintner's ratio and the firm's beta and cost of capital. However, the usual wisdom that they are diversifiable still holds for a well diversified investor. One single firm's idiosyncratic cash flow risks cause it a higher cost of capital but have negligible effect on the market cost of capital, because the individual firm is so small in the market aggregate. Many firms carry such risks, they are all relatively insignificant in terms of what they add to the total market payoff

---

7 The Allen Consulting Group, Empirical evidence on proxy beta values for regulated gas transmission activities, July 2002, p. 12.

8 Frontier Economics, Review of the AER's conceptual analysis for equity beta, June 2015.

variance. In fact, being random they cancel each other out and become even more insignificant at the market level. So we can say two things:

a. the firm's beta and cost of capital rises because of its idiosyncratic risk of loss; and

b. the market weighted average cost of capital is unaffected because at market level the one firm has no material effect.

114. Put another way, the firm suffers but the market does not (i.e. there is no material effect at market level). It is essential that we do not let the external well diversified investor's perspective blur the fact that the NSP carries a risk that might add significantly to that company's cost of capital. Regulators are not occupied foremost with external investors' objectives. Their role is more focussed on the NSPs ensuring that they maintain service levels in the cost-efficient way of a benchmark provider while also making appropriate capital investments. Thus, while the external investors who hold say 1% of their portfolio in utilities may not be greatly affected by a regulator's decision, the NSP can be and that can affect its operations and capital investment choices. It all comes down to whether the regulator is trying to assist energy consumers by maintaining predictable reliable cost efficient NSP service levels, or whether the objective is to please well diversified equity investors. Those different priorities lead to vastly different levels of concern about NSP's firm-specific risks, like the risk of asset stranding.

2.3 Mr Kumareswaran's opinion

2.3.1 The AER's identification of the problem and proposed solution

115. In my view, the AER is correct to be concerned that the diminishing sample of listed domestic comparators will limit its ability to derive reliable beta estimates for NSPs going forward. Given that eight of the nine domestic comparators identified by the AER have now de-listed, the only new market information that could contribute to future estimates of beta would relate to a single firm, APA Group. It is recognised widely that beta estimates for individual companies are subject to significant statistical noise. Hence, any new information that might inform the AER's future estimates of beta would be subject to significant statistical error and uncertainty.

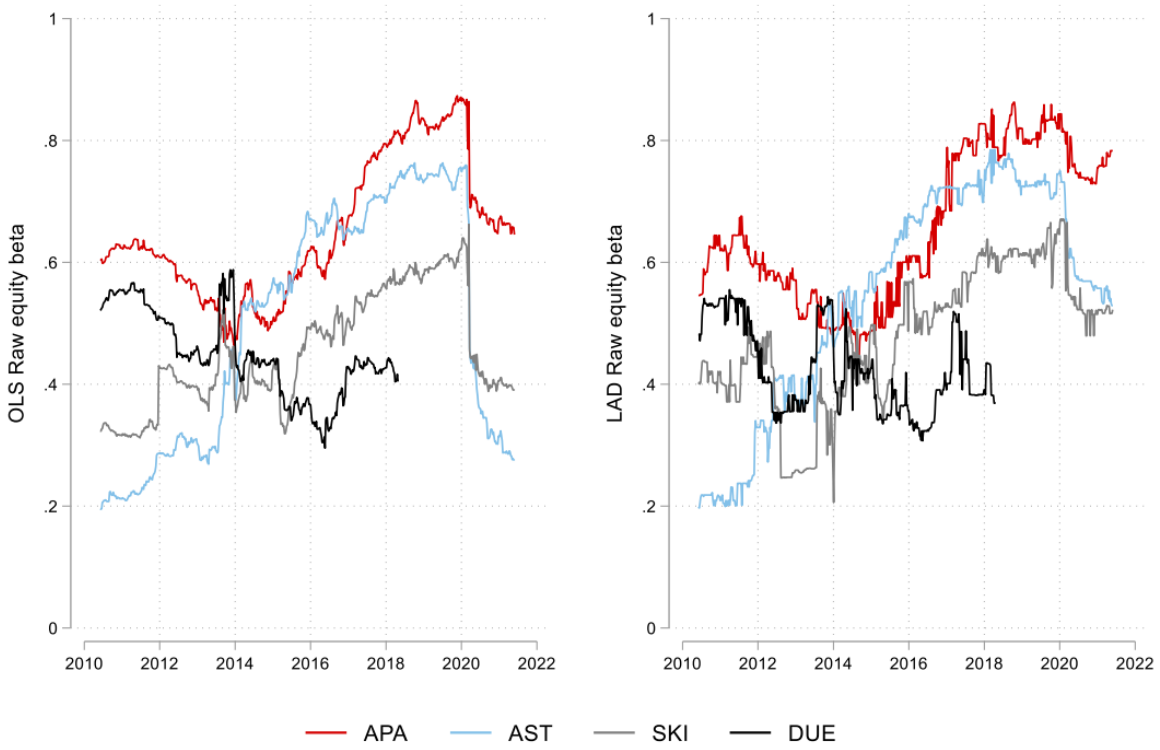
116. Furthermore, the AER has concluded that APA Group is not an optimal comparator for the NSPs it regulates, given that 90% of its revenue is unregulated.

117. The Discussion Paper states that if the status quo were maintained (i.e., if the AER were to continue to rely exclusively on the nine domestic comparators), the AER may need to apply "regulatory judgement going forward, as a diminishing sample could mean that we may not have sufficient data to reliably estimate equity beta going forward."[9] This implies that the AER may need to rely on information other than new empirical evidence (the nature of which is unclear to me) to inform its beta estimates. This would be problematic because such evidence would be inherently subjective and result in less transparent decisions by the AER.

118. The alternative would be for the equity beta allowance to remain fixed at 0.6 (assuming a benchmark gearing of 60%) forevermore. That too would be unappealing because it would mean the AER's assessment of the equity beta would no longer be informed by empirical evidence about changes in market conditions over time (unlike the other rate of return parameters the AER estimates). This would clearly be an unsound approach because, as Figure 1 below shows, equity beta estimates vary significantly over time in response to changes in market conditions (while the true equity beta is unobservable).

[9] Discussion Paper, p. 18.

Figure 1: Rolling equity beta plots for domestic comparator firms



Source: ERA, Explanatory statement for the 2022 draft gas rate of return instrument, 17 June 2022, Figure 9, p. 164.

119. For these reasons, my opinion is that it would be untenable for the AER to continue with its current approach.

120. I agree with the AER's conclusion that of the various options surveyed in the Discussion Paper, the only viable alternative would be to expand the sample of comparators used to include international energy firms. As the Discussion Paper notes correctly, a similar approach has been adopted by other regulators, including the ERA and the New Zealand Commerce Commission.

121. The ERA example is striking because:

    a. The ERA's regulatory framework (for gas networks) is exactly the same as the AER's, since both regulators are responsible for regulating under the National Gas Rules and have the same requirement to develop a Rate of Return Instrument under the National Gas Law; and

    b. The ERA has historically relied on the same empirical evidence—including the same set of nine domestic comparators and, often, the same consultants' reports—to inform its beta estimates as the AER. Yet, during the 2022 Rate of Return Instrument review, the ERA concluded that continued reliance on a dwindling sample of domestic comparators was no longer sustainable. The ERA therefore successfully developed a sample of 58 carefully filtered international comparators to inform its equity beta estimate for the 2022 Rate of Return Instrument.

122. I recommend that the AER similarly develop a broad sample of international comparators to inform its beta estimate for the 2026 Rate of Return Instrument.

2.3.2 Challenge 1: Fundamental differences in systematic risk between energy networks in Australia and international energy firms

123. The Discussion Paper states that there are differences between NSPs in Australia and international energy firms, including differences in regulatory frameworks, markets, business cycles, geography and other factors, and the extent of vertical integration.[10] These differences undoubtedly exist. However, for the purposes of compiling a suitable sample of comparators for beta estimation, the key issue is the extent to which these factors drive differences in the true betas between Australian NSPs and potential international comparators.

124. Unfortunately, it is practically impossible to determine this either *a priori* or through empirical investigation (due to the significant statistical noise involved in beta estimation).

125. The simple observation that international energy firms have tended to have higher beta estimates than Australian energy networks historically[11] is not itself dispositive on this issue. There are dozens of potential international comparators,[12] but there are at most only nine domestic comparators considered by the AER. Given the very small number of firms in the domestic sample, one cannot conclude with any reasonable certainty that use of international comparators would result in an upwardly biased asset beta estimate for Australian NSPs.

126. It is interesting to note that prior to 2009, when either all or nearly all of the nine domestic comparators were listed, the AER allowed an equity beta of 1.0 (with a benchmark gearing of 60%). One wonders (a) whether the fact that the equity beta allowance has now fallen to 0.6 is an artefact of increasing statistical noise caused by a shrinking comparator sample; and (b) whether the difference in beta estimates between the Australian and international comparators is as material as has been suggested. Is the observed difference simply the result of sampling error, due to a very small set of domestic comparators being compared to a much a larger set of international comparators? One could not exclude that possibility.

127. The difficulty in identifying suitably comparable firms, for the purposes of beta estimation, is a common problem encountered by regulators and finance practitioners. In practice, it is impossible to identify firms that are perfect comparators to the regulated NSPs. Any approach that insists on perfect comparability will inevitably result in a comparator sample that is a null set. Hence, in practice, some degree of compromise on the comparability of firms included in the sample is necessary. The extent to which one must compromise depends on the availability of good information. If one has imperfect information, then one must live with uncertainty over the resulting beta estimates.

128. My view is that that the most pragmatic approach would be to include in the comparator sample all international energy firms that are engaged in substantially the same operating activities as the Australian NSPs, provided that:

    a. The firm operates (and is listed) in a developed economy;

    b. There is sufficient historical returns data on those firms to estimate beta reliably; and

    c. The firms' stock returns are sufficiently liquid.

129. In that regard, the Discussion Paper proposes several 'filters' that the AER might apply when selecting suitable international comparators. Specifically, the AER proposes to select international firms that:

---

[10] Discussion Paper, p. 16.

[11] Discussion Paper, pp. 16-17.

[12] As noted above, the ERA identified 58 energy comparators in 2022. The New Zealand Commerce Commission identified 54 comparators in 2023.

a. operate in developed economies;

b. operate in energy-related sectors and industries;

c. derive most of their revenue from electricity and/or gas networks;

d. have been listed for at least a specific number of years;

e. have a market capitalisation that exceeds a certain threshold; and

f. have a bid-ask spread that is below a certain threshold.

130. I make the following observations on these proposed filters:

a. I agree with the inclusion of only companies listed in developed economies. These economies tend to have strict, standardised stock exchange reporting requirements that mean the company data needed to perform beta estimation is likely to be reliable. Furthermore, the stock markets in these economies are less prone to government intervention or expropriation that may distort trading and stock price information. I suggest that the AER adopt an objective method for classifying economies according to their stage of development. Data services such as Bloomberg and FTSE Russell provide such classifications. Another option would be to include only those companies domiciled in OECD nations.

b. I agree with the inclusion of only those companies that operate in energy-related sectors, and which derive most of their revenue from electricity and/or gas networks.

c. Rather than specifying a minimum number of years that an eligible firm must be listed, I recommend that the AER specify a minimum number of valid observations (i.e., observations where the stock was sufficiently liquid) within the estimation period. For example, the AER could specify that a valid comparator must have a minimum of 260 sufficiently liquid weekly returns over a 10 year-estimation period (corresponding to half the number of possible observations over the period), 130 sufficiently liquid weekly returns over a 5-year estimation period, and so on. The valid returns need not be contiguous. This 'data sufficiency' rule would allow the inclusion of comparators for which there is sufficient historical returns data to perform the estimation reliably, without imposing the more stringent requirement of an unbroken series of historical returns.

131. I am not convinced of the benefits of applying a size/market capitalisation threshold. This filter is likely intended to screen out illiquid stocks, since small companies are more likely to be thinly traded than large companies. The risk is that small but liquid stocks, which are in other ways good comparators, are excluded inadvertently by the size filter.

132. I agree that it is important to exclude illiquid stocks because it is well known that thin trading can produce biased estimates of beta. My view is that there are other measures of illiquidity that would not inadvertently exclude good, small comparators. For example, IPART has adopted the Amihud measure of illiquidity as a means of filtering out thinly traded stocks.[13] The Amihud measure is defined as the average ratio of the daily absolute stock return to the dollar trading volume on that day.[14] This ratio measures the average sensitivity of a stock's price, relative to the liquidity of the market. Illiquid stocks will generally have a high Amihud ratio.

133. I do not recommend the use of bid-ask spreads as a measure of illiquidity. Bids and asks can change many times over the course of a trading day. The bid-ask spreads for individual stocks

[13] IPART, Review of our WACC method, Final Report, February 2018.

[14] Amihud, Y. (2005), "Illiquidity and stock returns: cross-section and time-series effects", *Journal of Financial Markets*, 5, pp. 31-56.

available from data platforms such as Bloomberg and Refinitiv (now known as LSEG) typically reflect the bid-ask spread at a particular time in the trading day (e.g., the close of trade). Such 'snapshots' are unlikely to be representative of the bids and asks over the course of a trading. One would need very detailed data on the bids and asks for each comparator, over the course of a trading day, to build up a more representative picture of the illiquidity of each company. Such data are typically not available and, even if they were, analysis of the data would be impractical and involve effort that is disproportionate to the beta estimation task.

134. I note that IPART rejected the use of bid-ask spreads as a measure of illiquidity for similar reasons, noting the following:

> *While there are measures of illiquidity that are more precise in theory, such as the bid-ask spread, they require a lot of microstructure data that is often unavailable or difficult to obtain. For our purpose, a simple measure such as the Amihud measure is appropriate.*[15]

135. I recommend that the AER, similar to the ERA and the New Zealand Commerce Commission, develop the broadest and largest possible comparator sample that meets the selection criteria above. Adoption of a large comparator sample would dampen the influence of individual firms that differ significantly from the Australian NSPs in terms of systematic risk. A large sample will also tend to yield more statistically reliable estimates of the asset beta.

136. The ERA made a similar observation during the 2022 Rate of Return Instrument review:

> *The ERA considers that using international comparators has the following advantages:*
>
> - *An extended sample size results in equity beta estimates that are reliable and less sensitive to individual equity beta estimates of the Australian energy network sample.*
> - *Using international samples is a more robust approach over time, given that there is currently only one listed Australian energy network.*
> - *Other regulators have been using international comparators for their equity beta estimation, largely driven by the difficulty in finding a sufficient number of comparable businesses to estimate equity beta using a purely domestic sample.*[16]

137. The AER could also consider the median (rather than the mean) of asset beta estimates derived from an international comparator sample. This approach would also tend to dampen the influence of outlier estimates, including estimates for international firms with dissimilar systematic risk to the Australian NSPs.

2.3.3 Challenge 2: Upward bias in beta estimates due to a difference between average gearing of the comparator sample and benchmark gearing

138. The Discussion Paper observes that the average gearing ratio of international energy firms tends to be lower than the AER's current benchmark gearing ratio of 60%. The AER expresses concern that in these circumstances, continued use of the Brealey-Myers formula to de-lever and re-lever betas would likely result in an upwardly-biased estimate of the equity beta for Australian NSPs.

139. To explain this issue further, I note that standard finance theory says that the asset beta for a firm is a weighted average of the firm's equity beta and debt beta:

---

15 IPART, Review of our WACC method, Final Report, February 2018, pp. 62-63.

16 ERA, Explanatory statement for the 2022 final gas rate of return instrument, 16 December 2022, para. 1039.

$$\beta_a = (1 - G)\beta_e + G\beta_d, \quad (1)$$

where G is gearing.

140. Rearranging this equation gives the following relationship for the equity beta:

$$\beta_e = \frac{\beta_a}{1 - G} - \frac{G}{1 - G}\beta_d. \quad (2)$$

141. Equations (1) and (2) above are sometimes referred to as the Harris-Pringle de-levering and re-levering formulas, respectively.

142. The AER's current approach is to assume that the debt beta is zero. Hence, the AER uses the following (so-called Brealey-Myers) de-levering and re-levering formulas:

$$\beta_a = (1 - G)\beta_e \quad (3)$$

$$\beta_e = \frac{\beta_a}{1 - G} \quad (4)$$

143. The assumption that $\beta_d = 0$ will produce unbiased estimates of the re-levered equity beta if the gearing ratio used in equations (3) and (4) are identical. The benchmark gearing ratio of 60% that the AER currently uses was informed strongly by the average actual gearing of its domestic comparator firms.[17] Because this effectively meant that the same gearing ratio was used in the de-levering and re-levering steps, the AER had no concern that its re-levered equity beta estimates were biased. However, the AER is now concerned that moving to an international sample (while maintaining its use of the Brealey-Myers formulas) could result in biased estimates of the re-levered equity beta.

144. I agree with the AER that if the true debt beta is positive, then assuming (as the AER currently does) that $\beta_d = 0$ will result in:

    a. *Upwardly* biased re-levered beta estimates if the average gearing of the international comparators is lower than the benchmark level of gearing; and

    b. *Downwardly* biased re-levered beta estimates if the average gearing of the international comparators is higher than the benchmark level of gearing.[18]

145. To see this, consider the following illustrative example. For simplicity, assume two firms: a comparator firm, with a true equity beta of 0.50 and observed gearing of 45%, and a regulated NSP for which the AER must set an equity beta allowance. Assume also that the AER can estimate the comparator's true equity beta without error, the comparator and the NSP have the same asset beta, and that the AER adopts a benchmark gearing ratio of 60%. Finally, assume the true debt beta (for both the comparator firm and the NSP) is 0.10.

[17] The AER also cross-checked its benchmark gearing ratio by examining the average actual gearing of the NSPs it regulates.

[18] Note that this concern is somewhat separate to the issue of the so-called 'leverage anomaly' referenced in the Discussion Paper. According to the Modigliani-Miller theorem, a firm's Weighted Average Cost of Capital should be invariant to the level of gearing. The 'leverage anomaly' is a phenomenon identified by the New Zealand Commerce Commission (and some other regulators) that the allowed rate of return (determined using formulas similar to the ones employed by the AER) *does* vary with gearing, thus apparently violating the Modigliani-Miller theorem. One conclusion the New Zealand Commerce Commission drew from this observation is that it should use a benchmark gearing ratio, rather than the actual gearing ratio of the regulated business, to set the allowed rate of return because the use of a benchmark gearing ratio removes the ability to influence its allowed rate of return by varying its actual leverage.

146. In this case, the correct re-levered equity beta for the NSP would be 0.65.[19] However, if the AER were to use the Brealey-Myers de-levering/re-levering formulas (consistent with its current assumption that $\beta_d = 0$) the re-levered estimate of the NSP's equity beta would be 0.69. That is, the re-levered equity beta for the NSP would have been over-estimated by approximately 0.04.

147. In my view, it is plausible that the true debt beta is positive. In other words, it is likely that the risk of default on debt increases as market risk increases (e.g., during economic downturns) because in these circumstances firms are more likely to face financial distress, and vice versa. Hence, I agree with the AER that there is a risk of upward bias in re-levered estimates of the equity beta for NSPs in circumstances where the average gearing of the international comparators is lower than the benchmark gearing level determined by the AER.

148. I also agree with the AER that, in principle, there are two possible solutions to this problem:

    a. Account for debt betas when de-levering and re-levering; or

    b. Set the benchmark level of gearing equal to the average gearing of the international comparators.

149. The Discussion Paper recognises correctly that the second approach would introduce significant complexity to the process the AER uses to set revenue allowances. At present, the AER sets the return on debt allowance using a 10-year trailing average approach. That approach assumes that the current benchmark quantity of debt (i.e., 60% of the NSP's opening Regulatory Asset Base (RAB) value) is comprised of ten equal-sized tranches of debt. For example, consider an NSP with a RAB of $1 billion. The AER's current approach assumes that $600 million of the total RAB is financed by debt, and that total quantum of debt is made up of ten $60 million tranches of debt, issued on a staggered basis over the previous 10 years.

150. A prudent and efficient NSP that had sought to match its actual cost of debt to the trailing average allowance could have done so by issuing debt over a 10-year period, in a staggered fashion, that matched the benchmark debt strategy assumed by the AER when setting the return on debt allowance.

151. Suppose the AER were to revise its benchmark gearing ratio down to 45%, for argument's sake to match the average gearing of the international sample. The AER would then need to assume that the total quantity of benchmark debt for this NSP reduces from $600 million to $450 million, with the total quantum of debt being made up of ten $45 million tranches of debt.

152. An NSP that had sought to match the AER's trailing average allowance under the previous benchmark gearing ratio of 60% (by issuing over a 10-year period ten $60 million tranches of debt) could not immediately match the AER's regulatory allowance under the new benchmark gearing assumption of 45%. It would need to gradually unwind its existing debt portfolio, replacing each existing $60 million tranche of debt as it matures with a new $45 million tranche. In other words, some form of debt transition would be required to allow an NSP that had previously been matching the regulatory allowance set using a benchmark gearing ratio of 60% to shift to a position where it could match the regulatory allowance set using the new benchmark gearing ratio of 45%.[20] This would, as the Discussion Paper recognises, add complexity to the revenue-setting process.

---

[19] The correct re-levered equity beta would be obtained by first de-levering the comparator's equity beta using the Harris-Pringle formula, the debt beta of 0.10 and observed gearing of 45% to obtain an asset beta of 0.32. That asset beta would then be re-levered using the Harris-Pringle formula, the debt beta of 0.10 and benchmark gearing of 60% to obtain a re-levered asset beta of 0.65.

[20] The AER recognised that a similar transition was needed when it moved from the 'rate-on-the-day' approach to setting the return on debt allowance to the trailing average allowance—because NSPs that had previously sought to match an allowance set using the previous method would require a process to transition to alternative financing arrangements that would match the allowance set using the new method.

153. The second potential solution the Discussion Paper identifies is to use an estimate of the debt beta in the de-levering and re-levering steps. There are two main challenges with this approach.

154. Firstly, as the Discussion Paper recognises, deriving reliable debt beta estimates is very difficult. The promised return on debt may be written as the sum of the risk-free rate and the debt risk premium:

$$r_d = r_f + p \tag{5}$$

155. The debt risk premium, p, may be decomposed into systematic and non-systematic components, as follows:

$$r_d = r_f + \beta_d MRP + n \tag{6}$$

where MRP is the market risk premium, and the non-systematic component of the debt risk premium, n, may include elements such as:

a. A premium for expected default loss (which will vary depending on the creditworthiness of the borrower);

b. A term premium;

c. An illiquidity premium (since debt instruments are relatively illiquid assets);

d. And so on.

156. If one has estimates of the MRP and n, then one could estimate the debt beta as follows:

$$\widehat{\beta_d} = \frac{r_d - r_f - \hat{n}}{\widehat{MRP}} \tag{7}$$

157. The AER already derives estimates of the MRP, as part of the Rate of Return Instrument, to estimate the required return on equity. The difficulty is estimating all the non-systematic components of the debt risk premium correctly.

a. In order to estimate the premium for expected default loss, one would need a relatively large sample of defaults on corporate debt. There is a paucity of such data in Australia, not least because the corporate bond market in Australia is relatively small by international standards,[21] and there have historically been very few debt defaults by Australian corporates; and

b. It may also be difficult to obtain reliable estimates of the term and illiquidity premia embedded in observed debt risk premiums. Ignoring these elements would overstate the debt beta.

158. A second complication is that the true debt beta likely varies between firms. Given the practical difficulties in estimating debt betas reliably, the AER may have no choice but to assume the same debt beta for the comparator firms (when de-levering) and for the regulated NSPs (when re-levering). However, this simplifying assumption may introduce errors into the estimation exercise.

159. My key point is that it is difficult to estimate debt betas reliably. If the AER were to overestimate the true debt beta, that would result in a *downward* bias in the re-levered equity beta for the regulated NSPs (all else remaining equal). This can be shown using the simple numerical example presented above. For instance, suppose that the true debt beta (for both the comparator firm and

[21] See Jacobs, D., *Australia's bond market in a volatile world*, Address to Australian Government Fixed Income Forum, 12 June 2025.

the regulated NSP) is 0.1, as above. However, now assume that the AER incorrectly estimates the debt beta to be 0.15.

160. The resulting re-levered equity beta would be 0.63, rather than the correct estimate of 0.65.

161. With the above in mind, my recommendations on Challenge 2 are as follows:

a. Of the two solutions proposed by the AER, adoption of a positive beta assumption is likely to be the simplest and most practical.

b. Given the significant difficulty in estimating debt betas reliably, and the fact that overestimating the debt beta would introduce a *downward* bias in estimates of the re-levered equity beta, the AER should err towards the lower end of the range of debt beta estimates.

2.3.4 Challenge 3: Differences in the composition of the home market indices of international comparator firms

162. Equity beta estimates are typically derived by regressing the returns of individual firms against the returns on of the market portfolio of the country in which that company is listed. The Discussion Paper notes that the stock market indices of the countries from which the international comparator firms may be drawn are unlikely to have the same composition as the Australian stock market index. The Discussion Paper expresses concern that, consequently, the estimated betas for the international comparators may be poor proxies for the beta of regulated NSPs in Australia.

163. The AER is correct in principle. The equity beta measures the extent to which the returns of an individual firm covary with the returns on the market portfolio. The measured returns on the overall market portfolio may change as the composition of the market index changes. Therefore, the estimated beta relationship could differ as the composition of the index changes.

164. The Discussion Paper suggests that adoption of an 'international CAPM' may be one option to addressing Challenge 3. Under this approach, the equity betas of each comparator would be estimated by regressing the firm's returns against returns on a global market portfolio.

165. I do not recommend such an approach for the following reasons:

a. The international CAPM assumes that financial markets are perfectly integrated. Whilst financial markets are indeed highly integrated, there remain significant market frictions such that capital does not move perfectly freely between markets. There is also much empirical evidence of 'home bias', whereby investors tend to invest more capital in their home markets than in overseas markets;

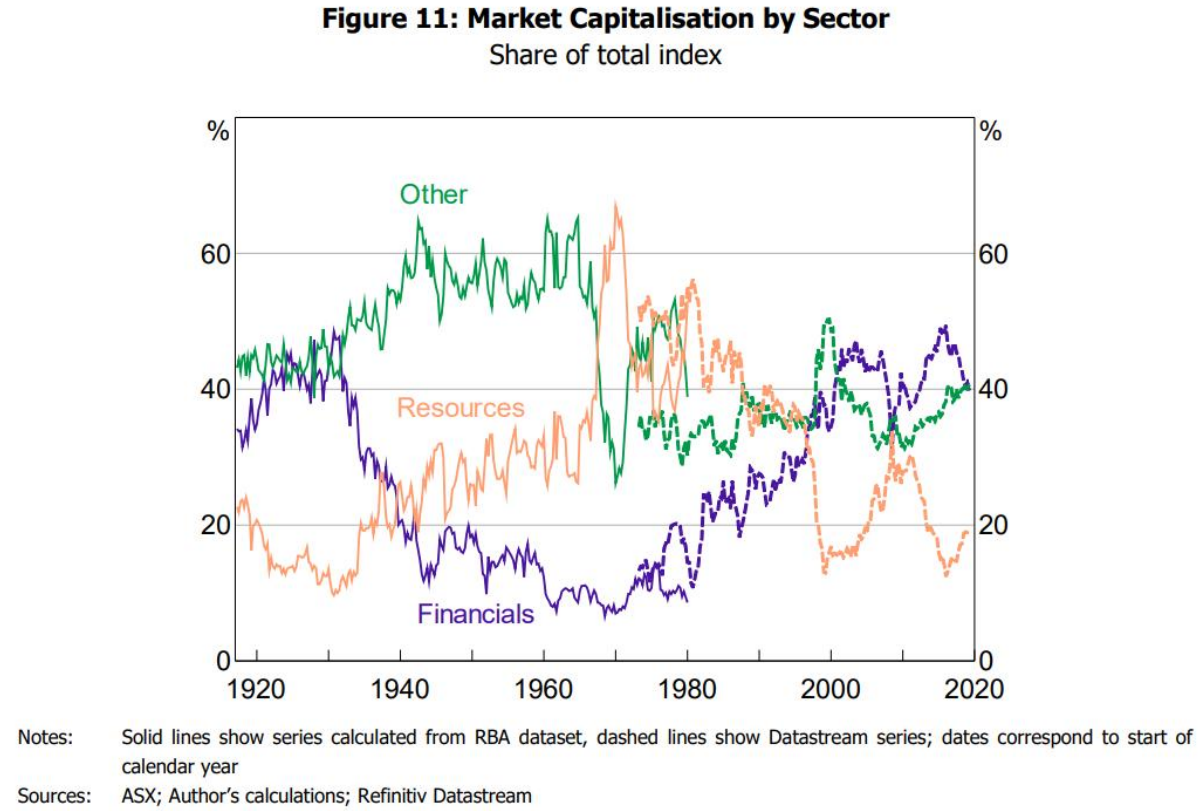
b. The Discussion Paper observes that individual firms' returns tend to correlate less with a world index than they do with their domestic indices. The AER concludes from this that economies and markets may not be sufficiently integrated globally to justify use of an international index, and that using a world index may lead to biased equity beta estimates. I agree with this conclusion; and

c. The Discussion Paper notes that adopting an international CAPM would require the AER to "internationalise" other rate of return parameters, such as the risk-free rate and the MRP, which would introduce significant additional complexity to the process for estimating the rate of return. I also agree with this observation.

166. I note that the composition of the Australian stock market index itself has changed materially over time, as illustrated in Figure 2 below. Yet, the AER has not previously expressed concern about this

when estimating beta using domestic comparators. I made this point during the 2022 Rate of Return Instrument review concurrent evidence sessions.[22]

Figure 2: Changes in the composition of the Australian market index over time



Source: Mathews, T., A History of Australian Equities, RBA Research Discussion Paper RDP 2019-04, June 2019, p. 16.

167. As the Discussion Paper notes, the AER places greatest weight on beta estimates over the longest available data period for each comparator, and has regard to estimates derived using data over the latest five years, when determining the equity beta allowance.[23]

168. Table 2 below shows that the period over which each of the domestic comparators has been listed varies considerably between the firms. Figure 2 shows that the composition of the Australian stock market differs materially between each firm's full period of listing. Notwithstanding this, the AER has hitherto treated the beta estimates for each of the nine domestic firms, over the longest available period, as comparable to one another and informative of the beta of the regulated NSPs.

169. Furthermore, the AER has also considered estimates for each of the domestic comparators derived using data over the longest period available for each firm as comparable to estimates derived for other defined time intervals (e.g., the most recent 5-year period).

170. In other words, the AER has ignored changes in composition of the Australian market index when evaluating empirical estimates of beta for the domestic comparators. This observation is not intended as a criticism of the AER's approach to date. I merely note that when it comes to the domestic comparators, the AER has evidently made a pragmatic (and sensible) choice to set aside

[22] AER, Rate of Return concurrent evidence session 1 – proofed transcript, 10 February 2022, p. 50.

[23] Discussion Paper, p. 11.

concerns about changes in the composition of the market index in order to make determinations about the allowed equity beta.

Table 2: **Domestic comparators used by the AER and their period of listing**

Comparator	Period of listing
AGL Energy Limited	January 1990 – October 2006
Alinta	October 2000 – August 2007
APA Group	June 2000 – present
DUET Group	August 2004 – April/May 2017
Envestra Limited	August 1997 – October 2014
GasNet	December 2001 – November 2006
Hastings Diversified Utilities Fund	December 2004 – November 2012
Spark Infrastructure Group	March 2007 – November 2021
AusNet Services	December 2005 – February 2022

Source: AER, Rate of Return Instrument, Explanatory Statement, February 2023, Table 8.1, p. 178.

171. I recommend that the AER make a similarly pragmatic decision when it comes to use of international comparators by not seeking to 'correct' for differences in the composition of the Australian and overseas market indices.

2.4 Associate Professor Partington's opinion

2.4.1 The beta problem

172. The problem faced by the AER is that only one listed NSP business remains available to estimate beta and only a minority that business's assets are regulated assets. Thus, a sensible estimate of NSP beta from current data is not possible. On the basis of past studies by Olan Henry and the AER the equity beta for NSPs has been considered to be relatively stable. Given stability, then it is valid to use the past estimates of equity beta as the current value. However, the assumption of continuing stability is open to challenge, and this challenge is difficult to defend without some check on the current value of beta. Even if the existing company were a fully regulated NSP there would still be a problem because when betas are estimated for individual companies they often have high standard errors. An obvious approach to this problem is to seek out comparators and make proxy estimates of beta, but it is not the only approach.

2.4.2 Checks with no comparators

173. Suppose there were no comparators, what could be done to check the reasonableness of the historic estimates. The checks would have to rely on theoretical considerations and empirical evidence on the properties of betas.

A priori estimates

174. Given that NSPs are regulated monopolies and face relatively inelastic demand it is reasonable to argue that they are no more risky and almost certainly less risky than the average company listed on the ASX. This would provide an upper limit on the value of beta of 1. If we considered that any value of equity beta between zero and one was equally likely, then our best estimate would be a beta of 0.5.[24] This, however, is likely to be too low as NSP betas close to zero seem improbable. It is a reasonable proposition that NSP equity is at least as risky as corporate debt. Then, if we take as a lower bound corporate debt beta of 0.2 or 0.3 our best estimate for the equity beta would be 0.6 to 0.65.

175. Introducing debt betas, suggests another way to look at the problem. The equity in utilities like NSPs carry the label bond proxies. If they truly were bonds, then they world have the betas of corporate debt. In the preceding paragraph we set a lower bound for NSP equity beta as the beta on corporate debt. The actual value of the NSP equity beta would be expected to be more than this value but, given the debt proxy characterisation, not by a very large premium. It is not known exactly what the premium should be. However, the debt proxy label suggests an NSP return on equity substantially below the return on the market, which in turn implies an NSP beta substantially below 1.

176. It is well understood that key drivers of beta are cyclicality, operating leverage, and financial leverage. Given a regulated monopoly with relatively inelastic demand then cyclical variation in cash flows is expected to be relatively low. NSPs have substantial fixed costs which normally increases operating leverage. However, the nature of regulation means that there is very little risk that NSPs will not recover their fixed costs and NSPs show sustained profitability. Thus, it is reasonable to conclude that operating leverage, although relatively high, does not contribute substantially to risky cash flows. Given relatively low cyclicality and relatively low risk from operating leverage, NSPs are expected to have low asset betas. My priors on the asset beta of NSPs is a value of about 0.4. However, the low asset betas are subject to substantial leverage. Using the AER's relevering formula the levered equity beta is given by $0.4 \times 1.6 = 0.64$. Allowing for a debt beta of 0.2, the relevered equity beta is $0.4 + (0.4 - 0.2) \times 0.6 = 0.52$.

Asset betas and leverage

177. The standard trade-off theory of capital structure where, in selecting a level of leverage, the tax benefits of debt are traded off against the costs of financial distress leads to the conclusion that there will be an inverse relation between asset betas and leverage. Low asset risk firms can carry more leverage since the risk of incurring the costs of financial distress is lower. Under the trade off theory high leverage in Australia would be even more strongly associated with low asset betas. This is because the imputation tax system substantially reduces the tax benefits of debt.[25] Thus there is less incentive to increase leverage and a relatively higher weighting to the costs of financial distress.

178. Under the trade-off theory the lower levels of leverage observed by the AER for overseas comparators further suggests that such comparators have higher assets betas than Australian NSPs because under the classical tax system that generally prevails overseas, the tax benefits of debt are larger. I cannot completely rule out competing explanations, for example, there might be institutional restrictions on the level of debt.

[24] This is the best estimate in the sense that the expected error is minimised, it is zero.

[25] The more so in the case of firms which have high dividend payouts and pay fully franked dividends.

179. Baker, Hoeyer and Wurgler (2019)[26] provide an alternative theoretical argument based on the low beta anomaly. In a careful empirical study using US data, they find evidence that there is an inverse relation between asset betas and leverage.

180. Irrespective of which theory applies, the message is clear, NSPs which are relatively highly levered are expected to have relatively low asset betas, and it is the asset beta that fundamentally determines the cost of capital. Although this analysis does not provide magnitudes for the equity beta the AER can take comfort from the support for a relatively low asset beta and thus a relatively low cost of capital.

My estimate and overseas evidence

181. On the basis of my estimates the equity beta for NSPs has an average of 0.59. I stress that this estimate comes from a priori reasoning and that my estimates above were not reverse engineered to get the result that I desired. However, it is unlikely that any of this analysis will be satisfying to those who want precise numbers empirically obtained.

182. For the empirically minded, Damodaran, a well-known source of beta estimates, reports asset betas (unlevered beta) for 94 US industries. [27] For utilities other than water the asset beta was 0.25. This was the second lowest asset beta in the 94 industries. The equity beta was 0.39. The standard deviation of returns was 18.21%, the lowest of 94 industries, and was substantially lower relative to the great majority of industries. The standard deviation in operating income for the last ten year was 12.8%, which ranked from highest to lowest was rank 88. The conclusion I would draw with respect to Australian NSPs is that this evidence is consistent with my opinion that they are very low risk businesses and hence will have a relatively low asset beta. However, given my reservations about international comparisons, even if Damodaran's utility sample only contained networks, I would not conclude that the AER should use 0.25 as the asset beta and 0.39 as the equity beta for Australian NSPs.

183. In the search for hard numbers that are precise, the problem is that there are none, even if comparators are used. Standard errors of the comparator beta estimates are likely to be substantial and because of the problems detailed later I would regard the numbers empirically obtained from comparators not as hard numbers but rather as soft ones. Therefore, with regard to the use of results from comparators and also the ongoing use of the historic betas from Australian NSPs I agree with the comments in the AER's Discussion Paper that:

> *Of the above potential alternatives, only international energy firms appear to be potentially viable. That said, even if we were to potentially expand the range of data points that we use to inform the estimate for equity beta, this would not eliminate the need for the application of regulatory judgement by the AER in determining the final estimate for equity beta.*[28]

184. There will be pressure for the AER to consider comparators, including because other regulators have done so.[29] Thus, I next consider the selection of comparators.

---

[26] M. Baker, M. Hoeyer, and J. Wurgler, 2020, Leverage and the beta anomaly, *Journal of Financial and Quantitative Analysis*, 55:5, pp. 1491 – 1514.

[27] See, https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/Betas.html, data used was as of January 2025. Accessed 31 October 2025.

[28] Discussion Paper, p. 16.

[29] This use by other regulators is no guarantee that it is the right thing to do. Is it a judicious choice, or misjudgement? Is it responding to pressure, or is it regulatory capture?

2.4.3 Challenge 1: Differences in risk exposure and selection of comparators

185. When a variable is observed with error, particularly if the sample is small, expanding the number of measurement observations and taking the mean will result in a more accurate estimate of the variable's value provided: the same underlying construct is being measured, the measurements of the variable are unbiased, and they are independent.

186. In the AER's Concurrent Evidence discussion of 2022 Glenn Boyle made the following point, suppose you wish to measure the height of spaniels but only had a small number of spaniels, so in order to increase sample size you also measured the height of Great Danes. Clearly, this will not give good results. Changing the underlying construct from height of spaniels to height of dogs allows the admission of Great Danes to the measurement sample, but you are no longer measuring what you wanted to measure. If you then apply your measurements to the original construct, you have introduced bias into your estimate and clearly you will overestimate the height of spaniels.

187. If you shift the construct from a benchmark efficient Australian NSP to Australian NSPs, then to electricity transmission businesses worldwide, or to other regulated businesses in Australia, you have moved some way from the original construct. Proxy betas from bigger samples are good if they provide relevant unbiased measurements, but it is not just a case that bigger is better. The AER proposes filters to try and restrict the set of overseas comparators so that it more closely resembles the construct of interest.[30] Whether the AER filters will result in a sample giving betas that are good comparators for Australian NSPs is very much an open question. A question that I address later.

Domestic comparators

188. The suggestion has been made that other Australian regulated businesses could be used as comparators. I have commented before that I would expect such businesses to have more risk than NSPs and higher betas. And the latter has turned out to be the case. Thus, domestic comparators will be of little benefit unless it proves possible to build a strong and stable statistical model to correct the difference in beta estimates between other businesses and NSPs.

Overseas comparators

189. There are many ways in which overseas power NSPs may differ from Australian power NSPs. Examples of differences include differences in regulation, differences in asset characteristics like vertical integration, infrastructure age, maintenance intensity, unregulated assets, different cost structures, and so on. Then there are differences in financing, such as in the use of use of debt and off-balance sheet financing. Then there are market differences including both the markets the NSPs service and the capital market. Capital market differences include variables like interest rates, risk premiums, inflation expectations, volatility, currencies, corporate tax treatments and personal taxes.

Differences in markets

190. The definition of the equity beta of security i, β_{ei}, is:

$$\beta_{ei} = \frac{\sigma_{im}}{\sigma_m^2}$$

[30] It may be possible to improve the selection of comparators using fuzzy set theory rather than filters. There are also statistical clustering methods that might be used to group similar networks.

191. And this can also be written as:

$$\beta_{ei} = \frac{\rho_{im}\sigma_i\sigma_m}{\sigma_m^2}$$

where:

a. σ_{im} is the covariance of the rate of return on security I with the rate of return on the market, and

b. σ_m^2 is the variance (standard deviation squared) of the rate of return on the market,

c. σ_iIs the standard deviation of the rate of return on the stock,

d. ρ_{im} is the correlation between the rate of return on the stock and the rate of return on the market.

192. From which it can be seen that differences in the volatility between markets as measured by standard deviation, will result in different estimates of beta unless there are offsetting changes in the covariance. This role of the market somewhat undercuts the matching of firms. For example, suppose we find a comparator firm which has exactly the same correlation with its domestic market as the Australian NSP has with its market and both firms have exactly the same standard deviation of rates of return. Their betas will still differ unless their respective markets also have exactly the same standard deviation of returns. If the overseas market has a lower standard deviation the beta of the comparator will be higher and vice versa.

193. We could add another filter to the AER's list. The comparators should be selected from markets that have the same standard deviation (volatility) as the Australian market. This presents difficulties since volatilities change over time and attempts to time match would likely eliminate all other markets.

194. It just has to be accepted that betas will vary according to the standard deviation of the market and the set of firms that constitute the market. They will also vary with the different indices that can be used to represent the market as these indices represent different sets of firms.

195. If you look at shares in the same firm listed across multiple markets, you should not be surprised to see differences in beta. BHP, for example, is listed on the Australian stock exchange, the London Stock Exchange, and the Johannesburg Stock Exchange. There are also American Depositary Receipts (ADRs) that replicate the shares. There are ADRs for both the ASX listed stock and the LSE listed stocks, and they trade on the New York Stock Exchange. You will almost certainly find that estimates of beta for BHP differ across these markets and across different data providers. If betas for the same company differ across markets it is absolutely to be expected that betas for different companies, such as different NSPs, will differ across different markets.

Differences in taxation

196. Differences in personal tax rates and differences in tax systems are also important as these affect the equilibrium in capital markets. The adoption by Australia of an imputation tax system will have changed the Australian capital market equilibrium. The imputation tax system was once a popular tax system, but I believe the only two remaining countries with a system comparable to the Australian system are New Zealand and Malta. Unfortunately, these two countries are of little value in providing comparators. For power regulation. New Zealand relies on overseas comparators, and I understand that Malta has only one company to regulate. Consequently, overseas comparators must be drawn from countries with different tax systems to Australia, most likely classical tax systems. Thus, a mismatch on tax systems is unavoidable and this matters, not just because of differences in the capital market equilibrium. Recall the discussion earlier that because of imputation, companies with higher leverage ratios in Australia, ceteris paribus, suggest lower asset betas than overseas comparators that have equal or lower leverage ratios.

Same or similar?

197. Suppose all the overseas NSPs were identical, the service markets and capital markets were identical, a full imputation tax system applied everywhere, and tax rates were all the same, in short conditions that suggest all NSP betas should be the same. However, I would not expect all NSP betas to be the same. Even if regulation was notionally the same, I would expect different betas in such a world to arise from differences in returns across jurisdictions due to differences in the degree of regulatory capture and hence differences in regulatory risk.

198. The examples of possible differences above give us plenty of reasons to believe that the estimated betas of overseas comparators are very likely not to be the same as the betas of the Australian NSPs. The question then is will the comparators' betas be similar to the betas of domestic NSPs?

199. The argument for similarity is that the comparators are in similar lines of business to the Australian NSPs and in the discussion between the authors it was suggested that there would be similar patterns in growth and similar patterns in cash flows. Metrics for such similarities could be measured, and this could form part of the selection criteria for comparators. I discuss specific metrics later.

200. Whether the betas of overseas comparators are similar to the betas of Australian NSPs and, if so, how similar, are open questions. We should not simply rely on the assumption, or assertion, that comparators will provide similar beta estimates to Australian NSPs, we should check this assumption with the evidence from a validation study as discussed below.

Filters

201. The AER proposes the following filters to improve the matching of comparators to Australian NSPs:

    a. operate in developed economies
    b. operate in energy-related sectors and industries
    c. derive most of their revenue from electricity and/or gas networks
    d. have been listed for at least a specific number of years
    e. have a market capitalisation that exceeds a certain threshold
    f. have a bid-ask spread that is below a certain threshold.

202. Items (a) to (c) on the list of filters are self-evidently desirable since Australia is a developed economy and also we are looking for firms in a similar line of business. Item (d) is a sensible requirement to ensure long histories from which betas may be estimated. A maturity requirement for comparators is also consistent with the well-established nature of Australian NSPs. It is naturally desirable to exclude start-ups which have a different set of risks to established firms.

203. Items (e) and (f) are desirable as small firms and illiquid firms are often thinly traded, which leads to stale prices. Small firms often tend to be start-ups. Thin trading is well known to create bias in beta estimates. Small and thinly traded firms also tend to operate in poorer information environments, such as less analyst coverage. Consequently, it can take more time for information to get into prices even when trades are occurring.

204. Since we are looking for similar firms, which the expert's discussion suggested should have similar patterns in growth and similar patterns in cash flows, I suggest adding some, or all, of the following filters. I have also added filters for similar profitability, volatility and rates of return:

    a. Similar growth in assets preferably the RAB;
    b. Similar growth in revenue;
    c. Similar growth in operating cash flow;

d. Similar growth in profits;
e. Similar standard deviation in assets;
f. Similar standard deviation in revenue;
g. Similar standard deviation in operating cash flow;
h. Similar standard deviation in profits;
i. Similar average book return on investment;
j. Similar average book return on equity;
k. Similar average return on investment in shares;
l. Similar standard deviation of book return on investment;
m. Similar standard deviation on book return on equity;
n. Similar standard deviation of return on investment in shares;
o. Similar average turnover ratio;
p. Similar average profit margin;
q. Similar standard deviation of turnover; and
r. Similar standard deviation of profit margin.

The importance of differences in leverage

205. It would also be desirable to have similar leverage ratios. Indeed, this is probably the most important variable to match on, but the AER's analysis to date suggests that the overseas comparators have lower leverage, so matches will be difficult to find. This difference in leverage is important and informative.

206. Recall the earlier discussion of an inverse relation between asset betas and leverage. There is a further simple observation that can be made to support this inverse relation. Lenders protect themselves from default by debt covenants that restrict the level of leverage. Accepting higher levels of leverage than they would normally accept suggest that lenders are relaxed about the default risk because the underlying assets are low risk. Now if we assume that overseas comparators are truly equivalent to Australian NSPs, the higher leverage of the Australian NSPs suggests that they have lower risk assets. That is, they have lower asset betas.

Applying Filters

207. Once upon a time it would have been a lot of work to apply these filters. Nowadays, it should be relatively easy to write some code to do this in a language such as python. Alternatively, write an AI prompt.

208. Matching could be done at the level of averages across sub-samples, or at the level of individual firms. Matching at the level of individual firms allows for differences within both Australian NSPs and across overseas comparators. Matching at the level of subsamples, for example, countries, or TNSPs and DNSPs, is a less stringent criterion, only requiring matching at the level of sample averages.

209. If matching at the level of individual firms, one way to implement this would be pair matching, or multiple matching, where individual Australian NSPs are matched to one or more overseas NSPs that have passed the filters. A question that naturally arises is over what period should the matching variables be observed? I would suggest using say 10 years to compute individual firm averages for comparison. If close matching could be achieved on all, or at least some of the filters,

at the individual firm level, then we could be more confident that we had good matches. The problem I expect is that it will turn out that we do not have many good matches and the comparator set is greatly reduced, possibly to a null set.

210. It is to make the filters less restrictive that I have used the term similar rather than the same. One way in which "similarity" could be defined is by allowing a range, say plus or minus 10%, or not significantly different at some set significance level. Judgement would be required in setting these limits so that a decent size sample could be obtained while still retaining a substantial degree of similarity between the firms. It would also be possible to not require matching on all 18 of these filters but instead specify a reduced set of filters. The AER could use its judgement to instead specify a minimum acceptable number of matches, or alternatively to remove those filters on which it was particularly difficult to obtain matches. This latter in itself would be informative of differences between Australian NSPs and comparators.

211. The alternative approach to matching could be at the level of the samples. Compute the average metric for the sample of Australian NSPs possibly sub divided into transmission and distribution networks. Then compare these metrics with the average metrics for the comparator samples, adjusting the comparator sample until a satisfactory match is obtained.

212. Boxplots would be a quick and easy way to examine the data for the filters (metrics) used in matching and also to identify outliers. Boxplots are built on the interquartile range. This suggests a possible criterion that comparators should have metrics that lie within the interquartile range for the Australian networks. A more liberal criteria would be to delete anything lying outside the inner fences of the boxplot. Observations beyond the inner fence of the box plot are potential outliers and strong outliers lie beyond the outer fence of the boxplot.

213. Finding individual networks that are good comparators may be hard even with flexible matching of the filters. However, if we cannot find reasonable matches at the level of averages taken across sub-groups of comparators, or at least for the full sample of comparators, then we should seriously question the relevance of the comparator betas. I am not looking for perfection here, just for a more solid basis that we truly have comparators that are comparable.

214. In any event, comparing networks and sample groupings across the filters will inform us of the differences and similarities between comparators and Australian networks. It will also inform us of the differences and similarities between Australian networks. This may be useful to the AER in exercising their regulatory judgement.

Alternative approaches to selecting comparators

215. The whole exercise of finding comparators can be thought of in terms of set theory. Given the set of Australian NSPs, the objective is to find a matching sets of comparators. Fuzzy set theory can be used for identifying sample matches without strict boundaries on the matching criteria, and this may be helpful to the AER.[31] There are also statistical techniques for clustering which might be used to identify similar groups of networks, and in particular comparator networks that cluster with Australian networks.

Validation of comparators

216. There is something that can be done that would help to address the open questions above and give greater confidence in the use of comparators. Test how well the use of comparators would have worked in the past. In other words, undertake a validation exercise. Compare beta estimates from comparator sets with matching estimates from the Australian beta estimates from previous periods when more data was available. Are they a good match? If not, is there is a strong and

[31] I acknowledge Steve Satchell for first suggesting this.

stable relation between the two sets of estimates. If so that relation can be used to correct the comparator estimates for use in ROI determination. However, whether relying on a good match or a stable relation, the assumption is that this persists going forward. I note that sensibly the AER has already begun a validation analysis.

217. The results mentioned in the AER review document suggest that the betas of overseas comparators are higher. This is not unexpected given the differences in leverage, ceteris paribus, the overseas comparators are expected to have riskier assets. If so, a correction will be required in utilising the beta estimates from comparators. However, the AER results also suggest instability in correlation between the overseas and Australian betas. This suggests that there is no stable basis for correction going forward.

218. So, what do we conclude if the validation exercise fails. Either the comparators do not provide good estimates for Australian NSPs, or that despite the work of Olan Henry and the AER, that the AER has had their beta estimates wrong all along. In my opinion the former conclusion is more likely.

Beta estimates for comparators

219. Once comparators have been determined, how are the beta estimates of the comparators to be determined? The AER's beta estimates for domestic NSPs were supported with extensive studies by Olan Henry. Is such an extensive study is contemplated for the comparators? The estimated betas will be influenced by the choices of market index, the length of the estimation period, the return interval, and adjustments, if any, applied for thin trading and mean reversion. How are these choices to be determined? Alternatively, if betas from a commercial data source are to be used it is well understood that there is variation in beta estimates across such data suppliers.

220. We can offer one strong recommendation in relation to the foregoing choices. Use lower frequency return intervals, say monthly, to compute equity betas. We base this advice on the work of Gilbert, Hrdlicka, Kalodimos and Siegel (2014) and Gregory, Hua and Tharyan (2016).[32] Gilbert et. al. using US data show that the positive alphas for excess returns (low beta bias), often used as evidence against the CAPM, became insignificant as return measurement intervals are increased. Gregory et. al. undertake similar research to Gilbert et. al. and get similar results. Gregory et.al. utilise data for the UK and Australia and make the following strong statement with respect to regulation:

> *Our conclusions are unequivocal and have important policy implications for regulatory use of the CAPM, as they imply that low frequency beta estimates should always be preferred to high frequency beta estimates.*[33]

2.4.4 Challenge 2: Relevering and differences in leverage

Unlevering and relevering

221. As well as the problems of finding comparators that are a good match and making appropriate choices for beta estimation, there are problems in the process of unlevering and relevering. These problems may give estimation errors that undermine the use of comparators. This applies even if domestic comparators were to be used.

---

[32] Gilbert, T., Hrdlicka, C., Kalodimos, J. and Siegel,S., ,2014, Daily data is bad for beta: Opacity and frequency dependent betas, *Review of Asset Pricing Studies*, 4, 78-117.

Gregory, A., Hua, S. and Tharyan, R., 2016, In search of beta, working paper, University of Exeter Business School, subsequently published in British Accounting Review, 2018

[33] Gregory, Hua and Tharyan (2016), p. 2.

222. The AER discusses the problem of excluding debt betas in levering and unlevering and the resulting leverage anomaly. The result in unlevering of excluding debt betas is to downward bias the asset beta and the result in relevering is to upward bias the equity beta. Clearly, if you unlever and relever to the same level of leverage these effects exactly cancel out. If you unlever then relever to a higher level of leverage an upward bias results, and vice versa.

Equalising leverage

223. One solution, suggested by the AER, to the problem of differences in leverage is to equalise the leverage. This would be achieved by changing the AERs benchmark leverage to match the average of domestic and comparator firms. This seems to me to be a case of the tail wagging the dog and I do not support it.

224. As the AER points out the flow on effects would require a revision in WACC and the trailing average cost of debt, which is not just additional work that involves the complexity of transition, but is also likely to be contentious. The benchmark level of leverage has been a settled issue. It is one of the few issues where I have observed very little debate over the years. The benchmark has empirical foundations in that it was set by approximating the average leverage of NSPs. Only if this average has substantially changed does it make sense to change it.

225. In relation to the additional work the AER Discussion Paper observes:

> *Adopting this approach would also affect the overall WACC calculations and require us to revisit other aspects of the RORI. This is because the benchmark gearing also determines the relative weights we give to the cost of equity and the cost of debt, respectively, within the overall WACC. Changing the benchmark gearing would also impact the trailing average return on debt. Therefore, this approach is likely to introduce significant additional complexity.*[34]

226. There would undoubtedly be more work and complexity. However, I note that a correctly calculated plain vanilla WACC should be independent of leverage.

Debt betas

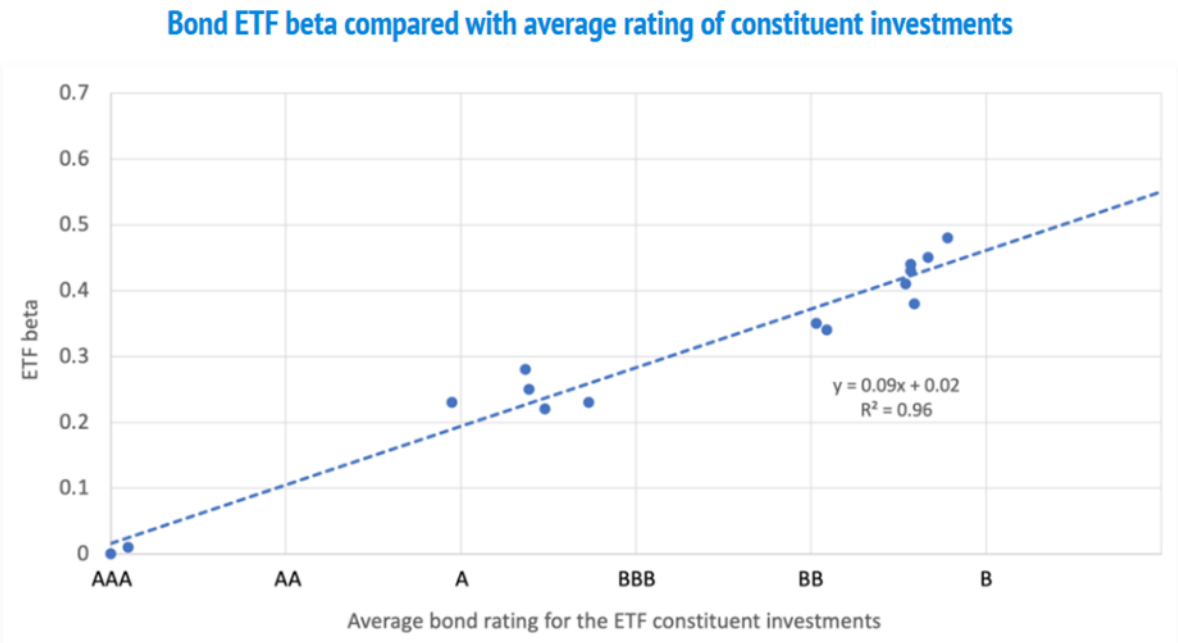
227. My solution to the debt beta relevering bias would be to include a debt beta in the unlevering and relevering. This then raises the question of what the debt beta should be. Unfortunately, debt betas can vary widely depending on how they are estimated and the data used. For example, UK regulators have used debt betas of 0.1 and when I recently looked up the betas for Australian corporate debt ETFs the betas were of the order of 0.4 and 0.5. These latter are inconsistent with my priors for debt betas and I found them difficult to believe. However, I note that in modelling the relation between debt beta and leverage CEG (2016)[35] uses 0.5 as one of the upper limits in the models presented. In my opinion, corporate debt betas in the range 0.1 to 0.2 are more plausible for investment grade corporate bonds.

228. The simplest solution for the AER is to allow a debt beta of 0.1 or 0.2 as representing a typical beta of investment grade corporate debt. This does assume that all the comparators debt is investment grade and debt betas do not vary greatly across national markets. In an ideal world we would use debt betas for the individual companies. However, corporate debt is generally not actively traded so using regression estimates as in equity beta estimation is not generally feasible. An exception is for ETFs that hold corporate debt. An example using estimates for US ETF debt betas and then estimating their relation to ratings grades is given below in Figure 3.

[34] Discussion Paper, p. 21.

[35] CEG, 2016, Review of Oxera debt beta analysis, authors T. Hird and K. Zhang.

Figure 3: Example of beta estimates for bond ETFs



"The two ETFs with betas close to or equal to zero are a US government bond ETF and a fund investing in high quality (94% AAA) CDOs. The middle group, with a beta of 0.2 to 0.3, are portfolios of investment grade corporate bonds where the credit ratings of constituent bonds are mostly in the range of BBB to AA. The average bond rating for the portfolio is derived from the disclosed asset allocation for each ETF. The final group represents portfolios of high yield / sub-investment grade bonds."

Source: https://www.footnotesanalyst.com/equity-beta-asset-beta-and-financial-leverage/ accessed 7/11/2025.

229. These estimates for investment grade debt are slightly higher than my priors, but not so different as to cause me serious concern. These results should be considered indicative rather than conclusive.[36] The data is also not Australian. However, in the case of debt betas I am less concerned about international comparisons. This is because debt of a given rating grade is a far more homogenous commodity than the equity of different firms. However, the problem of beta being estimated against a different set of firms remains.

230. It is possible to back out debt betas from the CAPM, where the debt beta is given by the excess return on the debt divided by the market risk premium. This excess return can be proxied by the credit spread, using the yield to maturity on debt, in place of the expected return on debt. It would easiest to do this at the level of rating grades. However using the credit spread will result is an upward bias in debt betas since the yield, which is the promised return, exceeds the expected return and there may also be a liquidity premium.

231. There is work on estimating default premiums and liquidity premiums so methods might be devised to correct for the bias, but it is hardly worth the trouble. Debt betas are fairly small, so their effect is not large. Also, any bias or measurement error will be reduced by offsetting effects in the process of unlevering and relevering. Consequently, highly refined debt beta estimates are likely to be an exercise in spurious precision.

[36] It does not have the authority of a refereed article in a reputable journal, and 15 data points is a small sample for estimating a regression.

Tenor of debt

232. It has been suggested, CEG (2016) [37] that debt betas are affected by the tenor of the debt. This is particularly the case where use is made of comparators from the USA, where utility debt may have an average debt tenor of 20 years, possibly more. CEG claim that failure to allow for the higher debt betas that arise for longer tenors can lead to regulatory error. Specifically, CEG argue that the higher debt betas will result in a lower asset beta for the comparators and that this asset beta is too low to apply in a regulatory regime which assumes a shorter tenor for the debt. Consequently, the allowed rate of return is too low. However, I am inclined to agree with Lally (2023)[38] that the effect on estimated asset betas of differences in tenor is likely to be a second order effect. The salient point from this regulatory debate is that debt betas do matter when computing asset betas and should be included in the calculation, rather than assuming that they are zero.

Choice of unlevering and relevering formula

233. The theoretically correct recommendation for the unlevering and relevering formula very much depends on what you assume about the risk of the debt tax shield. If you assume the debt tax shield is as risky as the firms' other assets, then consideration of the debt tax shield conveniently drops out of the analysis. If market value leverage is held constant, then it can be argued that the debt tax shield is the same risk as the as the firms' other assets. Unfortunately, firm's rarely have constant leverage and evidence that they have stable leverage targets has proved elusive. For the benchmark efficient entity, the AER assumes a constant leverage ratio. This is the assumption, coupled with the assumption that the debt beta is zero, that underpins the AER's use of the Harris Pringle/Brealey and Myers formula, which is:

$$\beta_e = \beta_u \left(1 + \frac{D}{E}\right)$$

234. If the debt beta is not zero that formula becomes:

$$\beta_e = \beta_u + \left(\beta_u - \beta_d\right)\frac{D}{E}$$

where:

a. β_u is the unlevered beta and is equal to the asset beta;

b. β_e is the levered equity beta;

c. D is the market value of debt; and

d. E is the market of equity.

235. I recommend that the AER considers the use of the formula including the beta of debt. While there are other formulas that could be used, most of these get little or no use.

236. The other formula with significant use is the Hamada formula which is used in practice.[39] This formula assumes that the debt tax shield has no risk and that the quantity of debt is fixed in perpetuity. Clearly these are not realistic assumptions, yet this is the formula used by practitioners. The Hamada formula is:

$$\beta_e = \beta_u \left(1 + (1 - T_c)\frac{D}{E}\right).$$

[37] CEG, 2016, Review of Oxera debt beta analysis, authors T. Hird and K. Zhang

[38] M. Lally, 2023, Review of CEG's submission on the debt tenor anomaly.

[39] It seems that this formula is widely used in practice and discussion with a practitioner from a leading valuation firm confirmed this, but I have seen no systematic study of the extent of the Hamada formula's use.

237. And with risky debt it is:

$$\beta_e = \beta_u + (\beta_u - \beta_d)(1 - T_c)\frac{D}{E},$$

where T_c is the effective corporate tax rate.[40]

238. The AER might consider the use of the Hamada formula as a check on the sensitivity of betas to formula choice. While the Hamada formula is on very shaky ground with respect to its assumptions, I am a believer in the test of extensive use over an extensive time period, which the Hamada formula appears to have passed.[41]

The importance of correctly measuring leverage

239. An issue that has received little attention in unlevering to get the asset beta and relevering to get the equity beta, is the measurement of leverage. However, it should receive significant attention because if you use different measures of leverage, it is self-evident that you will get different estimates of the asset beta and also the equity beta. For the purpose of levering and unlevering the definition of leverage is debt to equity. Equity is the market value of equity and debt is the market value of debt. For listed companies the measurement of the market value of equity is relatively straightforward. It is in measuring the value of debt where the problems begin.

Market value of debt and book debt

240. A key problem is that corporate debt in general is not traded actively, and in any event, tradable corporate debt is a subset of total company debt. The common solution to this problem is to use the book value of debt instead of the market value of debt. Does this matter? Yes and no. It matters if the debt is fixed rate debt and interest rates have changed, or if the credit risk of the debt has changed since issue. It also matters if the measurement of book debt is substantially affected by accounting choices. Otherwise, the book value is probably a reasonable approximation to market value. Ideally, we should compute an estimated market value for the debt, but there may be insufficient information in the financial statements to do this reliably and it would be a lot of work.

241. The next problem is in deciding what constitutes debt. This is more than an academic point. In a previous round of regulation there was a case where two experts providing beta estimates on behalf of the NSPs and using almost identical data gave different beta estimates due to different choices about measuring debt. The AER has also computed different beta estimates after changing its mind about which debt should be included in measuring leverage.

242. In order to determine what debt should be included for valuation purposes, the key principle is consistency between the definition of cash flow that is being valued and the definition of the finance (capital) being invested. I illustrate this principle below with reference to the next problem in measuring leverage. That is the problem of changing accounting standards for operating leases.

Operating lease capitalisation a big deal

243. An important issue that has arisen in the last ten years has been implementation of a new accounting standard for operating leases. Under the new accounting standard, the liability for ongoing payments on operating leases was capitalised, appearing in the balance sheet as both

[40] It is a common practice to use the statutory rate where the effective rate is not known. However, the statutory corporate tax rate (30% for large companies) in Australia should not be used as the effective rate is much lower due to imputation.

[41] This suggest that either the choice of formula is not that critical, or that practitioners find the Hamada formula has advantages.

asset and liability. Consequently, the book level of debt has gone up.[42] Complicating the issue is that the adoption date for the standard has varied across countries. In the USA the standard introduced in 2016 and became mandatory from the end of 2018. In Australia the standard was introduced in 2018 and became mandatory during 2019. Not only does this complicate comparisons of leverage across countries, but it also complicates comparison within countries as there can be early adopters of the standard and late adopters who wait until the standard is mandatory.[43]

244. So, what should be done about measuring debt consequent to the changes in accounting for operating leases? The answer depends upon how the cash flows are computed for valuation and ROI purposes. If the operating lease rental costs are included as part of operating cash flows, then treating the capitalised operating lease liability as debt that needs to be serviced would be double counting the cost of the operating leases. The operating leases should then be removed from the measurement of debt. In this case the operating lease contributes to operating leverage, but not financial leverage and vice versa if the lease rentals are not included in the operating cash flows.[44]

245. In the light of the foregoing, it is important to understand exactly what is being included in the measure of book debt that is used in the beta leverage adjustments. The liabilities included should only be those that the net operating cash flow (i.e. after operating costs) are expected to service. Anticipating that for valuation, operating lease rental costs will be treated as operating cash flows not financing charges, then it will be necessary to ensure that capitalised lease liabilities are not included in book debt and remove them if so included.

246. Is capitalisation of operating leases a material effect that needs to be worried about? That depends on the companies chosen as comparators. It is my understanding that US energy companies and other utilities were heavy users of off-balance sheet financing through operating leases. Therefore, the accounting changes will have made a substantial impact on measures of financial leverage using book debt. It is critical therefore that the AER understands the measure of book debt it is using when adjusting beta for leverage and makes sure that it is the correct measure of book debt for this purpose. This may require careful study of comparator financial statements over time, or the definitions used by data providers such as Bloomberg.

Leverage at what date?

247. Beta estimates are based on observations over time. So, a question that naturally arises, as values of equity and debt change over time, is what leverage measure should be used? Should it be some average over the period used in the beta estimates, or the leverage at the end of the estimation period, or the leverage currently observed? There are arguments for using each alternative, but the latter two are less work and the last option is the most relevant to the current beta. There is an argument for using the average leverage to estimate the asset beta since this is determined from historic data when leverage may have been changing and then using the current level of leverage to get a current levered beta.[45] This has merit but is a little more work to set up. It is likely that the four alternatives will give different values for leverage, consequently different relevered equity betas will result. Some sensitivity analysis might be considered by the AER.

---

42 I recall after this change a financial analyst commenting that he was spending time taking the value of capitalised leases out of the reported debt levels, as reported on Bloomberg as I recall, but I am not absolutely certain on this latter.

43 To make things even messier there is some difference between the US FASB (Financial Accounting Standards Board) and the IASB (International Accounting Standards Board) approaches.

44 There is a debate about whether financial leases have the same impact as debt on debt the capacity of a company, but I am not aware of work on its impact on beta.

45 Here we have an intriguing contradiction. We are using a measure of leverage that has been changing over time in order to make an adjustment using a formula that assumes leverage is held constant.

A fundamental flaw

248. The fundamental premise in the unlevering relevering exercise is that the underlying asset beta is the same for both firms However, the inverse relation between asset betas and leverage means that we should expect that there will be differences in the asset betas between firms that have different levels of leverage. Therefore, it makes sense to use unlevering and relevering for the same firm to investigate how its beta will change with leverage. However, for different firms the different leverage levels, which you are trying to adjust for, suggests that the firms have different asset betas. Thus, invalidating the fundamental premise underlying the leverage adjustment.

An exercise in spurious precision?

249. Given the pitfalls and potential inaccuracies in making the unlevering and relevering adjustments I question whether the whole exercise is worthwhile. You take an estimate of beta, which likely has a relatively high standard error, and subject it to an adjustment which can give varied outcomes depending on what you do and for which there is no guarantee of getting the adjustment right. Is this just an exercise in spurious precision?

250. It is true that the making of such leverage adjustments is commonplace. This is not surprising. The relation between beta and leverage is well established theoretically, so you are open to challenge if you do not adjust for leverage. Consequently, there is pressure to do something even if it might be just as good, or better, to do nothing.

2.4.5 Challenge 3: Use of indices with different composition

251. The problem is that different equity markets have different compositions, and it is well understood that equity betas vary with the composition of the market. The AER wishes to control for this in estimating comparator betas. The AER considers the solution of using the same index for all firms, both domestic networks and comparators. This involves adopting an international CAPM.

252. There are two flavours of model under the label international CAPM, one is essentially the domestic CAPM but with international data. This is probably the version the AER has in mind. This model requires the assumption that purchasing power parity holds universally, when clearly it does not. The other is a model that adds currency risks and their beta factors. Therefore, there is more complexity. As the AER points out the adoption of an international CAPM would also require updating the CAPM parameters. I do not recommend the use of an international CAPM, the solution is worse than the problem.

253. While the composition of stock markets varies across nations, they also vary within nations across time. Stock markets change in composition on a regular basis. A recent example from the US comes from the Magnificent 7 (tech stocks plus Tesla) who have grown extraordinarily rapidly and now account for about a third of US market capitalisation. While in the Australian market the importance and capitalisation of the service sector has grown substantially over the years. Now the top firms by market capitalisation tend to be service firms, so the biggest firms are big banks rather than big miners.

254. Changing market composition over time is just something you must live with when estimating a domestic beta. Differences in composition cross sectionally across markets is also something you must live with if you want to use international comparators. However, in making the decision to use international comparators it must be recognised that different market composition will cause different betas in the cross section.

2.5 Professor Johnstone's commentary on the opinions of the other experts

255. I find it hard to be confident in Mr Kumareswaran's premise that data from another country should trump what we already have. What will we do and how we should regard that data if it gives us answers that are far from current settings? Will we then reject that data post-sampling, which is poor science, or will we look for other data or for tweaks that are more acceptable? If the approach was truly objective, we would know in advance the matching criteria of firms and stick to them whatever the result. Instead, we have a plethora of possible criteria with no theoretical structure to choose between them or weight their relative importance.

256. I believe that network equity betas are very largely a function of the regulatory regime and its conventions and "culture", including for example the provisions it routinely (i.e. predictably) makes for ex post cash flow "shocks" such as occur when the NSP loses or saves money relative to forecasts (such as in realized construction costs departing from forecasts or random storm damage, etc.). That institutional/cultural aspect is likely to differ markedly across countries.

257. It worries me that our regulatory regime has "encouraged" the privatisation of nearly all previously listed firms and that alone suggests that our NSPs and their environments are different and possibly more reliably profitable than those listed in the US.

258. I believe that ultimately the use of betas drawn from say the US will leave us close to where we are at, or it won't be put into practice. I have no doubt that NSPs would like to open the debate because there is significant potential upside in revenue. If with the new data, we end up with a higher or lower equity beta, I would not conclude that it is "more accurate", either way, because the translation process requires so many assumptions and is finished off with conveniences such as an assumed benchmark debt level. Basically, my criticism is that we are trying to make an exercise "scientific" and "empirical" when the scientific controls that allow measurements in one setting to be mapped into another do not exist and are put up as matters of debate with no obvious answer in theory or even subjectively.

259. I agree with Associate Professor Partington's first principles approach when thinking about beta, particularly in his view that the NSPs under the Australian regulatory culture are sound and safe generators of returns to equity, more like returns to debt than equity. He works within the boundaries of 0 (risk-free) and 1 (the average firm) and reasons somewhere in between to reach a back of the envelope beta. That kind of thinking is an antidote to the scientism that we get into when we obsess over data, preferencing whatever data from other countries is available, even when data has always shown that betas are far from stable or even measurable in their own country. I do wonder, though, whether by the good arguments put in Associate Professor Partington's prima facie reasoning we can really come to a number between 0.6 to 0.65, or might it be that we are merely psychologically or conveniently anchoring on past assessments (e.g., would 0.55 or 0.7 be obviously not right?). I predict that whatever case is made, the final equity beta setting won't/can't be far from where we are at. The argument over beta while couched in science and objectivity is ultimately between those seeking higher returns to NSPs and those seeking lower electricity prices. When a change at the first decimal point is so beneficial in profits to NSPs, whereas no single consumer suffers a matching degree of pain, the argument is naturally one-sided.

260. Professor Partington makes the new point that levering and delevering is sensible for a firm with a given asset beta but not across different firms. I think that is correct. Consider what the asset beta is - it does not exist on its own, it is merely the value-weighted average of the debt and equity betas (because there are observable cash flows to debt and to equity but not "to assets"). The debt beta is likely fairly close to the same for two utilities in different countries, although I believe from it is inherently lower in Aust than the US average, but the equity beta, by my preceding analysis, is

rooted in highly variable cash flow fundamentals (namely cash flow mean and covariance) and in surrounding market parameters, specifically the risk-free rate, the market's risk aversion and the market returns variance. These characteristics do not need to be the same or even similar across different firms in different countries.

261. In a paper on Hamada and allowing for debt (*Accounting and Finance* vol. 62, 2022, pp.2385-2399) I derived the conventional formula connecting the beta of the unlevered and levered firm in terms of the Lintner ratios of the cash flows to debt and of equity. This is insightful because again it writes the betas in terms of exogenous parameters (mean and covariance of cash flows), thus helping us see how firms can match up fundamentally, or not. Related to Associate Professor Partington's point, a firm with higher gearing is one where the mean cash payoff to equity is lower (it pays higher interest) and its covariance with market conditions is unchanged (since by the laws of covariance, the covariance with the market of a sum is the sum of the individual covariances, so if we take the covariance of interest with the market as zero the overall covariance of the sum of sales dollars minus operating costs minus interest is unchanged when interest is higher).[46] Similarly, the mean cash flow to debt is higher and the covariance of cash paid to debt holders is higher (more risk of default). So a firm with different gearing is a different entity fundamentally, with a different asset beta.

262. One way to think of this is to say that managers could redesign the firm by changing its gearing ratio to minimize the weighted average of the betas of debt and equity. That would be a nice exercise because all four terms in the weighted average (the values of D and E and the betas of D and E) move when one moves. But that "optimization" would merely minimize its WACC, it would not maximize its total value (of debt plus equity). Instead, it sets gearing to maximize firm value (in its market/country) and that creates a different asset/firm with a different asset beta. Hence, we can't assume that the asset beta of a utility is the same from one utility to another, especially in countries with different economic fundamentals like tax rates etc.

263. To complicate things further, the Lintner fundamentals by which we can get to the economic drivers of betas include not only the parameters I just mentioned, but also the market returns variance and the market risk aversion, and these may differ markedly across countries.

2.6 Mr Kumareswaran's commentary on the opinions of the other experts

264. I focus my commentary on the opinions of the other Eligible Experts in relation to beta estimation on the following topics:

a. The use of international comparators;

b. The role of regulatory judgment when interpreting evidence from international comparators;

c. The reliability of beta estimates based on a priori reasoning;

d. The use of debt betas in the de-levering and re-levering process;

e. The choice of the de-levering and re-levering formula; and

f. The question of whether idiosyncratic risks affect beta.

[46] This is a good example of why we need Lintner's ratio. Higher gearing increases equity beta not because it increases the market covariance of cash flowing to equity holder but because it reduces the mean.

2.6.1 The use of international comparators

265. Based on discussions between the Eligible Experts, it seems all three of us agree that in an ideal world in which the AER had a large sample of listed domestic comparators, it would be preferable to rely on those firms when estimating beta, rather than use international comparators, so as to avoid introducing unnecessary bias.

266. However, that is not the situation the AER is in; the AER must deal in reality, where the number of listed domestic comparators has shrunk to just one firm, which the AER itself considers is not an optimal comparator to the NSPs it regulates. In these circumstances, my view is that it would be untenable for the AER to continue to rely exclusively on domestic comparators to estimate beta, and that the only viable option is for the AER to use listed energy networks overseas to inform its estimate of beta for the NSPs.

267. If the AER is to use international comparators, the main difference in opinion between the Eligible Experts seems to be over how those comparators should be selected, and how evidence from those comparators should be used by the AER when making its determination on beta.

268. Associate Professor Partington is in favour of more stringent selection criteria than the AER has proposed, and has suggested adding up to 18 more filters to screen out poor comparators. My view is that the approach to selecting international comparators that the AER has proposed in the Discussion Paper (with some minor tweaks) is pragmatic and likely to be the best that one could reasonably do in the circumstances, without introducing a sense of false precision into the task.

269. Furthermore, the AER's proposed approach to selecting international comparators is similar to the approach that many other regulators have followed when faced with a shortage of domestic comparators. Examples of regulators that have adopted a comparator selection approach similar to the one proposed by the AER include (amongst others):

    a. the ERA, when regulating gas and rail networks;

    b. the New Zealand Commerce Commission, when regulating energy networks, airports and fibre networks;

    c. the Independent Pricing and Regulatory Tribunal (IPART), when regulating water networks; and

    d. The Queensland Competition Authority, when regulating rail networks, coal terminals and water networks.

270. In other words, the comparator selection approach proposed by the AER (which involves focussing on listed energy networks in other developed economies, subject to passing liquidity and data sufficiency requirements) is well within the range of standard regulatory practice.

271. I do not support the use of the additional 18 filters proposed by Associate Professor Partington for the following reasons.

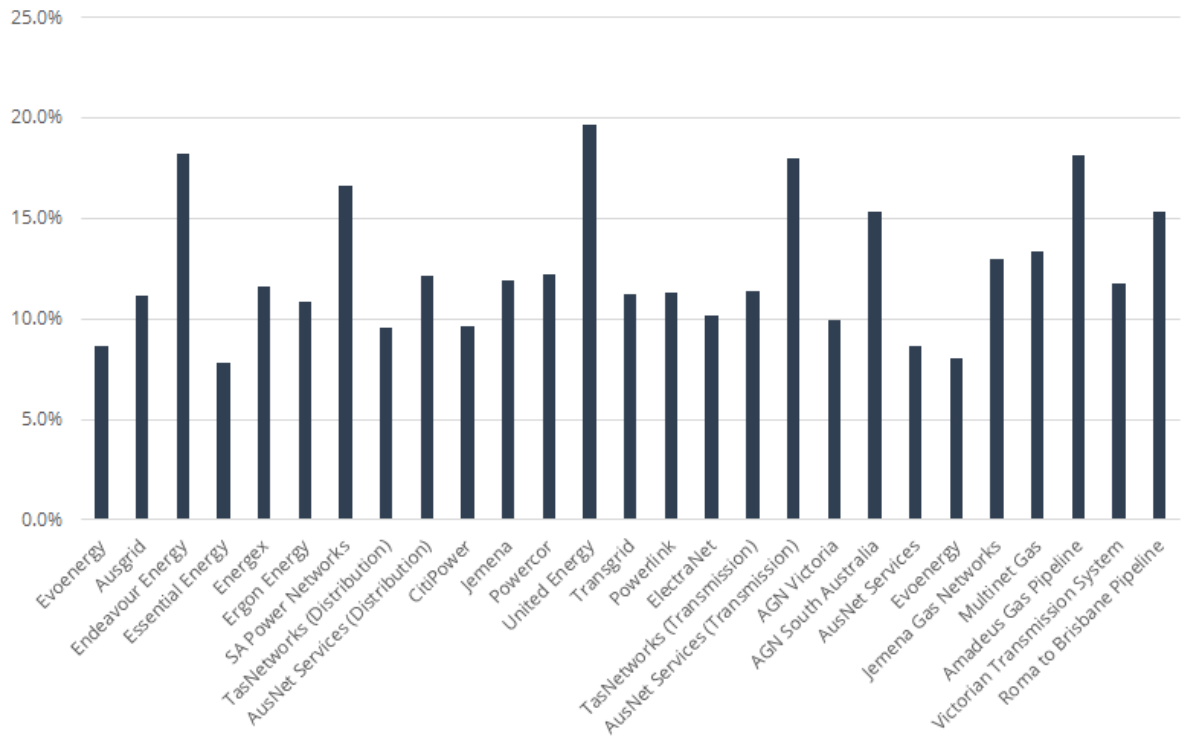
272. Firstly, it is not clear to me why these 18 metrics would be appropriate ways of identifying comparable firms for the purposes of estimating beta. In principle, we might find firms that are similar on some or all these 18 metrics that are randomly distributed across industries completely unrelated to energy networks. If we were to find firms that, through sheer coincidence, appeared similar to the regulated NSPs on these metrics, but which operated in say the construction industry, or the information and media industry, or the professional services industry, would we regard them as truly suitable comparators to the regulated NSPs? Obviously not. We would conclude that any such matches were entirely spurious. Why? Because those firms operate in different industries and, therefore, most likely, have different drivers of beta. Clearly, the nature of operations of the firms, rather than similarity on these metrics, is the more relevant consideration when choosing the comparators.

273. For the avoidance of doubt, I am not suggesting that Associate Professor Partington is proposing that the AER should cast the net for comparators widely across industries, and then select comparators from those industries using his 18 filters. I am simply pointing out that the additional filters proposed do not seem to be good indicators of the factors that drive beta. If we would disregard firms that were good matches according to these filters, but which operate in completely unrelated industries, why would we take seriously firms selected by those same filters within an industry?

274. Secondly, there seems to be considerable heterogeneity between the NSPs themselves on at least some of the 18 filters proposed. For example, Figure 4 plots the average nominal regulated return on equity for nearly all the regulated NSPs over the 10-year period 2014-23 using data published recently by the AER. The chart shows huge variation in returns across the NSPs, ranging from an average return of 7.8% p.a. (Essential Energy) up to an average return of 19.6% p.a. (United Energy). Why would it be reasonable to require comparators to the NSPs to have similar growth in the return on equity (for argument's sake), when the return on equity varies so markedly between NSPs?

275. One superficial solution would be to pool the NSPs together and to consider the average return on equity across all NSPs as the benchmark that must be met by potential comparators before they are included in the sample. But this would simply duck the issue by masking the underlying heterogeneity between the Australian NSPs.

Figure 4: Average nominal regulated return on equity of NSPs (2014-23)

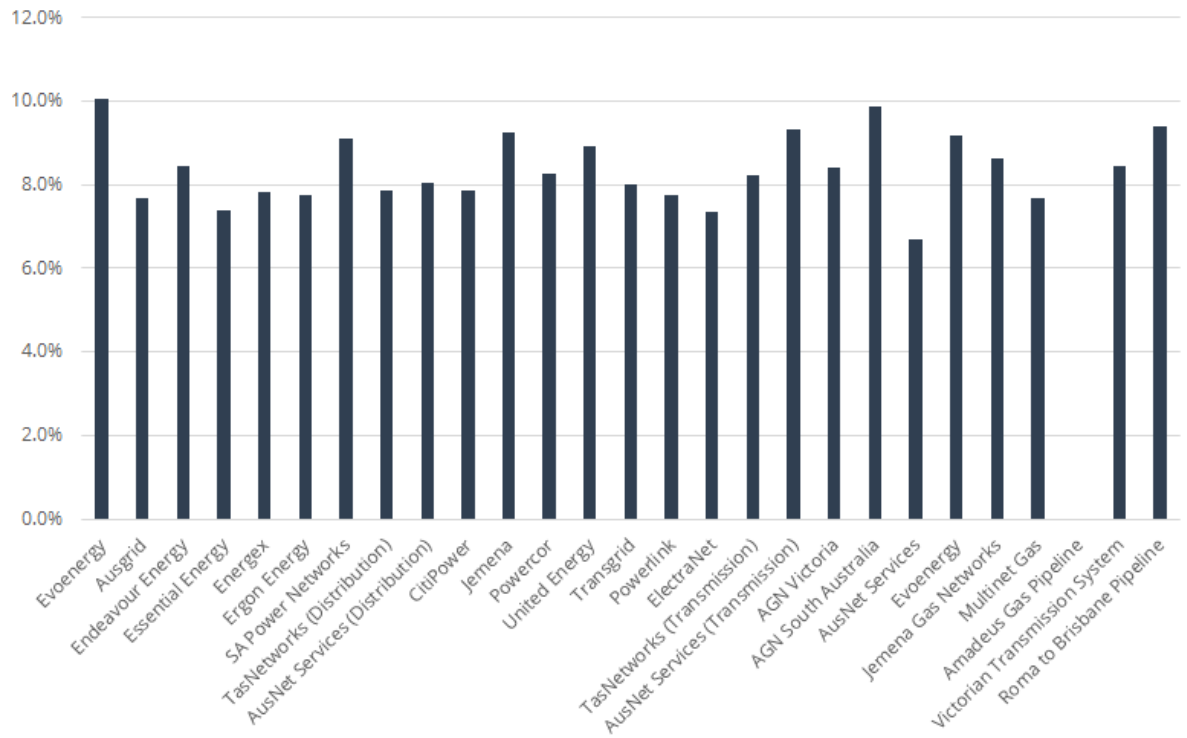


Source: Analysis of data from 2024 Electricity and Gas Networks Performance report.
Notes: Power and Water Corporation is excluded because data for this NSP is available only from 2020.

276. Thirdly, what if the potential comparators are similar on some metrics but dissimilar on others? In those circumstances, how should the AER decide which firms are permitted into the sample, and which should be excluded? Should some metrics be considered more important than others? If so, how should the AER rank the metrics by importance? These would all be ad hoc choices.

277. To demonstrate that this is not a purely theoretical problem, Figure 5 plots the average nominal return on assets (another metric proposed by Associate Professor Partington) for nearly all the regulated NSPs over the 10-year period 2014-23, again using data published recently by the AER. As the chart shows, there is considerably less variation in the average return on assets across NSPs than there is in the average return on equity. If a similar outcome were to obtain in relation to potential comparators being considered by the AER, which of these two metrics—the return on equity or the return on assets—would determine whether a particular comparator was 'in' or 'out' of the sample?

Figure 5: Average nominal return on assets of NSPs (2014-23)



Source: Analysis of data from 2024 Electricity and Gas Networks Performance report.
Notes: Power and Water Corporation is excluded because data for this NSP is available only from 2020. No return on assets data was available in the AER's financial performance dataset for Amadeus Gas Pipeline.

278. Finally, I note that no regulator (or finance practitioner) that I am aware of uses an approach to comparator selection similar to the one proposed by Associate Professor Partington. This is not because other regulators are less careful or diligent than the AER should be when selecting comparators. It is just that there is a limit to what can be achieved practically when screening firms for comparability.

279. Whilst I am sympathetic to Associate Professor Partington's concern that international firms may, due to fundamental factors, not be close comparators to the regulated NSPs on some dimensions, I fear that that the additional 18 filters proposed would be impractical for the purposes of identifying acceptable comparators, and their application is unlikely to result in a better set of comparators.

2.6.2 The role of regulatory judgment when interpreting evidence from international comparators

280. Professor Johnstone's view is that the most thorough and honest approach would be for the AER to derive beta estimates for a set of international comparators (selected using some filtering criteria), and then to use its judgment to assess whether the evidence from the international comparators would justify the AER departing from its existing beta estimate, which was determined using domestic comparators alone. I have two reservations about this proposal.

281. Firstly, I am generally in favour of an approach where the AER would depart from an established beta estimate only if there is good empirical evidence to do so—*provided the established estimate was sound*. Beta estimates are subject to much statistical uncertainty. Therefore, one should ensure that the evidence for any material change is compelling, rather than just an artefact of random noise or misestimation. It is for this reason that in 2020 IPART introduced a rule that it would change its established beta estimate only if (a) the established estimate was more than one standard deviation from the new mean estimate; and (b) if the evidence supporting a different value persisted over a long timeframe (i.e., a regulatory period or longer).[47]

282. My concern is that the soundness of the AER's current equity beta estimate of 0.6 is questionable. At the time the AER established its current estimate, in 2022, eight of the nine domestic comparators had already been delisted, and some had been delisted for more than 15 years. The AER argued that two comparators—Spark Infrastructure and AusNet Services—had only been delisted recently (roughly 15 months and 12 months, respectively, before the 2022 Rate of Return Instrument was finalised), which meant it had some empirical basis for its estimate of 0.6. Even if one were comfortable with the fact that all but one of the domestic comparators had been delisted for more than a year by the time the 2022 Rate of Return Instrument was finalised, my view is that just three 'live' firms is too small a sample with which to estimate beta reliably.

283. The point is that the problem of a dwindling sample of domestic comparators existed even during the development of the 2022 Rate of Return Instrument. Indeed, it was this situation that prompted the ERA to move away from reliance on the domestic comparators in favour of international comparators in 2022.

284. Given that the AER's existing estimate of beta was based on very limited empirical evidence, I would not recommend treating it as a reliable prior. Rather, I recommend using the international evidence to 'reset' the beta allowance, keeping an open mind about the possibility that the existing estimate may simply be wrong. From that point, the AER could adopt Professor Johnstone's suggestion of departing from the status quo estimate only if there is compelling evidence to do so.

285. If the AER wishes to have regard to evidence on beta from domestic comparators as well as international comparators, I recommend that the AER pool together into a single sample the estimates from the domestic comparators and the international comparators. This would reflect the reality that most of the available evidence is international rather than Australian, while still allowing the estimates for the domestic comparators to have some influence on the overall estimate. This would also allow all stakeholders to understand transparently the weight that is applied by the AER to the domestic evidence vis-à-vis the international evidence.

286. The weight given to the domestic evidence should decline over time, since that evidence will become staler with every passing year. Pooling together the domestic and international estimates would achieve this because, over time, the domestic comparators will exert diminishing influence on the overall estimate.

[47] IPART, Estimating Equity Beta for the Weighted Average Cost of Capital, August 2020, p. 2.

287. My second reservation about Professor Johnstone's recommendation is the role that regulatory judgment should play in deciding whether or not to depart from the established estimate. I am not against the exercise of regulatory judgment, per se — just unexplained regulatory judgment. My experience is that regulators' explanations for how they have exercised judgment are sometimes non-existent or unconvincing.

288. By way of example, as I noted in section 2.3.1, the AER and the ERA both regulate energy networks under a common set of rules and, since 2018, have developed Rate of Return Instruments under the same primary legislation. When doing so, both regulators have, until 2022, consistently examined exactly the same empirical evidence on beta and, typically, have referred to exactly the same studies by advisers, such as Professor Olan Henry, to inform their decisions. Yet, both regulators have in the past adopted different estimates for beta and gearing. For instance, in 2018, during the same Rate of Return Instrument review, the two regulators examined in parallel identical evidence on beta (the same domestic comparators, the same empirical techniques and the same empirical studies). Yet the ERA adopted an equity beta estimate of 0.7 (assuming a benchmark gearing ratio of 55%) and the AER adopted an equity beta estimate of 0.6 (assuming a benchmark gearing ratio of 60%). The discrepancy in the final outcomes was both stark and, frankly, inexplicable. The two regulators had evidently exercised their judgment differently, but for reasons and in ways that were not transparent to stakeholders.

289. I do not seek to criticise one regulator or the other for their 2018 decision. I simply observe that the exercise of regulatory judgment, particularly when not explained well, can produce strange outcomes that can erode the confidence of stakeholders in the regulatory process.

290. Therefore, if the AER wishes to adopt Professor Johnstone's recommendation of departing from an established beta estimate only if there is good evidence to do so, I suggest that it would be preferable for the AER to set out in advance a clear, objective decision rule (as IPART has done), rather than rely on subjective judgement, so that stakeholders can predict outcomes with confidence.

2.6.3 The reliability of beta estimates based on a priori reasoning

291. Associate Professor Partington suggests that the AER could test the reasonableness of its beta estimate from a priori reasoning. He suggests that an average estimate, using such an approach, would be 0.59, and that a range of 0.55 to 0.65 would be plausible.

292. I recommend that the AER rely on empirical evidence, rather than a priori reasoning, to inform its estimate of beta. A priori reasoning may rest on strong and opaque judgments that are difficult to explain or justify, and which may simply be wrong. There may be no good way to validate or test the conjectures on which such reasoning relies.

293. My concern is that any prior that is informed purely through theoretical reasoning will effectively anchor the AER's estimates, with the empirical evidence playing only a secondary role.

294. It is also difficult to reconcile the outcome of Associate Professor Partington's a priori reasoning with equity beta allowances that have been adopted by the AER in the past. For example:[48]

    a. Before 2009, the AER adopted an equity beta allowance of 0.9 or 1.0;[49]

[48] All the decisions listed below adopted a benchmark gearing ratio of 60%.

[49] AER, Electricity transmission and distribution network service providers, Review of the weighted average cost of capital (WACC) parameters, May 2009, Table A.1, p. v.

b. The AER adopted an equity beta allowance of 0.8 in its 2009 review of WACC parameters;[50] and

c. The AER adopted an equity beta allowance of 0.7 in the 2013 Rate of Return Guideline.[51]

295. The AER adopted an equity beta allowance of 0.6 for the first time in the 2018 Rate of Return Instrument. That is, for most of the time the AER has been regulating energy networks, the equity beta allowance set by the AER, informed by empirical evidence, has been *above* the 0.55 to 0.65 range proposed by Associate Professor Partington. Had Associate Professor Partington's a priori reasoning been applied, how could the equity beta allowances adopted by the AER in those past determinations been justified?

2.6.4 The use of debt betas in the de-levering and re-levering process

296. Associate Professor Partington and I agree that, if the average gearing of the comparator firms used by the AER differs from the current benchmark gearing ratio, then the AER's current process for de-levering and re-levering betas would result in a biased estimate of the re-levered beta estimate for regulated NSPs. We also agree that the appropriate way to address this problem would be for the AER to recognise debt betas in the de-levering and re-levering formulas, rather than adjusting the benchmark gearing ratio.

297. Associate Professor Partington proposes that "the simplest solution for the AER is to allow a debt beta of 0.1 or 0.2 as representing a typical beta of investment grade corporate debt." Professor Johnstone has suggested that a debt beta estimate of around 0.1 may be reasonable.

298. I am unsure what the correct estimate of the debt beta should be. However, I note that all regulators (in the UK and Australia) I am aware of that use debt beta estimates in their de-levering and re-levering formulas have recently adopted estimates that are much lower than 0.2. See, for example, Table 3. All these regulatory decisions have been informed by surveys of the empirical evidence in academic and consultant studies on debt beta estimates for investment grade firms.

Table 3: **Recent regulatory determinations on debt beta**

Regulator	Sector	Determination	Determination date	Debt beta estimate
Utility Regulator of Northern Ireland	Gas	GD17 - PNGL	September 2016	0.1
Utility Regulator of Northern Ireland	Gas	GD17 - FE	September 2016	0.1
Competition & Markets Authority	Gas	GD17 - FE	June 2017	0.1
Utility Regulator of Northern Ireland	Electricity	RP6 -NIEN	June 2017	0.1
Ofcom	Telecoms	WLA - Openreach copper	March 2018	0.1

[50] AER, Electricity transmission and distribution network service providers, Review of the weighted average cost of capital (WACC) parameters, May 2009, Table A.1, p. v.

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

Regulator	Sector	Determination	Determination date	Debt beta estimate
Ofcom	Telecoms	WLA - Other UK telecoms	March 2018	0.1
Ofcom	Telecoms	LLCC - Openreach	June 2019	0.1
Ofcom	Telecoms	LLCC - Other UK telecoms	June 2019	0.1
Civil Aviation Authority	National air traffic services	RP3	August 2019	0.1
Ofwat	Water and waste water	PR19	December 2019	0.125
Competition & Markets Authority	National air traffic services	RP3	August 2020	0.05
Ofgem	Gas distribution and electricity transmission	RIIO-GD&T2	December 2020	0.075
Utility Regulator of Northern Ireland	Electricity transmission	SRP20	December 2020	0.075
Competition & Markets Authority	Water and waste water	PR19	March 2021	0.075
Ofcom	Telecoms	WFTMR - Openreach	March 2021	0.10
Ofcom	Telecoms	WFTMR/MCT - Other UK telecoms	March 2021	0.10
Utility Regulator of Northern Ireland	Gas transmission	GT22	May 2022	0.075
Ofgem	Electricity distribution	RIIO-ED2	November 2022	0.075
Utility Regulator of Northern Ireland	Gas distribution	GD23	February 2023	0.075
Civil Aviation Authority	National air traffic services	NR23	November 2023	0.05
Civil Aviation Authority	Airports	Heathrow H7	July 2024	0.05 to 0.10
Queensland Competition Authority	Cross-sector	Rate of return method review	September 2024	0.12

Source: UKRN, Cost of capital – Annual update report, Information paper, October 2024; QCA, Rate of return review, Final report, September 2024.

299. As I have noted in section 2.3.3, inadvertently overestimating the debt beta would result in a downwardly biased estimate of the re-levered equity beta for the Australian NSPs. Therefore, if the AER decides to adopt a debt beta estimate in the de-levering and re-levering formulas, it would benefit from a survey of both the academic literature on empirical estimates of debt betas and a survey of relevant, recent regulatory decisions, rather than relying on rule of thumb estimates.

2.6.5 The choice of the de-levering and re-levering formula

300. Associate Professor Partington recommends that the AER consider the use of the Hamada formula for de-levering and re-levering beta as a check on the sensitivity of betas to formula choice, because the Hamada formula is used widely by finance practitioners.

301. I agree that the Hamada formula is used widely. However, in my view the Harris-Pringle formula—which includes a term for the debt beta, but which excludes the tax shield term in the Hamada formula—is theoretically more suited to the AER's framework. As Associate Professor Partington notes, the Hamada formula assumes that the quantity of debt of the firm remains constant. By contrast, the Harris-Pringle formula assumes that the firm's *gearing ratio* remains constant. I provide an algebraic derivation of the Harris-Pringle formula in Appendix B that demonstrates this.

302. As the AER assumes that the benchmark NSP maintains a constant level of gearing (in line with the benchmark gearing ratio) at all times, in my opinion the Harris-Pringle formula is the more theoretically correct formula to use in the AER's circumstances.

2.6.6 The question of whether idiosyncratic risks affect beta

303. Professor Johnstone's separate paper presents an interesting analysis that challenges the conventional understanding of the CAPM framework on which the AER relies when setting the allowed return on equity. The standard view adopted by finance practitioners and most regulators (including the AER) is that beta is a measure of only systematic (i.e., non-diversifiable) risk. Consequently, goes the orthodox view, the allowed rate of return should compensate regulated businesses only for risks that cannot be diversified away.

304. However, Professor Johnstone argues that this standard view is wrong and reflects a fundamental misunderstanding of the CAPM. He explains, using CAPM algebra, that beta is influenced by both systematic and non-systematic risks. Whilst I was initially sceptical of this claim, I have examined Professor Johnstone's algebra carefully and can find no errors in it.

305. In my mind, the key result in Professor Johnstone's paper is equation (10). He shows that the well-known beta identity (the ratio between the covariance of firm and market returns and the variance of market returns) can be rewritten mathematically in terms of the cash flows of the firm as:

$$\beta = \frac{R_f}{\text{var}(r_M)} \frac{\Lambda}{(1 - \lambda\Lambda)},$$

where:

a. R_f is the return factor on the risk-free rate (i.e., $R_f = 1 - r_f$);

b. λ is a constant measure of investor risk aversion; and

c. Λ is a term that Professor Johnstone refers to as the Lintner ratio, named after John Lintner, one of the discoverers of the CAPM.

306. The Lintner ratio can be written as:

$$\Lambda = \frac{\text{cov}(C, r_M)}{E[C]},$$

where:

a. $\text{cov}(C, r_M)$ is the covariance of the firm's cash flow C and the return on the market r_M; and

b. $E[C]$ is the firm's expected (i.e., mean) cash flow.

307. The first equation above shows that beta is a function of the Lintner ratio. The second equation implies that any risk—including any non-systematic risk—that reduces or increases the expected cash flow of the firm, without an offsetting change to the covariance term in the numerator, will alter the Lintner ratio. From these relationships, it follows that non-systematic risks that change a firm's Lintner ratio will also affect its beta.

308. There are two remarkable things about this insight provided by Professor Johnstone:

a. Firstly, it is not a new discovery because it was expounded by Lintner himself in the seminal paper in which he developed the CAPM; and

b. Secondly, for reasons that are unclear to me, it has been largely overlooked by most of the academic finance community. As a result, most practitioners (including regulators) are unaware of it.

309. Professor Johnstone's paper—and the various scholarly articles he has published explaining this issue—are serious pieces of work that warrant serious attention from regulators such as the AER.

310. The most important implication from Professor Johnstone's contribution is that regulators should compensate regulated businesses not only for systematic risks but also those non-systematic risks that alter the firm's Lintner ratio.

311. However, this idea is not as radical as it might seem at first blush. The fact is that the AER can, and does, take action to reduce NSPs' exposure to risks that might change their expected cash flows significantly. For example:

a. As the AER has already recognised in several recent determinations, government climate policies have raised the risk of asset stranding faced by gas networks materially. This risk is largely non-systematic because the risk of stranding does not vary with the state of the economy. However, it has the potential to reduce the expected future revenues of gas networks significantly to the point that they may be unable to recover the capital invested by their owners. Had the AER taken no action in response to this growing risk, Professor Johnstone's analysis would suggest that an increase in the allowed return on equity would be warranted, to compensate the networks' investors for this risk. However, in recent decisions the AER has accelerated the depreciation allowance for several networks to reduce the risk of asset stranding. This obviates the need to increase the return on equity allowance to compensate for asset stranding risk, provided that the accelerated recovery of costs is just sufficient to reduce the NSP's expected losses from asset stranding to zero; and, similarly

b. Major storms can damage or destroy network assets that NSPs use to deliver regulated services. If regulation prevented NSPs from recovering the cost of repairing or replacing those assets, there would be a reduction in affected NSPs' expected cash flows (all else remaining equal), and a reduction in the Linter ratio. Notwithstanding that the risk of network damage from storms is entirely non-systematic, Professor Johnstone's analysis would imply that such risks should be compensated through the allowed return on equity.[52] However, the AER typically provides cost pass-throughs that allow NSPs to recover the cost of rebuilding their networks after natural disasters, thus eliminating the need for any uplift in the allowed return on equity.

[52] One complication is that different uplifts would be required for different NSPs, depending on their idiosyncratic exposure to natural disasters. This would complicate the process for setting the allowed rate of return considerably.

312. There are many other examples of ways in which regulation can insulate NSPs from non-diversifiable risks that would otherwise warrant an increase in the allowed return on equity.

313. Note that not all such regulatory mechanisms involve protecting NSPs from a *reduction* in their expected cash flows; they can also operate to offset an increase in expected cash flows that may result in consumers paying more for regulated services. For example, a recent change to the National Electricity Rules by the Australian Energy Market Commission allows the AER to make revenue determinations that share with consumers the benefits of government concessional finance received by distribution and transmission NSPs, if that was an intent expressed in the concessional finance agreement.[53]

314. For the avoidance of doubt, I am not suggesting that the existing regulatory arrangements insulate NSPs from all conceivable non-systematic risks. Nor do I think they should because that would result in an overly burdensome and expensive regulatory process. However, if either the NSPs or consumers submit to the AER that there are material non-systematic risks that should be addressed through regulation, those proposals should be taken seriously by the AER. That is because, as Professor Johnstone's analysis shows, if those risks are genuine but not dealt with elsewhere within the regulatory framework, there would be a compelling case that they should be reflected in the allowed rate of return.

2.7 Associate Professor Partington's commentary on the opinions of the other experts

Professor Johnstone

315. I agree with Professor Johnstone's analysis of equity beta in all significant respects. His work may be difficult reading in regard to the mathematical derivations, but it is insightful. The CAPM relationship for how asymmetric idiosyncratic risk affects beta was first derived many years ago. However, Professor Johnstone's work drawing attention to this result has been widely ignored and indeed resisted, since it is contrary to the widely held view that idiosyncratic risks are not priced.[54] The critical point is that the relevant idiosyncratic risks are asymmetric, (non zero mean) and that they are shocks (new risks). Such shocks affect the expected cash flow, which via changing the mean cash flow in the Lintner Ratio affects beta.

316. I make the point that risks tend to be thought of bad things that can happen, and so it is natural to think of risks in terms of downside. However, in this context, it can also be thought of as good things that can happen. That is, increase the mean cash flow. For example, the government bales out an aluminium smelter, the AER allows the greater weight to higher current interest rates. As such events arise, they reduce beta.

317. The example of the regulator giving a higher allowance for interest costs, illustrates Professor Johnstone's point about the circularity of regulation. Indeed, many of his points about the regulatory process make good sense.

318. I particularly agree with his observations about the need for a stable benchmark as provided by the established AER estimate of beta, the fundamental problem of translating betas across markets, the difficulty in establishing what a difference between the Australian beta and overseas betas actually means, and the ad-hoc nature of filters, even my own, intended to match the sets

[53] AEMC, National Electricity Amendment (Sharing concessional finance benefits with consumers) Rule 2024, Rule Determination, 21 March 2024.

[54] It is appropriate to offer applause for Professor Johnstone's persistence in presenting the logic of the Lintner ratio in the face of sustained indifference and even outright opposition. I also acknowledge that the terminology is Professor Johnstone's. Initially he used the name Fama Ratio as the ratio appeared in a paper by Fama, but ultimately it became named the Lintner Ratio, because Lintner first published the ratio.

of domestic and overseas comparators. I also agree that the regulator needs to exercise regulatory judgement in relation to any divergence between evidence from overseas comparators and the AER's estimate of beta. Professor Johnstone also makes the point that the supposedly scientific calls for more data are not really scientific. I make the point that the supposedly hard numbers of more data are really soft numbers.

319. With one exception any differences of opinion that I have with Professor Johnstone's analysis are minor and mostly relate to matters of emphasis rather than substance. The exception is with respect to his argument that the betas of utilities debt being almost zero since the debt has almost zero risk. If the debt had almost zero risk, then I would expect it to be rated AAA. However, I agree with his further suggestion of using a low number for the debt beta. He suggests 0.1 rather than my alternative suggestion of 0.2, in reality it could be either.

Mr Kumareswaran

320. I note that Mr Kumareswaran has provided a clear and thorough analysis which demonstrates his considerable expertise in relation to matters of regulation. I am also impressed by his receptiveness to new ideas, as exemplified by his commentary on Professor Johnstone's work above.

321. Mr Kumareswaran and I agree that bias results from ignoring debt betas when unlevering and relevering equity betas. We both agree that setting the leverage ratio equal for domestic NSPs and overseas comparators is not a good solution.

322. We agree that the solution is to allow for a debt beta in the relevering formula. We also agree that the most theoretically correct formula for this purpose is an extension of the AER's existing Harris Pringle/Brealey and Myers formula.

323. The question is what value to use for the debt beta? I suggest a value of 0.1 or 0.2. Mr Kumareswaran leaves this as an open question. However, he recommends using a value towards the lower end of the range of debt beta estimates. He recommends this in order to avoid a downward bias in the equity beta that would result from using an overestimate of the debt beta. However, picking a lower end estimate is more likely to give an underestimate of debt beta, and this will result in an upward biased equity beta. It would seem better to pick a debt beta in the middle of the range, that is more likely to give an unbiased estimate.

324. I point to the extensive problems in correctly making the unlevering and relevering adjustments. I also identify a fundamental flaw in the method that is very likely to invalidate the results. My position, therefore, differs from Mr Kumareswaran in that while I agree that if unlevering and relevering takes place, then we should account for the debt beta, but I question whether unlevering and relevering should take place at all.

325. We both agree that equity betas will depend on the composition of the market which is used to estimate the equity beta. The problem then is that equity betas will vary cross sectionally across markets due to differences in composition. We also agree that adopting an international CAPM is not an appropriate solution to this problem.

326. We further agree that the composition of the Australian market has changed over time (time series variation) and that this been accepted in estimating the betas for Australian NSPs. Mr Kumareswaran's position recommends a similar pragmatic approach of not to seeking to correct for differences in composition across markets. My position is that in using international comparators you have to accept that there will be cross sectional differences in beta due to cross sectional differences in market composition.

327. Mr Kumareswaran and I differ on our views regarding the use of international comparators in estimating betas for Australian NSPs. Mr Kumareswaran considers it untenable for the AER to continue its current approach and advocates the use international comparators. I point out that

without using comparators the AER can test the reasonableness of its beta estimate from a priori reasoning. Using this approach my average estimate is 0.59.

328. I acknowledge however, that AER is likely to be under considerable pressure to consider international comparators. If it does so both Mr Kumareswaran and I agree that filters should be used to select suitable comparators. Mr Kumareswaran, with minor variations, broadly supports the filters proposed by the AER. I support the AER filters but also suggest using some, or all, of a relatively long list of additional filters.

329. Mr Kumareswaran favours the largest possible sample size that meets his modified version of the AER's filters. My additional filters strictly applied would be likely to reduce the sample size, possibly to zero. Recognising this I suggest some flexibility in applying the filters. The objective of these additional filters is, using Glenn Boyle's analogy, ideally to try and have a sample of spaniels, or failing that medium sized dogs, while excluding Great Danes. Unfortunately, homogeneity of comparators does not address the problem of differences in equity markets.

330. It is not entirely clear how Mr Kumareswaran thinks the results from the international comparators should be used, but he seems to favour some fixed rule for adjusting the AER's beta, based on how different it is from the international comparators' median beta. This assumes that the international comparators betas are a valid basis for determining the betas of Australian NSPs. Without evidence to support its validity this assumption is a leap of faith.

331. In contrast, I favour the use of regulatory judgement in interpreting the evidence from international comparators. This is because it is not self-evident that the betas of international network operators will be a valid basis for forming an estimate of an Australian NSP. Indeed, Professor Johnson and I provide strong reasons why they are quite likely to provide poor evidence for this purpose. In particular, given the inverse relation between asset betas and leverage, the lower leverage of overseas comparators makes it rational to expect that they have higher asset betas than Australian NSPs.

3 Weighted trailing average return on debt

3.1 What is the issue?

332. Since December 2013, the AER has applied a simple trailing average approach to set return on debt allowances for all NSPs. Under that approach, the return on debt allowance is calculated as an equal-weighted average of the return on ten historical tranches of debt. The simple trailing average approach assumes that a prudent and efficient NSP refinances 10% of its benchmark quantity of debt each year.

333. The AER's stated reasons for moving away from the 'rate-on-the-day' approach (the approach the AER used prior to December 2013) in favour of the trailing average approach were that the latter would:[55]

    a. reduce the difference between the return on debt and the return on debt of a benchmark efficient entity

    b. provide NSPs with incentives to engage in efficient debt financing practices, which would support efficient investment; and

    c. give NSPs a reasonable opportunity to recover at least their respective efficient debt financing costs.

334. The AER has provided clarification to the Eligible Experts that in considering any possible changes to the simple trailing average approach, the AER's objective continues to be that NSPs should be provided with a reasonable opportunity to recover at least their respective efficient debt financing costs as this would promote efficient investment in the assets used to deliver the regulated services.

335. The Discussion Paper notes that the simple trailing average is unlikely to meet this objective in circumstances where:

    a. An NSP is undertaking a large capital investment program (such as many TNSPs are currently doing under the Australian Energy Market Operator's Integrated System Plan). This would necessitate a large quantity of debt raising over short time periods, at prevailing market rates, in a way that does not match the 10% annual refinancing assumption that underpins the simple trailing average approach; and

    b. The prevailing rates at which the NSP is raising significant quantities of new debt are either above or below the simple trailing average allowance.

336. The AER is concerned that, in these circumstances, the simple trailing average approach "may no longer provide an efficient or accurate estimate of the return on debt for new investment."

337. The Discussion Paper consults on:

    a. whether the AER should adopt a 'weighted trailing average approach' that relaxes the assumption that 10% of the benchmark quantity of debt is refinanced annually in all circumstances;

    b. if a weighted trailing average approach is to be applied, what form that weighted trailing average should take. To that end, the AER has developed one possible version (described

[55] Discussion Paper, p. 20.

in Appendix A of the Discussion Paper). However, the AER also notes that alternative versions of the weighted trailing average approach are possible, such as the approach proposed by the Queensland Treasury Corporation;

c. when a weighted trailing average approach (vis-à-vis the simple trailing average approach) should be applied; and

d. if a weighted trailing average approach is to be applied, whether there should be a true-up to account for differences between forecast and actual capital expenditure, and associated implications for implementation of the Capital Expenditure Sharing Scheme (CESS).

338. The AER informed us that it is seeking advice from the Eligible Experts on practical solutions to the problem it has identified, rather than theoretically perfect solutions that are impractical or too complex to implement.

3.2 Professor Johnstone's opinion

3.2.1 Trailing average schemes

339. This is an intractable problem illustrated by the 12 solid pages of different possibilities and their pros and cons devoted to it in the AER August 2025 Review discussion paper. The essential problem is simply that the NSPs borrow large sums, and potentially very large sums in the next few years, at market interest rates of the time and under contracts of different lengths, and then invest that cash in infrastructure at a rate of return on debt determined by the regulator. So how should a regulator set that rate?

340. To make the scheme work, there should surely be some matching between the rates at which the NSPs borrow and the interest rates they are allowed in return. In a free market, a business will borrow when it can earn a higher rate, so much higher that it compensates for the risk of the investment. In the case of regulated utilities, the NSPs have the same outlook but the rate of return and the risk associated with it are both affected by the regulator. So the regulator is entirely in the driving seat, thus warranting its deep concern with this issue and its lengthy discussion of the issues.

341. If we take a "cost of service model", the allowed rate should be linked as closely as possible to the borrowing rate, subject to scrutiny on the terms of loans taken on and their prudence. But just as obvious from another perspective, the interest rates allowed to NSPs should not bias their investment decisions to either under-or over-invest in terms of economic efficiency and the NSPs service obligations to consumers. The solutions proposed are all compromises between these two ends, and inevitable a matter for negotiation with stakeholders including the NSPs (whose positions will differ depending on when and how much they borrow or intend to borrow) and consumers (who do not want NSPs over-compensated).

342. If we were to apply the cost of service principle, and simultaneously hold to the finance principle that the firm always pays the market cost of debt - it "pays" either by refinancing or hedging to effect that rate or by a change in its market value of debt - the allowed rate should change continuously over time and the reward flowing to the NSP would be paid "at each instant" in continuous time. Realistically, however, the more rudimentary method of compensating the NSP for its cost of service is by payments based on today's debt level and a ten year weighted trailing average interest rate. That approach can be viewed as a way to track market rates but with a lag of up to ten years after the event and with no compensation for waiting.

343. Because of the lag, there are generalized proposals for an ex post "true up", adjusting individually for differences in the costs incurred by NSPs (including potentially interest rates) paid by and those allowed to be recovered by the regulator. A true up might apply at times where the allowed rate

"looks unfair" merely because the interest rates actually being allowed to NSPs differ markedly from those in the past ten year window. They will look "too low" during years when the current day's market rates (being paid currently by NSPs under existing long term debt contracts) are higher than in the previous ten years, and will look "too high" (too generous to NSPs) when today's rates are low.

344. The flip side is that in the ten year period that is now causing the problem, the stakeholder now most disaffected were likely the ones most satisfied. Specifically, when interest rates are now low but were previously high, the NSPs will be delighted with an allowed return based on the previous high rates. But in the earlier period where rates were high, they would have been very dissatisfied when being allowed rates calculated on the ten years before that. It could be argued that these periods of "winning and losing" will balance themselves out in the longer run, but that won't do much to console anyone and does not help to avoid the short term under- or over-investment problem.

345. There is no obvious answer, especially when consideration is given to the complexity and administrative burden of any complicated individualised NSP matching exercise. The best approach is perhaps to decide on a pragmatic fixed rule such as those put forward by the AER, basing the cost of debt built into WACC partly on previous years' rates (allowing for debt already in place) but most heavily on the most recent rates and today's rates, at which the NSPs are now borrowing. A ten year rolling average weighted towards the current year can be used for existing debt and the current "on the day" rate for all new debt raised, thus avoiding any incentive for current under or over-investment.

346. By giving previous years a part in the average, there is a pragmatic damping effect on volatility in the allowed rate, thus minimizing its volatility and hence the potential for bill shock. That is generally the rationale I think for what is suggested in the trailing average discussions by the AER and considerations of its various possible forms. Which exact form of this approach to apply is not something that can be solved objectively. Any measurement scheme will fall somewhere between measuring the NSPs "historical cost" of debt and making NSPs investment decisions answerable to current market rates. More elaborate schemes will be more costly and less transparent, and usually more arguable and administratively time consuming.

347. Part of the workability of any such scheme is that it should not be open to being reversed in periods when it most seems to fail or does not fit well with one or more NSPs borrowing patterns. If a scheme is agreed and locked in, the NSPs should then be free to hedge their debt and potentially profit without penalty. The potential for NSPs making hedging profits can serve as an alternative to implementing cumbersome "true up" provisions.

348. By committing to an agreed scheme for rewarding NSPs for their debt financing, NSPs will know where they stand in terms of their allowed cash flows from debt, and can take that as one certain element in their investment decision making. Coming back to the underlying issue, the regulator cannot rely on purely finance theory market based solutions because the issues here, specifically the NSPs return and the prices paid by consumers, are obviously driven by external forces like consumer demand, construction costs, technological changes, etc. but around those variables the rest is largely in the regulators' own court and must come down to finding a workable compromise that satisfies the overall regulator objectives facilitating sustained efficient investment for the long-term interests of consumers.

3.2.2 Capital cost true up

349. Since capital investments in infrastructure have construction and related costs that are hard to forecast, the proposal is to make ex post adjustments so that neither NSPs nor consumers are burdened by unexpected but often large over or under errors in forecast construction costs. The usual problem is under-estimation of costs. Cost overruns present a great risk to NSPs unless

there is an ex post compensatory re-assessment or "true up". The AER has asked how this should be done. In particular, how soon should the extra cost be allowed and hence how soon should it appear in consumer's bills?

350. My first reaction is that this issue is piquant because it highlights the circularity issue raised in my earlier comments on beta and the ROE. If we reduce NSPs cost overrun risk, we take away the priced idiosyncratic cash flow risk that is correctly embedded in higher beta, so a true up must mean a reduction in that risk and hence in beta. But rather than reducing beta once true up provisions are built in, one of the AERs suggestions is to conduct the true up by granted by an increase in the rate of return, thereby allow higher cash flows to the NSP to offset the higher incurred costs.

351. Any ex post true up mechanism contradicts a pure CAPM framework. If at the start of the regulatory period the regulator - doing what the CAPM stock market would do - assesses a higher forward-looking beta and higher rate of return due to NSPs forecasting risk, it can't then back away from CAPM after the event and hand back any unexpected outlay as if that risk was not allowed in beta. To do so is simply shifting to a simple cost of service reimbursement model.

352. This discussion comes back to the problem that the CAPM framework does not work coherently in regulation. That shows up whenever the regulator tampers with the NSPs cash flows in ways that change its forward looking beta, which happens every time a regulation or allowance is changed. We keep hitting the same question of how we should compensate NSPs for the forward-looking cash flow risk that we change every time we try to compensate for that risk.

353. While the CAPM framework does not apply coherently to regulation, but it does give valuable insights, one of which is that idiosyncratic cash flow risk is priced by real-world rational investors. We can use those insights while accepting that ultimately the NSPs allowed revenue stream will be set on pragmatic rather than pure foundations, incorporating where needed the most unavoidable consideration that without covering costs of service NSPs cannot exist. For that basic reason, it is obvious that at least some partial ex post compensation or "true up" for unforeseen construction costs is necessary.

354. The practical issue is how to do that. Equity would suggest that is needs to be either "immediate" in the current regulatory period or come later "with compound interest", probably at the risk-free rate (although the NSPs will say that their opportunity cost of capital is higher than that). Incentive schemes set up specifically to penalize the NSPs for forecasting errors are a separate issue, however they fit in a model of regulatory pragmatism by encouraging generally better forecasts and better cost management.

3.3 Mr Kumareswaran's opinion

3.3.1 The AER's identification of the problem and proposed solution

355. The AER has clarified to the Eligible Experts that when setting the allowed rate of return, its objective is to ensure that NSPs are provided with a reasonable opportunity to recover at least their efficient debt financing costs, so as to incentivise NSPs to invest prudently and efficiently. The simple trailing average may not achieve this objective in circumstances where an NSP is undertaking a significant capital investment program that necessitates the raising of large quantities of debt within a short period of time.

356. There are two key issues that should be considered:

a. Firstly, the simple trailing average approach assumes that an NSP refinances 10% of its benchmark debt portfolio annually. This assumption is reasonable for debt related to an NSP's existing RAB. However, an NSP undertaking significant new investment would have to raise large quantities of *new* debt—in addition to refinancing the oldest tranche of its

existing debt—at the prevailing cost of debt in the market, to finance its capital expenditure; and

b. Secondly, any new debt needed to finance new investment (i.e., over and above the existing debt that needs to be refinanced) must be raised at prevailing market rates. The NSP cannot go back in time and raise debt at the historical market rates used to calculate the trailing average allowance.[56]

357. There would be no problem with the existing regulatory approach if, at the time the NSP is raising large quantities of new debt to finance a major expansion, the prevailing market cost of debt aligns with the simple trailing average allowance. However:

a. If the prevailing market cost of debt is higher than the simple trailing average allowance, then the NSP would expect to recover *less* than its prudent and efficient financing costs under the simple trailing average approach. This may incentivise the NSP to invest less than the prudent and efficient amount; and

b. If the prevailing market cost of debt is lower than the simple trailing average allowance, then the NSP would expect to recover *more* than its prudent and efficient financing costs under the simple trailing average approach. This may incentivise the NSP to invest more than the prudent and efficient amount.

358. Neither of these outcomes (i.e., under- or over-investment) would promote the long term interests of consumers.

359. I therefore agree with the AER that the simple trailing average approach may not be fit-for-purpose when NSPs are undertaking large investment programs that would increase their RABs materially.

360. To address this issue, the AER has proposed what it refers to as a weighted trailing average approach.[57] At its simplest, the AER's approach involves:

a. Identifying the total quantity of new debt (over and above the existing debt that must be refinanced) required by the benchmark NSP in each year;

b. Setting the cost of debt allowance for that quantity of debt in the first year equal to the prevailing market cost of debt in that year; and

c. Allowing that 'rate-on-the-day' allowance in the first year to transition gradually, over a period of ten years, to a simple trailing average allowance.

361. At a high level, this proposed approach seems reasonable. It addresses the problem identified by the AER, in the sense that it sets the return on debt allowance for the full quantum of new debt (over and above the quantity of existing debt that needs to be refinanced), to be compensated, in the first year in which it is issued, at the prevailing market rate. This recognises that NSPs cannot finance significant new investment at historical market rates.

362. In my view, the key issues that need to be resolved relate to the implementation of the weighted trailing average approach. I address those implementation issues next.

---

[56] The AER has previously made a similar point. See: AER, Overall rate of return, equity and debt omnibus, Final working paper, November 2021, p. 94.

[57] The terminology 'weighted trailing average approach' may cause some confusion. The AER is not, as I understand it, proposing to calculate in each year the weights that should apply to each historical tranche of debt in the trailing average allowance. Rather, the AER simply proposes to recognise that 100% of any additional new (benchmark) debt issued in a year (i.e., over and above any existing debt that needs to be refinanced in that year) would be raised at the prevailing market rate. If the RAB is expected to grow in a particular year (e.g., because of new investment in that year), recognising that (a) 10% of the existing debt must be refinanced at the prevailing market rate and (b) all additional new debt must be issued at the prevailing market rate *will have the effect* of giving more weight to that year's prevailing market rate in the trailing average calculation.

3.3.2 Which transition?

363. Under the AER's proposed approach, the return on debt allowance for all new additional debt (over and above any existing debt that must be refinanced) issued by the benchmark NSP would be set as follows:

    a. For year 1 (the year in which the new debt is assumed to be raised), the total quantum of debt would be divided into 10 equal tranches:

        (i) 10% would be assumed to be financed at the 1-year rate;

        (ii) 10% would be assumed to be financed at the prevailing 2-year rate;

        (iii) And so on, with the final 10% assumed to be financed at the prevailing 10-year rate.

    b. In year 2 the tranche of 1-year debt would mature and be replaced with a new tranche of 10-year debt at the prevailing 10-year rate in that year;

    c. In year 3, the original tranche of 2-year debt would mature and be replaced with a new tranche of 10-year debt at the prevailing 10-year rate in that year;

    d. And so on, until by year 11 the final remaining tranche of the original debt would mature and be replaced by a new tranche of 10-year debt at the prevailing 10-year rate in that year. At that point the return on debt allowance for the original quantum of new debt issued in year 1 would have transitioned completely to a 10-year simple trailing average.

364. Whilst such a transition may be theoretically possible, it is overly complex. As the Discussion Paper notes, the debt transition proposed by the AER could involve "up to 55 overlapping debt tranches at any one time, each with its own benchmark rate of return and weight"—to transition debt raised to finance capital expenditure over a 10-year period.[58] Furthermore, some NSPs may be undertaking multiple such projects. The transition proposed by the AER would be even more complex for such NSPs.

365. The problem of complexity is not so much about the challenge of modelling the transition (although it is easy to see how any model the AER might develop to reflect its proposed transition could become unwieldy). The issue is that it is difficult to see how any NSP would, in practice, enter into such complicated financing arrangements. The transactions costs of issuing so many tranches of debt, perhaps over multiple projects, are likely to be prohibitive for most NSPs. It is therefore doubtful that any NSP would actually be able to match the regulatory allowance set using this approach.

366. An alternative, much simpler approach would be to apply the transition that the AER adopted when it first introduced the 10-year trailing average approach. Under that transition:

    a. For year 1 (the year in which the new debt is assumed to be raised) the NSP is assumed to issue a single tranche of 10-year debt at the prevailing 10-year rate to finance all its new capital expenditure requirements in that year. Hence, the return on debt allowance for year 1 would be set by giving 100% weight to the prevailing 10-year rate in that year;

    b. In year 2, the NSP is assumed to retire 10% of the debt issued in year 1 and issue a new tranche of 10-year debt (raised at the prevailing 10-year rate in year 2) to replace the debt that was retired. Hence the return on debt allowance for year 2 would be set by giving 90% weight to the prevailing rate in year 1 and 10% weight to the prevailing rate in year 2;

[58] Discussion Paper, p. 33.

c. In year 3, the NSP is assumed to retire another 10% of the debt issued in year, replacing that with a new tranche of 10-year debt (raised at the prevailing 10-year rate in year 3). Hence the return on debt allowance for year 2 would be set by giving 80% weight to the prevailing rate in year 1, 10% weight to the prevailing rate in year 2 and 10% weight to the prevailing rate in year 3;

d. And so on, until by year 11 the NSP would have transitioned completely to a 10-year simple trailing average.

367. My understanding is that this transition would be consistent with the approach proposed by the Queensland Treasury Corporation (QTC) during 2013 Rate of Return Guideline review, which was accepted by the AER.[59] As the AER has already implemented this transition successfully for all NSPs when it switched from the rate-on-the-day approach to the 10-year trailing average approach, the complexity associated with this transition is already well-understood by all stakeholders.

368. Given the AER's preference for pragmatic, rather than theoretically pure, approaches I recommend the AER apply the (simpler) transition it has already applied when it adopted the 10-year trailing average approach.

3.3.3 When should the weighted trailing average approach be applied?

369. The Discussion Paper proposes two options for determining the circumstances in which the weighted trailing average approach would apply:[60]

a. Option 1 – the weighted trailing average approach would apply to all NSPs, regardless of the size or timing of their debt raising; or

b. Option 2 – the weighted trailing average approach would apply to all NSPs that meet a certain trigger, such as a large increase in forecast debt funding needs. NSPs that do not meet this trigger would stay on the simple trailing average.

370. In my view, the choice between options 1 and 2 comes down to the administrative costs associated with applying the weighted trailing average approach. If the approach can be implemented simply, with low administrative cost, then it would be appropriate to apply the weighted trailing average approach to all NSPs. This is because, in my view, if implemented correctly, the weighted trailing average would produce a closer match between the regulatory allowance and the efficient financing costs of a benchmark NSP. The Discussion Paper makes a similar point:

> *The weighted trailing average approach provides a targeted way to improve the alignment between the return on debt allowance and benchmark financing costs for individual businesses, particularly where a business raises a large volume of new debt in a short period of time.*[61]

371. By contrast, the simple trailing average will produce mismatches between the regulatory allowance and the efficient financing costs of an NSP when:

a. The prevailing market cost of debt is either higher or lower than the simple trailing average allowance; and

b. The NSP raises a large volume of new debt within a short period of time.

372. As the AER has previously recognised, the incentives for NSPs to make efficient investments is best promoted when the allowed rate of return is set equal to the efficient financing costs faced by

[59] AER, Rate of Return Guideline, Explanatory Statement, December 2013, p. 120.

[60] Discussion Paper, p. 30.

[61] Discussion Paper, p. 32.

NSPs. Hence, it would be strictly preferable to apply the weighted trailing average allowance in all instances, provided that the administrative costs of doing so are relatively low.

373. If the AER determines that it would be administratively burdensome to implement the weighted trailing average approach (which I think is doubtful), then it would be reasonable for the AER to pursue option 2 above. The problem with this approach is that the trigger(s) for application of the weighted trailing average would necessarily be arbitrary.

374. Another drawback of option 2 is the scope for gaming by NSPs. If the trigger is a function of the capital expenditure incurred by NSPs, then an NSP would have an incentive to defer capital expenditure inefficiently (so as to not breach the threshold) in circumstances where the simple trailing average approach would result in a higher allowance than would the weighted trailing average approach.[62]

375. For example, suppose the AER specifies that the weighted trailing average approach would be triggered if the total amount of new debt raised in a single year is $250 million or more.[63] Suppose also that the AER maintains the current 60% benchmark gearing ratio. In these circumstances, the weighted trailing average approach would be triggered if an NSP incurs (or expects to incur) approximately $417 million or more.

376. An NSP would be incentivised to incur (or propose to incur) less capital expenditure than $417 million if the simple trailing average approach produced a higher allowance than the weighted trailing average approach. In those circumstances:

    a. If the NSP spends $417 million or more, it would receive the weighted trailing average allowance, which would match its efficient financing costs; but

    b. If the NSP spends *less* than $417 million, it would remain below the trigger and receive the simple trailing average allowance for every dollar of that capital expenditure. Since the weighted trailing average approach ensures a close match between the regulatory allowance and the NSP's efficient financing costs, the NSP would (by receiving the higher simple trailing average approach) enjoy a windfall gain in this case.

377. For this reason, and because I think that implementation of the weighted trailing average is unlikely to be complex (if the debt transition I suggest in section 3.3.2 above is adopted), I recommend that the weighted trailing average approach be applied to all NSPs.

3.3.4 Should the AER apply a true-up to correct for differences between forecast and actual capital expenditure?

378. The Discussion Paper considers whether a true-up should be applied to correct for differences between forecast and actual capital expenditure.

379. During the 2022 Rate of Return Instrument review, the AER consulted on the application of the weighted trailing average approach, where the effective weights used to determine the return on debt allowance would be determined by the forecast capital expenditure (and the associated benchmark quantity of new debt) accepted by the AER in a revenue determination.

380. The problem with this approach is that the precise amount and timing of capital expenditure — particularly for large, complex projects — can be highly uncertain. Furthermore, the AER's regulatory framework creates incentives for NSPs to defer capital expenditure if it is prudent and

[62] A similar concern was raised by Dr Martin Lally during the 2022 Rate of Return Instrument review concurrent evidence sessions.

[63] As proposed on p. 30 of the Discussion Paper.

efficient to do so. These things mean that there can be (often large) mismatches between forecast and actual capital expenditure in individual years of a regulatory control period.

381. The scope for large differences between forecast and actual expenditure may exacerbate, rather than reduce, the mismatches between the allowed return on debt and the efficient financing costs incurred by NSPs that the AER seeks to address through implementation of the weighted trailing average approach. In other words, implementation of the weighted trailing average approach could make the problem identified by the AER worse rather than better, due to the scope for significant forecasting error in relation to capital expenditure.

382. One way to address this problem would be to true-up, in an NPV-neutral fashion, the difference in the revenue allowance set using a weighted trailing average that reflects:

    a. forecast capital expenditure over the regulatory control period; and

    b. actual capital expenditure incurred by the NSP over the regulatory control period.

383. The Discussion Paper suggests that the such a true-up could move the regulatory framework towards cost-of-service regulation. The critical consideration is whether the application of such a true-up would diminish the incentives of an NSP to invest prudently and efficiently? To the contrary, I think that the application of a true-up would improve incentives for prudent and efficient investment by providing NSPs with a better opportunity to recover their prudent and efficient costs. This is because the (trued-up) allowance would more accurately reflect the timing and quantum of the *benchmark* debt issuance for the NSP.

384. Under a true-up, the return on debt allowance would continue to be set on a benchmark basis (i.e., using a benchmark term to maturity, a benchmark credit rating and assuming a benchmark gearing ratio). The allowance would not reflect the quantity of actual debt raised by the NSP to finance its investments, so would not be a pass-through of the NSP's actual costs.

385. Furthermore, a true-up would preserve incentives under the AER's CESS. The CESS provides incentives for NSPs to deliver efficiencies associated with its capital expenditure—for instance, by deferring or reducing capital expenditure when it is prudent and efficient to do so. There may be situations where it would be efficient to defer some capital expenditure. However, the NSP may be disincentivised from doing so if deviating from the forecast capital expenditure accepted by the AER in the NSP's revenue determination would result in a worse financial outcome (e.g., due to a mismatch between the regulatory allowance and its efficient financing costs).

386. An NSP would have weaker incentives to incur capital expenditure efficiently if doing so would result in it facing windfall losses, or if it would enjoy windfall gains as a result of pursuing a less efficient capital expenditure profile. The true-up described above would remove any such windfall gains or losses that might otherwise distort incentives for NSPs to pursue efficient capital expenditure decisions under the CESS.

387. The true-up would be straightforward to implement:

    a. First, the AER would calculate, for each year of a regulatory control period, the allowed revenue using a weighted trailing average rate of return on debt determined using its approved forecast of the NSP's capital expenditure over the period (call this the 'forecast revenue');[64]

    b. At the end of the period, the AER would look back and observe the actual capital expenditure incurred by the NSP. (The AER does this in any case to roll forward the NSP's RAB from one period to the next.) The AER would then recalculate what the NSP's allowance would have been over the regulatory control period if the AER had set a

[64] Note, it would be important to calculate the total revenue allowance, rather than just the return on capital allowance, because the return on capital allowance also affects the benchmark tax allowance for the NSP.

weighted trailing average rate of return on debt allowance that reflected the NSP's actual capital expenditure, rather than its forecast capital expenditure (call this the 'actual revenue'). For the avoidance of doubt, the difference between these two sets of figures is that the former would be determined using effective weights that reflect the NSP's forecast capital expenditure, whereas the latter would be determined using effective weights that reflect the NSP's actual capital expenditure. The actual revenue would not in any way include a pass through of the NSP's actual interest costs;

c. The AER would then calculate the difference between the forecast and actual revenue for each year of the current regulatory control period, and compound those differences forward to the end of the period using the allowed rate of return used to determine the actual revenue in the previous step; and

d. Finally, the AER would add up the compounded present value amounts, which may be positive or negative. The resulting figure would be used to adjust (i.e., 'true-up') the NSP's allowed revenue for the next regulatory control period.

388. This would be a relatively simple calculation to perform. Indeed, As I explain below, such a true-up could be implemented straightforwardly with some minor modifications to the existing model the AER uses to calculate CESS rewards and penalties. There would be no need to develop a separate true-up model.

389. The Discussion Paper notes that a true-up could interact with the CESS by reducing or duplicating the incentives provided by that scheme.

390. I agree that a true-up would have implications for implementation of the CESS.

391. The calculation of rewards or penalties under the CESS involves four steps:

a. Calculate efficiency gains and losses (i.e., the difference between allowed and actual capital expenditure) in present value terms, as at the end of each regulatory control period. This is done for each year of the regulatory period and then the present value of total efficiency gain/loss is calculated for the regulatory control period;

b. Apply a sharing factor to the total efficiency gain/loss to calculate the NSP's share of the gain/loss (i.e., the NSP keeps/bears a certain proportion of the present value of capital expenditure under/overspend during the regulatory control period);

c. Calculate financing benefits/costs that accrue through the regulatory period—namely, the difference between the return on capital allowance on the NSP's forecast RAB and actual rolled forward RAB over the regulatory control period. If the NSP incurred less capital expenditure than it had been allowed by the AER, it would have received a higher return on capital allowance than it actually needed (i.e., a financing benefit). Conversely, if the NSP incurred more capital expenditure than it had been allowed by the AER, it would have received a lower return on capital allowance than it actually needed (i.e., a financing cost); and

d. Calculate the CESS reward/penalty by subtracting the financing benefit/cost that has accrued over the regulatory control period from the NSP's share of the total efficiency gain/loss.

392. A true-up could have implications for the implementation of the CESS in two ways.

393. Firstly, a discount rate is required to express the total efficiency gain/loss in present value terms at the end of the regulatory control period. The AER currently uses the allowed rate of return for each year of the regulatory control period to perform this calculation, on the grounds that this

reflects the NSP's cost of capital. If the AER adopts a weighted trailing average approach, it would need to consider whether to use:

a. the allowed rate of return determined using the NSP's forecast capital expenditure (call this the 'rate of return reflecting forecast weights'); or

b. the allowed rate of return determined using the NSP's actual capital expenditure (call this the 'rate of return reflecting actual weights').

394. In my view, since the latter more closely reflects the cost of capital of a benchmark NSP incurring the capital expenditure of the NSP being regulated, the AER should use the rate of return reflecting actual weights to convert the efficiency gains and losses over a regulatory control period into present value amounts.

395. Secondly, the calculation of financing benefits/costs in the CESS could be modified slightly to implement the true-up itself. Recall that, currently, the financing benefits/costs to an NSP in any given year within a regulatory control period is calculated as the difference between:

a. The return on forecast capital expenditure (i.e., allowed rate of return × forecast capital expenditure); and

b. The return on actual capital expenditure (i.e., allowed rate of return × actual capital expenditure).

396. Notice that the same rate (i.e., the allowed rate of return for the year in question) is used to calculate both the return on forecast capital expenditure and the return on actual capital expenditure.

397. The true-up could be implemented easily by making two minor changes to the calculation of financing benefits:

a. Instead of calculating the return on capital expenditure, the CESS would calculate the return on the NSP's total RAB. This would be recognise that under the weighted trailing average approach, the existing RAB continues to attract the simple trailing average return on debt allowance, whereas new capital expenditure attracts the rate-on-the-day allowance in the first year and gradually transitions to the simple trailing average allowance over ten years.

b. The rate of return reflecting forecast weights is applied to the forecast RAB, and the rate of return reflecting actual weights is applied to the actual RAB.[65]

398. In other words, under the modified CESS, the financing benefits/costs to an NSP in any given year within a regulatory control period would be calculated as the difference between:

a. The return on the forecast RAB (i.e., allowed rate of return reflecting forecasts weights × forecast RAB); and

b. The return on the actual RAB (i.e., allowed rate of return reflecting actual weights × actual RAB).[66]

399. These would be relatively simple changes to make to the CESS model, and would obviate the need for a separate true-up model. I do not think that any of these proposed changes would weaken or duplicate the incentives created by the existing CESS.

---

[65] By 'forecast RAB', I mean the RAB reflecting the forecast capital expenditure allowed by the AER, which the AER uses to set the allowed return on capital for a regulatory control period. By 'actual RAB' I mean the RAB that would obtain by replacing the allowed capital expenditure for a regulatory control period with the actual capital expenditure incurred by the NSP over that period.

[66] Note that, consistent with the current RAB roll forward model, the actual RAB would reflect forecast, rather than actual, regulatory depreciation.

3.4 Associate Professor Partington's opinion

3.4.1 Trailing averages and an incentive mismatch

400. During the AER's Concurrent Evidence discussion of 2022 I made the point that as interest rates started to rise, a likely problem with the trailing average (equally weighted) cost of debt would be NSPs going on a capital strike.[67] As I discuss later, this problem was also raised by Partington and Satchell (2016). I claim no great insight or predictive power in this matter. It is blindingly obvious that an equally weighted trailing average provides an incentive for underinvestment when the trailing average is below the current cost of debt and an incentive for overinvestment when the trailing average is above the current cost of debt. This will be true for any weighted trailing average that does not reproduce the current cost of debt. As long as a trailing weighted average continues to be used problems will recur.

401. The underinvestment problem is now a cause for serious concern given a requirement for a substantial expansion of the RAB. It is widely agreed that substantial additional investment in transmission NSPs is required to connect renewable energy sites to the East coast network and to handle large projected increases in demand for electricity. There is also an ongoing need for maintenance which naturally increases as the network gets bigger. Consistent with NEO and NGO objectives new investment will contribute to a reduction in greenhouse gas emissions and reduce the risk of disruptions to supply. The AER express the problem as in the Discussion Paper as follows:

> *Major transmission projects being delivered under the Australian Energy Market Operator's (AEMO) ISP are driving large, lumpy capital programs for several NSPs. These investments often require significant volumes of debt to be raised over short time periods, rather than following the simple trailing average assumption that around 10% of debt is financed each year at prevailing interest rates.*
>
> *When interest rates move materially over time, this mismatch in timing can result in over- or under-compensation. In these cases, the simple trailing average may no longer provide an efficient or accurate estimate of the return on debt for new investment.*[68]

402. I agree with this statement, with the exception that I doubt that the simple trailing average from 2014 to date has ever provided an efficient or accurate estimate of the return on debt for new investment. And I expect it is very unlikely ever to do so.

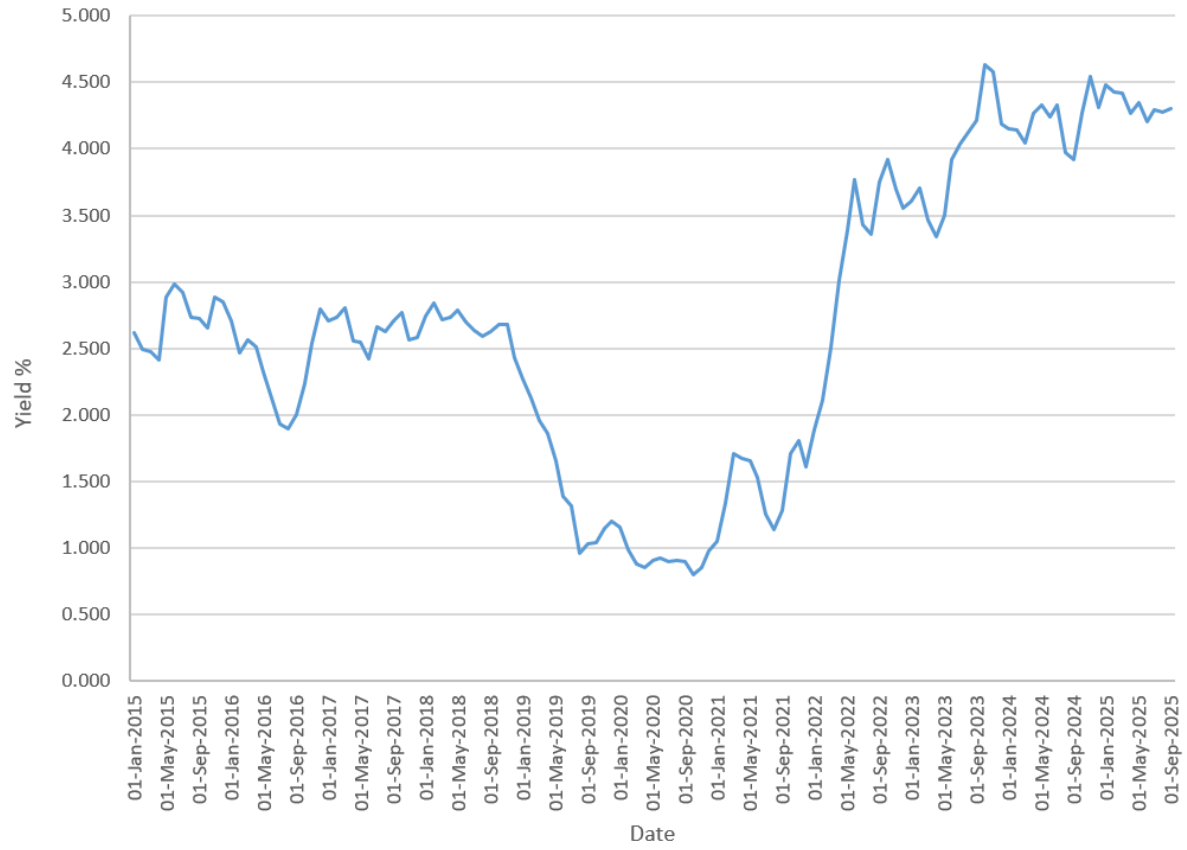
403. The risk of a capital strike is of concern because a material rise in interest rates has occurred at a time when substantial expansion of the regulated asset base (RAB) has become desirable. Figure 6 below shows the monthly 10 year government bond yield from 2015 to the present.

404. It is clear from Figure 6 that for most of the last ten years the 10-year bond yield has been below 3%. In 2019 the rate dropped sharply and remained low until 2022. In 2022 the rates rose sharply and settled at levels above 4%.

[67] By capital strike I did not mean a complete cessation of investment. Rather firms will be reluctant to investment, some investments will not be made and there will be substantially less than the optimal level of investment.

[68] Discussion Paper, p. 21.

Figure 6: 10-year bond yield



Source: RBA Statistical Tables.

Effect of higher interest rates

405. The recent rise in yields gives a higher return to the NSPs via an increase in the risk-free rate used to determine the cost of equity in the CAPM, but it also signals a rising interest rate regime and higher costs for corporate debt. As a result, the current cost of NSP debt will be higher than the equally weighted trailing average cost of debt. This is because most of the observed rates going into the calculation from the last ten years are drawn from the lower interest rate regime.

406. The good news for NSPs is a higher allowance for the cost of equity, but the bad news is a lower allowance than the current cost of debt. This latter is significant as under the AER's regulatory approach the cost of debt is weighted at 60% in the weighted average cost of capital calculation, so debt is assumed to fund the majority of the RAB. Consequently, a lower cost of debt relative to the current cost is likely to have a significant downward impact on the allowed ROI, relative to the cost at which NSPs are raising capital to fund new investment. It also means that the allowed ROI is below the opportunity cost of capital. Thus, there is a disincentive to new investment and unfortunately it arises at a time when a substantial increase in investment is considered desirable, or even essential.

407. The effect of observations from the lower interest rate regime will continue for several years. Consequently, if the higher interest rate regime persists, which seems likely,[69] there will be a continuing disincentive to investment. The conditions for a capital strike are clearly there. The

[69] It seems unlikely that we will soon return to the exceptionally low interest rates of the Covid crisis., with a cash rate of 0.1 % at the lowest point. There are expectations of some further reductions in the cash rate, but medium term expectations are for a cash rate at, or somewhat above, 3%. If we based our expectations on the long run average cash rate than we would expect a cash rate in excess of 4% longer term.

difficulty is in assessing the precise probability of occurrence, the likely magnitude, and the cost of a capital strike relative to the cost to consumers of moving away from an equally weighted trailing average.

The AER's problem and a solution

408. The problem for the AER is to ensure that the desirable investment occurs without gold plating, without excess returns to NSPs, and while promoting efficiency and the long term interests of consumers. I suggested a solution to this problem at the Concurrent Evidence discussion of 2022. That solution is to go back to the on the day determination of the cost of debt. This gives a WACC that reflects the current opportunity cost of capital. This is the required return for an investment as determined by the capital market. Historic interest rates have no role in determining this cost of capital.

409. The use of the opportunity cost of capital as the allowed ROI would have the advantage that the resulting NPV of investment is zero, thus encouraging neither too little nor too much investment, and avoids excess returns to NSPs. It also provides a proper computation of the WACC that reflects its substance as well as its form. This also avoids the need for specification of efficient financing practice.

410. The specification of efficient financing practice is an impossible task, since the unambiguously correct criteria for determining efficient financing a priori are not known. Indeed, a solution to this conundrum would probably be worthy of a Nobel prize. Instead, a Nobel Prize was given Merton Miller, famous for the debt irrelevance proposition that leverage does not matter to firm value. At least under the assumptions of the paper that Miller and Modigliani wrote, it would be fair to say we know one thing about efficiency, leverage does not matter. This is because the consequent to the work of Miller and Modigliani, we know that the plain vanilla WACC is a constant independent of leverage. However, the AER computes a plain vanilla WACC that represents a WACC in name only. As a result of the AER's use of a trailing average cost of debt their WACC will depend on leverage.

Fundamental problems with trailing averages

411. Partington and Satchell (2016, pp15-17)[70] in a report to the AER advise against specifying efficient financing practices and it is worth quoting their comments in full as they directly bear on the current problem.

> *In particular we recommend against interpreting the efficient financing costs as relating to some assumed financing strategy. For example, the trailing average approach for the cost of debt, or costs of debt actually incurred by regulated businesses. There are several reasons why we recommend against this.*
>
> *First, by definition, present values and net present values should be calculated using the opportunity cost of capital to give the right incentives with respect to investment. For debt the opportunity cost of capital is the current return on debt in the capital market. Second, as we subsequently explain, it is fundamentally the assets that determine the required rate of return, rather than the portfolio of securities that have been issued by the firm. Third, as we also subsequently explain, what constitutes benchmark efficient financing practices is ambiguous. Fourth, there is likely to be conflict with the stated desirability under the NER of having consistent estimates that are common to the cost of equity and the cost of debt. Fifth, because the WACC is no*

[70] G. Partington and S. Satchell, 2016, *Report to the AER: Cost of Equity Issues 2016 Electricity and Gas Determinations*, Report for the Australian Energy Regulator.

longer the opportunity cost of capital we lose the property that the plain vanilla WACC is a constant independent of leverage. Lastly, it can easily be demonstrated that taking a specific financing policy and using historic costs as the efficient financing costs can lead to undesirable results.

Let us demonstrate the last point. Suppose that the regulatory period is about to start and we have recently entered a high interest rate regime. The current interest rate for BBB+ debt is 11%. We emphasise that this is not an abnormally high interest rate relative to rates in recent decades. Also suppose that in the previous low interest rate regime some regulated businesses were sufficiently prescient to lock in low rates by issuing fixed rate debt with long maturities, at close to the minimum rate over the low interest regime. Other businesses that did not lock in the low rates with long maturities have substantial refinancing to undertake over the next five years.

The result for those businesses that locked in the low rates is that they now have debt with a 5% YTM, an average term to maturity of 11 years, and very little debt maturing in the next five years. If the objective is to maximise the value of equity, then locking in the low rates has turned out to be a very efficient financing practice. Therefore, let us take this to be the financing practice of the benchmark efficient entity. Thus 5% becomes the allowed cost of debt in computing the regulatory WACC.

Suppose that the current cost of equity is 15%, with the cost of debt at 5% and the regulatory weight of 60% debt this gives a regulatory WACC of 9.0%. The current WACC at market rates (the opportunity cost of capital) is 12.6%. If you invest to earn a return of 9%, when the market requires 12.6% the value of your business is going to fall. Thus, there is a substantial incentive for under-investment in regulatory assets. We doubt that any of the regulated businesses would express satisfaction with this regulatory outcome and it could be quite problematic for those businesses that have to undertake substantial refinancing during the regulatory period. Borrowing at 11% while only being allowed a cost of debt of 5% could lead to financial distress and is likely to give rise to calls for regulatory relief.

The required return and the trailing average

412. There are widespread misconceptions about the role of financing in determining the cost of capital. Therefore, it is important to be absolutely clear that the financing of the firm is not the causal variable in determining the firm's cost of capital.

413. The objective in the on the day approach is to compute the current required rate of return on the assets. This is determined by the nature of the cash flows from the assets. The NSPs can finance the assets however they like. The causal variable determining the required rate of return is the risk of the assets, not how they are financed. The use of the returns on financing in computing the WACC is merely a measuring device which is used as a proxy for trades in the assets. The use of the trailing weighted average cost of debt completely breaks this nexus between the cost of financing and the return required on the assets. As a result, the AER's WACC is not appropriate for present value calculations, thus is it not appropriate as a benchmark for investment decisions.

414. Provided the regulator correctly estimates the current required rate of return the decision on the allowed revenue will be value neutral under the on the day approach. In contrast the use of a trailing weighted average cost of debt will almost certainly never give a value neutral outcome. It will be value positive when interest rates start to fall from a previous higher level and it will be value negative when interest start to rise, as currently. These effects are compounded by the incentives to overinvest and underinvest respectively.

Why the trailing average?

415. It is instructive to consider some of the driving forces leading to the adoption trailing weighted average approach. At the time the move to a trailing average was first mooted, there was continuing complaint from some NSPs about the difficulties of hedging the cost of debt under the on the day approach.[71] Also, shortly following the GFC a trailing average was attractive to NSPs as the debt allowance in new determinations would be greater due inclusion of the substantially larger interest rates that had prevailed before the GFC. The trailing average cost of debt was also expected to increase stability in prices relative to the on the day approach, resulting in more stability (less risk) in expected cash flows. In turn this should increase the value of NSP assets.

416. The expectation of more stable prices was also attractive to consumers.[72] This simplifies budgeting and minimises the shocks of adjustment to spending when prices rise.[73] As I recall price stability was also favoured by electricity retailers. This is understandable as greater stability in prices facilitates setting offers for consumers, planning, budgeting and performance assessment, the latter three are also benefits for NSPs.

3.4.2 The efficiency of the AER debt allowance

417. The AER has an objective of encouraging efficient financing. With respect to debt, they state in the Discussion Paper that the objective is:

> *reduce the difference between the return on debt and the return on debt of a benchmark efficient entity*
>
> *provide NSPs with incentives to engage in efficient debt financing practices, which would support efficient investment; and*
>
> *give NSPs a reasonable opportunity to recover at least their respective efficient debt financing costs.*[74]

418. The AER attempts to achieve this by setting a benchmark for "efficient" debt financing, which currently is the ten year equally weighted trailing average. A fundamental problem with this is that it is not known what constitutes efficient financing.

419. Efficient financing comprises both strategy and tactics and we still have much to learn. To quote Myers (2001, p. 82):

> *We know much more about financing tactics—for example the tax-efficient design or timing of a specific security issue—than about financing strategy, for example the firm's choice of a target overall debt level.* [75]

420. A ten year equally weighted average represents a feasible pattern of financing, but I doubt that it is exemplar of efficient financing. An obvious tactic is to exploit the divergence between the return allowed and current interest rates when those current rates are below the trailing average. The data below indicates that the NSPs have successfully employed this tactic since the trailing average

---

71 Our (Partington and Satchell) response to this was that hedging was an optional choice, not a requirement. Indeed, some NSPs chose not to hedge.

72 In discussions by the experts, it was noted that one motivating factor for change was complaints by consumers that regulatory determinations pre GFC had led to prices post GFC being based on interest rates that were far higher than current rates.

73 Due to the diminishing marginal utility of consumption, a rise in prices represents a bigger loss of utility than a price reduction of the same magnitude.

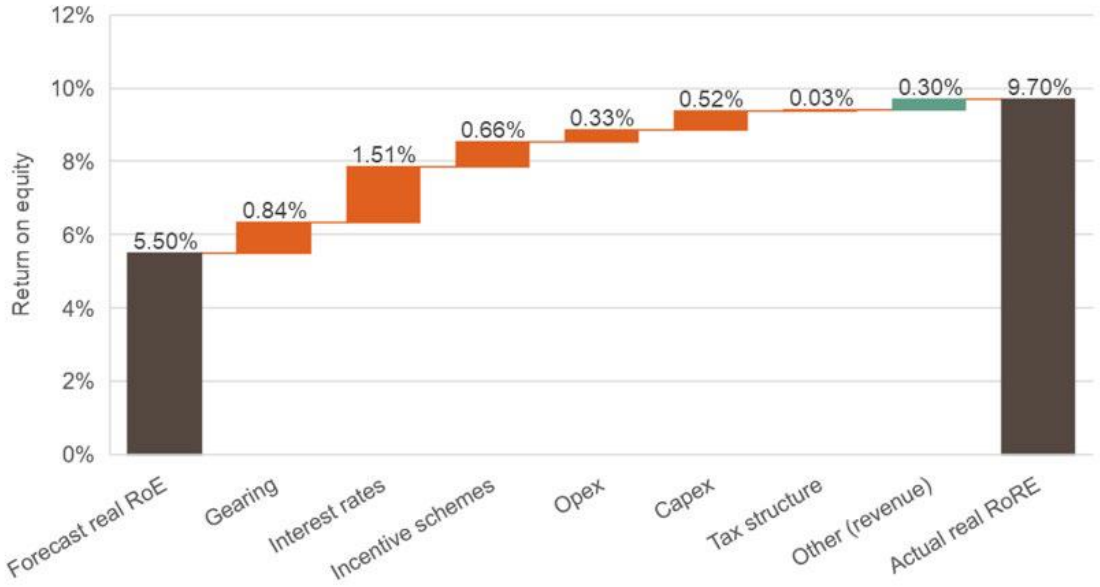
74 Discussion Paper, p. 20.

75 Myers S., 2001, Capital structure, *Journal of Economic Perspectives*, 15, pp.81-102.

was introduced in 2013. Therefore, I suggest that calling the trailing average cost of debt an efficient benchmark is most kindly described as somewhat optimistic.

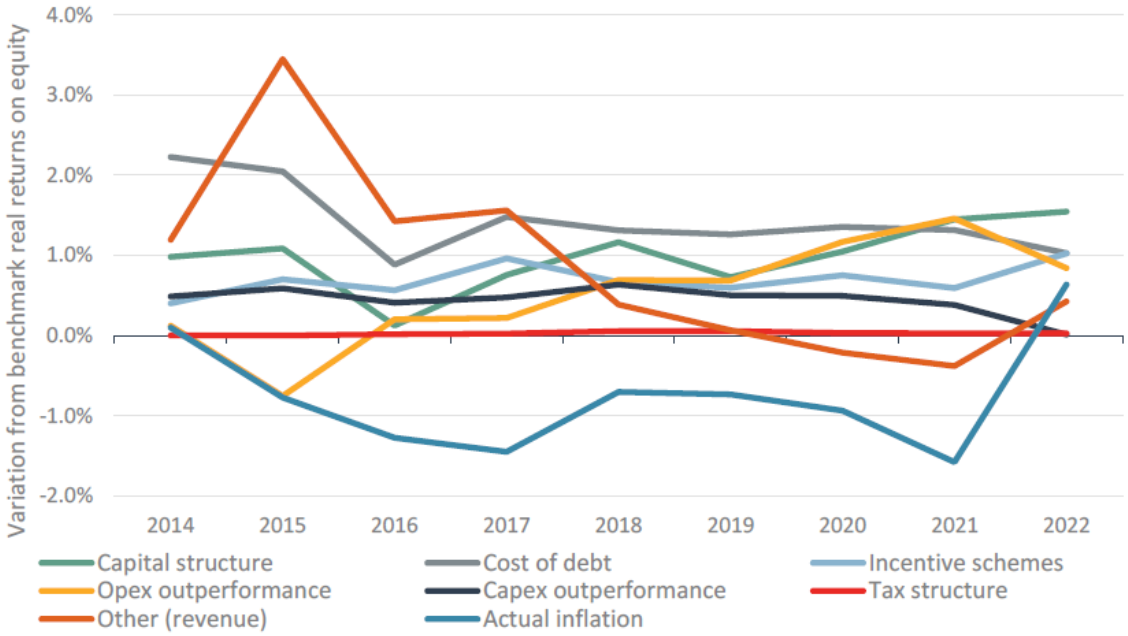
421. The data in Figure 7 suggests that the NSPs did particularly well out of the trailing average in 2021. Out of a 4.2% difference between the actual real return on equity and the forecast real return on equity, 1.5% was due to outperformance on interest. This was a much larger effect than any of the other areas of outperformance. Of course, 2021 was part of the very low interest rate regime and so considerable outperformance was to be expected. However, the time series of sources of outperformance in Figure 8 shows that 2021 was not unusual in its outperformance on interest. The cost of debt (the grey line in Figure 8) was a major source of outperformance in every year and the best source of outperformance in several years. As a finance benchmark it seems the trailing weighted average was very easy to beat from its introduction in 2013 through to 2022.

Figure 7: Analysis of sources outperformance for the return on equity in 2021



Source: Electricity NSP performance report AER 2021.

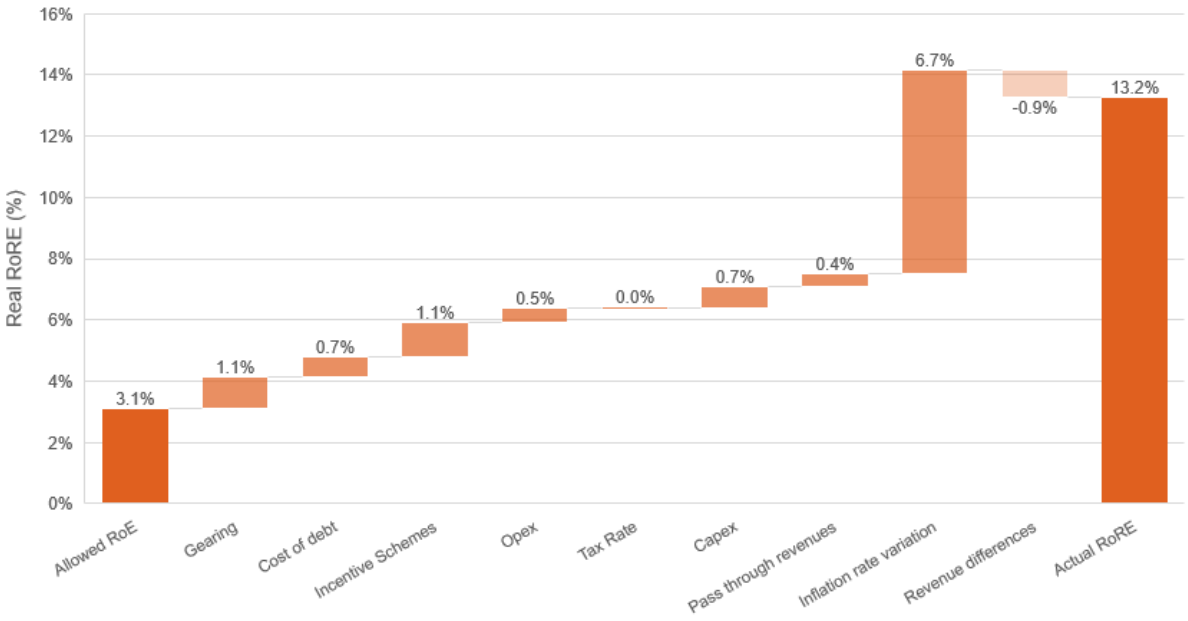
Figure 8: Contributions to real returns on regulated equity – NSP simple average



Source: Electricity NSP performance report AER 2023.

422. However, in 2023 there was noticeable drop in the outperformance on interest as Figure 9 shows. This followed a sharp rise in interest rates in 2022 as the market switched to a higher interest rate regime. Thus, it would be expected that the gap between the trailing average and the current interest rate would narrow, and outperformance would become more difficult. So, as the benchmark tightens, we are understandably seeing calls for change.

Figure 9: Detailed contributions to real RoRE - electricity NSPs - 2023



Source: Electricity NSP performance report AER 2024.

423. The magnitude and persistence of outperformance from 2014 onwards is somewhat surprising, even given that the equally weighted trailing cost of debt should have been easy to beat over this

period.[76] It would be instructive to see a breakdown of the sources of outperformance. One of which would be the credit spread.

424. Early analysis of the credit spread by the AER suggested that from 2014 onwards there was consistent outperformance of the credit spread of new issues of debt by privately owned NSPs, relative to the AER credit spread. However, it appears that much of this outperformance was illusory. Hird (2022)[77] reports the result of a subsequent revision by the AER resulting in an average difference of only 4 basis points of NSP overperformance, tenor weighted. Hird also reports his own analysis with an average of NSP underperformance of 1 basis point tenor weighted. So, it seems that credit spreads may not be a significant contributor to the outperformance in Figure 8.[78]

425. If outperformance is not due to credit spreads, then this suggests that the outperformance is Figure 8 arises from a lower base rate. This would be unsurprising under the trailing average approach.

426. Based on the foregoing results, consumers might reasonably ask, have we been paying too much due to an overly generous allowance for the cost of debt? I would reasonably ask can we really be confident that the ten year equally weighted average, or some reweighted variant is an efficient benchmark? I think it more than likely that the answer is no. In which case it is not clear how the AER can be confident of achieving the efficiency objectives listed above. I also observe that no company operating in a competitive market gets a guarantee of earning the historic cost of debt.

Fairness to consumers

427. More stability is synonymous with reduced risk. A decrease in risk leads to a lower discount rate, thereby increasing the present value of future payment liabilities for consumers, while increasing the value for NSPs of the asset represented by the present value of payment receipts. Consequently, an increase in price stability results in a transfer of wealth from consumers to NSPs. Most consumers are likely to be unaware of this wealth transfer,[79] but it is there nonetheless. Greater stability in their payment liabilities also represents a wealth transfer from retailers to NSPs.

428. Consumers pay for stability via a wealth transfer and to date there has been another cost to consumers. That is the extra cumulative cost that consumers have borne from the divergence between costs that would have applied from on the day approach and higher costs actually incurred under the trailing average approach.[80] Given that a one percent difference between allowed and actual interest costs on a RAB of $100 billion, is 600 million dollars a year, then the cumulative costs to consumers are likely to have been substantial. It would be interesting to know the exact cost and how much stability in prices arose from the use of the trailing average relative to the on the day approach. Given this data a comparison of costs and benefit would be possible.

429. When there is a shift to a higher interest rate regime, there should be a cost saving for consumers using the trailing average, relative to the on the day approach. I have previously stated that fairness to consumers required that when the switch to a higher interest rate regime occurred the

[76] In considering the outperformance remember that in relates to the return on equity. The proportion of equity will vary across NSPs, but notionally it is 40% of the RAB. Also remember that these are real returns, the nominal returns would be larger.

[77] T. Hird, 2022, Use of industry debt data Hird presentation to expert conclave.

[78] I have not yet carefully studied the AER credit spread comparisons. If as I expect the comparison is based on contemporaneous credit spreads, then this is not informative about the credit spreads from the trailing average cost of debt.

[79] Most consumers are unaware of the wealth transfer because most of do not have a good understanding of present value calculations and also because the effect per capita is probably quite small.

AER would need to hold the line on the continuing use of the trailing average (equally weighted). I also noted that this would be likely to be challenging and so it has turned out to be.

430. The issue of fairness also came up in the AER's Concurrent Evidence discussion of 2022, when I advocated a return to the on the day method. I was asked a question by a board member to the effect of what would be fairest for method consumers, my response was: stick with the existing trailing average. My view has not changed. Without compensation, moving away from the equally weighted trailing average will not be fair to consumers. The question for consumers is whether a capital strike will damage their long run interests by more than the cost savings they will currently receive from sticking with the equally weighted trailing average.

3.4.3 Alternative solutions

Solution 1

431. In the light of the foregoing discussion, it should be clear that my first solution is to go back to the on the day approach. This will give the opportunity cost of capital which has many advantages as discussed earlier.

432. When past interest rates differ from current interest rates there will be gains or losses arising from the interest rate changes. These gains or losses are incorporated into the market value of debt and equity at the time the interest rates changed. These changes involve wealth transfers between debt holders and equity holders.

433. Such value changes are not a consequence of regulatory decisions about the cost of debt. Regulatory decisions about the allowed cost of debt do affect future cash flows and so can directly affect the value of equity. Such decisions are unlikely to have much, if any, effect on the value of debt unless they have such a large effect on cash flow that they are likely to lead to a rating change.

434. I suspect that a desire for regulatory stability, forces of inertia, and the difficulties of reversing policy including a need to transition back to the on the day approach, will lead to reluctance to shift from a historic cost approach of a trailing average.

435. The question I pose, however, is that given current risk of underinvestment which is more important boosting investment, or maintaining price stability via a trailing average?[81] Also, the more weight that is given to recent and current interest rates in a weighted average, the closer you move to the on the day approach and the further you move from price stability.

Solution 2

436. Alternatively, apply the trailing equally weighted average to the existing RAB and use the on the day rate for new investment. This gives the correct rate for the new investment, overcoming reluctance to invest, and compensating NSPs for actual current debt costs. This has similarities to the QTC approach, but without reversion to an equally weighted trailing average.

437. It gives higher costs to consumers in the high-interest rate regime but lower costs in the low-interest rate regime. There will be some reduction in price stability relative to the equally weighted of the trailing average. However, higher prices for consumers arise with a reweighting of the trailing average to give greater weight to current higher interest rates and also you get less price stability. Plus, you get all the disadvantages of a trailing average.

438. If the current cost of debt is allowed with respect to the new investments in the RAB, the reduction in price stability will be relatively small at first but will become larger as more of the RAB becomes subject to the on the day cost of debt. However, before this becomes a major issue it will likely be

[81] I note that the extent of resulting price stability seems to be an unknown quantity.

time for the next four-year review, or the one after that. This will give an opportunity to determine whether any increase in price volatility has been significant and if so, what might be done to dampen that volatility.

Solution 3

439. Another option is to reimburse the actual debt costs of NSPs subject to a reasonableness cap. One suggestion is a cap equal to the allowance that would have been provided under the on the day approach, although some other reasonableness test would be possible. For example, matching with costs of other similar issues.

440. The on the day cap has the advantage for consumers that they will never be worse off than under the on the day approach and may be better off. Ex-post consumers would have been substantially better off had the NSPs been reimbursed for their actual interest costs since 2014, whether or not a cap applied. Ex-ante firms might not have tried so hard to control their debt costs, hence the need for a cap.

441. For NSPs a change in market interest rates will cause the market value of debt to change for fixed rate debt. This will create wealth transfers between shareholders and debt holders. If unhedged, an on the day cap would create an additional wealth effect, with shareholder wealth gains as interest rates rise, since expected cash flow rises, and vice versa as interest rates fall.

442. NSPs might prefer the recovery of their debt costs subject some other reasonableness limit. An incentive to minimise debt costs could be provided by allowing the NSPs to benefit from some fraction of the difference between the actual debt cost and the reasonableness limit. However, such a limit would need to be tightly set.

443. For what it is worth, allowing actual costs subject to a reasonableness test is consistent with regulation in America. There, across multiple jurisdictions, I understand the tendency is to allow the actual costs of debt subject to a reasonableness check. I provide details of the US reasonableness tests in Box 1 at the end of my discussion.

Solution 4

444. Another more radical solution is not to use the cost of debt at all, just use the asset beta. Once the asset beta has been determined plug it into the CAPM and this gives you the plain vanilla WACC. There is no need to consider the cost of debt. This approach has the advantage of being straightforward, avoids the relevering step, and is conceptually correct.

445. The one disadvantage is to do with measurement. Equity betas are measured with error; asset betas may incorporate additional measurement error from the unlevering process. In contrast the yield on debt can be measured relatively accurately. Strictly speaking this is not the value you require, but at least it can be somewhat accurately measured. Using the yield as the cost of debt has an advantage for NSPs in that it is the promised cost of debt, which is higher than the expected return of debt, as would be given by the CAPM.

446. The use of the asset beta approach would effectively be a return to the on the day approach. Thus, we have a somewhat different model and a return to the on the day approach combined. It is an implementable solution. However, given a desire for regulatory stability, I expect this to be a bridge too far.

3.4.4 Debt rating

447. In the AER's Discussion Paper there is mention of Transgrid's concern about a ratings downgrade. With large capital expenditures, and an allowed cost of debt that does not match the current cost

of debt, this is a valid concern. As is concern about revenue shortfalls in the absence of a true-up process.

448. However, a rating change for NSPs is unlikely to occur suddenly out of the blue. Advance guidance on changes is ratings is provided by ratings agencies. Some are longer term, say one to two years as in S&P's rating outlook, or shorter term perhaps six months as in S&P's credit watch. Thus, the AER will get significant advance warning of threats to NSPs rating grades.

449. With specific reference to Transgrid, on 16 September 2024, S&P released a rating notice for Transgrid's NSW Electricity Networks Finance Pty. Ltd. (TG-OG) with a BBB rating, and the outlook was stable. The accompanying commentary notes that the Transgrid group is expected to retain an investment grade profile. However, specifically with respect to TG-OG the commentary states:

> *We could downgrade the rating on TG-OG if its FFO to debt stays below 6.5% for two years without any corrective action to restore it. This could happen if there are no timely shareholder measures to support the metrics or if there is inadequate regulatory compensation for large projects, thereby exposing TG-OG to weaker metrics.*

450. So, TG-OG is not BBB+ but is investment grade. No change to credit rating appears imminent but might happen two years or more down the track. Thus, there would via outlook or credit watch notices be time to consider regulatory relief, such as accelerated depreciation, or increased revenue allowances.

451. It is unclear what S&P consider to be adequate compensation for large regulatory projects, but presumably the objective of the AER is to provide adequate regulatory compensation for all projects. Except that the use of the equally weighted trailing average cost of debt can fail to do this when interest rates start to rise.

452. As the S&P quote makes clear there are alternatives to regulatory relief, in this case timely shareholder measures. Partington and Satchell (2016)[82] have previously observed:

> *We would, however, question an automatic assumption that regulatory action was necessary. It is not at all clear that passing the cost of credit downgrades on to consumers is in the long-term interest of consumers. It can also have perverse consequences for incentives. We recall a comment in a credit agency report to the effect that utility defaults/bankruptcies were very infrequent and that when they occurred, they tended to be strategic. That is, their purpose was to seek regulatory relief.*[83]

Thresholds

453. An issue for the AER is whether to apply any changes in the allowed cost of debt to all NSPs or only to NSPs passing some threshold of capital expenditure. The advantage in the threshold approach is that it focuses on the cases where the problems with the equally weighted trailing average are most severe. However, this raises the question of where the threshold should be set. It is doubtful that there is any objective basis to determine the optimal level. So, this requires the AER to exercise its regulatory judgement. I expect it would do this judiciously. However, the result would to some extent be arbitrary.

454. The more serious problem is the potential for gaming. When the change in the allowed cost of debt results in an allowance below the current cost of debt, the incentive is to defer investment to stay below the threshold and vice versa.

[82] G. Partington and S. Satchell, 2022, *Report to the CRG: AER Cross Checks.*

[83] Partington and Satchell, 2022, pp. 22-23.

455. Unless the cost of applying the change to all NSPs is very large, then I favour no threshold. The potential arbitrary element and more importantly the opportunities for gaming should be avoided if it is cost effective to do so.

True-up measures

456. True-up measures will move the debt costs allowance even more to a cost of service recovery model. However, one of my options, under alternative solutions, was cost recovery subject to a reasonableness test. Thus, if historic costs are going to be used, it is not so much cost recovery that worries me as getting the benchmark for reasonableness sufficiently tight. The trailing average has a poor record so far as a tight benchmark.

457. A true-up has the desirable feature of avoiding penalising forecast errors that are unavoidable while reducing incentives for gaming of forecasts. Given large and complex projects it is to be expected that there will be significant errors in the forecast magnitude and timing of capital expenditures.[84] I agree with the AER's observation that the true-up will reduce the risk of over or under compensating businesses due to forecast errors in their capital expenditure plans. In my opinion this is desirable. It also helps address the concerns that Transgrid has expressed.

458. An advantage of rolling true ups, applied as part of the annual return on debt upgrade, is that it reduces the importance of present value adjustments. Another advantage of true ups at shorter durations is the general principle that more frequent audits are more likely to induce compliance.

459. On the other hand, making one adjustment at the end of the five year regulatory period and applying it in the next regulatory determination may be administratively simpler. This would involve comparing forecast and actual capital expenditure for the period, computing the debt under and over allowances as they occurred and compounding them forward to the end of the regulatory period. Here we hit a snag.

460. To correctly adjust for present value effects, we should do our compounding using current discount rates. Then there is the question about whether we should use the cost of debt, the cost of equity, or the current WACC as the discount rate. The correct answer to the latter question is that we should use a discount rate that is the most appropriate to the risk of the cash flows. Unfortunately, I expect the compounding may be done using the AER's WACC, which is clearly the wrong thing to do.

461. I have no expertise with respect to the reporting processes involved in regard to capital expenditure. Thus, with respect to the frequency of true ups, the AER and the networks are far better placed than me to compare the administrative burden and costs.

462. Given that I have no expertise in relation to the administrative aspects of regulating NSPs, nor in relation to the operation the CESS. I cannot offer an expert opinion on the questions relating to these matters.

Overall Design

463. There is a problem with the trailing weighted average in incentivising investment as interest rates rise. Hence the current debate. However, the underinvestment incentive is not the only problem. Other problems are:

    a. The inputs to the AER's WACC are incommensurate. One input is a historic cost, the other is a current cost.

[84] Also, the CESS provides incentives that encourage deferral of planned capital expenditure, and this is seen as desirable.

b. As a consequence of i), the AER's WACC is not a discount rate. It should not be used in present value calculations, and it is not an opportunity cost of capital.[85]

c. The plain vanilla WACC should be a constant independent of leverage, giving the required return for the risk of the assets. However, as a consequence of i) the AER's WACC, computed using the plain vanilla formula, is not a constant independent of leverage.

d. The use of the trailing average cost of debt does not in general give value neutral revenue decisions. As interest rates change, it tends flip between revenue decisions that support overvaluation and then support undervaluation.

e. The use of the trailing average cost of debt means the AER's WACC is not an appropriate benchmark for investment decisions. It incentivises overinvestment as interest rates fall and disincentivises investment as interest rates rise, particularly if large capital investments are required (the current problem).

f. The equally weighted trailing average cost of debt has little support as an efficient benchmark. So far It has been a rather lose benchmark and has been consistently beaten since its inception. Now it is starting to tighten and threatens to become too tight a benchmark. Consequently, its continued use is now a subject of concern in relation to inadequate compensation of NSPs and resulting underinvestment.

464. Because of the problems listed above, I think it rather unlikely that a trailing average cost of debt will ever "provide an efficient or accurate estimate of the return on debt for new investment." Therefore, I would favour a design that gives up on reversion to the equally weighted trailing average. Currently, we have a hybrid model for the WACC, which mixes a cost of service for the debt and an expected return approach for the cost of equity. It does not seem as though this is working particularly well.

465. I suggested four alternative approaches above, but I expect that only the second and third options have a chance of being considered. That is, either allow the trailing average cost of debt on the existing RAB and the current cost of debt on new investment; or allow the actual cost of debt for the NSP subject to a reasonableness test. Allowing the actual cost of debt is consistent with the AER's proposed alternative approach based on the projected and actual capital expenditures.

466. The reasonableness test could be the on the day rate of return for BBB+ debt. However, the reasonableness test might also be the rate of return at about the time of original issue on similar debt to that issued by the NSP, or on BBB+ debt at that time. Whatever is used as the reasonableness test it should be a relatively tight benchmark and should vary as the NSP's cost of debt varies. An AI summary of the reasonableness tests applied by US regulators is given in Box 1. These seem to provide a sensible set of tests.

467. Increasing the current debt allowance for new investment is a sensible way to overcome reluctance to invest. However, given my lack of conviction about the success of the equally weighted trailing weighted average so far, a transition back to the equally weighted trailing average does not seem to have much merit. Therefore, of the options presented, I would favour the AER's alternative proposal of a more detailed RAB roll forward model that does not assume reversion to an equally weighted 10-year trailing average. An advantage of the AER's alternative proposal is that it avoids what seems to be a fairly complex model of the transition back to the equally weighted trailing average.

468. Reimbursing the actual cost of debt will help with the current underinvestment problem. Also, with a tight reasonableness test it might be efficient. However, a WACC which blends the historic cost

[85] In using present value analysis to value bonds, current yields are used as the discount rate. not historic yields.

of debt with the current cost of debt will not give an appropriate benchmark for investment decisions and will still be subject to several of the problems that I list above.

Box 1: AI summary of the reasonableness tests used by American regulators

Purpose of the Reasonableness Test

The reasonableness test serves to verify that the cost of debt claimed by a utility is:

1. Consistent with prevailing market rates at the time of issuance;
2. Reflective of prudent financial practices;
3. Free from undue or excessive costs arising from imprudent borrowing decisions;
4. Appropriately allocated to regulated operations.

Key Steps in the Reasonableness Test

1. Benchmarking Against Market Rates:

Regulators compare the utility's actual cost of debt with prevailing market rates for similar credit profiles and maturities. Common benchmarks include yields on corporate bonds within the same industry and credit rating, as well as government bonds adjusted for risk premiums.

2. Reviewing Debt Issuance Practices:

The test examines whether the utility's debt was issued under competitive conditions and on reasonable terms. Regulators scrutinise the timing, structure, and associated costs (such as underwriting fees) to ensure prudent financial management.

3. Assessing Prudence of Decisions:

Utilities are expected to act prudently in their borrowing strategies. The reasonableness test evaluates whether the utility avoided unnecessary risks, secured favourable rates, and refrained from speculative or imprudent financial practices.

4. Allocation to Regulated Operations:

Only the portion of debt attributable to regulated activities is considered. Any debt incurred for unregulated ventures or excessive leveraging may be excluded from the regulated cost of debt.

3.5 Professor Johnstone's commentary on the opinions of the other experts

469. This is a messy problem with no obviously best answer. Contrary to the purist finance position put by Professor Partington, I don't think that NSPs should have the cost of debt set at the current rate because they are locked into contracts and should not have to be trading a book of debt related securities. For debt, I believe there is little option but a cost of service approach premised on efficient borrowing decisions. For equity using the market cost of capital is also a "cost of service" approach, except that cost is measured in "real time" at today's rate rather than a past rates.

470. If existing debt is reimbursed at today's rate, the NSPs will be left either short or with a large windfall. The post hoc adjustments ("true ups") that are applied to things like construction costs would then appear, in other word moving back to cost of service.

471. I find it hard to decide about how a trailing average debt rate should be calculated, apart from agreeing with Mr Kumareswaran that it needs sufficient weighting for debt raised now, particularly given that large borrowing is currently essential and should not be biased by past interest rates.

472. The debate is perplexing, again because there is no one answer and no obviously appropriate benchmark weighting scheme. Accounting practitioners would say that the objective approach is to revert to pure historical cost of service calculated for NSPs case by case and then brought to today's dollars PV techniques (at what discount rate?). That approach has been criticized for not rewarding and motivating efficient borrowing. So we have a contest between one view where NSPs should be constantly accountable to market interest rates and the other view that they should be compensated fairly for the actual financing costs.

473. If we are taking a cost of service rather than perpetually market focussed approach, the debate informed by both the Partington and Kumareswaran discussions is about how to choose the regulated scheme and fixed weights in a trailing average. This is a worthy argument for (i) regulators looking to find a sufficiently agreeable method that does not repeatedly come up for criticism and review, and (ii) for networks that see again the large profits available from small variations in the chosen method. My view is that ultimately the regime we have stands or falls on pragmatic regulatory judgement, and a depth of experience with NSP borrowing practices and needs well beyond my own. Whatever we choose can only be one of those things that is agreeable because neither NSPs nor consumers fully accept it.

3.6 Mr Kumareswaran's commentary on the opinions of the other experts

474. I focus my commentary on the opinions of the other Eligible Experts in relation to the weighted trailing average approach on the following topics:

a. The case for a switch back to the 'rate-on-the-day' approach;

b. Proposed alternatives to the weighted trailing average approach;

c. The setting of thresholds for the application of any new approach to the return on debt; and

d. The case for a true-up.

3.6.1 The case for a switch back to the 'rate-on-the-day' approach

475. Associate Professor Partington's preferred approach, consistent with his long-held view, would be to abandon the trailing average approach altogether and switch back to the rate-on-the-day approach that the AER used prior to 2013 on the grounds that:[86]

a. The rate-on-the-day approach is consistent with NSPs' cost of capital, whereas the trailing average approach is not;

b. The trailing average approach distorts incentives for efficient investment; and

c. NSPs have an incentive to exploit any difference between prevailing market rates and the trailing average allowance such that consumers pay too much for regulated services.

476. I address each of these points in turn, below.

[86] Associate Professor Partington acknowledges that any move back to the rate-on-the-day approach would need to be implemented via transitional arrangements.

The rate-on-the-day approach is consistent with NSPs' cost of capital, whereas the trailing average approach is not

477. Associate Professor Partington argues that:

a. the rate-on-the-day approach produces an estimate of the weighted average cost of capital that reflects the current opportunity cost of capital (i.e., the market-determined required return for an investment);

b. historical interest rates have no role in determining this cost of capital and, therefore, the trailing average approach will not produce an estimate of the weighted average cost of capital that reflects the current opportunity cost of capital;[87] and

c. setting an allowed rate of return in line with the opportunity cost of capital would ensure that the NPV of investment is zero, thus encouraging neither too little nor too much investment, and avoiding excess returns to NSPs.

478. The basic premise is that regulators should set the allowed rate of return equal to the market cost of capital. That logic works well for the return on equity but, for reasons I explain below, it does not work well in respect of the return on debt.

479. Equity investors can withdraw their capital (i.e., sell their stake in an asset) and redeploy it elsewhere at any time if they expect that they can secure a better return from doing so. The prevailing market price of equity capital (i.e., the required return on equity) is the key thing that determines the outcomes of such marginal decisions. Therefore, the AER seeks to set the allowed return on equity in line with its estimate of the market cost of equity, because that is the opportunity cost of funds for equity investors. I agree with that approach.

480. However, debt is fundamentally different to equity in the sense it is a contractual obligation between a firm (the borrower) and its lenders that lasts for the term of the borrowing. The cost of servicing that debt obligation is the NSP's interest expense. Since interest expenses are a legitimate cost of delivering regulated services, the AER sets a revenue allowance that would permit NSPs to recover an efficient amount of interest expense over a regulatory period—just as the AER allows NSPs an opportunity to recover their forecast prudent and efficient operating expenditure over a regulatory control period. In that sense, the return on debt allowance is more akin to an allowance for operating expenditure than it is to an allowance for the return on equity capital.

481. To see this more clearly, it is worth considering the role the return on debt allowance plays in the AER's Post-Tax Revenue Model (PTRM).

482. In the PTRM, the return on capital allowance is calculated as:

$$\begin{aligned} R &= WACC \times RAB \\ &= (r_e(1-G) + r_d G) \times RAB \\ &= r_e(1-G) \times RAB + r_d G \times RAB \\ &= \underbrace{r_e E}_{\substack{\text{Expected} \\ \text{return on} \\ \text{equity}}} + \underbrace{r_d D}_{\substack{\text{Benchmark} \\ \text{interest} \\ \text{expense}}}, \end{aligned}$$

where:

a. r_e and r_d are the allowed return on equity and the allowed return on debt, respectively;

b. G is the benchmark gearing ratio;

[87] Except, of course, if the prevailing market cost of debt happens, through coincidence, to equal the trailing average estimate.

c. RAB is the NSP's regulatory asset base; and

d. E and D are, respectively, the benchmark quantities of equity and debt finance for the NSP in question, such that $E + D = RAB$.

483. That is, in the AER's PTRM, the allowed return on debt, r_d, is used to calculate the allowance for the benchmark efficient interest expense that an NSP can expect to incur when delivering the regulated services.[88]

484. I agree with the AER's objective of setting a revenue allowance that would allow NSPs to recover their efficient interest expenses. If the AER allowed insufficient revenue to recoup these costs, NSPs would be reluctant to make efficient investments that deliver welfare enhancing services to consumers, because doing so would result in a situation where the expected NPV of those investments are negative (all else remaining equal). If the AER allowed more revenue than would be necessary to recoup the NSP's efficient interest expenses, consumers would pay more than the efficient cost of delivering the regulated services. Neither outcome would be in the long-term interests of consumers.

485. Clearly, an NSP's forecast interest expense depends on the debt financing strategy it adopts. Hence, the first step in determining an allowance for benchmark efficient interest expenses is to assume a benchmark debt strategy that would be adopted by a prudent and efficient NSP. Associate Professor Partington argues that the specification of efficient financing practice is an impossible task. That is easy enough to say. However, the AER must have some basis for determining an allowance for a benchmark efficient interest expenses. Therefore, the AER has sensibly made a judgement, not about the optimal financing strategy, but a strategy that one might expect a prudent and efficient NSP to adopt.

486. What financing strategy would be consistent with the rate-on-the-day approach? I am aware of only two possible strategies:

a. Either the NSP would need to refinance its entire debt portfolio at the start of each regulatory period to match the rate-on-the-day allowance, exposing it to extreme refinancing risk; or

b. The NSP would need to issue floating rate debt, and then use interest rate swaps to match the base rate to the risk-free rate component of the rate-on-the-day allowance. However, the debt premium would remain completely unhedged, exposing the NSP (and consumers) to possible windfall gains or losses.[89]

487. The first approach above would be imprudent due to the refinancing risk that would be imposed on the NSP, and the second approach would not effectively match the NSP's cost of debt to the regulatory allowance. In my view, this disqualifies both approaches as suitable benchmarks, and therefore disqualifies the rate-on-the-day approach as a viable method for setting the return on debt allowance.

488. In 2013, when the AER first considered switching from the rate-on-the-day approach to the trailing average approach, the AER determined that:

> *In the presence of refinancing risk, it is efficient for a service provider to hold a portfolio of [fixed rate] debt with staggered maturity dates. The allowed return on debt under the trailing average portfolio approach reflects the financing cost of a benchmark efficient entity with such a staggered portfolio. Further, we consider the*

[88] This is evident when one examines the calculation of the regulatory tax allowance in the PTRM. In that calculation, the deductible interest expense is calculated as $r_d D$.

[89] AER, Rate of return guideline, Explanatory statement, December 2013, p. 105.

approach promotes productive, allocative, and dynamic efficiency of debt financing practices.[90]

489. As the AER explained, such a debt management approach would minimise NSPs' refinancing risk, and could be implemented by NSPs to match the regulatory allowance fully.

490. It is important to note that this benchmark debt management approach was not conjured out of thin air. Rather, it was informed by the observable financing practices of NSPs in the real world. The AER noted that "most service providers hold a diversified portfolio of debt with staggered maturity dates" because this means only a portion of their overall debt portfolio needs to be refinanced at any point in time, thus helping to manage refinancing risk.[91] Whilst necessarily simplified, the assumed debt management approach described in the quote at paragraph 488 received broad support from both NSPs and consumers groups because it had a logical basis and loosely mirrored the actual financing practice of NSPs seeking to minimise refinancing risk.

491. Having assumed a benchmark financing strategy, the next step is to determine what the associated rate of interest would be under that strategy.

492. If a firm issues fixed rate debt for say 10 years, it is contractually obliged to pay the agreed rate of interest, even if five years later the prevailing market cost of debt had fallen materially relative to the original borrowing rate. Therefore, resetting the return on debt allowance in line with prevailing rate five years after the debt was issued would not provide the NSP with sufficient revenue to pay its interest expenses. Symmetrically, if interest rates had risen five years later, resetting the return on debt allowance in line with the prevailing rate at that time would leave the NSP with more revenue than it needed to meet its interest expenses. To avoid such windfall losses or gains, the AER would need to set a return on debt allowance that matched the original borrowing rate, even though the debt had been raised five years prior.

493. If an NSP issues 10-year fixed-rate debt annually, on a staggered maturity basis (consistent with the approach the AER assumes is prudent and efficient), and if the total quantity of debt it holds remains roughly constant, its interest expense at any point in time will be approximated by a simple 10-year trailing average. This was the basis for the AER adopting the trailing average approach.

494. In summary, the AER's objective is not to set the return on debt allowance in line with the prevailing market cost of debt. Rather, the AER's objective is to set a return on debt allowance that would provide NSPs with sufficient revenue to, in expectation, recover their efficient interest expenses. I agree with that approach. In my view, the AER's assumption that a prudent and efficient NSP would stagger the issuance of fixed rate debt is sound and I have seen no evidence to contradict that assumption. Given that assumption, it is reasonable for the AER to continue to set the return on debt allowance using a trailing average approach.

495. The key issue at hand is whether the AER should modify slightly the trailing average approach to ensure that NSPs are compensated properly for the interest expenses they would incur if they were to raise large quantities of additional debt, to finance new investment? For the reasons explained in section 3.3, I think it should.

The trailing average approach distorts incentives for efficient investment

496. Associate Professor Partington argues that the simple trailing average approach creates incentives for underinvestment if the trailing average allowance is below the current cost of debt and incentives for overinvestment when the trailing average allowance is above the current cost of debt.

[90] AER, Draft rate of return guideline, Explanatory statement, August 2013, p. 13.

[91] AER, Rate of return guideline, Explanatory statement, December 2013, p. 105.

497. I agree with Associate Professor Partington that this is a weakness of the simple trailing average approach. However, that is not a good reason to abandon the trailing average approach altogether in favour of the rate-on-the-day approach. Reverting back to the rate-on-the-day approach would result in NSPs receiving more revenue than would be required to recoup their efficient interest expenses in some periods, and less revenue than would be required to recoup their efficient interest expenses in others. These 'swings and roundabouts' may distort incentives for NSPs to invest efficiently even more than under the simple trailing average approach.

498. Network assets are long-lived and the recovery of the capital costs associated with those assets occurs over very long horizons. Given the significant volatility in the rate-on-the-day allowance from one period to the next, NSPs could never be sure that in individual regulatory control periods, and over the life of the investment, they will receive sufficient revenue to recoup their efficient interest costs.

499. The incentive problem identified by Associate Professor Partington could be addressed by the weighted trailing average approach, which recognises that any additional capital investment required (over and above what is required to maintain the existing RAB) must be financed at prevailing market rates. The return on debt allowance in relation to that additional capital expenditure then transitions smoothly, over 10 years, to the simple trailing average allowance. Such an approach would preserve the incentives for efficient investment.

NSPs have an incentive to exploit any difference between prevailing market rates and the trailing average allowance such that consumers pay too much for regulated services

500. Associate Professor Partington expresses concern that when the prevailing market cost of debt is lower than the trailing average allowance, NSPs will face incentives to finance themselves in a way that exploits that difference, resulting in consumers paying more for regulated services than they ought to.

501. The AER investigated this issue thoroughly during the 2022 Rate of Return Instrument review and found no evidence of any material outperformance of the trailing average allowance across the industry. Specifically, the AER compared the Energy Infrastructure Credit Spread Index (EICSI)[92] against the benchmark credit spread associated with the trailing average allowance, where both the EICSI and the benchmark credit spread were calculated relative to a common base rate. This allowed the AER to assess the extent to which NSPs' actual cost of debt had outperformed the trailing average allowance.

502. The AER found that, when the actual and allowed credit spreads were compared on a matched-term basis:

    a. The average outperformance over the period January 2014 to June 2024 was just 2.5 basis points, a very immaterial amount;[93] and

    b. The average outperformance for the period post April 2018 was -2.4 basis points (i.e., there was slight underperformance against the trailing average allowance).[94]

503. The AER concluded from that analysis that:

> *After adjusting for the impact of term, our analysis suggests there remains some small residual outperformance on average since 2014, particularly when credit spreads in*

[92] The EICSI is a rolling 12-month historical average of credit spreads across all new debt instruments issued by privately owned NSPs, developed by the AER using Regulatory Information Notice data collected from NSPs.

[93] AER, Rate of Return Instrument, Explanatory Statement, February 2013, p. 218.

[94] AER, Rate of Return Instrument, Explanatory Statement, February 2013, p. 214.

> *the secondary debt market are high. However, we do not consider there is sufficient evidence to suggest this residual outperformance is material and persistent.*[95]

504. And that:

> *We do not consider there is sufficient evidence to suggest any residual outperformance is material and persistent to justify formulaic adjustment to the benchmark.*[96]

505. Based on the AER's analysis in 2022, there is no evidence that consumers have overpaid materially as a result of the AER adopting the trailing average approach in 2013.

3.6.2 Proposed alternatives to the weighted trailing average approach

506. Associate Professor Partington proposes three alternative approaches, if his preferred approach of reverting back to the rate-on-the-day approach ('Solution 1') is not accepted by the AER:

a. Solution 2 – Apply the simple trailing average to the existing RAB and the prevailing rate for new investment, without any transition to the simple trailing average;

b. Solution 3 – Reimburse the NSPs for their actual cost of debt subject to a reasonableness cap; or

c. Solution 4 – Do not use the cost of debt at all.

507. I discuss each of these alternative solutions briefly below.

Solution 2 – Apply the simple trailing average to the existing RAB and the prevailing rate for new investment, without any transition to the simple trailing average

508. Under this approach, any new capital expenditure would be assumed to be financed at the prevailing market rate. It is unclear what would be assumed once the original tranche of debt, used to finance that capital expenditure, matures. Suppose the AER continues to assume a 10-year tenor for benchmark debt. Under Solution 2 the AER would assume each lump of new capital expenditure would be financed using a tranche of 10-year debt at the rate prevailing in the year in which the capital expenditure was incurred. What would occur after year 10, once that original tranche of debt matures?

509. The most logical approach would be to assume:

a. All new capital expenditure is financed using a tranche of 10-year debt at the prevailing rate; and

b. When that tranche matures, it is refinanced with another tranche of 10-year debt, and so on.

510. This would mean that the allowed return on debt for each tranche of new debt (used to finance any new capital expenditure) would be set at the prevailing rate observed at the time the debt was issued and held fixed for 10 years. It would then be reset to the then-prevailing rate and fixed for another 10 years, and so on.

511. This approach has the appeal of simplicity. It would also provide the correct incentives for the NSP to undertake new investment efficiently.

512. I see two main drawbacks with this approach:

a. Firstly, there would be an inconsistent treatment between the existing RAB (which would continue to receive the simple trailing average allowance) and new capital expenditure

95 AER, Rate of Return Instrument, Explanatory Statement, February 2013, p. 218.

96 AER, Rate of Return Instrument, Explanatory Statement, February 2013, p. 222.

(which would only ever receive the rate-on-the-day allowance). This implies one debt management approach in relation to the existing RAB, and a different debt management approach in relation to any new capital expenditure. It is hard to rationalise why any business would run, in parallel, two different debt management approaches. Whereas, under the weighted trailing average approach I have suggested above, all debt would eventually transition to the simple trailing average approach.

b. Secondly, NSPs undertaking very large expansion projects would need to raise large quantities of debt and may therefore face unacceptably high refinancing risk under Solution 2. This is because the approach outlined above assumes that a benchmark NSP would refinance a large quantity of debt (relating to the tranche of debt that was used to finance any new capital expenditure) every 10 years. The NSP would be unable to roll over its debt if debt markets happened to be closed or disrupted each time it needed to refinance. However, under the weighted trailing average approach, once the NSP has transitioned to the simple trailing average approach, the quantity of debt that would need to be refinanced each year would be much smaller, thus exposing it to less refinancing risk.

513. For these reasons, I prefer the weighted trailing average approach over Solution 2.

Solution 3 – Reimburse the NSPs for their actual cost of debt subject to a reasonableness cap

514. The phrase "actual debt costs" is ambiguous. Does this mean the actual interest expense incurred by an NSP in each year? If so, then the interest expense incurred by an NSP that holds portfolio of fixed rate debt with staggered maturity dates to finance its existing assets, and which finances new investments at the prevailing market cost of debt, would somewhat approximate the allowance that would be produced using the weighted trailing average approach. In which case, why not simply use the weighted trailing average approach to set the return on debt allowance? The mechanism that would ensure the 'reasonableness' of the allowance under this approach would be the benchmark assumptions (i.e., credit rating, tenor of debt, third party debt series) adopted by the AER.

515. If, however, "actual debt costs" means the prevailing rate of interest at which the NSP finances new investment each year, that would ignore the fact that (as the AER has previously determined) most NSPs stagger the issuance of debt to minimise financing risk. The interest expense that such NSPs would need to pay each year would be a function of the historical rates at which they had raised staggered debt. It would be very problematic if the reasonableness cap were set equal to the prevailing market rate (on option suggested by Associate Professor Partington), if that rate happened to be below or above the blended historical interest rate being paid by the NSP, because this would either mean the NSP would have insufficient revenue to meet its interest expenses, or consumers would be paying more than would be necessary for the NSP to cover its interest expenses.

516. In addition, there are practical challenges associated with Solution 3:

a. As the AER has previously found, it is not straightforward to determine the actual debt costs faced by NSPs, given the variety of financing and hedging arrangements and structures used by NSPs; and

b. Publicly owned NSPs are financed very differently to privately owned NSPs, and are subject to competitive neutrality provisions under the Competition Principles Agreement (CPA).[97] This further complicates the measurement of actual debt costs for all NSPs.[98]

517. For these reasons, I do not support Solution 3.

Solution 4 – Do not use the cost of debt at all

518. If my understanding is correct, Solution 4 would *effectively* mean adopting a benchmark gearing ratio of zero (i.e., assuming that the benchmark NSP holds no debt at all)—even if no such explicit assumption were made—because the NSP would receive no return on debt allowance, and the return on equity allowance would be computed using the asset beta, rather than a re-levered equity beta with a benchmark gearing greater than zero.

519. In an idealised setting (i.e., if the vanilla WACC was truly invariant to the firm's gearing ratio as suggested by the second Modigliani-Miller proposition), this would produce the same allowed rate of return as would obtain assuming the current benchmark gearing ratio of 60% (all else remaining equal). However, given the formulas the AER uses to set the allowed rate of return, the vanilla WACC is not invariant to the gearing ratio. So, effectively adopting a gearing ratio of zero does matter in practice.

520. For this reason, and as Associate Professor Partington notes, Solution 4 would be a radical. Moreover, it would fail to match the real world observation that all NSPs regulated by the AER hold some debt. Such a radical change would also necessitate complex debt transitions that would neither be warranted nor desirable.

521. To borrow a phrase from Associate Professor Partington from earlier in this report, Solution 4 would be a case of the tail wagging the dog and I do not support it.

3.6.3 The setting of thresholds for the application of any new approach to the return on debt

522. Associate Professor Partington's favours no threshold for the application of any new return on debt approach, unless the cost of applying that change to all NSPs is very large. I agree completely.

3.6.4 The case for a true-up

523. Associate Professor Partington considers that the application of a true-up is desirable as it would avoid penalising NSPs for forecasting errors that are unavoidable for large, complex projects.[99]

524. He also notes that making a single, NPV-neutral true-up adjustment at the end of each regulatory period would be administratively simpler than rolling true-ups within each regulatory control period.

525. I agree with Associate Professor Partington on both these points.

---

[97] The effect of these competitive neutrality provisions was discussed at length in: AEMC, National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012, National Gas Amendment (Price and Revenue Regulation of Gas Services) Rule 2012, Rule Determination, 29 November 2012.

[98] It is worth noting that the AER does not use data from publicly owned NSPs to construct the EICSI.

[99] Symmetrically, a true-up would also protect consumers from forecasting errors.

3.7 Associate Professor Partington's commentary on the opinions of the other experts

Professor Johnstone

526. Professor Johnstone lays out the problems clearly and suggests: *A ten year rolling average weighted towards the current year can be used for existing debt and the current "on the day" rate for all new debt raised, thus avoiding any incentive for current under or over-investment*. I have made a very similar suggestion as one of my four solutions, and it is probably the best option of those that we might reasonably expect to be implemented. It will mitigate the underinvestment problem.

527. However, to the extent that this approach gives an allowed ROI that is higher or lower than the current required rate of return there will still be some overinvestment and underinvestment incentives. There will also be mixing of historic costs of debt and current costs of debt and equity in the AER's WACC. The mixing of historic costs and current costs creates problems as I explain in my report. However, this may be the best that can be done.

528. Professor Johnstone points to the advantage of averaging in reducing volatility in the allowed revenue and hence reducing bill shock. This is an advantage for consumers, but it does not seem to be known how much stability has been achieved. If you said to the average consumer "How much are you enjoying price stability and the absence of bill shock?" I doubt if you would get a very positive response. An important question, therefore, is how much has the trailing average cost of debt contributed to price stability and is this significant in the overall volatility of electricity prices?

529. Another point of Professor Johnstone's is that any scheme *should not be open to being reversed in periods when it most seems to fail or does not fit well with one or more NSPs borrowing patterns*. This is a fair point. I have previously made a very similar point with respect to holding the line with the equally weighted trailing average when interest rates rise. Yet here we area, as I expected, contemplating not holding the line. The reality is that lobbying and circumstances will conspire to motivate change whatever scheme is implemented.

530. An ex-post true up mechanism contradicts the CAPM framework as Professor Johnstone points out. However, we are operating in a regulatory framework where allowed revenue is based on approved expenses and approved capital expenditure plans, so some true up seems inevitable.

531. It is also true that by setting up systems to compensate NSPs ex-post, this reduces their beta. The problem, however, is being sure that the effect of asymmetric idiosyncratic risks that increase or reduce beta, have been adequately captured in the allowed ROI. It would be extraordinarily difficult to determine what beta adjustments should be made a priori to reflect emerging risks. Consequently, the pragmatic solution is an ex-post true up. Ex-post true ups also have the advantage that they can be measured with reasonable precision.

Mr Kumareswaran

532. Mr Kumareswaran and I agree that the equally weighted trailing average cost of debt incentivises underinvestment or overinvestment depending on the level of interest rates. We also agree that this is a particular problem when large capital investments are required.

533. Mr Kumareswaran also makes the point that the AER's proposed weighted trailing average model and its transition back to an equally weighted model is model is overly complex. I am inclined to agree. The alternative simpler model proposed by Mr Kumareswaran seems to have merit, but my preference is not to transition back to an equally weighted trailing average at all.

534. We both agree that provided the administrative burden and costs are not excessive it would be better that the weighted trailing average applied to all NSPs. We share a concern that the use of thresholds will incentivise gaming and that there would be an arbitrary element to any threshold.

535. We also agree on the desirability of a true up in relation to capital expenditures.

536. Mr. Kumareswaran is under a misapprehension about the use of the asset beta approach. The Capital Asset Pricing Model does what it says, it prices capital assets. In the familiar returns form it does that by giving the equilibrium required rate of return on the asset. Using the equity beta, the asset is the equity. Using the asset beta, the asset is the firm's assets. Using the asset beta for an NSP therefore gives the required return on the NSP's assets. It makes no assumption about the level of leverage whatsoever. In particular, it does not assume that the level of leverage is zero.

537. Mr Kumareswaran's analysis seems to implicitly accept the desirability of an equally weighted trailing average. Whereas I see the trailing average as a source of problems. It is the source of the current problem of concern, the years in advance entirely predictable risk of underinvestment. Trailing averages for the cost of debt will continue to be a source of problems for as long as they continue to be used.

4 Third party yield curve data

4.1 What is the issue?

538. The 2022 Rate of Return Instrument specified that the AER would make use of yield curve data obtained by three sources to set the return on debt allowance: the Reserve Bank of Australia (RBA), Bloomberg and Refinitiv. The AER's view, in specifying this approach, was that using data from multiple data providers would reduce the risk of shocks to any one of the individual curves, and would mitigate against the risk that any one of the curves may cease to be published.[100]

539. The RBA data were obtained using the RBA's F3 statistical table. The AER's current approach is to assume a benchmark debt tenor of 10 years. However, the RBA's F3 table only provides yield data on bonds with target tenor of 10 years; the average effective tenor of the bonds used to construct the yield curve is typically shorter than 10 years. To correct for this, the AER used to make use of spread to swap data published by the RBA in the F3 table to extrapolate the corporate bond yields to 10-year tenor yields.

540. In November 2023 the RBA discontinued the publication of the swap to spread data in its F3 statistical table. This meant that the AER could no longer extrapolate the corporate bond yields in the RBA F3 table to a 10-year tenor. As a result, the AER determined that the RBA data would no longer be used under the 2022 Rate of Return Instrument.

541. We understand that the AER still considers that it would be prudent to use three sources of data (for the reasons it decided to do so in 2022). Therefore, for the 2026 Rate of Return Instrument, the AER proposes to use spread to swap data obtained from either Bloomberg or Refinitiv, depending on availability, to extrapolate the corporate bond yields published by the RBA to 10-year tenor yields.

4.2 Opinion of the Eligible Experts

542. The nature of the problem is that when the RBA discontinued the provision of credit spreads the AER was constrained under the 2022 Rate of Return Instrument to discontinue the use of RBA data. However, the 2026 Rate of Return Instrument provides the opportunity to publish a method using credit spread data from other credit spread providers (Bloomberg and Refinitiv/LSEG Data and Analytics) for use in interpolation of RBA bond yields.

543. The AER will also estimate bond yields using Bloomberg and LSEG bond and credit spread data. Given the use of the same credit spread across RBA and Bloomberg or LSEG yield measurements, the measurements will not be strictly independent. However, in this context we do not see that as a problem. The underlying construct is the same, the RBA inclusion adds a reputable source of data, and the AER's objective of reducing "the impact of volatility or data shocks from any single source" is sensible. Therefore, we all agree with the proposal.

[100] AER, Rate of Return Instrument, Explanatory Statement, February 2023, p. 227.

A Response to consultation questions

Table 4: Eligible Experts' responses to Discussion Paper consultation questions

Question	Professor Johnstone	Mr Kumareswaran	Associate Professor Partington
Overall priority issues for assessment			
1. Are there other issues, beyond the weighted trailing average, equity beta and third-party yield curves stakeholders wish to raise? If yes, what are these and why do you consider they warrant consideration during the review?	The largely unstated point is that the regulatory regime always relies in the end reasonableness (equity and prudence) judgements. But instead there is emphasis on micro-issues pseudo-theoretical questions which cannot be answered objectively. It is tempting to seek precision, especially when a change at the 2nd or 3rd decimal place can mean a very different outcome for consumers or NSPs, but debate becomes self-interested rather than objective, leaving spurious precision and high administration costs.	No.	No
Equity beta			
2. Do you agree with our preliminary options, as outlined in section 5.1.3? If no, why not? Are there any other potential options that you would like us to consider?	Empiricism supports judgement but the data need to be relevant to the local context. Using betas extracted from the joint returns of US stocks is questionable in theory.	My opinion is that it would be untenable for the AER to continue with its current approach of relying exclusively on domestic comparators to determine the equity beta allowance, given that all but	It is possible from a priori reasoning and an understanding of the theoretical and empirical properties of beta to form an assessment of the reasonableness of the AER's

Question	Professor Johnstone	Mr Kumareswaran	Associate Professor Partington
		one of the nine domestic comparators have been delisted since at least February 2022. I disagree with the option of giving primary weight to estimates derived using the nine domestic comparators, overlaid with AER regulatory judgment to determine an overall estimate. The use of judgment alone to either maintain or deviate from the existing estimate of 0.6 would result in decisions that are not transparent to stakeholders. The alternative would be to fix the equity beta allowance at 0.6 forever. Such an approach would be unsound, since beta estimates change materially over time in response to changes in market conditions. Moreover, the AER has previously changed the beta allowance significantly over time. Clearly the AER has believed in the past that beta is not constant over time. There would be no sound basis to adopt that assumption going forward. In my view, the AER's beta estimates should be informed by empirical evidence. This would lead one to the AER's second option of giving weight to estimates derived using a sample of	estimate of beta. This does not require the use of proxy comparators. See Section 2.4.2. The use of international proxy comparators faces many problems. Key problems are matching firms, differences in capital markets, differences in tax systems and problems arising from differences in leverage. The intractable nature of these problems makes it extremely doubtful that the asset betas of overseas NSPs can provide reliable estimates for Australian NSPs. See Section 2.4.3. In particular, there is an inverse relation between asset beta and leverage. This means that the lower overseas leverage ratios (reported by the AER) suggest that overseas NSPs have higher asset betas. See paragraphs 177-180, and 205, 206. There should be a study to confirm the valid use of overseas NSPs betas as proxy estimators of Australian NSP betas. Otherwise, the use of such proxies is an act of faith. See paragraphs 216-218.

Question	Professor Johnstone	Mr Kumareswaran	Associate Professor Partington
		international comparators. See section 2.3.1.	
3. How could we use the equity beta estimates of international energy firms to inform our decision on equity beta?	The betas of international utilities are obviously of relevance when thinking about what 'a utility beta' might reasonably be. However, I believe there are unexplored theoretical issues in translating a 'foreign' market utility beta to make it Australian. The methods usually proposed of "delevering and relevering" across countries are not well conceived in this application.	The AER should not use the existing beta estimate of 0.6 as a prior to anchor its estimates, since the existing estimate was informed by too small a sample of domestic comparators. If the AER wishes to have regard to evidence on beta from domestic comparators it should pool together the estimates from the domestic comparators and the international comparators. This would reflect the reality that most of the available evidence is international rather than Australian, while still allowing the estimates for the domestic comparators to have some influence on the overall estimate. This would also allow all stakeholders to understand transparently the weight applied to the domestic evidence compared to the international evidence. The weight given to the domestic evidence should decline over time, since that evidence will become staler with every passing year. Pooling together the domestic and international estimates would achieve this because, over time,	Given the problems that Professor Johnstone and I identify, it is not at all clear that the AER should use international proxy betas to inform its decision on equity beta. However, a successful validation study could provide the basis for how international proxy betas should be used. Currently, there is no objective scientific solution to the question of how international proxy betas should be used. Therefore, if such proxies are used, it will be appropriate for the AER to use regulatory judgement and give reasons for that judgement.

Question	Professor Johnstone	Mr Kumareswaran	Associate Professor Partington
		the domestic comparators will exert diminishing influence on the overall estimate. I recommend that the AER rely on empirical evidence, rather than a priori reasoning, to inform its estimate of beta. See sections 2.6.2 and 2.6.3.	
4. What other filters and/or adjustments should we make to international energy firms and their equity beta estimates to make them more comparable to the equity beta estimates of Australian regulated energy networks, as outlined in section 5.1.2.1?	The filters need to be not only at firm-level but at whole-of-market level. A utility might have given returns covariance with the market return but if the market return has higher variance in one country than another, that same utility can have quite different betas in different markets. Other market parameters also have effect.	I agree with the AER's overall approach of selecting listed energy networks in other developed economies that satisfy certain liquidity and data sufficiency requirements. The AER should use the broadest and largest possible sample that meets these criteria. Rather than specifying a minimum number of years that an eligible firm must be listed, I recommend that the AER specify a minimum number of valid observations (i.e., observations where the stock was sufficiently liquid) within the estimation period. I do not recommend that the AER use market capitalisation or bid-ask spread thresholds to screen out illiquid stocks. Instead, the AER could consider using the Amihud ratio, which measures the average sensitivity of a stock's price, relative to the liquidity of the market.	The AER's suggested filters are sensible but somewhat ad-hoc. I suggest a range of additional filters that would more closely match the domestic and international NSPs. See paragraphs 201–215. I expect that matching on these additional filters will prove difficult and therefore some flexibility in their application may be necessary. However, the very process of comparing the Australian and international NSPs on these filters will be informative of the similarities and differences between domestic and overseas NSPs.

Question	Professor Johnstone	Mr Kumareswaran	Associate Professor Partington
		See sections 2.3.2 and 2.6.1	
5. Do you have any suggestions on how best to address the leverage anomaly, as outlined in section 5.1.2.2?	This is a small part of what is a much bigger theoretical question of whether we can take the equity beta of a firm in another market with another level of debt and convert it to the equity beta of an Australian firm. A more complete theory is needed and at a higher level than raised in this question.	The AER could use de-levering and re-levering formulas that assume a positive debt beta. The appropriate debt beta estimate could be informed by a review of the empirical finance literature and recent regulatory determinations that have adopted debt beta estimates. The AER should err towards the lower end of the range of debt beta estimates, since debt betas are difficult to estimate accurately, and because an overestimate of the true debt beta would downwardly bias the re-levered equity beta estimate for regulated NSPs. See sections 2.3.3 and 2.6.4.	I explain the many pitfalls in unlevering and relevering. See section 2.4.4, particularly paragraphs 232 to 250. Most importantly, I explain a fundamental flaw in unlevering and relevering involving companies with different leverage. The fundamental premise of the exercise is that the two companies have the same underlying asset beta. However, given the inverse relation between asset beta and leverage, different levels of leverage between companies are prima facie evidence that they have different asset betas. See paragraphs 248-250. Therefore, I see little, if any merit, in leverage adjustments to the equity beta If unlevering and relevering is undertaken, then I recommend allowing for the beta of debt. Given varying, but equally valid, estimates for the debt beta I recommend a mid-range estimate as most likely to result in an unbiased estimate of the equity beta.

Question	Professor Johnstone	Mr Kumareswaran	Associate Professor Partington
6. Do you have any suggestions on how best to address the issue of different domestic indices between Australian and international firms, as outlined in section 5.1.2.3?	The same thing applies. Specifically what is the theory that allows equity betas from one market to inform those of 'similar looking' entities in another. The work I have provided on the cash flow parameters that drive beta is essential to such analysis.	Differences in index composition between countries, and changes in index composition within countries, is unavoidable. It is not possible to make reliable adjustments for these differences. Nor should the AER consider using the international CAPM in response to this problem. Most regulators (including the AER in the past) are aware of this issue but ignore it because there is no pragmatic alternative. See section 2.3.4.	When estimating betas domestically you will very likely have changing market composition. Over short intervals this may not be such a serious problem. In any event you have to live with it. If you decide to use international comparators, then even with identical comparators you will have different betas in the international cross section due to differences in market composition. Using the international CAPM to solve the problem of different indices creates more problems than it solves. See Section 2.4.5.
7. Other than the comparator set, do you have any comments on any other aspects of our approach to estimating equity beta?	My main concern is that the NSP beta being "estimated" is largely determined by the regulator's own decisions, so I don't see this as an objective detached process in the same way as an analyst estimates the beta of say Myers or CBA.	No.	When estimating beta I recommend using lower frequency return intervals. See paragraph 220.
Weighted trailing average			
1. Introduction of a weighted trailing average approach: (a) Do you in principle support the introduction of some form of	I agree with a weighted trailing average as a way to proxy for NSPs actual interest costs. However, there needs to be appropriate weight given to current interest costs of current	Yes. I agree with the AER's analysis that adoption of a weighted trailing average approach would improve incentives for NSPs to invest efficiently as they would be appropriately compensated for their	There seems to be little evidence of the success of trailing averages, and so far, the equally weighted trailing average has been costly for consumers. The change to a

Question	Professor Johnstone	Mr Kumareswaran	Associate Professor Partington
weighted trailing average (qualified by your answers to the later questions in this section)? Please include reasons.	debt to enable (not discourage) prudent current borrowing for investments that should occur. This becomes an issue obviously when the trailing average is lower than the current interest rate.	efficient interest expenses. See section 3.3.1.	weighted trailing average will also be costly for consumers. See paragraphs 417-427. Trailing averages predictably give rise to several problems such as the current incentive for underinvestment. Consequently, I do not in principle support trailing averages. See paragraphs 44-47, 397, 408-423, and 463-464. I suggest four alternative solutions to the underinvestment problem. See paragraphs 431-446. Of the solutions suggested by the AER I prefer the alternative proposal of a more detailed RAB roll forward model. Although the discussion of this approach is somewhat short on detail, it has the merit of not transitioning back to an equally weighted trailing average.
2. Application of the weighted trailing average approach: (a) Should it apply to all network businesses by default, or only when forecast capital expenditure exceeds a certain threshold? Please include reasons.	Since this is 'cost of service' based, it needs to capture the NSP's reality as closely as administrative costs allow, including the costs of considering what debt is reasonably taken on by the NSP. Any default or benchmark scheme can unfairly favour or harm a given NSP, which adds investment	The weighted trailing average approach should be applied to all NSPs unless it would be administratively burdensome to do so. In my view, the application of the weighted trailing average approach would be straightforward. Hence, I see	The use of a threshold will inevitably have a degree of arbitrariness and will encourage gaming. Therefore, unless it is particularly costly to do so, it would be better to apply changes to the allowed cost of debt

Question	Professor Johnstone	Mr Kumareswaran	Associate Professor Partington
(b) If a threshold is preferred, what kind of threshold would work best (e.g. a percentage of RAB and/or a fixed dollar amount or some other measure/s), and what level would be appropriate for your suggested trigger/s? Please include reasons.	uncertainty and helps neither NSP nor consumers. That deficiency must be balanced against the limits of practicality and the generally desirable simplicity, stability and objectivity of a default method (anchored on past experience of NSP borrowing patterns).	no reason why it should not be applied to all NSPs. This would avoid the need to set arbitrary thresholds, and would also remove the incentive for gaming. See section 3.3.3.	to all NSPs. See paragraphs 453-455.
3. How the true-up mechanism should work: (a) Do you support using a true-up to reduce the risk from capital expenditure forecasts? If you do or do not, please explain why. (b) What do you consider a preferred method of applying a true-up? Would it be through adjustments to the rate of return during the regulatory period (i.e. some form of rolling true-up), or through an adjustment to the rate of return in the next regulatory period (potentially at the time of the RAB roll forward calculations)? Why? (c) If a rolling return based true-up with a two-year lag were adopted, are there specific implementation	(a) True up is necessary to offset unavoidable NSP cost overruns (or windfalls) that should be shared between NSP and consumers. Without true up provisions the NSP risk is much higher and prices would need to be higher to reward that forecasting risk. So either way the consumer needs to pay. The true up is a common sense "cost of service" accounting solution. (b) When making post hoc adjustments, I see no theoretical or practical reason to lag. (c) What are we trying to do exactly? I think the task is to reward and motivate efficient investment. A rolling return is an unnecessarily convoluted way to compensate NSPs for what is ultimately a simple issue more to do with the reasonableness of the	I support the application of a true-up for the return on debt allowance, to account for NSPs' actual, rather than forecast, capital expenditure. This would better ensure that NSPs' revenue allowances permit the recovery of efficient interest expenses, and would preserve incentives for efficient investment. The true-up could be implemented as an NPV-neutral adjustment to allowed revenues in the next regulatory period, rather than as a 'rolling' adjustment. To that end, the true-up could be implemented through relatively minor modifications to the existing AER model for calculating rewards and penalties under the CESS. See section 3.3.4.	True up measures will move debt costs even more to a cost of service model. However, true ups are desirable so that unavoidable forecast errors are not penalised, and also to reduce incentives for gaming. See paragraphs 456-457. I do not have a strong preference for one or other of rolling true ups, or adjustment at the end of the regulatory period. However, the latter is likely to be administratively simpler. To make the adjustments NPV neutral will require discounted cash flow calculations at an appropriate discount rate. That discount rate is not the AER's WACC. See paragraphs 458-459.

Question	Professor Johnstone	Mr Kumareswaran	Associate Professor Partington
risks or modelling issues we should consider? Why?	investment (from a long term consumer perspective). Every time we invent a complex but still arbitrary method, we lose sight of the wood for the trees.		
4. Interaction with the CESS: (a) Could financing benefits or losses be double-counted under both a true-up and the CESS? Why? (b) If so, should the CESS be amended after the Rate of Return Instrument is made to ensure it operates as intended?	There are two criteria here. They are more accounting and administration matters than finance. First only efficient capex is allowed into the RAB and, second, the cost of debt to finance efficient capex is compensated. The CESS deviates somewhat from the first principle by sharing any capex over/underspend. It could occur that the NSP earns WACC on the full RAB as forecast during the period but does not spend the forecast amount, thus earning on that part of its RAB that it did not buy.	If implemented properly, the true-up would support, rather than undermine, the incentives for efficiency created by the CESS. I propose two modifications to the CESS that would preserve incentives for efficiency (both of which are discussed in section 3.3.4).	N/A
5. Reporting: (a) Are there any concerns with changes that might be needed to Regulatory Information Notices, the Roll-Forward Model, or the RORI?		No.	N/A
6. Costs: (a) Are there likely to be material incremental costs imposed on	There will be such costs no matter the formula by which the cost of debt is rewarded, because there will be	I agree with the AER's proposed approach of applying the rate-on-the-day allowance to the benchmark quantity of debt used	The transition model proposed by the AER seems rather complex.

Question	Professor Johnstone	Mr Kumareswaran	Associate Professor Partington
network businesses from applying a weighed trailing average to them (e.g. additional hedging or other financial transaction costs). If yes: what would these costs relate to (e.g. additional financial transactions of a given type); how large would you expect these to be; are these costs one-off or transitional; and what scheme design elements might reduce any incremental costs?	motivation to set up debt hedges or to time their borrowings to maximize the difference between debt costs incurred and the way they are rewarded. The NSP costs if incurred are presumably offset by the benefits.	to finance new capital expenditure in the year in which it is incurred, and then transitioning the allowance over 10 years to the simple trailing average approach. However, the debt transition proposed by the AER is too complex, and the debt management approach underpinning that transition is unlikely to be used by any NSP in the real world. For simplicity, I recommend that the AER use the debt transition it adopted when it switched from the rate-on-the-day approach to the trailing average approach. This transition has been applied successfully to all NSPs once, is simple, and is well understood by stakeholders. See section 3.3.2.	More complexity seems likely to give rise to more costs.
7. Transition: (a) What transitional arrangements or lead times would be necessary to help NSPs prepare for a change to a weighted trailing average?	Any sudden shift will harm either NSPs or consumers. If there is a chosen trailing average formula that is decided upon, then the concept of true up (or any post hoc sorting out) would suggest that the transition cannot cause a shock to NSP profits or consumer prices, since that would call for a true up like compensation. A phased transition is necessary to minimize 'regulatory risk'. This one issue among many exemplifies how	It seems unlikely that any lead time would be required. Hence, the AER should implement the weighted trailing average when it begins to apply the 2026 Rate of Return Instrument.	This is a question best answered by the NSPs.

Question	Professor Johnstone	Mr Kumareswaran	Associate Professor Partington
	regulators' own chosen methods constrain the cash flows to NSP equity, and thus influence the firm betas that the regulator sets out to objectively "estimate". This unavoidable circularity is a fundamental problem in utility regulation by CAPM.		
8. Overall design: (a) Does the proposed approach strike the right balance between incentive-based benchmark regulation and greater use of firm-specific cost information that may move the trailing average approach closer to cost-of-service regulation? (b) Does the proposed approach strike the right balance between accuracy, simplicity and regulatory consistency? Why? (c) Would the use of a weighted trailing average add material regulatory burden and/or cost for NSPs to which it would apply? If yes, what are these likely to be? (d) Are there any other ideas or refinements we should consider? If yes, what are these?	(a) I think that a trailing average (informed by the historical patterns of NSP debt raising) is a sensible way to approximate the debt 'cost of service', simply because loans are not taken and paid back in the same year or even decade. I agree with greater use of firm-specific information and rewarding actual costs when found to be reasonable and well justified. That approach has an objectivity and clarity to it that is not available in the more esoteric and logically circular finance paradigm. (b) A heavily complicated weighting scheme is not desirable, there is no scheme that fits all and the more convoluted it is the more open to lobbying and gaming. (c) There is a trade-off between simplicity and accuracy (in terms of rewarding firm-specific prudent costs).	In my view, the weighted trailing average approach would (for the reasons explained in the Discussion Paper) improve incentives for efficient investment. Hence, I do not think it is a significant step towards cost-of-service regulation. The weighted trailing average approach would be relatively simple to implement. The true-up for actual capital expenditure could be implemented simply through minor modifications to the CESS. No separate true-up model would be required.	As an incentive based benchmark I consider the equally weighted trailing average a failure. I expect the weighted trailing average will not be much better. See particularly Section 3.4.2, but also see 44-47, 400, 411 and 463-464. The weighted trailing average approach coupled with true ups does move the balance towards cost of service. This in itself is not such a bad thing as long as a tight benchmark is established. Indeed one of my solutions is to reimburse actual interest costs subject to a reasonableness test. For other ideas see paragraphs 431-446 and 463-468.

Question	Professor Johnstone	Mr Kumareswaran	Associate Professor Partington
	Any one scheme will often fail or be found wanting by one or other NSP or its consumers. Regulatory judgement on a case by case basis seems to be the least confusing approach.		
Third-party yield curves data			
1. Do you support the reintroduction of the use of RBA yield curve data combined with Bloomberg or Refinitiv swap data? If no, why not?	These are questions with no satisfying answers because we are talking about the different levels, terms and dates of borrowing by different NSPs. The NSPs will answer these questions by what they see (for the moment) as their best regulatory outcome. From a regulator's perspective, it would make sense to test the sensitivity of price and revenue outcomes to the method chosen. That will allow the regulator to better assess the arguments posed for one or other solution by whatever interest group is making that argument.	Yes.	Yes
2. Are there any concerns with the proposed method of calculating the return on debt in the absence of RBA spread to swap data (i.e. using swap rate data from another source)?	It is not clear whether the AER approach is one based on debt betas and theoretical CAPM style cost of debt or one based on actuals (either past incurred rates or forecast future incurred rates). Is the guiding framework to be one of cost of service	No.	No

Question	Professor Johnstone	Mr Kumareswaran	Associate Professor Partington
	or one based on the theoretical CAPM cost of debt?		

B Derivation of de-levering and re-levering formulas with constant gearing

544. This Appendix contains a full derivation of formulas, presented by Mr Kumareswaran, for the relationship between asset and equity betas for a firm with a constant leverage ratio. He shows that under the assumption of constant gearing, the de-levering and re-levering formulas do not contain the tax rate term.

545. Consider a firm with a target leverage ratio of L and assume that the firm continuously adjusts its capital structure to maintain this leverage ratio at all times. This is analogous to the AER's assumption that a benchmark efficient NSP will always maintain a gearing ratio equal to the AER's assumed benchmark gearing ratio. That is $\frac{D_i}{V_i} = L$ for all points in time, i. No assumptions are made about the pattern of the firm's operating cash flows.

The effect of tax benefits on the WACC

546. First note that if the firm were unlevered, its value would be given by:

$$V^U = \sum_{i=1}^{N} \frac{C_i(1-\tau)}{(1+r_a)^i}, \quad (1)$$

where:

a. V^U is the value of an otherwise identical unlevered firm;

b. τ is the effective corporate tax rate; and

c. r_a is the required return on the assets of the firm, which is the same as the return required by equity holders in an otherwise identical unlevered firm.

547. Under the CAPM, the required return on the assets of the firm is:

$$r_a = r_f + \beta_a \, MRP, \quad (2)$$

where

a. r_f is the risk-free rate of interest;

b. β_a is the asset beta or systematic risk of the firm's assets. This is the same as the equity beta for an otherwise identical unlevered firm; and

c. MRP is the market risk premium.

d. The after-tax operating cash flows for an otherwise identical levered firm exceed those of the unlevered firm by the tax savings due to interest payments. Thus, the cash flows in period i are:

$$C_i(1-\tau) + r_d D_{i-1}\tau, \quad (3)$$

where

a. r_d is the required return on debt; and

b. D_{i-1} is the value of debt at time $i-1$.

548. The first component of this cash flow is identical to that of the unlevered firm, and therefore should be discounted at r_a. The second component must be discounted at a rate that reflects the risk of tax benefits. Note that at time $i-1$ the value of debt, D_{i-1}, is known and the tax benefit at time i, $r_d\ D_{i-1}\tau$, is a fixed multiple of the required return on debt, r_d. Thus, it is appropriate to discount the tax benefit from time i to time $i-1$ using r_d.

549. Note that we cannot use r_d to discount these tax benefits right to time 0 because the amount of debt varies over time with the cash flows of the firm. We can only use r_d to discount from time i to $i-1$ because the tax saving at time i depends on the amount of debt at time $i-1$, D_{i-1}, which is only known at time $i-1$.

550. Now, we use induction (recursively) to determine the relationship between r_*^L and r_a. First note that at time N, the firm generates its last cash flow of $C_N(1-\tau)$. One period before this (at time $N-1$, immediately after the cash flow at $N-1$has been paid) the value of the unlevered firm is:

$$V_{N-1}^U = \frac{C_N(1-\tau)}{1+r_a}.$$

551. The value of the otherwise identical levered firm at the same time is:

$$V_{N-1}^L = \frac{C_N(1-\tau)}{1+r_a} + \frac{r_d D_{N-1}\tau}{1+r_d}.$$

552. Note that $D_{N-1} = LV_{N-1}^L$ since the firm has a constant leverage ratio of L. Therefore:

$$V_{N-1}^L = \frac{C_N(1-\tau)}{1+r_a} + \frac{r_d L V_{N-1}^L\tau}{1+r_d}.$$

553. So,

$$V_{N-1}^L\left[1-\frac{r_d L\tau}{1+r_d}\right] = \frac{C_N(1-\tau)}{1+r_a},$$

and,

$$V_{N-1}^L = \frac{C_N(1-\tau)}{(1+r_a)\left(1+\frac{r_d L\tau}{1+r_d}\right)}. \quad (4)$$

554. Thus, when discounting from time N to time $N-1$, we must use:

$$\begin{aligned}(1+r_*^L) &= (1+r_a)\left(1-\frac{r_d L\tau}{1+r_d}\right)\\ &= 1+r_a-\frac{r_d L\tau(1+r_a)}{1+r_d}.\end{aligned}$$

555. Consequently,

$$r_*^L = r_a - r_d L\tau\frac{1+r_a}{1+r_d}.$$

556. Note that at time $N-2$, the value of the levered firm is:

$$V_{N-2}^L = \frac{C_{N-1}(1-\tau)}{1+r_a} + \frac{r_d L\ V_{N-2}^L\tau}{1+r_d} + \frac{V_{N-1}^L}{1+r_a}.$$

557. Now we substitute for V_{N-1}^L in (4):

$$V_{N-2}^L = \frac{C_{N-1}(1-\tau)}{1+r_a} + \frac{r_d L\ V_{N-2}^L\tau}{1+r_d} + \frac{C_N(1-\tau)}{(1+r_a)^2\left(1-\frac{r_d L\tau}{1+r_d}\right)}.$$

558. So,

$$V_{N-2}^{L}\left(1-\frac{r_d L\tau}{1+r_d}\right)=\frac{C_{N-1}(1-\tau)}{1+r_a}+\frac{C_N(1-\tau)}{(1+r_a)^2\left(1-\frac{r_d L\tau}{1+r_d}\right)}.$$

559. Also,

$$\begin{aligned}V_{N-2}^{L}&=\frac{C_{N-1}(1-\tau)}{(1+r_a)\left(1-\frac{r_d L\tau}{1+r_d}\right)}+\frac{C_N(1-\tau)}{(1+r_a)^2\left(1-\frac{r_d L\tau}{1+r_d}\right)^2}\\&=\frac{C_{N-1}(1-\tau)}{1+r_*^L}+\frac{C_N(1-\tau)}{(1+r_*^L)^2},\end{aligned}$$

where,

$$1+r_*^L=(1+r_a)\left(1-\frac{r_d L\tau}{1+r_d}\right).$$

560. We can do the same thing recursively from $N-2$ to $N-3$ and so on. In all cases, we have:

$$r_*^L=r_a-r_d L\tau\frac{1+r_a}{1+r_d}. \tag{5}$$

561. Note that this implies:

$$\begin{aligned}1+r_*^L&=1+r_a-\frac{r_d L\tau}{1+r_d}(1+r_a)\\&=(1+r_a)\left(1-\frac{r_d L\tau}{1+r_d}\right)\\&=\frac{(1+r_a)(1+r_d-r_d L\tau)}{1+r_d}\\&=\frac{(1+r_a)\big(1+r_d(1-L\tau)\big)}{1+r_d}.\end{aligned}$$

Constant re-balancing to the target leverage ratio

562. Next, we note that this expression simplifies considerably if the time between each period becomes arbitrarily small. If, for example, interest compounds m times per year, we have the following relation:

$$\left(1+\frac{r_*^L}{m}\right)^m=\left(\frac{\left(1+\frac{r_a}{m}\right)\left(1+\frac{r_d(1-L\tau)}{m}\right)}{\left(1+\frac{r_d}{m}\right)}\right)^m.$$

563. Taking the limit as m becomes large gives:

$$\lim_{m\to\infty}\left(1+\frac{r_*^L}{m}\right)^m=\lim_{m\to\infty}\left(\frac{\left(1+\frac{r_a}{m}\right)\left(1+\frac{r_d(1-L\tau)}{m}\right)}{\left(1+\frac{r_d}{m}\right)}\right)^m,$$

which implies that:

$$e^{r_*^L}=e^{r_a+r_d(1-L\tau)-r_d}=e^{r_a-r_d L\tau}.$$

564. Consequently, if we assume that the firm *continuously* rebalances its capital structure to the target leverage ratio, L, the relationship between the cost of capital of a levered firm and an otherwise identical unlevered firm is:

$$r_*^L = r_a - r_d L\tau,$$

or,

$$r_*^L = r_a - r_d \tau \frac{D}{V}. \tag{6}$$

Weighted Average Cost of Capital

565. The cash flow to equity at any time N can be written as:

$$E_N^L = C_N(1-\tau) - r_d D_{N-1} + \tau r_d D_{N-1} + (D_N - D_{N-1}) + (1-L)V_N^L.$$

566. That is, the equity holders receive the after-tax operating cash flow, $C_N(1-\tau)$, less the interest paid to debtholders, $r_d D_{N-1}$. They also receive the tax benefit on interest $\tau r_d D_{N-1}$ plus any net change in the amount of debt, $D_N - D_{N-1}$. If the amount of debt financing increases ($D_N > D_{N-1}$), this additional cash is available to the equity holders and vice versa. They also receive a proportion $(1-L)$ of the present value of all future cash flows which is V_N^L at time N.

567. Substituting $D_N = LV_N^L$ yields:

$$\begin{aligned} E_N^L &= C_N(1-\tau) - r_d L V_{N-1}^L + \tau r_d L V_{N-1}^L + L V_N^L - L V_{N-1}^L + (1-L)V_N^L \\ &= C_N(1-\tau) + V_N^L - [1 + r_d(1-\tau)]L V_{N-1}^L. \end{aligned}$$

568. Dividing all terms by the value of equity at $N-1$ gives:

$$\frac{E_N^L}{E_{N-1}^L} = \frac{C_N(1-\tau) + V_N^L}{(1-L)V_{N-1}^L} - \frac{[1 + r_d(1-\tau)]L V_{N-1}^L}{(1-L)V_{N-1}^L}$$

which implies that:

$$1 + r_e = \frac{1 + r_*^L}{(1-L)} - [1 + r_d(1-\tau)]\frac{L}{1-L},$$

because $V_{N-1}^L(1 + r_*^L) = C_N(1-\tau) + V_N^L$. That is, the value of the whole firm must increase to provide a return of r_*^L over the period.

569. This implies that:

$$(1 + r_e)(1-L) = 1 + r_*^L - [1 + r_d(1-\tau)]L.$$

570. So,

$$1 + r_*^L = 1 + r_e(1-L) + [1 + r_d(1-\tau)]L,$$

and,

$$r_*^L = r_e(1-L) + r_d(1-\tau)L,$$

or,

$$r_*^L = r_e \frac{E}{V} + r_d(1-\tau)\frac{D}{V}, \tag{7}$$

which is the standard expression for the post-tax WACC.

Return on equity

571. Rearranging equation (7) yields:

$$r_e = \frac{V}{E} r_*^L - r_d(1-\tau)\frac{D}{E}.$$

572. Recall from equation (6) that if the capital structure is continuously rebalanced to the target leverage ratio:

$$r_*^L = r_a - r_d\tau\frac{D}{V}.$$

573. So,

$$\begin{aligned} r_e &= \frac{V}{E}\left(r_a - r_d\tau\frac{D}{V}\right) - r_d(1-\tau)\frac{D}{E} \\ &= \frac{E}{E}r_a + \frac{D}{E}r_a - \frac{D}{E}r_d\tau - r_d(1-\tau)\frac{D}{E} \\ &= r_a + \frac{D}{E}r_a - \frac{D}{E}r_d\tau - \frac{D}{E}r_d + \frac{D}{E}r_d\tau. \end{aligned} \quad (8)$$

574. So,

$$r_e = r_a + (r_a - r_d)\frac{D}{E}.$$

Levering and de-levering betas

575. Finally, we need an expression to relate the equity beta of a levered firm to the asset beta (or equity beta of an otherwise identical unlevered firm). Combining Equations 5 and 8 yields:

$$r_*^L = r_a - r_d\tau\frac{D}{V} = r_e\frac{E}{V} + r_d(1-\tau)\frac{D}{V}.$$

576. Now, substituting expressions for r_a, r_e, and r_d from the CAPM yields:

$$\left(r_f + \beta_a MRP\right) - \left(r_f + \beta_d MRP\right)\tau\frac{D}{V} = \left(r_f + \beta_e MRP\right)\frac{E}{V} + \left(r_f + \beta_d MRP\right)(1-\tau)\frac{D}{V}.$$

577. This implies that:

$$r_f\left(1 - \tau\frac{D}{V}\right) + \left(\beta_a - \beta_d\tau\frac{D}{V}\right)MRP = r_f\left(\frac{E}{V} + \frac{D}{V} - \tau\frac{D}{V}\right) + \left(\beta_e\frac{E}{V} + \beta_d(1-\tau)\frac{D}{V}\right)MRP.$$

578. So,

$$\begin{aligned} \beta_a - \beta_d\tau\frac{D}{V} &= \beta_e\frac{E}{V} + \beta_d(1-\tau)\frac{D}{V} \\ \beta_a &= \beta_e\frac{E}{V} + \beta_d\left[\frac{D}{V} - \tau\frac{D}{V} + \tau\frac{D}{V}\right]. \end{aligned}$$

579. So,

$$\beta_a = \beta_e\frac{E}{V} + \beta_d\frac{D}{V}. \quad (9)$$

580. This implies that:

$$\begin{aligned} \beta_e &= \beta_a\frac{V}{E} - \beta_d\frac{D}{V}\frac{V}{E} \\ \beta_e &= \beta_a\left(1 + \frac{D}{E}\right) - \beta_d\frac{D}{E}. \end{aligned}$$

581. So,

$$\beta_e = \beta_a + (\beta_a - \beta_d)\frac{D}{E}. \quad (10)$$

582. This is the Harris-Pringle formula. That is, when a constant leverage ratio is assumed, as the AER does when regulating NSPs, then the relevant de-levering and re-levering formulas contain no tax rate term (as the Hamada formula does).