Issues for discussion at the Concurrent Evidence Sessions

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1. Introduction

Dr Lally has made two significant contributions in relation to the issues that may be discussed during the upcoming Concurrent Evidence Sessions:

- A 2021 report to the AER that presents his views on the appropriate term for the allowed rate of return;[1] and
- A 2022 note that presents a summary of Dr Lally's views on a number of key topics that may arise during the Concurrent Evidence Sessions.[2]

This note sets out my views on each of the issues raised by Dr Lally in his 2022 paper, which include:

- The appropriate term for the allowed return on equity;
- The use of multiple estimators of the market risk premium (MRP);
- The use of multiple estimators of beta;
- How much historical data to use when estimating beta; and
- Geometric versus arithmetic means.

I also set out my views on two additional topics:

- The use of RAB multiples as a cross-check; and
- The use of determinations by other regulators as a cross-check.

2. The appropriate term for the allowed return on equity

I agree with Dr Lally that the correct framework to use when selecting the appropriate term for the allowed return on equity is the NPV = 0 condition. One of the clearest explanations of the NPV = 0 condition I have seen is the following offered by Partington and Satchell:

> *The zero NPV investment criterion has two important properties. First, a zero NPV investment means that the ex-ante expectation is that over the life of the investment the expected cash flow from the investment meets all the operating expenditure and corporate*

[1] Lally, M., *The appropriate term for the allowed cost of capital*, 9 April 2021.

[2] Lally, M., *Some thoughts on the upcoming expert sessions*, 28 January 2022.

taxes, repays the capital invested and there is just enough cash flow left over to cover investors' required return on the capital invested. Second, by definition a zero NPV investment is expected to generate no economic rents. Thus, ex-ante no economic rents are expected to be extracted as a consequence of market power. The incentive for investment is just right, encouraging neither.[3]

In the context of setting the allowed rate of return, this definition says that the NPV = 0 condition will be satisfied when the regulator sets the allowed rate of return equal to the rate of return ***investors require*** in order to commit capital to the regulated business.

When explaining why the AER should set the term of the return on equity equal to the length of the regulatory period, Dr Lally uses a mathematical example involving a regulated firm that exists for just two periods. Dr Lally argues that the correct way to value such a firm is recursively, first considering the expected cash flows over regulatory period 2, and then the expected cash flows over regulatory period 1.

The main rationale for adopting this recursive valuation approach, restricting attention to the cash flows expected over each regulatory period individually, appears to be that regulators need only care about cash flows over the regulatory period for which they are setting allowances.

Following this recursive method, Dr Lally presents the following expression for the expected value of the firm at time 1:

$$V_1 = \frac{E(REV_2)}{1 + k_{e12}} = \frac{[A - DEP_1]k_1 + (A - DEP_1)}{1 + k_{e12}} = \frac{(A - DEP_1)(1 - k_1)}{1 + k_{e12}}, \quad (1)$$

and the following expression for the value of the firm at time 0:

$$V_0 = \frac{E(REV_2) + E(V_1)}{1 + k_{e01}} = \frac{[Ak_0 + DEP_1] + E(V_1)}{1 + k_{e01}}. \quad (2)$$

Dr Lally then shows that the NPV = 0 condition is met if $V_0 = A$, which will only occur if:

- The allowed rate of return over the second period is set equal to the discount rate over the second period: $k_1 = k_{e12}$; and
- The allowed rate of return over the first period is set equal to the discount rate over the first period: $k_0 = k_{e01}$.

The discount rate used by investors to value the expected regulatory cash flows represents their required return. Therefore, Dr Lally's mathematical example simply shows that the NPV = 0 condition is satisfied if the allowed rate of return in each regulatory period is set equal to investors' required rate of return.

[3] Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 14.

Hence, there appears to be no conflict between the main insight from Dr Lally's example and the definition of the NPV = 0 principle provided by Partington and Satchell.

The main difference of views appears to be over the appropriate term for the discount rate to be applied in each regulatory period:

- Dr Lally argues that the term of the discount rate used to discount expected cash flows over the regulatory period should match the length of that regulatory period. That is, Dr Lally argues that if the length of the regulatory period is five years, investors *ought* to require a five-year rate of return. The AER should then set the allowed rate of return using a five-year term.
- The alternative perspective is that the AER should set the rate of return in line with the rate of return that investors *actually* require. Of course, we cannot literally observe the rate of return investors do require. However, we have overwhelming evidence—including evidence from actual investors and independent valuation experts—that standard Australian market practice is to use 10-year discount rates when valuing regulated energy networks and other regulated infrastructure firms.[4] Investors view the assets regulated by the AER as long-term investments, and therefore use long-term (10-year) discount rates to value such investments. Consequently, the AER should set the allowed rate of return using a 10-year term.

I favour the second approach. Since investors appear to require a 10-year return in order to commit capital to regulated energy networks, the AER should use a 10-year term when determining the allowed return on equity. This would satisfy the NPV = 0 condition.

This approach is entirely consistent with the approach the AER has taken in relation to the term for the cost of debt. In the 2013 Rate of Return Guideline, the AER selected a 10-year term for the return on debt by examining actual debt financing practice.[5] In the current RORI review, the AER is considering the appropriate term for the return on debt allowance by investigating the term of debt actually issued by network businesses. In other words, the AER's choice of the term for the return on debt has been informed by considering actual (not theoretical) market practice—because that tells us the actual return required by debt investors. It would seem reasonable for the AER to follow the same approach when choosing the appropriate term for the return on equity allowance.

What Dr Lally appears to be proposing is that the AER should set the allowed return on equity in line with the return it considers investors *ought* to require rather than the return investors *actually* require. This is evident from Dr Lally's presentation of the valuation problems for regulated and unregulated assets.

[4] This evidence is summarised in: ENA, *The term of the rate of return: Response to Draft AER Working Paper*, 2 July 2021, section 4.4.

[5] AER, *Rate of return guideline*, Explanatory Statement, December 2013, p. 136.

Dr Lally (2021, pp. 18) explains that when valuing unregulated assets, investors forecast out to infinity a set of cash flows, and then select a single discount rate k (which is typically a 10-year rate) from which the value of the asset V_0 follows:

$$V_0 = \frac{E(C_1)}{1+k} + \frac{E(C_2)}{(1+k)^2} + \cdots \qquad (3)$$

Dr Lally then argues that the valuation problem facing a ***regulator*** is entirely different. As the regulator need only be concerned with setting regulatory allowances over the forthcoming regulatory period, Dr Lally (2021, p. 19) considers that the task for the regulator is to choose a discount rate k, and then set the allowed rate of return equal to k such that discounted present value of the expected regulatory cash flows is equal to the opening asset value A_0:

$$V_0 = A_0 = \frac{E(C_1)}{1+k} + \frac{E(C_2)}{(1+k)^2} + \cdots + \frac{E(C_5)+A_5}{(1+k)^5} \qquad (4)$$

Notice that Dr Lally says that the ***regulator*** (rather than investors) should choose the discount rate k (i.e., the return required by investors). Given that the regulated cash flows are expected to arise over five years (in the case of a five-year regulatory cycle), Dr Lally concludes that k should be chosen by the ***regulator*** to be a five-year rate.

The real world evidence suggests that investors value regulated assets in the same way Dr Lally says unregulated assets are valued—i.e., according to equation (3). This is because, unlike regulators, investors in regulated assets are concerned with cash flows beyond just the forthcoming regulatory period. However, Dr Lally implies that fact should be ignored, and argues that regulated assets ***ought*** to be valued using equation (4) rather than (3). Hence, according to Dr Lally, the fact that investors in regulated assets require a 10-year return on equity rather than a five-year return on equity should be disregarded by the AER.

I disagree. In my view, the AER should determine the term of the return actually required by investors. This is clearly 10 years, not five. Then, the AER should set an allowed rate of return that matches the term required by investors. If the AER were to follow such an approach, the NPV = 0 condition would be satisfied.

If the AER were to adopt Dr Lally's approach, it would effectively be saying that all investors that require a 10-year return on equity rather than a five-year return on equity are valuing their assets incorrectly.

Since investors appear to require a 10-year return on equity in order to commit capital to regulated assets, and since the term structure of interest rates is usually upward-sloping, under Dr Lally's approach the allowed rate of return would typically be lower than the return required by investors. Consequently, the AER would be targeting an NPV < 0 outcome, rather than an outcome that satisfies the NPV = 0 condition. This follows from Dr Lally's equations (1) and (2).

In summary, when determining the appropriate term for the allowed return on equity, I think there are three questions the AER should consider:

- Should the AER choose a term equal to the term equity investors *actually* require, or equal to the term it considers investors *ought* to require?
- If the AER considers it should set the term of the return on equity allowance equal to what investors ought to require, why does the AER do something different when selecting an appropriate term for the return on debt allowance?
- How is it possible to satisfy the NPV = 0 condition if the term of the return on equity allowance is set equal to something other than what investors actually require?

3. The use of multiple estimators of the MRP

Dr Lally has demonstrated mathematically that the Mean Squared Error (MSE) of a parameter estimate can be minimised by combining two uncorrelated estimates of the same parameter—even if one of those estimates is biased.[6] I agree with the analysis presented by Dr Lally on this point.

The intuition for this result is that if the errors associated with each estimate are uncorrelated with one another, then combining the estimates will result in at least some of the errors cancelling out—thus lowering the MSE of the combined estimate. This is the same reason why an investor that holds a diversified portfolio of assets faces less overall risk than an investor that invests the same amount in individual assets contained within the portfolio. As long as the returns of the individual assets within the portfolio are not perfectly correlated with one another, combining the assets into a portfolio will reduce the variability of the investor's overall returns below the level that would be faced if the investor were to put all their money into any individual asset contained in the portfolio.

Note that the approach of combining different estimates using explicit weights outlined by Dr Lally corresponds to Option 3 for estimating a forward-looking MRP, as set out in the AER's final Omnibus paper.[7] It does *not* correspond with Option 2, which is to use DGM evidence qualitatively, to inform the AER's point estimate for the MRP within a range defined by the historical excess returns (HER) evidence.

The range of HER estimates reflects the extent to which there is statistical estimation uncertainty about the historical mean. The rationale for using DGM evidence is our lack of confidence that the HER point estimate (on its own) is a good estimate of the true MRP in the prevailing market conditions. The range of HER estimates tells us that the long-run mean could be as low as X or as high as Y. It does not tell us that the true MRP could be as low as X in some market conditions or as high as Y in others.

[6] Lally, M., Some thoughts on the upcoming expert sessions, 28 January 2022, pp. 3-4.

[7] AER, *Overall rate for return, equity and debt omnibus*, Final working paper, November 2021, p. 33.

Dr Lally goes on to state that (2022, pp. 4-5):

> *An even better goal than choosing an estimator with minimal MSE for the MRP over the next regulatory cycle would be to choose an estimator with minimal MSE for the MRP over the life of the regulated assets.*

Dr Lally's main reason for this opinion seems to be an ***assumption*** that over a long period of time, over-compensation in some periods will tend to offset under-compensation in other periods:

> *In this case, under or over estimation within a single regulatory cycle would be of no great consequence relative to aggregate errors over the entire life of the regulated asset. With such a long period, shorter term biases in an estimator will tend to wash out. This point may apply to historical averaging of excess returns.*

I disagree with Dr Lally on this issue. In my view, it would be preferable for the AER to set the allowed rate of return at ***each reset*** equal to the best possible estimate of the true market cost of capital over ***that*** regulatory period – rather than seeking to set an allowance that is likely to be too low in some regulatory periods and too high in others, with the hope that the positive and negative errors will even out over time.

As explained in section 1, the NPV = 0 principle would be satisfied when the AER sets the allowed rate of return equal to the return required by investors. In my view, the AER should seek to satisfy the NPV = 0 principle in each regulatory period because:

- There is no guarantee that all periods of under-recovery will neatly offset all periods of over-recovery. Such an outcome may occur only over the very long-run, if at all. As Keynes put it, "in the long-run, we are all dead."
- Doing so would provide incentives for efficient investment by regulated businesses in *every* regulatory period, rather than just *some* regulatory periods.
- Doing so would also ensure that consumers pay the efficient cost of delivering regulated services in each regulatory period. This would minimise intergenerational equity problems, whereby consumers in some regulatory periods pay too little and consumers in other regulatory periods pay too much.
- In order for negative and positive errors to even out over time, the AER would need to apply a consistent methodology for setting allowances over time. However, the current AER cannot bind future AERs to follow the same approach.

4. The use of multiple estimators of beta

Dr Lally explains (2022, p. 5) that the AER may be able to reduce the estimation error (MSE) associated with its beta estimates by combining estimates derived using multiple samples (e.g., foreign and domestic comparator firms), rather than relying exclusively on estimates derived using domestic comparator firms. I agree entirely with Dr Lally on this point.

5. How much historical data to use when estimating beta

Dr Lally notes (2022, pp. 6-7) that the AER faces a trade-off when selecting how much historical returns data to use when estimating beta. Specifically:

- Using a very long period of historical data may introduce bias in the estimates by including stale returns data that do not reflect prevailing market conditions. However, using a very long history of returns data would increase the number of observations, thereby reducing the scope for statistical estimation errors.
- By contrast, using a relatively short period of recent data would reduce the likelihood of bias, but may result in statistically noisier estimates.

My understanding is that, consistent with the reasoning employed by Dr Lally in relation to the issues discussed in the preceding two sections, he recommends giving some weight to estimates derived using both long and short (recent) estimation periods.

The AER's preference to give some (most) weight to beta estimates derived using the longest estimation period possible and some weight to estimates derived using the most recent five-year period accords with Dr Lally's advice that a regulator can minimise estimation error by combining estimates derived using different information sources—even if one or more of those individual estimates is biased.

If the AER favours the approach of giving weight to beta estimates from different estimation periods to minimise estimation error, it would be consistent to also give weight to beta estimates derived using foreign firms alongside estimates derived using domestic comparators—again, to minimise estimation errors.

6. Geometric versus arithmetic means

Dr Lally (2022, pp. 6-7) provides a clear explanation of why the AER should only use arithmetic means, and not geometric means, when estimating an MRP using historical excess returns for application in the CAPM. Dr Lally is entirely correct on this point. In fact, Dr Lally's opinion on this issue is so mainstream that it can be found in a number of leading undergraduate finance texts.[8]

To elaborate on Dr Lally's exposition, I note the following:

When assessing what average returns have *actually* been realised by investors over some historical period, then the appropriate approach to use is to compute the geometric mean of historical returns. This is because geometric averaging accounts for the compounding of returns over time. The returns that an investor receives over one year can be reinvested to generate returns over the next year, and the next year, and so on. The process of geometric averaging recognises that returns can be reinvested such that

[8] Berk, J. and P. DeMarzo, 2020, *Corporate Finance*, 5th global edition, Pearson, p. 368; Brealey, R., S. Myers and F. Allen, 2020, *Principles of Corporate Finance*, 13th edition, McGraw-Hill, p. 170.

they are compounded over time, and so computes the average rate that delivers the total compounded return over the averaging period.

However, when assessing what return investors can *expect* to receive over some future period (which is what is required for an MRP estimate for use in the CAPM), then the only appropriate approach to use is arithmetic averaging.

Suppose an investor has 50 years of historical excess returns data, and seeks to estimate the excess return that might be received in the following (i.e., the 51st) year. Then one could interpret the historical data in the following way:

- There is a 1-in-50 chance that the excess return in the 51st year will turn out to be the same as the excess return that was realised in the 1st year;
- There is a 1-in-50 chance that the excess return in the 51st year will turn out to be the same as the excess return that was realised in the 2nd year;
- …and so on.

Given the historical data, the *expected* excess return in year 51 is the simple arithmetic mean of the excess returns realised in each of the previous 50 years.

7. RAB multiples as a cross-check

The AER is currently consulting on whether and how it might use transaction RAB multiples or trading RAB multiples as a cross-check on its rate of return determinations.

In my view, observed RAB multiples will nearly always provide no useful information that could be used by the AER to cross-check its rate of return decisions.

In practice, the RAB multiples that the AER can observe represent the ratio of the expected enterprise value of the firm that owns the regulated assets and the ***existing*** RAB:

$$RAB\ multiple = \frac{E[Enterprise\ Value]}{Existing\ RAB} \quad (5)$$

The expected enterprise value of the firm (i.e., the numerator in the ratio above) usually reflects the expected present value of cash flows such as the:

- Revenue allowances (i.e., return on and return of capital) related to the existing RAB $(REV_{existing})$;
- Revenue allowances related to future investments in regulated assets (REV_{future});
- Payoffs from outperformance of regulatory allowances (OUT), such as incentive payments; and
- Net cash flows from unregulated activities $(UNREG)$.

This means that the equation (5) can be rewritten as:

$$RAB\ multiple = \frac{E\left[REV_{existing}\right] + E\left[REV_{future}\right] + E[OUT] + E[UNREG]}{Existing\ RAB} \qquad (6)$$

Note that the last three terms in the numerator of equation (6) are completely unrelated to the existing RAB, and therefore are not relevant to the task of cross-checking whether the AER has set an appropriate allowance for the rate of return on capital invested to date.

What the AER requires in order to provide a meaningful cross-check of its rate of return determinations is the following ratio:

$$RAB\ multiple = \frac{E\left[REV_{existing}\right]}{Existing\ RAB} \qquad (7)$$

This RAB multiple will be 1 if the discount rate used to compute the present value in the numerator is equal to the rate of return allowance set by the AER. Since the discount rate used in the numerator represents the return required by investors, equation (7) simply represents a test of whether the allowances set by the AER satisfy the NPV = 0 condition.

The problem that the AER faces is that it can almost never observe RAB multiples of the form expressed in equation (7). Nor can the AER compute RAB multiples using equation (7), because to do so it would need to know the discount rate actually used by investors to value the cash flows in the numerator of that expression.[9] That information is unavailable to the AER.

In any case, if the AER *knew* the discount rate that investors actually used for valuation purposes, then there would be no need for the AER to do any rate of return estimation, and there would be no need for any cross-checks, since the AER could simply set the allowed rate of return equal to the return it knows investors require.

8. Determinations by other regulators as a cross-check

As I understand it, the AER's preliminary position is that rate of return determinations by other regulators should not be used to cross-check its own rate of return decisions. The main reasons given by the AER for this preliminary position are the following:[10]

- Other regulators may use different data and methodologies to estimate the required rate of return;
- The methodologies used by other regulators to determine the allowed rate of return may not be transparent;

[9] The AER might assume that the rate of return it allows is equal to the discount rate actually used by investors. However, that would be tautological and render the cross-check meaningless.

[10] AER, *Overall rate for return, equity and debt omnibus*, Final working paper, November 2021, pp. 137-138.

- Other regulators may have different objectives to the AER's when determining rate of return allowances; and
- There may be country-specific differences (e.g., systematic risk, risk-free rates) that make like-for-like comparisons between regulatory determinations in different jurisdictions difficult.

In respect of the AER's first concern, the fact that other regulators may use different data and methodologies to estimate the required rate of return is precisely why the AER ***should*** use other regulators' rate of return determinations as a cross-check. When determining the allowed rate of return, the AER must make several choices about the data, models and methodologies it will use in the estimation process. This requires judgment, which could be wrong. That is why cross-checks are required. If the AER were infallible, or were to *assume* from the outset that all of its choices about data, models and methodologies were correct, there would be no point in conducting cross-checks.

In my view, it is odd to suggest that other regulators' determinations would only be useful cross-checks if the data, models and methodologies adopted by those regulators conformed with those adopted by the AER. In what sense would such a cross-check be useful? Behavioural scientists refer to that mode of reasoning as confirmation bias.

The second reason the AER should use the rate of return determinations of other regulators as cross-checks is because capital is internationally mobile. The investors in Australian energy networks can allocate their funds to any investment anywhere in the world. In other words, there is global competition for capital, whereby investors look around the world to identity the most attractive investment opportunities. This point is obvious if one considers the identity of existing investors in the privately-owned network service providers, or the range of bidders in recent Australian energy network transactions. In such a world, if the allowed return on regulated assets provided by the AER is less attractive than the return offered by assets of comparable risk in other countries, it would be rational for these global investors to commit their capital elsewhere.

This means it is irrelevant whether other regulators use different methods to determine the allowed rate of return, or if the methodologies used by other regulators are not transparent, or if other regulators have objectives that differ from the AER's when setting the allowed rate of return. What matters is whether the *outcome* of the determinations by regulators in other countries—i.e., the allowed rate of return—is more or less attractive than the one available to them if they were to invest in Australia. Therefore, several reasons the AER gives are not good reasons to eschew the determinations by overseas regulators as a cross-check on the AER's rate of return decisions.

I also think the AER overstates the potential for, and significance of, differences between the objectives pursued by the AER and overseas regulators. No doubt the legislation and regulatory instruments that govern regulatory regimes differ between countries. However, in my experience most regulatory regimes around the world have the same

basic objective, regardless of how it is codified: namely to promote economic efficiency. For that reason, it is very easy to identify a large sample of regulators around the world that are engaged in essentially the same task as the AER: to estimate the minimum return required by investors to commit capital to the regulated firms.

Indeed, the AER itself seems to recognise this point when it discusses why other regulators' rate of return determinations might be a relevant cross-check on its own decisions:

> *Other regulators have similar task as us which is to set the rate of return for regulated businesses. Their estimates may be comparable to our rate of return because they are for businesses with similar risks.*[11]

Finally, I note that discarding other regulators' determinations as a relevant cross-check would not matter much if the evidence suggested the AER's determinations were within the range of allowances provided by comparable regulators elsewhere. But Brattle's recent analysis shows that the AER's determinations are not in the 'middle of the pack.'[12] Brattle found that the AER's return on equity allowance (real and nominal) was significantly lower than the return on equity allowance set by every other regulator considered in its study.

I do not think other regulators' determinations should be used mechanistically to adjust the AER's estimates. However, I do think that evidence that the AER's methodology is producing (upwardly or downwardly) outlying estimates compared to those of other regulators is useful information that should inform the AER's decisions.

[11] AER, *Overall rate for return, equity and debt omnibus*, Final working paper, November 2021, p. 137.

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