**THE PRESENT VALUE PRINCIPLE: RISK, INFLATION, AND INTERPRETATION**

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**EXECUTIVE SUMMARY**

This paper has sought to address a number of questions posed by the Australian Energy Regulator (AER), as follows.

Firstly, in respect of the implications of risk for the Present Value principle, the principle applies equally to risk free and risky situations. In the former case, the risk free rate is defined over the regulatory period and based upon conditions prevailing at the start of that period. In the latter case, both the risk free rate and the risk premium are defined over the regulatory period and based upon conditions prevailing at the start of that period.

Secondly, in respect of how the Sharpe-Lintner version of the Capital Asset Pricing Model (CAPM) should be applied to ensure consistency with the Present Value principle and whether this principle requires use of an inter-temporal version of the CAPM, the Sharpe-Lintner CAPM is consistent with the Present Value principle so long as the parameter values are defined over the regulatory period and based upon conditions prevailing at the start of that period. Furthermore, although the model is a one-period model and therefore inconsistent with the usual multi-period regulatory situation, this is merely one of many features of the model that simplify reality and recourse to models with more realistic assumptions generally incurs greater difficulties in estimating parameters, thereby requiring a judgement over the trade-off. The AER’s preference for a one-period version of the model is universal amongst regulators, overwhelmingly typical of submissions to them, and consistent with most other applications of the CAPM, presumably in recognition of this trade-off.

Thirdly, in respect of the impact of inflation on the Present Value principle and the validity of Gregory’s comments on this matter, Lally (2012a) examines the implications of inflation and shows that it induces a very small understatement in the allowed rate of return when setting the risk free rate equal to the yield to maturity on a bond whose term to maturity matches the regulatory cycle. Thus Gregory’s claim that Lally fails to account for inflation is wrong.

Fourthly, in relation to whether papers by Gregory, Wright, and CEG have correctly interpreted the Present Value principle and applied it to Australia’s regulatory context, Wright agrees with the Present Value principle and his favoured strategy of estimating the cost of capital for the market portfolio (using the historic average return) coupled with the use of the risk free rate prevailing at the commencement of the regulatory cycle (both in real terms) is consistent with the Present Value principle. Whether it is the best approach is a distinct matter and is the subject of another paper (Lally, 2013). In addition, Gregory appears to agree with the Present Value principle and argues that a long-run historical average of government bond yields (or some weight on this in conjunction with the current value) could provide an estimate of the risk free rate that is consistent with the Present Value principle, on the grounds that the risk free rate is unobservable because even government bond yields are subject to default, re-investment and inflation risks. However, whilst government bonds do or may have such characteristics, none of these characteristics support the use of a long-run historical average risk free rate or some weight being placed upon this. Finally CEG also agree with the Present Value principle but consider that the relevant period for assessing whether a particular approach to parameter estimation is consistent with it is the entire life of the regulated assets rather than each regulatory cycle. I agree with this. CEG also favours using a long-run average risk free rate along with a long-run estimate of the market risk premium (MRP) on the grounds that this produces the best estimate of the cost of equity for a regulated business over the entire life of the regulated assets. However this approach to the risk free rate is not consistent with the Present Value principle, except in the special case where beta is 1 because CEG’s approach then coincides with Wright’s preferred approach. Furthermore, even under the idealised conditions underpinning CEG’s approach in which the expected rate of return on the market portfolio is constant over time, their approach is still inferior to Wright’s approach.

1. **Introduction**

Consequent upon earlier work by Lally (2012a) relating to the Present Value principle, and critiques of it by various authors, the AER has raised a number of questions that this paper seeks to address, as follows.

Firstly, to assess whether the Present Value principle is affected by the presence of risky assets and what relevance the principle has to the determination of the MRP.

Secondly, to assess how the Sharpe-Lintner CAPM should be applied to ensure consistency with the Present Value principle and whether this principle requires use of an inter-temporal version of the CAPM.

Thirdly, to assess the impact of inflation on the Present Value principle and the validity of comments on this issue by Gregory (2012a, para 11).

Fourthly, in relation to papers by Gregory (2012), Wright (2012), and CEG (2012), to assess whether these authors have correctly interpreted the Present Value principle and applied it to Australia’s regulatory context. Consideration should be given to the effect of regulatory periods that consist of multiple single years and the relevance of the expectations hypothesis.

1. **The Impact of Risk on the Present Value Principle**

The Present Value principle states that the present value of a regulated firm’s revenue stream should match the present value of its expenditure stream plus or minus any efficiency incentive rewards or penalties. This principle is sufficiently general that it deals with situations that involve risk. In assessing the implications of this principle for the choice of the risk free rate, Lally (2012a) assumes away any risk relating to operating costs or revenues and concluded that the appropriate risk free rate is that prevailing at the commencement of the regulatory period and applicable to the regulatory period. Thus, if the regulatory period were five years, the appropriate risk free rate would be the five year rate prevailing at the commencement of the regulatory period. In respect of risks relating to operating costs or revenues, Lally (2012a, footnote 1) notes that any such uncertainty leads to a risk premium being added to the discount rate and that this does not affect the appropriate choice of the risk free rate. Like the risk free rate, this risk premium must reflect conditions prevailing at the commencement of the regulatory period and applicable to the regulatory period. Thus, if the regulatory period were five years, the appropriate risk premium would be the five year premium prevailing at the commencement of the regulatory period.

In summary, the Present Value principle applies equally to risk free and risky situations and, in the latter case, requires both a risk free rate and a risk premium that are defined over the regulatory period and based upon conditions prevailing at the start of that period.

1. **Application of the Sharpe-Lintner CAPM to Regulatory Situations**

The Sharpe-Lintner version of the CAPM (Sharpe, 1964; Lintner, 1965; Mossin, 1966) specifies the equilibrium expected rate of return on asset *j* (‘the cost of capital’ for asset *j*) as follows:

**** (1)

where *Rf* is the risk free rate, *E*(*Rm*) is the equilibrium expected rate of return on the ‘market’ portfolio, and *βj* is the beta of asset *j* defined as

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In light of the conclusions in the previous section, if the regulatory period were five years, the appropriate values for *Rf* and *E*(*Rm*) would be the five year rates prevailing at the commencement of the regulatory period and *βj* should be defined with respect to the probability distributions for *Rj* and *Rm* over the five year period corresponding to the regulatory period.

However there are some situations where variations from these implications are inconsequential or unavoidable. One of them occurs where *E*(*Rm*) is estimated and beta is 1; in this case, the value for *Rf* is irrelevant because it washes out. The second situation occurs when *E*(*Rm*) or the MRP has a term structure, i.e., the expected rate over the next (say) five years differs from the expected rate over a different term. Unlike the term structure in the risk free rate, this term structure in *E*(*Rm*) or the MRP cannot be observed or (in general) even estimated using historical or other data.[[1]](#footnote-1) Consequently one is bound to act as if the term structure is always flat. The third situation arises in respect of beta, which is defined with respect to probability distributions for *Rj* and *Rm* over the regulatory period (typically several years). However, when using past data to estimate beta, it is necessary to use data of a higher frequency (usually monthly) in order to provide sufficient observations to estimate beta and this induces bias in the estimate.[[2]](#footnote-2)

In addition to issues relating to definitions within the Sharpe-Lintner model, there are also issues arising from the fact that this is a one-period model that is being applied successively in a multi-period regulatory situation, i.e., the model assumes that investors select portfolios at a point in time with the intention of liquidating them at some later point in time whilst the regulatory situations to which the model is applied do not have this terminal feature. As noted by Gregory (2012a, page 4), application of the CAPM to a succession of periods requires either a multi-period version of the CAPM or highly unrealistic assumptions about various parameters within one-period versions of the CAPM (such as the Sharpe-Lintner model). However all models make simplifying assumptions and the usual consequence of invoking a model with more realistic assumptions is to aggravate difficulties in estimating parameters. Thus, regulators and others must exercise judgement in making the trade-off. So far as I am aware, all regulatory applications of the CAPM, the overwhelming majority of submissions to regulators, and most other applications of the CAPM involve a one-period version of the model presumably in recognition of this trade-off. Gregory (2012a) is no exception to this; although raising these concerns about one-period versions of the CAPM, he adopts the same model in another paper written for the same parties at the same time (Gregory, 2012b).

In summary, the Sharpe-Lintner CAPM is consistent with the Present Value principle so long as the parameter values are defined over the regulatory period and based upon conditions prevailing at the start of that period. Furthermore, although the model is a one-period model and therefore inconsistent with the usual multi-period regulatory situation, this is merely one of many features of the model that simplify reality and recourse to models with more realistic assumptions generally incurs greater difficulties in estimating parameters, thereby requiring a judgement over the trade-off. The AER’s preference for a one-period version of the model is universal amongst regulators, overwhelmingly typical of submissions to them, and consistent with most other applications of the CAPM, presumably in recognition of this trade-off.

1. **The Impact of Inflation on the Present Value Principle**

Lally (2012a) examines the implications of the Present Value principle for the choice of the risk free rate. In response, Gregory (2012a, para 11) claims that Lally ignores inflation with the result that the allowed rate of return will be systematically too low.

Inflation matters in two principal respects: it causes capital expenditure to grow over time, leading to growth in the book value of regulatory assets, and it also causes operating costs to grow over time. In respect of inflation in capital expenditure, and contrary to Gregory’s claim, Lally (2012a, section 3.3) does in fact examine the implications of both inflation and real growth in capital expenditure, finding that the dual effect is to induce an understatement in the allowed rate of return of up to 0.07% (seven basis points) when setting the risk free rate equal to the yield to maturity on a bond whose term to maturity matches the regulatory cycle. I do not think this error is material.

In respect of inflation in operating expenditure, this is not considered in Lally (2012a) because it does not induce any further error in the allowed rate of return. To see this, consider the example in Lally (2012a, section 3.3) and extend it to allow for operating expenditures growing over time. The effect will be that the revenues of the business will grow even faster than as shown in the example but the net cash flows (revenues less operating expenditures and capital expenditures) will not be affected and therefore the understatement in the allowed rate of return will still be up to 0.07%.

In summary, and contrary to Gregory’s claim, Lally (2012a) does examine the implications of inflation and shows that it induces a very small understatement in the allowed rate of return when setting the risk free rate equal to the yield to maturity on a bond whose term to maturity matches the regulatory period.

1. **Interpretations of the Present Value Principle**

*5.1 Wright’s Arguments*

Wright (2012) agrees with the Present Value principle and also invokes the Sharpe-Lintner CAPM as shown in equation (1). His preferred approach to the parameter values, which he calls strategy 2, is to invoke the observed risk free rate at both points in the model (presumably the rate prevailing at the commencement of the regulatory period) along with use of the historical average *Rm* as an estimate of *E*(*Rm*) (Wright, 2012, section f). His recourse to the historical average *Rm* is premised upon *E*(*Rm*) being fairly stable over time. Consequently his strategy 2 is consistent with the Present Value principle. Whether his assumption about *E*(*Rm*) is valid and, even if it is, whether there is a better approach to estimating *E*(*Rm*), or the MRP directly, is a quite distinct matter and will be addressed in another paper (Lally, 2013). However it is worth noting that a minimum condition for believing that *E*(*Rm*) is stable over time is a focus upon the real rather than the nominal value and Wright (2012a) repeatedly refers to the real value in his paper. Consistent with this, the prevailing risk free rate that he invokes would also have to be the real rate.

Wright (2012, section f) also refers to a different approach, which he calls strategy 3, involving estimating the MRP directly from the historical average of real excess returns and using the historical average real risk free rate for the first term of the CAPM as shown in equation (1). Wright correctly notes that strategy 3 is identical in outcome to his preferred strategy 2 when beta is 1. He clearly appreciates that the AER’s beta estimate is 0.8 rather than 1 and he (properly) notes that strategies 2 and 3 will generate different results in this case. Given that he prefers strategy 2, this implies that he rejects strategy 3 in the present case because beta is 0.8.

To illustrate this point, suppose the historical average real market return since 1900 has been 8% comprising an average real risk free rate of 2% and therefore average real excess returns of 6%. In addition, the current real risk free rate is 1%. If asset *j* has a beta of 1, and strategy 3 uses the average real risk free rate since 1900, both strategies 2 and 3 yield an estimated real cost of equity for asset *j* of 8%, i.e.,

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However, if the beta of asset j is 0.8, then the resulting estimated cost of equity for asset *j* would be higher under strategy 3 as follows:

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In summary, Wright agrees with the Present Value principle and his favoured strategy of estimating the cost of capital for the market portfolio (using the historical average real market return) coupled with the use of the real risk free rate prevailing at the commencement of the regulatory cycle is consistent with the Present Value principle. Whether it is the best approach is a distinct matter and is the subject of another paper (Lally, 2013). Wright also implicitly rejects use of the historical average real risk free rate throughout the CAPM.

*5.2 Gregory’s Arguments*

Gregory (2012a) appears to agree with the Present Value principle but asserts that a long-run historical average of government bond rates (or some weight on it in conjunction with the current value) could provide an estimate of the risk free rate that is consistent with the Present Value principle. In support of this, he argues that the risk free rate is unobservable because even government bond yields are subject to default, re-investment and inflation risks.

In respect of default risk, naturally all government bonds face this to some degree and their yields will therefore overestimate the risk free rate to some degree. However this problem cannot be mitigated by using the historical average government bond yield or placing some weight on it. Such medicine bears no connection to the diagnosed ailment. For example, suppose the yield on some government bond overestimates the risk free rate by 0.1% due to default risk. So, if the historic average government bond yield is less than the current yield on these bonds by exactly 0.2%, a 50/50 weighting of the historic average and the current government bond yield will generate the correct result. However, the far more likely result of such a weighting scheme would be to aggravate the minor error from using the current yield on government bonds. For example, if the historical average is 2.0% higher than the current value, the 50/50 weighting scheme will overestimate the risk free rate by 1.1% rather than the 0.1% overestimation from using the current government bond yield, i.e., the error would be magnified 11 times. Furthermore, given that the historical average government bond yields that have been proposed by regulated businesses or their advisers all exceed the current yield, the effect of putting any weighting on the historical average rates will be to increase the estimated risk free rate and therefore aggravate the overestimation that arises from default risk. Thus Gregory’s proposal would in general aggravate error and, in the present circumstances, would definitely do so.

In respect of reinvestment risk, Gregory notes that a holder of government bonds faces uncertainty about the rates that will prevail at the dates on which the coupons are received. However this characteristic of these bonds does not disqualify their current yield from being the appropriate risk free rate for setting the allowed rate of return for a regulated business. Apart from cost and demand shocks, a regulated business subject to a regulatory cycle of (say) five years is like a coupon bearing government bond maturing in five years, in that it delivers cash flows over the course of the regulatory cycle and a value at the end of that cycle. As shown in Lally (2012a, sections 3.2 and 3.3), because the durations on the two assets are similar, the yield to maturity on a government bond with a maturity equal to that of the regulatory cycle will yield regulatory cash flows that satisfy the Present Value principle to a very close approximation. Of course, the cash flows from the regulatory asset are exposed to demand and costs risks but these are dealt with through a risk premium in the allowed rate of return. If Gregory considers that reinvestment risk disqualifies the current yield on government bonds from satisfying the Present Value principle, he ought to identify the point or assumption in Lally’s analysis at which this problem arises, and he has not done so. Furthermore, even if it were true that reinvestment risk did disqualify the current yield on government bonds from satisfying the Present Value principle, Gregory fails to explain how some average of the current and historical average yields would overcome or even mitigate this problem.

In respect of inflation risk, government bonds deliver payoffs that are either fixed in nominal terms (a conventional bond) or real terms (an inflation-indexed bond) and regulatory situations can also be of either type. Thus, if a regulatory situation sets a price or revenue cap based upon forecast inflation and does not protect the regulated business from inflation shocks, the appropriate government bond to use in setting the allowed risk free rate will be a conventional government bond despite its exposure to inflation risk (because the regulated business would face the same risk). Thus the issue (if there is one) is that of consistency between the risk faced by the regulated business and that faced by investors in government bonds rather than the fact that conventional government bonds face inflation risk. However, even if there were an inconsistency, this would be an argument for switching to the alternative government bond rather than for placing some weight on the historical average government bond yield.

Gregory (2012a, pp. 3-5) also refers to the expectations hypothesis relating to the term structure of interest rates, notes (correctly) that it has not been empirically supported, and asserts that this hypothesis underlies the analysis in Lally (2012a, section 3.2). However the expectations hypothesis is neither explicitly nor implicitly assumed by Lally and Gregory fails to identify the point at which he believes that Lally makes this assumption. In fact, not only does Lally *not* invoke the expectations hypothesis but the term structure example he uses involves an upward slope on the grounds that “this situation is typical” (Lally, 2012a, footnote 6) and it is typical precisely because the expectations hypothesis is *not* valid.

In summary, Gregory appears to agree with the Present Value principle and argues that a long-run historical average of government bond yields (or some weight on this in conjunction with the current value) could provide an estimate of the risk free rate that is consistent with the Present Value principle, on the grounds that the risk free rate is unobservable because even government bond yields are subject to default, re-investment and inflation risks. However, whilst government bonds do or may have such characteristics, none of these characteristics support the use of a long-run historical average risk free rate or some weight being placed upon this.

*5.3 CEG’s Arguments*

CEG (2012b, pp. 47-51) seems to accept the Present Value principle but claims that there are two versions of it. The first version involves satisfying the principle cycle by cycle, i.e., at the commencement of the regulatory cycle, the present value of revenues over that cycle plus the regulatory book value of assets ‘received’ at the end of the cycle should match the present value of expenditures over that cycle plus the regulatory book value of assets ‘paid’ at the beginning of the cycle (plus or minus any efficiency incentive rewards or penalties). The second version involves satisfying the principle over the full life of the regulated assets, i.e., at the time of purchasing the assets, the present value of revenues received over the life of the assets equals the present value of all expenditures including the initial cost of the assets. In respect of the first version, CEG states that it requires use of both a risk free rate and a market risk premium that reflect conditions prevailing at the commencement of the regulatory period. In respect of the second version, CEG does not clearly state its implications for the risk free rate and the market risk premium, and refers only to it admitting values for these rates that are averaged over a relatively long period so that the first version of the Present Value principle is satisfied on average over the life of the regulated assets rather than for each cycle. CEG argues that the second version is more important and therefore averaging of the cost of equity parameters over a long period is justified. This approach matches that of Gregory (2012a), as discussed in the previous section, although the rationale for using the historical average risk free rate is different.

I agree that these two versions of the Present Value principle exist, with the first version merely being that one used by a regulator to operationalise the second version. I also agree that the second version is more fundamental, and therefore more important, and that this *might* lead to favouring an estimate of the MRP that was appropriate on average over the life of the regulated assets but would be too high for some regulatory cycles and too low for others. This is consistent with my views in Lally (2012b, page 26) and arises from the fact that the MRP is unobservable. However this does not support averaging of the risk free rate over a long historical period because the risk free rate (unlike the MRP) is observable. CEG (2012a) argues that the resulting errors in the risk free rate that is used tend to offset the resulting errors in the MRP estimate. However, if this is believed to be true, the appropriate course of action would be to add these two estimates to produce an estimate of *E*(*Rm*) in the CAPM, as shown in equation (1), and to couple this parameter estimate with the risk free rate prevailing at the commencement of the regulatory cycle. Such a process corresponds to Wright’s preferred strategy, which is consistent with the Present Value principle.

To illustrate these points, consider a regulatory situation in which assets with a life of 50 years have just been purchased, the regulatory cycle is five years, and the risk free rate moves over time. In addition, the (unobservable) MRP may move over time and all that is known about it is that it is drawn from a distribution with a mean believed to be 6% based upon the historical average outcome (a historical average market return of 11% and a historical average risk free rate of 5%). One possible strategy for estimating the cost of equity on asset *j*, which I denote option 1, would be to use the observed risk free rate at the commencement of each regulatory cycle (*Rf0*) with the MRP estimate of 6%. A second possibility, being Wright’s preferred strategy, would be to use the observed risk free rate at the commencement of each regulatory cycle (*Rf0*) with the *E*(*Rm*) estimate of 11%.[[3]](#footnote-3) The third possibility, being CEG’s proposal, is to use the historical average risk free rate of 5% along with the historical average MRP estimate of 6%:[[4]](#footnote-4)

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In respect of which, if any, of these approaches to estimating the cost of equity capital is compatible with the Present Value principle, compatibility must exist at every beta level because the approaches are intended to be applied across a range of possible beta values arising in different regulatory situations. So, if any model fails the test at a particular beta level, it must be rejected. So, consider a beta of zero. At this beta level, the estimated costs of equity under the three approaches are as follows:

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So, both option 1 and Wright’s approach use the risk free rate prevailing at the beginning of each regulatory cycle, and will therefore satisfy both versions of the Present Value principle. By contrast, CEG’s approach will always use the historical average risk free rate of 5%. Invariably the risk free rate at the commencement of the regulatory cycle will differ from this and therefore CEG’s approach will not satisfy the first version of the Present Value principle. Nor will it satisfy the second version of the Present Value principle because the average of the actual risk free rates that prevail over the life of the regulatory assets (one at the beginning of each regulatory cycle) will almost certainly differ from the historical average of 5%. In fact, CEG’s approach would be akin to a bond trader valuing government bonds using the historical average risk free rate rather than the prevailing rate.

It might be observed that CEG’s approach will always match Wright’s approach when beta is 1. This is true but the two approaches will otherwise produce different results, including the case just examined of beta being zero. It might also be observed that, apart from the case in which beta is zero, option 1 and Wright’s approach will produce different results and therefore one of them must be better. This is true but, in the hypothesised situation here of only minimal knowledge about the MRP, we cannot say which is better.

It might be argued that this comparison is unfair to CEG’s proposal, because it fails to account for CEG’s *belief* that movements in the MRP are negatively correlated with movements in the risk free rate, and is also unfair to Wright’s proposal because it fails to account for his *belief* that *E*(*Rm*) is fairly stable over time. So, suppose now that *E*(*Rm*) is constant over time and therefore that movements in the risk free rate and the MRP are perfectly negatively correlated. Suppose further that we have enough historical returns data to be assured that the historical average market return of 11% matches *E*(*Rm*). In this case, unsurprisingly, Wright’s approach is the best (it always produces the correct result). CEG’s approach matches it when beta is 1, but not otherwise, and is therefore inferior to Wright’s approach. Thus, even under the idealised conditions underpinning CEG’s approach, in which *E*(*Rm*) is constant over time, their approach is inferior to Wright’s approach and it does not satisfy either version of the Present Value principle except when beta is 1.

In summary, CEG also agree with the Present Value principle but consider that the relevant period for assessing whether a particular approach to parameter estimation is consistent with it is the entire life of the regulated assets rather than each regulatory cycle. I agree with this. CEG also favours using a long-run average risk free rate along with a long-run estimate of the MRP on the grounds that this produces the best estimate of the cost of equity for a regulated business over the entire life of the regulated assets. However this approach to the risk free rate is not consistent with the Present Value principle, except in the special case where beta is 1 because CEG’s approach then coincides with Wright’s preferred approach. Furthermore, even under the idealised conditions underpinning CEG’s approach in which *E*(*Rm*) is constant over time, their approach is still inferior to Wright’s approach.

1. **Conclusions**

This paper has sought to address a number of questions posed by the AER, and the conclusions are as follows.

Firstly, in respect of the implications of risk for the Present Value principle, the principle applies equally to risk free and risky situations. In the former case, the risk free rate is defined over the regulatory period and based upon conditions prevailing at the start of that period. In the latter case, both the risk free rate and the risk premium are defined over the regulatory period and based upon conditions prevailing at the start of that period.

Secondly, in respect of how the Sharpe-Lintner CAPM should be applied to ensure consistency with the Present Value principle and whether this principle requires use of an inter-temporal version of the CAPM, the Sharpe-Lintner CAPM is consistent with the Present Value principle so long as the parameter values are defined over the regulatory period and based upon conditions prevailing at the start of that period. Furthermore, although the model is a one-period model and therefore inconsistent with the usual multi-period regulatory situation, this is merely one of many features of the model that simplify reality and recourse to models with more realistic assumptions generally incurs greater difficulties in estimating parameters, thereby requiring a judgement over the trade-off. The AER’s preference for a one-period version of the model is universal amongst regulators, overwhelmingly typical of submissions to regulators, and consistent with most other applications of the CAPM, presumably in recognition of this trade-off.

Thirdly, in respect of the impact of inflation on the Present Value principle and the validity of Gregory’s comments on this matter, Lally examines the implications of inflation and shows that it induces a very small understatement in the allowed rate of return when setting the risk free rate equal to the yield to maturity on a bond whose term to maturity matches the regulatory cycle. Thus Gregory’s claim that Lally fails to account for inflation is wrong.

Fourthly, in relation to whether papers by Gregory, Wright, and CEG have correctly interpreted the Present Value principle and applied it to Australia’s regulatory context, Wright agrees with the Present Value principle and his favoured strategy of estimating the cost of capital for the market portfolio (from the historical average return) coupled with the use of the risk free rate prevailing at the commencement of the regulatory cycle (both in real terms) is consistent with the Present Value principle. Whether it is the best approach is a distinct matter and is the subject of another paper. In addition, Gregory appears to agree with the Present Value principle and argues that a long-run historical average of government bond yields (or some weight on this in conjunction with the current value) could provide an estimate of the risk free rate that is consistent with the Present Value principle, on the grounds that the risk free rate is unobservable because even government bond yields are subject to default, re-investment and inflation risks. However, whilst government bonds do or may have such characteristics, none of these characteristics support the use of a long-run historical average risk free rate or some weight being placed upon this. Finally CEG also agree with the Present Value principle but consider that the relevant period for assessing whether a particular approach to parameter estimation is consistent with it is the entire life of the regulated assets rather than each regulatory cycle. I agree with this. CEG also favours using a long-run average risk free rate along with a long-run estimate of the MRP on the grounds that this produces the best estimate of the cost of equity for a regulated business over the entire life of the regulated assets. However this approach to the risk free rate is not consistent with the Present Value principle, except in the special case where beta is 1 because CEG’s approach then coincides with Wright’s preferred approach. Furthermore, even under the idealised conditions underpinning CEG’s approach in which *E*(*Rm*) is constant over time, their approach is still inferior to Wright’s approach.

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1. The one exception is survey evidence on *E*(*Rm*) or the MRP, where the survey question could be framed to specify the future period of interest. [↑](#footnote-ref-1)
2. Levi and Levhari (1977) argue that beta estimates will be biased up (down) when the investor horizon is longer than the data frequency used in estimating betas and the true beta is less (greater) than one. Empirical estimates of the predicted bias by Levy and Levhari (1977, Table 1) and Handa et al (1989, Table 1) are consistent with this. [↑](#footnote-ref-2)
3. Wright’s preferred approach generates a real cost of equity, which must then be converted to nominal terms. To facilitate comparison with CEG, I treat inflation as zero. [↑](#footnote-ref-3)
4. Gregory (2012a) favours CEG’s approach whilst Gregory (2012b) instead seems to equally favour this approach and Wright’s approach. [↑](#footnote-ref-4)