Trailing average cost of debt Issues Paper

SUBMISSION TO THE QCA – 24 APRIL 2014

QUEENSLAND TREASURY CORPORATION

Summary of QTC's views

- QTC supports the use of a properly designed trailing average approach to calculate the regulated cost of debt.
- A properly designed trailing average will create incentives for businesses to adopt efficient debt financing practices, reduce mismatches between regulatory allowances and efficiently incurred debt costs and deliver more stable prices for consumers over the long-term.
- The benefits of a trailing average approach will be maximised if it is implemented in full, which requires the following attributes to be included:
  - The trailing average should apply to the entire 10-year benchmark debt yield.
  - The trailing average cost of debt should be updated annually. Not doing so will create avoidable price volatility for consumers and cash flow mismatches for businesses.
  - To provide correct investment signals, new borrowings should be compensated at the prevailing 10-year debt yield. This can be achieved by calculating a weighted trailing average based on changes in the benchmark debt balance.
- In QTC's view, efficient debt costs are not determined by arbitrary factors such as the term of the regulatory period. Rather, it is the observed practices of comparable firms and financial risk management principles that should determine the regulated cost of debt.
- A decision to retain the 'on the day' approach or only apply the trailing average to the debt risk premium (DRP) would incorrectly imply that efficient debt costs and debt management strategies are determined by factors such as the term of the regulatory period.
- QTC does not agree that the regulated cost of debt will be overstated if a trailing average is applied to the entire 10-year debt yield. This approach will produce a relatively stable cost over the long-term, and this is considered appropriate for firms with relatively stable revenues that are not overly sensitive to the economic cycle.
- QTC does not agree with Associate Professor Martin Lally's conclusion that a strong case does not exist for moving away from the 'on the day' approach.
- Implementing a weighted trailing average with annual updates involves additional steps, however QTC does not consider the approach to be complex. QTC has developed a simple and transparent spreadsheet model to demonstrate how the required calculations could be performed. The model forms part of this submission.

Response to questions raised in the Issues Paper

3.1 - Please comment on the possible advantages and disadvantages of the QCA adopting a trailing average cost of debt approach rather than the current 'on the day' approach to determining the regulatory cost of debt.

In QTC's view, the advantages of a trailing average cost of debt approach are as follows:

- A properly designed trailing average can be replicated in practice with a prudent and efficient debt financing and risk management strategy. As a consequence, the trailing average cost of debt is likely to be an accurate estimate of the efficient cost of debt for a benchmark firm.
- The potential for mismatches between the regulated cost of debt and efficiently incurred debt financing costs, which are windfall gains and losses for regulated businesses, will be reduced.
- A weighted trailing average will provide appropriate investment signals by compensating the debt funded portion of new capital expenditure at the prevailing 10-year debt yield.
- A trailing average that applies to the entire 10-year debt yield will significantly reduce risks for consumers by producing a more stable long-term regulated cost of debt that is not exposed to short-term volatility or shocks in interest rate markets.
- The impact of non-systematic estimation errors in the benchmark debt yield will be reduced as only 10 per cent of the regulated cost of debt is 're-priced' each year.

Implementation issues

The ongoing implementation of a trailing average involves more steps than the 'on the day' approach, however these steps are not overly complex and the required calculations are straightforward to perform in a spreadsheet.

A trailing average approach requires the benchmark debt yield to be estimated more frequently. A potential solution to this problem is outlined in our response to Question 4.1.

The 'on the day' approach

Despite being simple to implement, the 'on the day' approach has several disadvantages:

- The implied debt management strategy cannot be implemented in practice. As a consequence, the 'on the day' approach will not produce an estimate of the efficient cost of debt for a benchmark firm.
- Consumers are exposed to greater variation in output prices over the long-term because the regulated cost of debt is fully reset based on prevailing rates at the start of each regulatory period.
- The regulated cost of debt is determined by arbitrary factors such as the term of the regulatory period and timing of the rate reset periods.
- Windfall gains and losses will regularly occur as it is not possible for an efficiently financed firm to align the average DRP on its borrowings with a DRP that is fully reset at the start of each regulatory period.
- Estimation errors in the benchmark debt yield are more significant as the estimates are made during short averaging periods and locked in for the term of the regulatory period.

3.2 - How should the QCA address the potential problems that arise from implementing a trailing average cost of debt approach, in particular potential overstatement of the allowed cost of debt and complexity in implementation of the trailing average cost of debt?

QTC does not agree that the cost of debt will be overstated if a trailing average is applied to the entire 10-year debt yield. Simply observing that the 10-year swap rate is usually higher than the 3-year swap rate does not make a 10-year swap more 'expensive' on a risk-adjusted basis.

Following an extensive consultation process, the AER concluded that applying a trailing average to the entire 10-year benchmark debt yield will produce a cost of debt that is commensurate with the efficient financing costs of a benchmark firm.

Assessing risk-adjusted interest costs

Lally[1] (p. 43) claims that an efficient unregulated firm that is otherwise similar to the firms regulated by the QCA, would issue 10-year debt and swap the base interest rate to a term shorter than 10 years:

> *'It is implicit in such an approach that the benchmark firms borrow but do not then enter into swap contracts to shorten the effective life of their debt, in respect of the risk free rate or DRP components. However, it is unlikely that efficient unregulated firms would act in this way because debt is (in general) progressively more expensive as its term increases. It is more likely that an efficient unregulated firm would choose both its debt term and interest rate swap contracts to optimally trade off the reduction in refinancing risk from longer term debt, the increase in the risk free rate with the effective debt term, the transactions costs of the swap contracts, and the increased interest rate volatility arising from a shorter effective debt term. Consequently an efficient unregulated firm might borrow for ten years but couple this with interest rate swap contracts in order to convert the risk free rate component of the cost of debt to (say) three years, thereby reducing the risk free rate component to the three year rate.'*

Lally's example can be summarised as follows:

1. Refinancing risk can be reduced by issuing 10-year debt.
2. Due to the positive slope of the yield curve, an efficient unregulated firm is 'likely' to enter into a swap contract to lock in a fixed base rate for a term that is shorter than 10 years.
3. In deciding on the term of the swap the firm will optimally trade-off the increased interest rate risk and transaction costs associated with a shorter-term swap against the expected interest savings compared to the base swap rate implicit in 10-year fixed rate debt.
4. On a risk-adjusted basis, a 10-year swap is more expensive than a shorter-term swap.

There are several problems with Lally's reasoning and the conclusions drawn from it.

Firstly, the appropriate interest rate risk exposure for a firm cannot be determined without considering the characteristics of its revenues. Using swaps to achieve a shorter-term base rate may be appropriate if the revenues are highly cyclical or correlated with changes in interest

[1] M. Lally, *The trailing average cost of debt*, 19 March 2014

rates[2]. This approach will reduce earnings volatility by achieving consistency between debt servicing costs and revenues. For example, floating interest rates may provide a natural hedge for commodity producing firms:

> *'Rio Tinto's interest rate management policy is generally to borrow and invest at floating interest rates. This approach is based on historical correlation between interest rates and commodity prices. In some circumstances, a higher proportion of fixed rate funding may be considered appropriate.'* [3]

Many of the firms that are subject to regulation or price monitoring by the QCA can be broadly characterised as natural monopoly businesses that:

- provide an essential service
- operate long-lived assets in a capital intensive industries, and
- maintain gearing levels that are significantly higher than the average gearing for listed firms.

In the absence of regulation or price monitoring it is likely that these businesses would have relatively stable revenues that are not highly sensitive to the economic cycle. For these businesses, exposure to a shorter-term base interest rate will increase the potential for a mismatch between the revenues and debt servicing costs, which increases earnings volatility and the probability of financial distress.

In contrast, the time series properties of the cost produced by a portfolio of fixed rate debt with staggered maturities out to 10 years is likely to be appropriate for firms with above market-average gearing and relatively stable revenues that are not highly sensitive to the economic cycle.

Secondly, Lally does not explain why the trade-off between interest rate risk and cost (ie, transaction and collateral costs) will identify a shorter-term swap rate as being 'optimal'. This may be the case for firms with pro-cyclical revenues and/or relatively low gearing, but that does not describe the characteristics of the firms that are of interest to a regulator.

Finally, in similar advice provided to the AER Lally concluded that the term of the base rate under a trailing average approach is indeterminable[4]. This conclusion does not support the claim that the regulated cost of debt will be overstated if a trailing average is applied to the entire 10-year benchmark debt yield.

Perceived complexity in implementation

Although implementing a trailing average approach involves more steps than the 'on the day' approach, QTC does not consider the implementation to be complex.

The spreadsheet model which forms part of this submission demonstrates how the key features of the trailing average approach (ie, annual updates and the weight-averaging of new borrowings at the prevailing debt yield) could be implemented in practice. The underlying calculations are simple, transparent and straightforward to replicate.

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[2] It may be appropriate for firms with relatively low gearing to maintain a shorter-term base interest exposure. If the impact of changes in interest rates on earnings is sufficiently small, there would be no need for these firms to incur the term premium associated with longer-term swap rates.

[3] Rio Tinto 2011 Annual Report. Note 31, p. 176

[4] M. Lally, *Estimating the cost of debt of the benchmark efficient regulated energy network business*, 26 June 2013, p. 11

3.3 - Are there any other issues for stakeholders that the QCA should consider as part of deciding to adopt a trailing average cost of debt approach?

We do not offer any views on this matter.

4.1 - Are there any issues that need to be considered in applying the PwC estimation methodology to derive the prevailing cost of debt for the benchmark firm each year under a trailing average cost of debt approach?

The ongoing application of a trailing average approach requires more frequent estimates of the benchmark debt yield to be made. Whether this is an issue will depend on how frequently the QCA is prepared to engage PwC to produce its econometric-based yield estimates.

The Reserve Bank of Australia (RBA) has recently started publishing non-financial corporate yields for 3, 5, 7 and 10 year tenors and broad credit ratings of A and BBB. The estimates are currently produced on a month-end basis, although QTC understands the RBA is considering producing daily estimates. This represents a new data series that can be considered by the QCA when estimating the benchmark debt yield.

The AER recently released an issues paper that outlines a method for interpolating between the RBA's month-end estimates to produce daily benchmark yield estimates[5]. This method could be applied if PwC produces a limited number of estimates each year. For example, if PwC produces daily estimates for March, June, September and December, the AER's method could be used to estimate the daily benchmark yields between these dates. This will provide the QCA with sufficient data to cover all possible averaging periods within each year.

4.2 - If the QCA were to adopt a trailing average approach, should the average apply to the entire benchmark cost of debt or to the debt risk premium component only?

In QTC's view, the trailing average approach should apply to the entire 10-year benchmark debt yield. This approach will produce a more stable long-term cost of debt that is not exposed to short-term volatility or shocks in interest rate markets.

Only applying a trailing average to debt risk premium will still produce potentially large step changes in the regulated cost of debt at the start of each regulatory period, which is an undesirable feature of the 'on the day' approach. Furthermore, businesses will still be required to use interest rate swaps to lock in a fixed base rate for the term of the regulatory period. The swap strategy used by some businesses under the 'on the day' approach is a rational response to a regulatory distortion rather than being reflective of how a comparable unregulated firm would manage interest rate risk.

In QTC's view, a properly designed trailing average should not incorporate the regulatory distortions that exist under the 'on the day' approach.

[5] AER, *Return on debt: Choice of third party data service provider*, April 2014, Section 5.1

Debt management practices in the absence of regulation

In its draft and final rule determinations the Australian Energy Markets Commission (AEMC) reached an important conclusion on how the regulated cost of debt should be estimated:

> *'…the long-term interests of consumers would be best served by ensuring that the methodology used to estimate the return on debt reflects, to the extent possible, the efficient financing and risk management practices that might be expected in the absence of regulation.'* [6]

The AEMC's conclusion is consistent with the advice provided to it by SFG Consulting:

> *'Yet there seems no reason why the term of the regulatory period, which represents a trade-off between administrative efficiency and timeliness of reviews, would bear any relationship to the prices which would prevail in a competitive market.'* [7]

In QTC's view, efficient debt costs are not determined by arbitrary factors such as the term of the regulatory period. Rather, it is the observed practices of comparable firms and financial risk management principles that should determine the regulated cost of debt.

As explained in our response to Question 3.2, the characteristics of a firm's revenues will determine the most appropriate interest rate risk management strategy. In the absence of regulation, a natural monopoly business that provides an essential service in a capital intensive industry is likely to have relatively stable revenues that are not highly sensitive to the economic cycle. To reduce earnings volatility and the probability of financial distress it would be appropriate for the business to have an average total cost of debt that slowly responds to changes in market interest rates. This is consistent with a trailing average that applies to the entire 10-year benchmark debt yield.

It should not be assumed that this type of business would use an interest rate swap to fully reset the base interest rate on its entire debt portfolio once every 5 years, or at any other frequency. Doing so would increase volatility in earnings over the long-term by creating large step changes in the total cost of debt. On this point, we agree with Lally (p. 44):

> *'For example, if the regulatory regime is the present one and the regulatory cycle is five years, regulated firms could be expected to convert the risk free rate component of their cost of debt into five year debt and the evidence presented indicates that they do this…* ***This tells us nothing about how they would behave if they were not regulated.'*** *[emphasis added]*

The term of the regulatory period has not been chosen based on financial risk management principles. As such, it is QTC's view that the term of the regulatory period should not affect the regulated cost of debt, which is consistent with applying a trailing average to the entire 10-year benchmark debt yield.

Additional considerations

If a trailing average is only applied to the DRP, a regulated business is likely to enter into forward-starting swaps prior to the start of each regulatory period to lock in the base interest rate on forecast new borrowings. If the forecast borrowings do not occur, the forward-starting swaps will need to be closed out at the prevailing swap rate. The business will incur a windfall

[6] AEMC, *Final Rule Determination, Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services*, November 2012, p. 73

[7] SFG Consulting, *Preliminary analysis of rule change proposals*, February 2012, para. 180

gain if the swap close-out rate is higher than the original forward swap rate (and vice versa). This problem also exists under the 'on the day' approach.

If the trailing average is applied to the entire 10-year debt yield and a weighted average approach is adopted, there is no requirement for a business to enter into forward-starting swaps because new borrowings are compensated at the prevailing debt yield. As a consequence, the firm's actual cost of debt will not be affected if the actual borrowings differ from the forecast borrowings.

4.3 - Should the QCA consider making annual adjustments to the regulatory cost of debt? If so, how should the QCA address the issues relating to annual adjustments?

QTC considers annual updates to the regulated cost of debt to be essential to the proper application of a trailing average approach.

There appears to be general agreement that a portfolio of debt with staggered maturity dates out to 10 years is an efficient funding strategy for a benchmark firm with above market-average gearing and long-lived assets. By construction, the portfolio cost will change each year as 10 per cent of the existing debt matures and is refinanced at the prevailing 10-year debt yield.

If the debt financing costs of an efficiently financed benchmark firm change each year, it follows that the regulated cost of debt should also change each year.

Consequences of not making annual updates

The contractual nature of interest payments means that a borrower usually has no ability to change the size or timing of the payments, so any shortfalls relative to the cost of debt allowance must be funded as they occur. For this reason, QTC considers the time series properties of the regulated cost of debt to be just as important as the long-term average cost of debt.

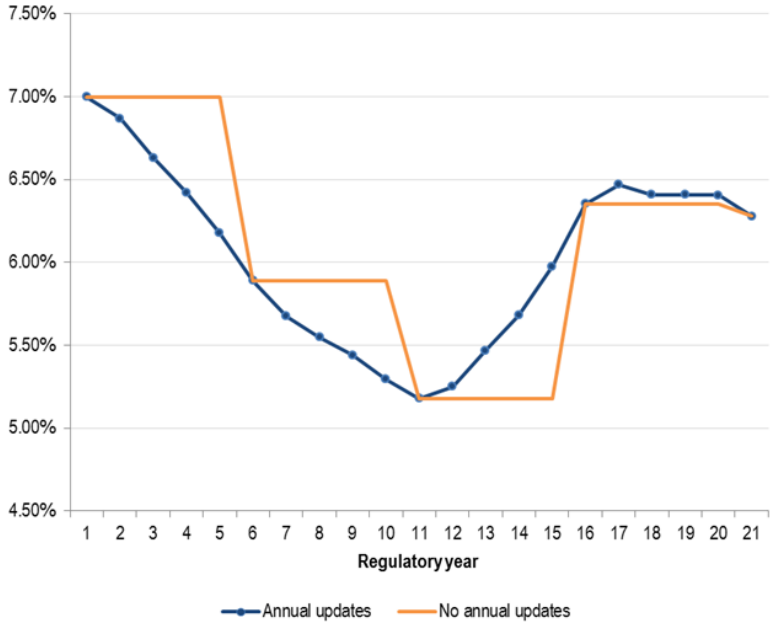
An analysis of the potential mismatches created by not annually updating the regulated cost debt under a trailing average approach is presented in Appendix A. This analysis demonstrates that the mismatches can be significant and will tend to display persistence over time. The persistence of the mismatches is important because it can lead to extended periods of sustained over- or under-compensation.

Implementation issues

The Issues Paper (p. 27) identifies increased price volatility within the regulatory period as a potential issue associated with annually updating the trailing average cost of debt.

Consumers will be exposed to the same amount of total risk regardless of whether the trailing average is updated annually or once at the start of each regulatory period. The only difference between these approaches is how the change in the cost of debt is delivered. As shown in Figure 1, a single update of the trailing average at the start each regulatory period concentrates the change in year one, while annual updates distribute the change in smaller amounts throughout the regulatory period.

FIGURE 1: TRAILING AVERAGE COST OF DEBT WITH AND WITHOUT ANNUAL UPDATES



Both approaches will produce the same cost of debt in the first year of each regulatory period, so the total change in the cost of debt from one regulatory period to the next will be the same. It should also be noted that the size of the total change will be significantly lower compared to the changes produced by the 'on the day' approach.

The Issues Paper considers a retrospective true-up as an alternative to making annual updates to the cost of debt. The Issues Paper correctly notes that a true-up may result in higher step changes in allowed revenues at the start of each regulatory period. To address this issue it is suggested that the true-up could be capitalised into the regulated asset base (RAB), which would result in the mismatches being recovered over a term longer than the regulatory cycle.

QTC does not support this approach as it is inconsistent with reducing the mismatch between efficiently incurred debt costs and the regulated cost of debt. As explained previously, interest payments are contractual and any mismatch between the payments on the regulated cost of debt allowance must be funded as they occur. Gradually recovering the mismatches over a relatively long period of time will not address this issue, which is consistent with Lally's (p. 31) observation that:

> *'… the use of a trailing average regime is premised on the need to better match the allowed cost to that actually incurred. Since the cost actually incurred better corresponds to the trailing average with annual updating, this suggests that annual updating should be used if a trailing average regime is adopted.'*

In QTC's view, the best outcome for consumers and businesses is to annually update the trailing average cost of debt rather than apply a true-up at the end of each regulatory period.

Implementing annual updates

The spreadsheet model that forms part of the submission demonstrates how the allowed revenues can be adjusted to account for annual updates in the cost of debt. The proposed approach is based on the following steps:

1. Use the trailing average cost of debt at the start of each regulatory period as an estimate of the regulated cost of debt for each year in the regulatory period.

2. Use the estimated cost of debt to determine the expected cost of debt allowance for each year in the regulatory period. The expected allowances will form part of the expected allowed revenues.
3. Adjust the allowed revenue for the year equal by an amount equal to the benchmark debt balance multiplied by the difference between the annually updated trailing average cost of debt and the estimated cost of debt.

4.4 - What are the advantages and disadvantages of applying a weighted, rather than simple, average under a trailing average cost of debt approach?

A weighted trailing average will minimise the difference between regulatory allowances and efficiently incurred debt costs when borrowings are made to fund new expenditure. This will reduce the potential for investment distortions by compensating new borrowings at the prevailing debt yield rather than the historical average debt yield. The importance of creating incentives for efficient capital expenditure was emphasised by the AEMC:

> *'The impact on the incentives for efficient capex is also an important consideration. The incentives for efficient capex are stronger when the difference between the return on debt and the debt servicing costs of the service provider is minimised.'* [8]

As explained in our response to Question 4.2, if a weighted trailing average is applied to the entire 10-year debt yield, there is no requirement for a business to enter into forward-starting swaps to hedge the base interest rate on new borrowings.

There are many disadvantages associated with a simple (ie, unweighted) trailing average, and QTC does not support the use of this approach:

- An unweighted trailing average assumes that a firm can issue debt at historical rates to fund new investment, which is not possible in practice.
- Unless the RAB is constant, an unweighted trailing average will create a mismatch between the regulated cost of debt and the true cost of new debt. As a consequence, the firm's investment decisions will be affected by the difference between the prevailing debt yield an the trailing average cost of debt.
- Due to the use of overlapping data, large and persistent mismatches between the unweighted trailing average and the prevailing debt yield will naturally occur.
- An unweighted average creates a bias towards under-investment when the prevailing debt yield is higher than the simple trailing average (and vice versa). Due to the persistence of the mismatches between these costs, it may take several years for the trailing average to 'catch up' to the prevailing cost of debt.

An unweighted average may produce a reasonable estimate of the cost of debt for businesses that have a relatively stable RAB, or if interest rates are stable for long periods of time.

Implementing a weighted trailing average

The spreadsheet model that forms part of the submission demonstrates how a weighted trailing average could be calculated using benchmark debt balances. The calculations are simple

[8] AEMC Final Rule Determination, p. 77

and transparent way of incorporating new borrowings into the trailing average at the prevailing debt yield rather than the historical average debt yield.

To avoid creating a 'lumpy' maturity profile, an adjustment is made to each yield in the trailing average. The adjusted yields are a weighted average of the previous year's value and the prevailing 10-year debt yield, with the weight based on changes in the benchmark debt balance.

A worked example is provided in Appendix B.

4.5 - What is the most appropriate data source and weighting approach for minimising the potential mismatch between the allowed and actual cost of debt without distorting incentives for regulated firms to seek to achieve an efficient debt policy?

The benchmark debt balances currently used by the QCA to determine the regulated cost of debt allowance can be used to calculate a weighted trailing average cost of debt.

The Issues Paper (p. 30) states that investment distortions under a weighted trailing average may still arise if the forecast investment does not occur, because the regulated cost of debt will not reflect the actual debt costs incurred. One way to address this problem is by using weights based on actual changes in the RAB multiplied by the benchmark gearing.

Assuming the QCA has made an accurate estimate of the benchmark debt balance for each year in the regulatory period, a firm should be incentivised to follow the implied borrowing profile. This can be achieved if the new borrowings are compensated at the prevailing debt yield, which requires to use of a weighted trailing average approach.

4.6 - What are important considerations when developing transitional arrangements that ensure regulated firms and customers are not adversely affected?

As part of the development of the Rate of Return Guideline QTC proposed a transitional arrangement based on the prevailing debt yields during the next rate reset period. This approach involves one more application of the 'on the day' approach followed by a gradual transition to a trailing average over a 10-year period.

In the Final Rate of Return Guideline the AER considered the following objectives when determining its transitional approach:[9]

- providing a gradual transition to the trailing average approach given a possible change in prior expectations regarding the regulatory framework by stakeholders
- practical considerations regarding use of historical information (and possible agreement) to calculate the cost of debt, and
- minimising incentives for potential strategic behaviour of regulated businesses.

The AER concluded that QTC's transitional arrangement is consistent with these objectives.

[9] AER Final Rate of Return Guideline, p. 120

QTC also suggested that different transitional arrangements may be appropriate for some businesses. For example, if a business can demonstrate that it already has in place a debt portfolio that is consistent with a trailing average approach, it may be appropriate for the transitional arrangement to include some historical data. The RBA's non-financial corporate yields could be used for this purpose as month-end data is available back to January 2005.

4.7 - Should the QCA apply a single cost of debt approach across all regulated firms, or should it determine the most 'efficient' benchmark for a given regulated firm on the basis of certain, firm-specific parameters?

4.8 - Should the QCA consider allowing different regulated firms to choose the cost of debt benchmark approach that they prefer (subject to certain pre-specified limitations)?

The QCA could adopt more than one cost of debt approach provided mechanisms are in place to prevent businesses from opportunistically switching between approaches at future determinations.

The Issues Paper (p. 36) considers the possibility of allowing for more than one cost of debt approach:

> *'To address the issue that may arise for some regulated firms which are not able to employ debt management strategies that closely align with trailing average assumptions, the QCA could decide to adopt the trailing average cost of approach with the provision for a particular firm to justify retaining the current 'on the day' approach in exceptional circumstances. This would place the onus on the regulated firm to demonstrate why the debt management strategy implicit in the trailing average cost of debt approach is not appropriate given the firm's characteristics. The QCA could then consider the benefits of the proposal to be satisfied that it is fully justified.'*

There are only two viable debt management strategies that can be adopted by a regulated business; a trailing average the applies to the total debt yield and a trailing average that only applies to the DRP. The debt management strategy implied by the 'on the day' approach is not viable because in cannot be implemented in practice (Lally pp. 14–15).

In QTC's view, it would be more appropriate for the choice to be between the two different applications of a trailing average, rather than between a single trailing average approach and the 'on the day' approach.

Comments on Lally's report

Implications for capex and new entrants

QTC agrees that incorrect investment signals will be provided if the regulated cost of debt equals a simple average of historical debt yields (Lally, pp.18–19). To address this issue, QTC has developed a simple and transparent method for calculating a weighted trailing average that compensates new borrowings at the prevailing debt yield.

Potential overcompensation if a total 10-year debt yield is used

The claim that the regulated cost of debt will be overstated if a trailing average is applied to the total 10-year debt yield has been addressed in our response to Question 3.2.

Variation over time in output prices

QTC agrees that applying a trailing average to the entire 10-year debt yield will produce the greatest reduction in output price variation over time (Lally p. 27).

> *'Using data from 2003 to 2013, output prices would have exhibited moderately less variation if a trailing average were applied to the DRP compared to the current regime and substantially less if a trailing average were also applied to the risk-free rate component of the cost of debt.'*

The potential role of credit default swaps

Lally (p. 51) refers to a likely improvement in the credit default swap (CDS) market as a reason for not departing from the 'on the day' approach. Specifically, the market may develop to a point where CDS can be used to hedge the DRP under the 'on the day' approach.

When considering potential strategies for hedging the DRP, it is important to understand that a CDS does not involve exchanging a fixed credit margin for a variable credit margin. A CDS is similar to an insurance contract where the protection buyer pays a fixed premium to the protection seller. If the underlying reference entity experiences a credit event (eg, bankruptcy, default, failure to pay), the protection seller makes cash payment to the protection buyer.

An essential feature of a CDS transaction is the presence of three *unrelated* entities: the protection buyer, protection seller and the underlying reference entity. Given this requirement, the protection seller cannot also be the reference entity (ie, an entity cannot sell credit protection on itself). If the entity were to default on its obligations, this is likely to include the promised cash payment to the protection buyer. The protection buyer would effectively be paying for an insurance policy that is virtually guaranteed to never pay off.

Similarly, it is highly unlikely that an entity would be able to purchase credit protection in itself, as a potential protection seller would rightly suspect that the entity had some non-public information about its ability to meet its financial obligations. As such, it is the structure of a CDS that makes it unsuitable for hedging the DRP, rather than a lack of liquidity or because contracts are not available on the desired bonds (Lally, pp.13–14).

Even if CDS could be used to hedge the DRP under the 'on the day' approach, a regulated business will end up with a total derivatives position that is *at least three times* the size of the book value of its debt[10]. This is likely to create relatively large collateral requirements through time, which may impose additional funding requirements on the business. Furthermore, relatively large derivative counterparty limits would be required, especially if cross-currency swaps are also used to swap offshore debt issues to Australian dollar funding.

In QTC's view, it is unlikely that maintaining such a large derivatives position would be efficient practice, especially for a non-financial firm that provides an essential service. Furthermore, the objective of these exposures is to hedge risks that are entirely the product of regulatory design. These issues are absent under trailing average approach that applies to the entire benchmark debt yield because there is no need to use interest rate swaps or CDS.

Based on these considerations, QTC considers that no weight should be given to arguments that suggest that CDS could be used to hedge DRP risk under the 'on the day' approach.

[10] For each dollar of debt the business would require one dollar of interest rate swap exposure and two dollars of CDS exposure to hedge interest rate and DRP risk under the 'on the day' approach. These requirements would be in addition to any cross-currency swaps that are used to swap offshore debt issues to Australian dollar funding.

Appendix A – Annual updates to the cost of debt

The appendix sets out the results of simulation analysis that quantifies the potential mismatch between the cost of debt produced by a portfolio of fixed rate bonds with annually spaced maturities out to 10 years and a trailing average cost of debt that is not updated annually[11].

By construction, the cost of debt produced by the portfolio will change annually as 10 per cent of the total debt balance is refinanced at the prevailing 10-year interest rate.

Simulation analysis

A lack of long-term historical Australian corporate interest rates prevents an analysis of the mismatch risk from being performed across a large number of non-overlapping 5-year periods.

To address this issue QTC has used a simple model to generate 5,000 random interest rate scenarios, each spanning a 200-year period. This allows the mismatch risk to be quantified across 200 annual periods and 40 non-overlapping 5-year periods for each scenario.

Model specification and parameters

The random interest rates have been generated using the following model:

$$S_t = S_{t-1} + \alpha T(\theta - S_{t-1}) + \sigma S_{t-1} N(0,1)\sqrt{T}$$

where:

S_t	=	the randomly generated interest rate at time *t*
S_{t-1}	=	the randomly generated interest rate at time *t-1*
T	=	time increment in years (T = 1/12 to produce monthly observations)
α	=	annual mean reversion speed (α = 0.2)
θ	=	long-term average interest rate (θ = 7.0 per cent)
σ	=	annualised yield volatility (σ = 12.0 per cent)
N(0,1)	=	random normal variable with a mean of zero and standard deviation of one

The mean reversion and yield volatility parameters have been estimated using monthly Bloomberg 7-year BBB yields from December 2001 to April 2013. To avoid introducing a directional bias into the analysis, the starting interest rate in each scenario equals the assumed long-term average interest rate of 7.0 per cent.

It should be noted that the statistical evidence of mean reversion in long-term interest rates is weak, and the estimated mean reversion parameter of 0.2 is not statistically significant[12]. As recently noted by the Independent Pricing and Regulatory Tribunal (IPART):

> *'While economic theory assumes nominal interest rates are in the long run mean reverting, empirical evidence is inconclusive. Recent research on long-term bond yields in a range of countries indicates that they can persistently deviate from their average values and statistical evidence of mean reversion is not strong.'*[13]

[11] This appendix is taken from QTC's June 2013 submission to the AER's Consultation Paper.
[12] A mean reversion test was performed using monthly 10-year swap rates from June 1988 to May 2013. The estimated mean reversion parameter was also statistically insignificant.
[13] IPART, *Review of method for determining the WACC*, December 2012, p. 33

The mean reversion parameter has only been used to prevent the randomly generated interest rates from taking on unrealistically extreme values. If the true dynamics of corporate interest rates are not described by a mean reverting process, or if the actual mean reversion parameter is less than 0.2, the random interest rate model can be expected to understate the size of the potential mismatches.

Approach

Each interest rate scenario has been used to simulate the mismatch between the portfolio cost of debt, which changes annually, and the trailing average without annual updates. The portfolio cost of debt equals the average simulated interest rate over the last 10 years using annual observations. The trailing average cost of debt without annual updates equals the average simulated interest rate over the 10 years up to the start of each 5-year period and is not updated until the start of the following 5-year period.

The mismatches have been calculated as follows[14]:

1. The difference between the portfolio and trailing average cost of debt in each year.
2. The average difference (per annum) between the portfolio and trailing average cost of debt for each non-overlapping 5-year period.

Each random interest rate scenario produces 200 annual mismatches and 40 average mismatches for each non-overlapping 5-year period. The standard deviation of the mismatches is calculated using the annual and 5-year average mismatches, and the process is repeated 5,000 times. The average standard deviation is then calculated for each mismatch measure.

Results

The long-term average mismatch between the portfolio cost of debt and the trailing average without annual updates is zero. However, the volatility and persistence of the mismatch (ie, its time series properties) are very important as a regulated firm has no ability to change the size or timing of its interest payments. As a consequence, any shortfall between the portfolio and trailing average cost must be funded as they occur with new borrowings or by reducing operating expenditures.

Annual mismatches

Table 1 displays the average standard deviation based on the simulated annual mismatches:

[14] The mismatches do not take into account the time value of money.

TABLE 1: SIMULATED ANNUAL MISMATCHES

Average standard deviation	Simulated mismatch (basis points)
Year 1	0
Year 2	17
Year 3	33
Year 4	47
Year 5	61
All years	***38***

The main observations from Table 1 are as follows:

- The mismatch in year 1 is always zero because the trailing average cost of debt is updated at the start of each 5-year period.
- The mismatches become progressively larger during the 5-year period as the portfolio cost of debt changes as maturing debts are refinanced annually at prevailing rates.
- On average, the standard deviation of the mismatches is **38 basis points**. The average standard deviation in year 5 is significantly higher at **61 basis points**.
- The average correlation between the mismatch in consecutive years is **+0.66**. This occurs because the portfolio cost of debt is a rolling average of the interest rates over the last 10 years. As a consequence, there is a large amount of overlapping data when calculating the mismatch in consecutive years.

Average mismatches for non-overlapping 5-year periods

Table 2 displays the average standard deviation based on the simulated average mismatch (per annum) measured across non-overlapping 5-year periods:

TABLE 2: SIMULATED AVERAGE MISMATCHES ACROSS 5-YEAR PERIODS

	Average mismatch (pa) (basis points)
Average standard deviation	31

The main observations from the simulated average mismatches are as follows:

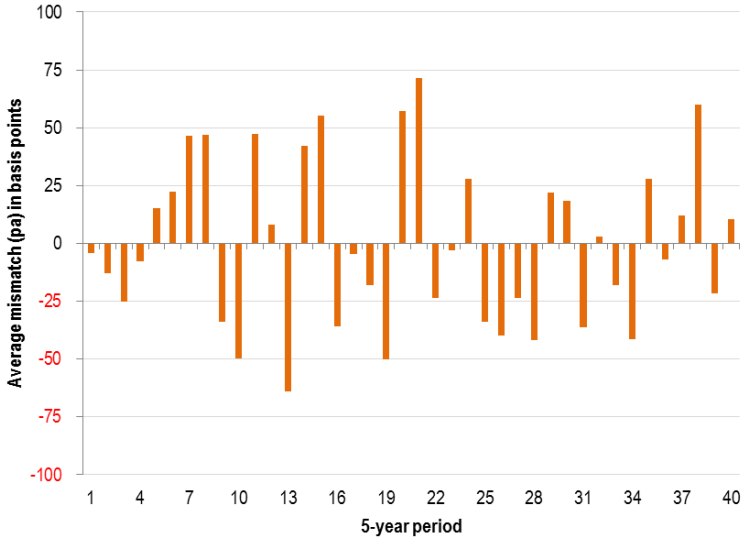
- On average, the standard deviation of the average mismatch (per annum) is **31 basis points**. This is only slightly lower than the 38 basis point standard deviation based on annual mismatches due to the strong positive correlation between the mismatch in consecutive years.
- The average correlation between the average mismatch in consecutive 5-year periods is **+0.23**, which indicates some persistence in the average mismatch over a 10-year period.

The simulated mismatches are based on a constant debt balance. The mismatches would be larger if new borrowings were taken into account, especially if the borrowings are not compensated at the prevailing cost of debt (ie, if an unweighted trailing average is used).

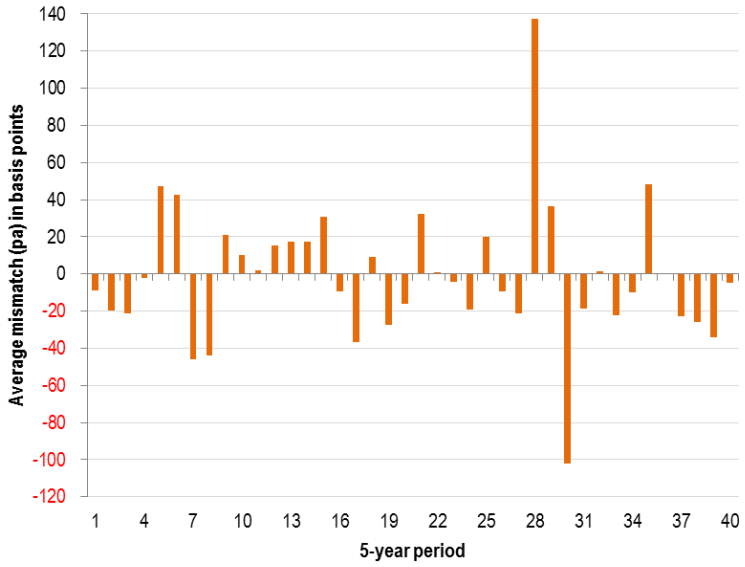
Examples

Some randomly chosen examples of the simulated average mismatches (per annum) based on non-overlapping 5-year periods are shown below. A positive mismatch occurs when the average portfolio cost of debt in a 5-year period is higher than the trailing average cost of debt without annual updates.

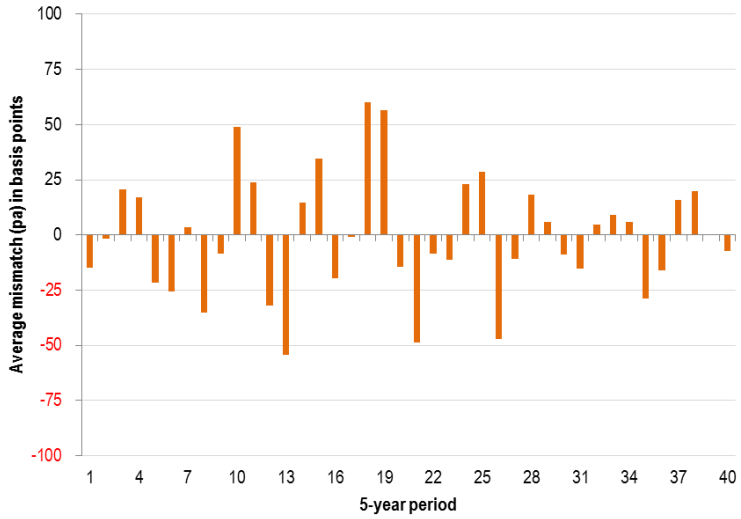
EXAMPLE 1: SIMULATED AVERAGE MISMATCH (PA) FOR NON-OVERLAPPING 5-YEAR PERIODS



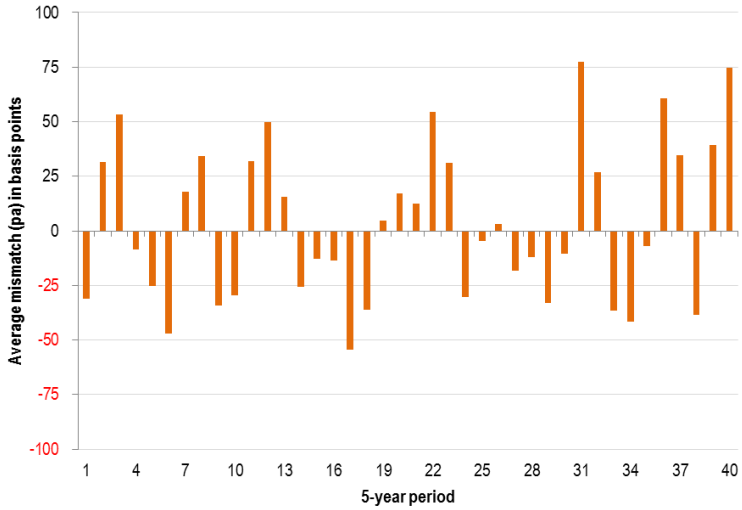
EXAMPLE 2: SIMULATED AVERAGE MISMATCH (PA) FOR NON-OVERLAPPING 5-YEAR PERIODS



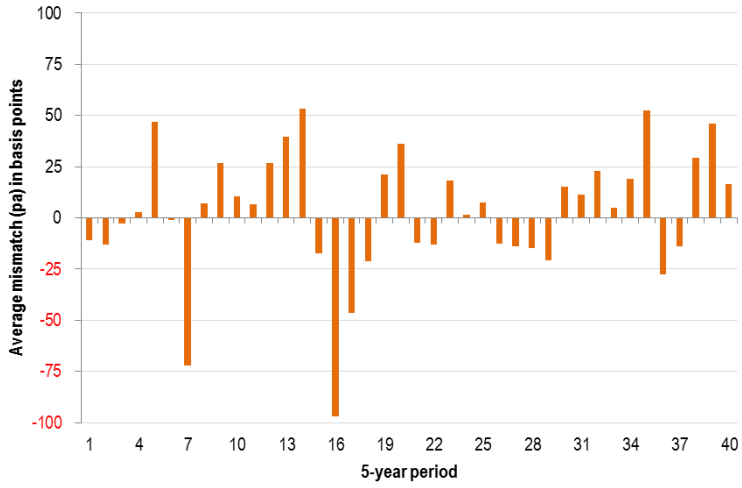
EXAMPLE 3: SIMULATED AVERAGE MISMATCH (PA) FOR NON-OVERLAPPING 5-YEAR PERIODS



EXAMPLE 4: SIMULATED AVERAGE MISMATCH (PA) FOR NON-OVERLAPPING 5-YEAR PERIODS



EXAMPLE 5: SIMULATED AVERAGE MISMATCH (PA) FOR NON-OVERLAPPING 5-YEAR PERIODS



These examples show several instances where a regulated business is over- or under-compensation across multiple *consecutive* 5-year periods. These outcomes, which are undesirable

for consumers and regulated businesses, can be avoided by making annual updates to the regulated cost of debt.

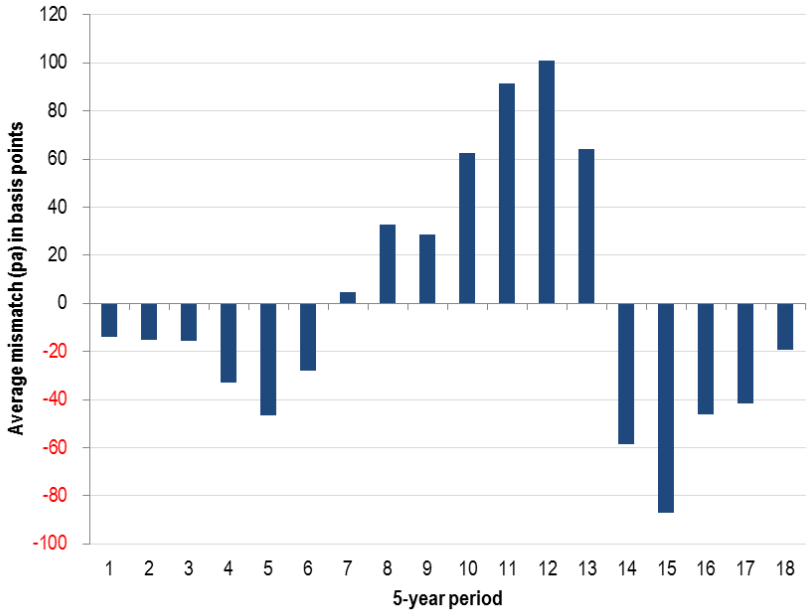
Long-term analysis based on US corporate interest rates

Long-term historical data on the Moody's Seasoned Baa Corporate Bond yield is available from the Federal Reserve Bank of St. Louis. As the data series extends back to 1919 it can be used to measure the actual mismatch across 18 non-overlapping 5-year periods.

The portfolio cost of debt has been calculated annually using the average Baa yield over the previous 10 years. The trailing average cost of debt equals the average Baa yield over the 10 years up to the start of each 5-year period and is not updated until the start of the following 5-year period.

Figure 2 displays the average simple mismatch (per annum) for each non-overlapping 5-year period. A starting date of April 1923 has been chosen to allow 18 full 5-year periods to be analysed up to April 2013:

FIGURE 2: AVERAGE MISMATCH (PA) FOR NON-OVERLAPPING 5-YEAR PERIODS BASED ON THE MOODY'S SEASONED BAA CORPORATE BOND YIELD



The standard deviation of the annual mismatches is **66 basis points** and the standard deviation of the average mismatch (per annum) for the non-overlapping 5-year periods is **53 basis points**. The correlation between the average mismatch in consecutive 5-year periods is **+0.75**, which indicates a high level of persistence in the average mismatch.

These figures are higher than the average standard deviations and correlations produced by the random interest rate model. This is mainly due to the large interest rate trends that were experienced in the US market during the analysis period. Scenarios such as these occur infrequently in the random interest rate model due to the mean reversion parameter.

If a regulated business had operated during this period and received a cost of debt allowance that was not updated annually, it would have experienced sustained under- and over-compensation for very long periods of time. For example, the first 6 bars in Figure 2 (ie, 30

years) are negative, which indicates that consumers would have paid too much compensation to an efficiently financed business over this period. During the next 7 bars (ie, 35 years) the result is reversed with the return on debt allowance being significantly lower than the business's efficiently incurred debt financing costs.

The mismatches presented in Figure 2 do not account for the time value of money. In practice, any shortfall between the portfolio cost of debt and the return on debt would need to be funded at a cost. The mismatches should therefore be viewed as a conservative estimate of the costs that an efficiently financed business would have incurred.

Conclusions

Based on the simulation results, a regulated business could expect to experience annual mismatches of between ± **76 basis points** if the trailing average cost of debt is not updated annually[15]. The annual mismatches are positively correlated and there is also a positive correlation in the average mismatch across consecutive 5-year periods.

The mismatches based on actual long-term interest rate data are larger than the simulated mismatches and display a much higher level of persistence over time. These results demonstrate that large cumulative mismatches can occur during trending interest rate environments if annual updates to the trailing average cost of debt are not made.

[15] Measured as ± 2 standard deviation range.

Appendix B – Calculating a weighted trailing average

A weighted trailing average can be calculated using the prevailing 10-year benchmark debt yield and the benchmark debt balances currently used by the QCA to determine the dollar value of the regulated cost of debt allowance.

Worked example

Assume the benchmark debt balance increases from $100 to $115 over the next year. The regulated business is assumed to have been operating under the trailing average approach for at least 10 years, so the underlying interest rates in the trailing average reflect the historical rates over the last 10 years. For the purpose of this example a series of hypothetical rates have been used to populate the trailing average.

The following weights will apply (either explicitly or implicitly) to the yields associated with the existing and new debt:

Weight applying to new debt = $15 ÷ $115 = **0.1304**
Weight applying to existing debt = $100 ÷ $115 = **0.8696**

Regardless of how the cost of debt is calculated, it will be applied to the benchmark debt balance to determine the dollar value of the cost of debt allowance. As such, *all* cost of debt approaches involve an implicit weighting scheme when the benchmark debt balance changes. The only difference is the yield(s) that apply to the change in the benchmark debt balance.

Table 3 displays the adjusted rates in the trailing average based on QTC's proposed method, which compensates the increase in the debt balance at the prevailing cost of debt (6.25 per cent). Table 4 displays the implicit adjustments in a simple trailing average, which compensates the increase in the debt balance at the average debt yield over the last 10 years (7.38 per cent).

Both sets of calculations assume that the refinancing of the maturing portion of the existing debt balance (ie, 10 per cent) is performed immediately prior to funding the $15 increase in the benchmark debt balance.

TABLE 3: WEIGHTED TRAILING AVERAGE

Observation	Yields before new borrowing (%)	Yield adjustment based on change in debt balance	Yields after new borrowing (%)
-9	8.00	8.00 x 0.8696 + ***6.25*** x 0.1304	7.77
-8	8.50	8.50 x 0.8696 + ***6.25*** x 0.1304	8.21
-7	9.00	9.00 x 0.8696 + ***6.25*** x 0.1304	8.64
-6	8.00	8.00 x 0.8696 + ***6.25*** x 0.1304	7.77
-5	6.00	6.00 x 0.8696 + ***6.25*** x 0.1304	6.03
-4	6.00	6.00 x 0.8696 + ***6.25*** x 0.1304	6.03
-3	7.00	7.00 x 0.8696 + ***6.25*** x 0.1304	6.90
-2	8.00	8.00 x 0.8696 + ***6.25*** x 0.1304	7.77
-1	7.00	7.00 x 0.8696 + ***6.25*** x 0.1304	6.90
Prevailing	6.25	6.25 x 0.8696 + ***6.25*** x 0.1304	6.25
Cost of debt[16]	**7.38**		***7.23***

TABLE 4: SIMPLE TRAILING AVERAGE

Observation	Yields before new borrowing (%)	Yield adjustment based on change in debt balance	Yields after new borrowing (%)
-9	8.00	8.00 x 0.8696 + ***8.00*** x 0.1304	8.00
-8	8.50	8.50 x 0.8696 + ***8.50*** x 0.1304	8.50
-7	9.00	9.00 x 0.8696 + ***9.00*** x 0.1304	9.00
-6	8.00	8.00 x 0.8696 + ***8.00*** x 0.1304	8.00
-5	6.00	6.00 x 0.8696 + ***6.00*** x 0.1304	6.00
-4	6.00	6.00 x 0.8696 + ***6.00*** x 0.1304	6.00
-3	7.00	7.00 x 0.8696 + ***7.00*** x 0.1304	7.00
-2	8.00	8.00 x 0.8696 + ***8.00*** x 0.1304	8.00
-1	7.00	7.00 x 0.8696 + ***7.00*** x 0.1304	7.00
Prevailing	6.25	6.25 x 0.8696 + ***6.25*** x 0.1304	6.25
Cost of debt[17]	**7.38**		***7.38***

The proposed method (Table 3) makes an adjustment to each yield in the trailing average calculation based on the prevailing 10-year benchmark debt yield and the change in the benchmark debt balance. This method is simple, transparent and avoids creating a 'lumpy' debt maturity profile when the benchmark debt balance changes.

[16] The cost of debt is a simple average of the data in the '*Yields after new borrowing'* column.
[17] As above.