



THE ALLOWED COST OF CAPITAL

OFGEM: GDPCR 2008 - 2013

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1. EXECUTIVE SUMMARY

In this section we summarise the main points set out more fully in each of the later sections of the document. Our assessment of the cost of capital of gas distribution network (GDN) businesses places particular emphasis on the interpretation of market evidence.

1.1. Notional gearing (*Section 3*)

To determine the weighted average cost of capital (WACC) the regulator must set the net debt to RAB ratio at which the cost of debt and cost of equity are to be assessed.

Conceptually, notional gearing should reflect the gearing that would be chosen by an efficiently financed business. Given the regulator's view that the regulated companies should seek to retain a solid investment grade rating the notional gearing should be consistent with retention by a well managed company of such a rating.

Market evidence for GDNs indicates that the perceived revenue and cost risks are low and that they can secure senior investment grade rated debt at debt: RAB ratios up to 70%. Therefore our judgment is that the 62.5% notional gearing currently used by Ofgem is, if anything, relatively conservative.

1.2. Cost of Debt (*Section 4*)

There is no doubt that the real cost of debt in the markets has fallen sharply since the late 1990s. In considering an appropriate range for the cost of debt over the next price control period we have considered the historic average, the current cost of debt issues by comparable regulated utilities and judgements about likely future debt market developments over the period.

Market evidence of the real risk free rate based on nominal gilt yields deflated for expected inflation indicate a range from 2.0-2.5% (depending on the judgement about the market's expected inflation rate). However the real risk free rate embedded in index-linked gilts is significantly lower, at about 1.8%.

Market evidence of the debt premia based on nominal investment grade rated debt issues indicate that the debt premium for A rated debt has been at or below 1.0% since 2003. Debt premia on corporate index-linked issues have been lower than this.

The key regulatory judgments around the cost of debt for Ofgem are:

- To what extent should the lower cost of index-linked debt issuance be taken into consideration when setting the GDNs' allowed cost of debt?
- How should Ofgem deal with the risk that current low rates could rise unexpectedly during the next 5 year control period?

On the **first question** it is clear that various domestic and international influences have been depressing the cost of index-linked debt relative to nominal debt. In our view it is reasonable to expect GDNs to exploit this opportunity for the benefit of shareholders

and network users by issuing index-linked paper, subject to the capacity of the market to absorb it. There is currently significant unmet demand for investment grade rated corporate index-linked debt. In our view when setting the allowed cost of debt the regulator should take account of the cost of index-linked debt and possible capacity constraints in the index-linked market.

In forming the latter judgment (about capacity in the index-linked market), Ofgem will need to take advice from banking advisers. In our assessment of the cost of debt we suggest that a GDN debt portfolio might reasonably be expected to be made up of 25% 'index-linked debt' and 75% 'nominal' debt.

On the **second question** it is necessary to form a view of the probability that the risk free rate and debt premia will increase significantly over the price control period and how to deal with that possibility when setting allowed revenues. It is clear that, in the past, regulators across most sectors in the UK have dealt with the risk of an unanticipated increase in the cost of debt by "aiming high". The allowed cost of debt has been set significantly higher than the actual cost of debt to allow for the risk that market rates could rise during the 5 year price control period. This response by regulators has (i) raised user prices above where they would have been if the actual cost of debt had been allowed, and (ii) increased the actual return on equity well above the allowed cost of equity. This "arbitrage" opportunity is a major reason that regulated assets trade, on listed markets and in asset transactions, at a significant premium to their RABs.

In our judgement, given the persistence of low costs of debt issuance for the last 10 years, Ofgem should now reduce the allowed cost of debt to more accurately reflect the real cost of debt in this decade. Ofgem should also take account of the opportunity for regulated companies to benefit from the lower cost of debt in the index-linked markets. On this basis our view is that the appropriate allowed real cost of debt is 3%.

1.3. Triggers (*Section 5 and Appendix*)

It is probable that the reluctance of regulators to set the allowed cost of debt in line with market evidence has arisen from concerns that market rates could increase unexpectedly during the price control period, leaving companies unable to (debt) finance their activities. As a result 'headroom' in the allowed cost of debt has been allowed. If regulators are now to set the cost of debt at a level reflecting the market evidence then there is merit in providing new mechanisms to deal with the risk of unanticipated rate increases. This report describes various adjustment mechanisms which could be triggered in the event that market cost of debt moved outside a pre-agreed band, thereby providing a symmetric hedge against unexpected rate movements within a 5 year price control period.

Adjustment mechanisms, if adopted, should be transparent, predictable and not subject to influence by the regulated companies or by third parties. Clear benchmarks for risk-free rates exist (e.g. from the Bank of England) and "triggers" (i.e. bands around these benchmark rates) could readily be established. Adjustment mechanisms could be devised

which were symmetric and which shared the cost of significant upward or downward shifts in the market cost of debt equitably between shareholders and users.

1.4. Cost of Equity (*Section 6*)

We have consistently been of the view that uncritical reliance on CAPM to derive the cost of equity is inappropriate and gives implausibly low values. This is also Ofgem's view. Rather, we place greater reliance on available market information. In particular, we note:

- The same global liquidity that is driving down returns on cash and bonds is likely to be driving down the required return on equities as well. Portfolio investors must choose between cash, bonds, property and equities. With the available returns on two asset classes – cash and bonds - having fallen sharply portfolio investors are forced to accept lower expected returns on property and equities. This is evident in property price inflation and high equity prices. The clear implication is that the current equity market risk premium is likely to be lower than the long run average of 4-5%¹, not higher.
- The trading valuations of listed regulated companies with few non-regulated assets are at a significant premium to their RABs. Adjusting for the 'arbitrage opportunity' arising from the allowed cost of debt being higher than the actual cost of debt suggests the current cost of equity is in the range 6.5-7.0%. Valuations of asset transactions support this assessment.
- The recent phenomenon of infrastructure funds with considerable liquidity and aggressively priced and structured bids for infrastructure assets should be taken into account. The evidence indicates that the required return on equity of these funds is significantly lower than the implied cost of equity referred to above.

An important issue for Ofgem is whether or not to take account of the low cost of equity of infrastructure funds when setting the allowed cost of equity. There is clearly some risk that in doing so the regulator could inadvertently bias financing of GDNs in favour of one particular type of owner. On the other hand if infrastructure funds have a great deal of institutional funds under management and those institutions are content to earn a lower return on equity then this genuinely reflects a lower market cost of equity.

Ofgem must also form a view about whether the current low cost of equity is likely to persist over the next price control period. Reversion to the mean has been the pattern over many decades and this possibility clearly must be taken into account when setting the cost of equity.

In our view Ofgem should give greatest weight to market evidence of the cost of equity from trading and asset valuations. This indicates a cost of equity range for GDNs of 6.5-7%. When forming its judgement about the 'point estimate' it is reasonable to take account of the entry of infrastructure funds with a low cost of capital. This may suggest adopting a point estimate towards the lower end of this range.

¹ The Smithers Report, September 2006.

1.5. Taxation Costs *(Section 7)*

We support the approach adopted by Ofgem in the TPCR. We believe that Ofgem should in principle agree to ex post adjustments to take account of unanticipated changes in taxation law (including the recent budget changes to corporation tax).

1.6. Overall assessment of WACC *(Section 8)*

We note that it is the WACC that matters, rather than the individual components. In setting the WACC value we consider it relevant to note that, if the current benign conditions in debt markets were to be abruptly reversed - with reduced liquidity, a higher risk free rate and widening debt spreads - then there would in all probability be a 'flight to safety'. UK regulated companies - including GDNs - may well be beneficiaries of a 'flight to safety' because regulated assets are perceived to be 'quasi-bonds' with lower risk than the equity market as a whole. Therefore a higher cost of debt may be offset by an increase in appetite for RAB-backed equity.

Our estimate of the Vanilla WACC based on the analysis in the report is a range of 4.3% - 4.5%. The market evidence may suggest a point estimate towards the lower end of this range. These estimates do not take account of the possibility of Ofgem adopting a trigger mechanism on the cost of debt.

2. INTRODUCTION

This report has been prepared by CEPA on behalf of Centrica plc and presents our assessment of the appropriate cost of capital for the Gas Distribution Companies (GDNs). The views expressed here are those of the authors and may not reflect those of Centrica plc.

In order to define the allowed revenues that relate to the cost of the capital, the regulator needs to determine for the next review period: the cost of debt²; the cost of equity; the appropriate gearing (measured as net debt: RAB); an approach to allowing for taxation costs; and the appropriate regulatory asset base against which the WACC should be applied to get the allowed revenues. It is important to note that for each element of this framework the regulator is seeking to set the parameters on a forward looking basis – i.e. to an appropriate level for the forthcoming price review period.

A purely mechanical application of the Capital Asset Pricing Model (CAPM) approach to the cost of equity typically generates a wide range of values, and with mid-points that are often implausibly low. CEPA's approach is therefore to take account of all relevant evidence including CAPM but to give particular weight to the available market evidence on the cost of equity.

In the rest of this report we outline the market evidence on each of the components set out above, discuss alternative approaches and views used previously by regulators or recommended by consultants and give CEPA's view on the appropriate range of values for the components of the WACC.

This report is structured as follows:

- Section 3 - notional gearing.
- Section 4 - the cost of debt.
- Section 5 - cost of debt adjustment mechanisms.
- Section 6 - cost of equity.
- Section 7 - allowing for taxation costs.
- Section 8 – CEPA assessment of the appropriate WACC.

² All of these parameters are in real terms.

3. NOTIONAL GEARING

3.1. Introduction

In assessing the WACC, the regulator needs to make an assumption about the appropriate level of gearing for an efficiently financed GDN. In theory, the appropriate optimal level of gearing is the level which equates the marginal interest tax shield (arising from tax allowances) with the marginal default risk cost. The ‘notional’ level of gearing used by the regulator is a judgement about the optimal rate - currently 62.5% (net debt: RAB) for GDNs.

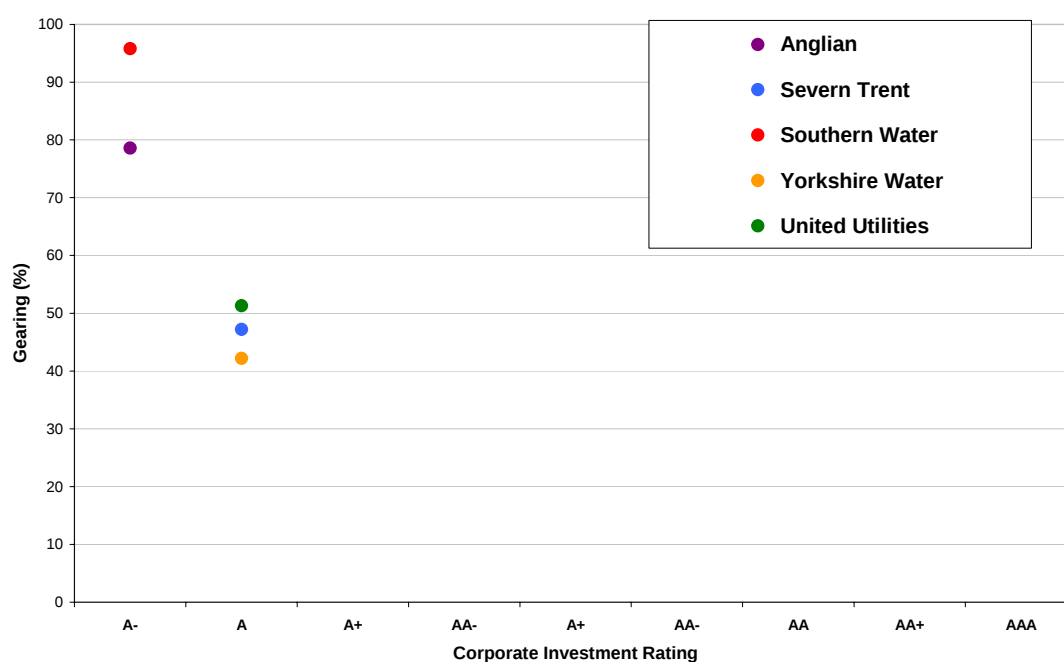
Regulators have typically derived notional gearing ratios that would allow efficiently financed and managed companies to achieve a solid (i.e. A or A-) investment grade rating, rather than a BBB rating. This gearing ratio is likely to be higher for regulated companies with lower business risks, such as GDNs. The risk profile of GDNs is particularly mitigated by a revenue regime which exposes the companies to little volume risk.

3.2. Market evidence

Figure 3.1 below shows gearing ratios (debt:RAB) for regulated water companies against corporate investment ratings. Water companies have been selected as they are the most directly comparable utilities to GDNs as, typically: (i) a low proportion of the listed parent company’s business is non-regulated; and (ii) water companies face similar revenue risks to GDNs (where volume risk is minimised by the regulatory approach).

Figure 3.1 shows that Southern Water and Anglian Water have sustained ‘solid’ (i.e. A/A-) investment grade ratings with gearing levels well in excess of 70%.

Figure 3.1: Gearing and investment ratings



Source: Ofwat³ and CEPA analysis

Note: gearing is calculated as net debt :RAB.

3.3. Conclusion

Market evidence suggests that debt: RAB ratios up to 70% are comfortably consistent with maintaining a solid investment grade rating for regulated utilities. The 62.5% notional gearing currently used by Ofgem⁴ is therefore not inappropriate. In fact it is relatively conservative.

³ Ofwat: Financial performance and expenditure of the water companies in England and Wales, 2005-06 report

⁴ Ofgem GDPCR: One Year Control Final Proposals, December 2006, p30

4. COST OF DEBT

4.1. Introduction

The appropriate cost of debt to be set by the regulator is that which an efficiently operated and financed company with comparable risks to a GDN would incur. This comprises an estimate of the risk free rate and the debt premium for a company with notional gearing.

In assessing the cost of debt we assume that, at notional gearing, the borrower will retain an A or A- rating⁵.

In this section we set out evidence for the cost of debt including:

- The risk free rate based on the evidence from index-linked gilts.
- The risk free rate based on the evidence from ‘deflated’ nominal bonds.
- Evidence on the debt premium for nominal and index-linked debt.
- We then set out our assessment of the appropriate pre-tax cost of debt approach for regulators.

4.2. Background

In the recent ‘Transmission Price Control Review’⁶, Ofgem took account of a range of factors in setting the allowed cost of debt. We note that:

- Smithers maintained that the preferred approach to estimating the cost of debt is to focus on nominal yields and their associated risk premia. Their report argues that using index-linked yields in setting the cost of capital may under-estimate the cost of debt;
- Ofgem noted that the debt premium is at historically low levels. Due to the uncertainty as to whether these low levels will persist over the entire period of the price control, Ofgem decided to use a cost of debt figure above that implied by current market levels; and
- Following the approach suggested by Smithers, Ofgem estimated the long term risk free rate as 2.5%, and for the reason stated above, a debt premium within the range of 1.0-1.5%.

4.3. The risk free rate

Risk free rates are currently well below the very long-run average, especially for long-term securities. Against this background, Ofgem will need to make a judgement about the value of the real, risk-free rate based on the information contained within both index-linked gilts and nominal gilts at different maturities. We discuss each of these in turn.

⁵ Standard and Poor’s rating

⁶ Ofgem TPCR: Final Proposals, 4 December 2006, p55

4.3.1. Index-linked gilts

Smithers have recently argued that it is inappropriate to use the yields on index-linked gilts in assessing the appropriate risk free rate. They justify this on the grounds that utilities have typically not used index-linked debt to finance their investment, and because the rates implied by indexed-linked bonds are affected by particular, current market conditions.

In our view it is reasonable to expect that regulated utilities will access index-linked debt markets to access debt on favourable terms. This position is supported by the market evidence - according to City analysts “*utilities are perfect issuers as their revenues are index linked and they have little natural competition*”⁷. As of September 2006, National Grid has increased the proportion of index-linked debt to 19% of total net debt and, according to analysts⁸, this proportion is likely to increase further in the near future. Network Rail has just announced the intention to issue up to £3 billion of index-linked gilts.

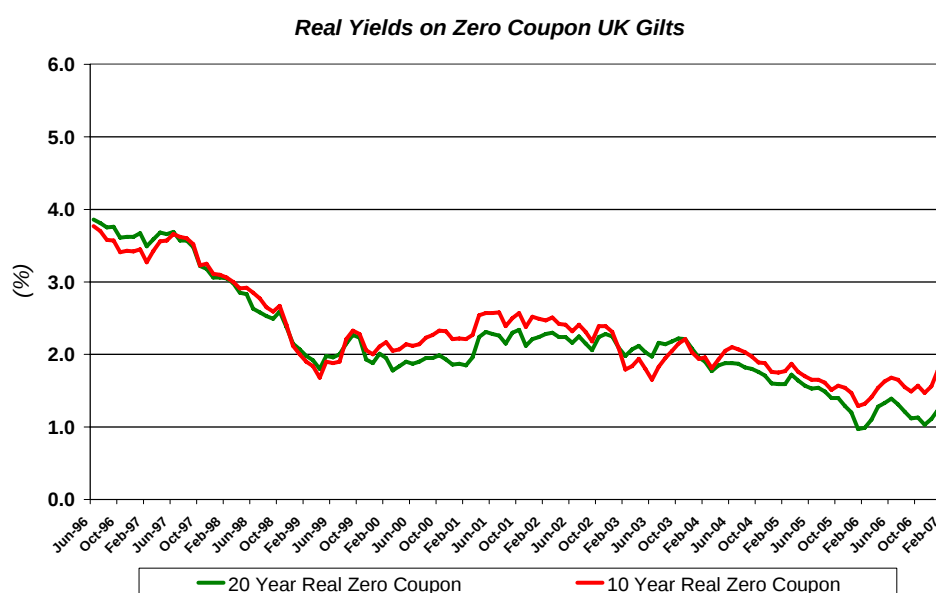
The issue is not whether regulated companies can or should access the index-linked market, so much as what are the capacity constraints in aggregate and for an individual borrower. Our judgment is that when setting the cost of debt, Ofgem should assume a proportion of the debt will be issued in the index-linked market. The proportion should be determined after enquiry as to capacity constraints. We consider a proportion of 25% as advisable.

The current market evidence, as illustrated in Figure 4.1 below, suggests that real yields on British Government index-linked securities are very low. 20 year real risk free rates (from index-linked gilts) have fallen to around 1.2% in the last year, and the 5 year average is around 1.7% (the ten year average is 2.0%).

⁷ Cazenove, February 9th, 2007.

⁸ Ibid.

Figure 4.1: Real yields on zero coupon gilts



Source: Bank of England⁹.

4.3.2. Nominal gilts

An alternative approach is to derive the risk free rate by deflating nominal yields on government gilts by the expected inflation, as suggested by Smithers.

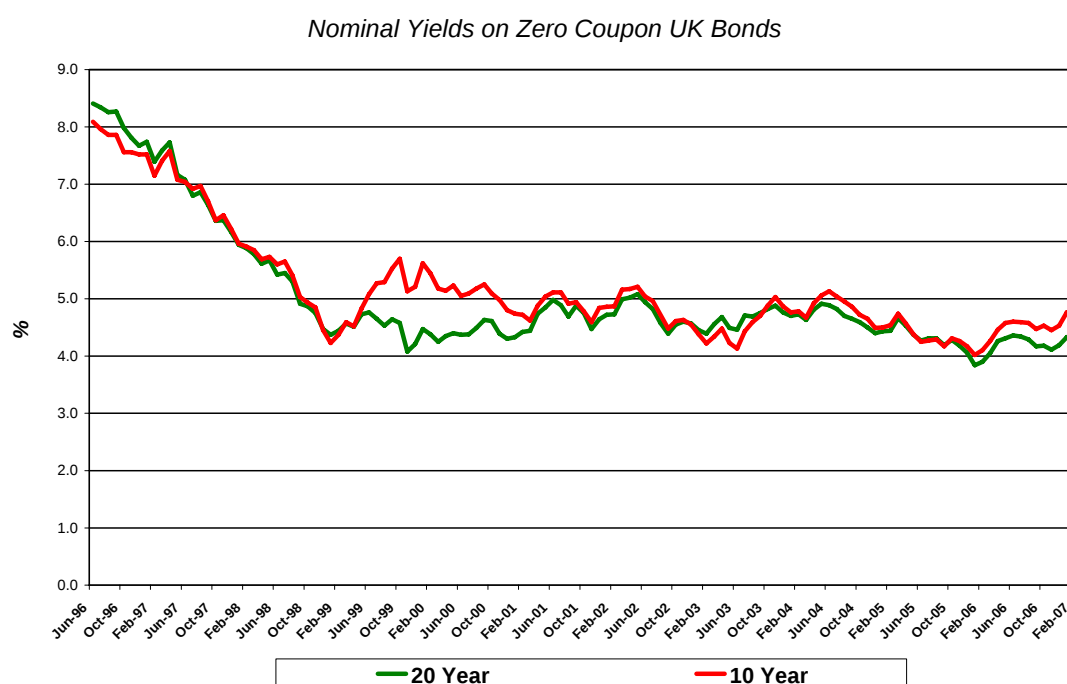
Figure 4.2 below sets out nominal yields on 10 and 20 year zero coupon bonds. On the 20 year bonds yields are currently around 4.3%, with a five year average of 4.5% (the ten year average is 4.8%).

To derive the real risk free rate we need the expected inflation rate. Figure 4.3 below shows market evidence of inflation expectations (derived from real and nominal zero coupon curves) at over 3.0%. Money market commentators assume inflation over the long run of 2.5 – 3%.

Assuming a range of inflation expectations of 2.5 - 3%, and taking account of both the ten year averages and the most recent data, suggests average real risk free rates, derived from nominal bonds, of 2.0 – 2.5%.

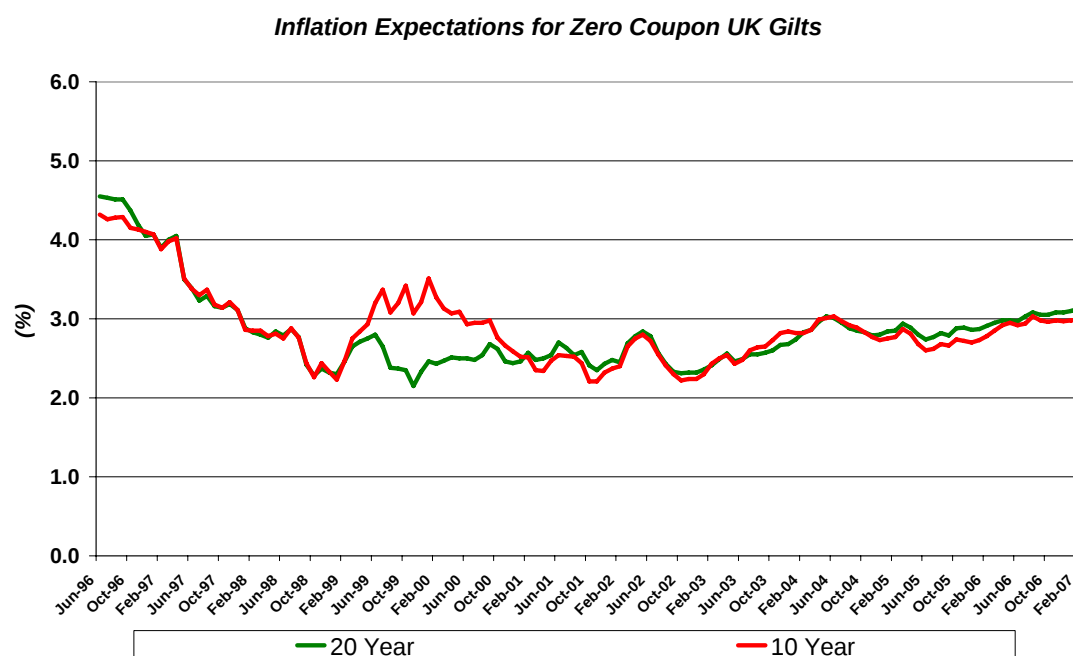
⁹ Calculated using the Variable Roughness Penalty Model, whereby information from the nominal yield curve is used to extract the real risk-free rates of interest embodied in the prices of index linked bonds

Figure 4.2: Nominal yields on zero coupon UK bonds



Source: Bank of England¹⁰

Figure 4.3: Inflation expectations for index-linked gilts



Source: Bank of England¹¹

¹⁰ Calculated using the Variable Roughness Penalty Model

¹¹ Calculated using the Variable Roughness Penalty Model

4.3.3. Conclusion on the risk free rate (using averages)

We consider here the appropriate blend of index-linked and nominal bonds and the appropriate mix of maturities for an efficiently financed GDN.

As noted above, the significant reductions in risk free rates since 1999 have lowered the longer-term average risk free rate. Given the difference in the risk free rates derived from index-linked and nominal bonds, our suggested approach is to assume that an efficiently financed GDN would, and could, fund itself using 25% index-linked and 75% nominal debt. This assumption is reasonable given that the index-linked market is about 25% of the UK market¹² and certain regulated utilities are approaching this level.

We have assumed a portfolio maturity range of 5-20 years reflecting asset life profiles. The choice of 20 years as a maximum maturity does not reflect our view of the likely maturity of actual debt issued by GDNs. Rather it is a conservative assumption (given the downward sloping yield curve) that reflects the reduced liquidity for corporate borrowers at the very long end of the market.

Tables 4.1 and 4.2 below summarise our ranges for the risk free rate on an index-linked and nominal basis.

Taking the five year averages, which we consider most appropriate given the sustained reduction in rates since 1999, the evidence suggests that an appropriate range for the risk free rate based on a basket of 25% index-linked and 75% nominal gilts is 1.6 - 2.0%. This range assumes that a company will finance itself with 1/3rd 5 year, 1/3rd 10 year and 1/3rd 20 year debt.

Table 4.1: Summary on risk free rate – index-linked

	Index-linked bonds		
Maturity	5 year	10 year	20 year
Assumed % of funding	1/3 rd	1/3 rd	1/3 rd
5 year average yield	1.9%	1.9%	1.7%
Implied risk free rate (5 year)	1.8%		

Table 4.2: Summary on risk free rate - nominal

	Nominal bonds		
Maturity	5 year	10 year	20 year
Assumed % of funding	1/3 rd	1/3 rd	1/3 rd
5 year average yield	4.5%	4.6%	4.5%
Deflator (5 year)	2.5% - 3%		
Implied RfR (5 year)	1.5% - 2.0%		

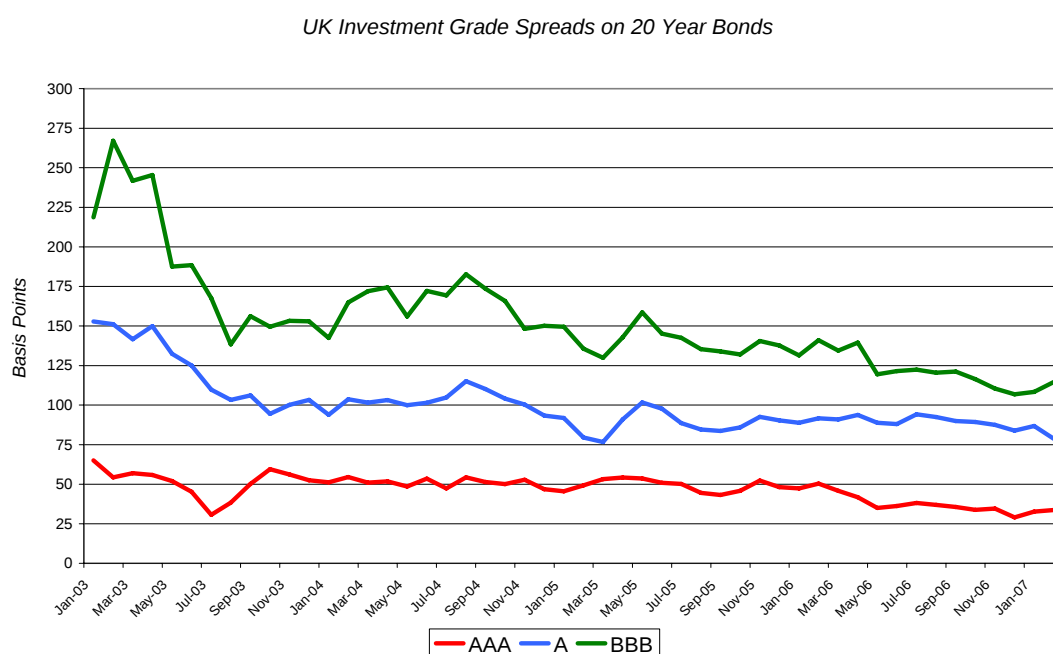
¹² Bank of England: index-linked gilts comprised approximately 25% of the UK Government bond market at end-March 2001.

4.4. The debt premium

This section sets out the evidence on debt premium for rated nominal bonds.

Figure 4.4 shows that ‘A’ rated 20 year bond debt premia have fallen from c. 150bp to below 100bp since 2003. These rates are consistently lower than the allowed premium in TPCR (2006) of 1.25%, and reflect high capital market liquidity and low market cost of systematic risk bearing. Note that the recent average premium on 5 year and 10 year spreads are about 50bp and 80bp respectively, so the average on the portfolio of medium and long-term bonds is lower, at under 80 bp.

Figure 4.4: Investment spreads



Source: Reuters

4.5. ‘Total’ cost of debt implied by actual debt issuance

In this section we cross check the market evidence on risk free rates and debt premia against the evidence from actual bond issues by regulated utilities.

The market data on actual index-linked issues shows a very low real cost of debt. Table 4.3 below shows that recent National Grid index linked bonds have been issued at total costs averaging 1.7%. Table 4.4 shows similarly low rates for water companies, averaging 1.6%.

Table 4.3: National Grid index-linked bond issues

Issue date	£M	Coupon (%)	Maturity date
28/07/2006	50	1.66	2056
28/07/2006	25	1.58	2056
27/07/2006	25	1.69	2056
14/07/2006	50	1.80	2056
26/05/2006	150	1.82	2056
11/05/2006	50	1.82	2056
07/04/2006	50	1.68	2036
03/04/2006	200	1.65	2036

Source: Cazenove, February 2007 (Note, Coupons = YTM if issued at par)

Table 4.4: Water company index-linked bond issues

Issuer	£M	Coupon (%)	Maturity date
Yorkshire Water	125	1.46	2056
Yorkshire Water	125	1.46	2051
Northumbrian Water	100	1.75	2053
Northumbrian Water	100	1.71	2049
Northumbrian Water	60	1.63	2041
Northumbrian Water	150	2.03	2036
United Utilities Water	50	1.44	2056
United Utilities Water	35	1.38	2056
United Utilities Water	50	1.56	2056
United Utilities Water	25	1.59	2056
United Utilities Water	50	1.59	2056
United Utilities Water	100	1.85	2056

Source: Cazenove, February 2007 (Note, Coupons = YTM if issued at par)

It should be noted that these costs are for 30 - 50 year maturities.

4.6. Conclusions on cost of debt

Our analysis shows that the range for the real pre-tax cost of debt, allowing a conservative debt premium of 1% and based on five-year averages of market data, is 2.8% for index-linked debt and 2.5-3% for nominal debt (assuming inflation expectations of 2.5-3%).

We have also considered these returns against evidence on actual issuance of long-dated index-linked debt. This suggests that the all-in cost of index-linked debt for comparable regulated utilities in recent years is below 2%. Set against this, we are aware that the risk

free rate on nominal bonds has very recently increased, particularly at the shorter end of the yield curve – this, together with evidence from 10 year averages, indicates a range of 2.0-2.5%.¹³

Taken together, we believe that this analysis clearly points towards an appropriate cost of debt for GDNs that is significantly below the 3.75% allowed in TPCR 2006.

Based on the above evidence, we believe that a defensible range for the cost of debt is 2.5% - 3.25%. This range takes account of the opportunity for regulated companies to benefit from the lower cost of debt in the index-linked markets. The lower end of the range places greater weight on the actual cost of index-linked issuance at the moment and five year averages for the real interest rate implicit in nominal gilts. The higher end of the range assumes significant mean reversion over the next five years.

Our judgement is that an appropriate point estimate for Ofgem in the absence of a trigger mechanism is likely to be 3%. The introduction of a trigger mechanism should allow Ofgem to set the cost of debt in the lower end of the range.

¹³ If we take account of the most recent data on yields for a blend of maturities we derive an average yield of 4.9%. Assuming inflation expectations in the range 2.5 to 3% suggests an implied real interest rate from current nominal gilts of around 2-2.5%.

5. TRIGGERS

5.1. Introduction

This section sets out the rationale for, and potential mechanics of, a trigger for the components of the cost of debt.

5.2. Rationale

Section 4 has demonstrated that low risk free rates have now been sustained for a significant period of time, and that debt premia for investment grade bonds have also remained low and stable in recent years. The cost of debt allowed by regulators in recent determinations has been in excess of the actual cost of debt incurred by regulated companies. This higher allowed rate has typically been set in order to protect the company from the risk that the current low rates could increase unexpectedly during the price control period, potentially rendering the companies unable to finance their activities.

Regulators have tended to allow for this risk by ‘aiming high’ in setting the allowed cost of debt with consumers bearing the cost.

The result is that consumers have not benefited from the full extent of the reduced costs of debt, whilst shareholders in regulated companies have earned returns in excess of the allowed cost of equity.

Consumers have, of course, been protected from the risks of any sharp increases in the cost of debt during a particular control period, but at a high cost.

An alternative approach worth exploring further would be for regulators to allow a cost of debt with much less ‘headroom’, but to incorporate adjustment mechanisms that would allow automatic adjustments to the allowed cost of debt in the event that market rates increased above the allowed rate during the price control period for a sustained period.

5.3. Regulatory precedent for use of triggers

There is considerable regulatory precedent for the use of triggers, both automatic (which would, for example, grant pre-defined changes in allowed revenue) and ones which would trigger an in-period review.

Although we are not aware of triggers relating to the risk free rate or the cost of debt currently in use, we are aware that a number of regulators are considering whether such arrangements might be appropriate. For example, in its Quinquennium referral of Heathrow and Gatwick airports, CAA has asked the Competition Commission to consider the case for triggers on the cost of debt. In addition we understand that Ofwat and ORR are about to commission a study to look at the case for triggers.

The Office of Rail Regulation (ORR) in particular is considering the use of triggers in the Periodic Review 2008¹⁴. It has indicated that ‘An important driver of Network Rail’s financing costs is the underlying market conditions. These underlying market conditions are largely beyond Network Rail’s control, although they can be efficiently managed, for example through hedging. In determining the allowed revenue the approach we and other regulators have taken to date is to fix the allowed rate of return...This places on Network Rail the risks of movements in the underlying financial markets...Regulators have typically allowed for this risk by taking a relatively cautious approach to determining the allowed return in order to limit the company’s exposure to the downside.’

As part of its consultation exercise ORR has therefore set out two alternative approaches to indexing a part of the allowed return to a pre-determined benchmark in order to reduce interest rate risk:

- Indexing part of the return to a defined and transparent debt market benchmark; or
- Providing an allowed return that embeds a cost of debt towards the bottom end of the estimated range for the cost of debt but providing a mechanism for compensating Network Rail in the event that a defined and transparent debt market benchmark rises above a pre-determined level. i.e. log up/down any differences between the allowed rate and the benchmark.

5.4. Trigger mechanisms

The form of trigger should be predictable, transparent to all users and as simple as possible. Whilst the precise form of trigger will require further consideration, we set out below initial thoughts on potential forms of trigger.

5.4.1. Benchmarks

The components of the trigger should be transparent and non-controllable by the GDNs or third parties. The trigger could be on the risk free rate only or the all-in cost of debt. Examples of benchmarks (which are consistent with the analysis in Section 4) are:

- Risk free rate: specified basket of benchmark gilts, as published on the Bank of England website, as an indicator of the allowed risk free rate. The basket could consist of nominal and/or index-linked gilts in pre-specified proportions.
- Debt premium: the current spreads on UK investment grade bonds as published by Reuters, as an indicator of the allowed debt premium.

Alternatively the benchmark could relate directly to movements in the total cost of debt using a reference basket of debt issues with the appropriate rating as published by an authoritative source e.g. Reuters.

¹⁴ ORR – Periodic Review 2008 (PR 08): The treatment of risk and uncertainty

5.4.2. Thresholds

There would need to be agreed thresholds around a base value (say +/-50bp change in the average over a, say, 6 month period). If market rates fell outside the threshold the pre-agreed adjustment mechanisms would apply.

5.4.3. Adjustment mechanisms

There are a number of ways in which the trigger mechanics could work. We set out here a number of options:

- **Logging up/down mechanisms.** If the actual cost of debt falls outside the threshold then the extra costs could be ‘logged’ and allowed for at the next price control review. This mechanism would potentially be the most straightforward to implement once the benchmarks have been agreed, and would be transparent. The amount of any adjustment ‘logged-up’ would have to be predictable and unambiguous.
- **Intra-period interim review.** If the actual cost of debt falls outside the threshold then the company could seek intra-period adjustment to allowed revenues at the discretion of the regulator (within pre-announced general principles that are known to the markets). This mechanism would create more uncertainty for stakeholders, including investors, suppliers and consumers and risks the regulator being faced with a large number of parties seeking interim review at the same time.
- **Automatic adjustment mechanism.** In general such an approach would involve:
 - The allowed cost of debt (or risk free rate only) being set by the regulator at the outset of the control.
 - Benchmarks for the cost of debt (which are consistent with the regulators methodology) being agreed (e.g. transparent, non-controllable measure of cost of debt issuance for specified rated debt).
 - Cost of debt ‘tolerance’ bands would then be agreed – e.g. 50 basis points, within which the allowed cost of debt would remain unchanged. But if actual cost of debt of the benchmark moved outside the tolerance, then an automatic adjustment would be made to the allowed cost of debt and allowed revenues in period.
 - The mechanism would operate over a specified period e.g. 6 months or one year, so the test of whether the benchmark rate was outside the tolerance would be undertaken periodically in arrears and any adjustment to allowed revenue made over the remainder of the price control period.

There are a number of possible variants to the automatic adjustment mechanism: one variant is illustrated below and two further variants are shown in the Appendix.

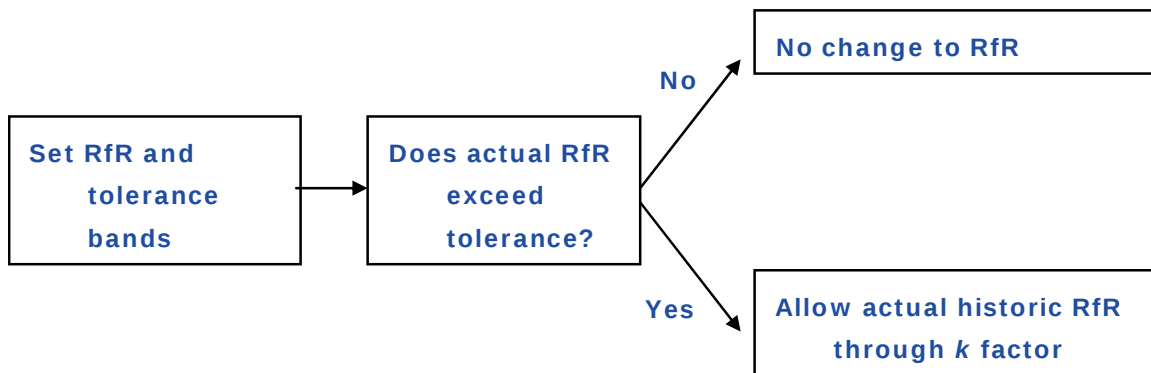
Variant 1: Log up/down mechanism

The most straight forward mechanism would simply track the observed risk free rate against the allowed risk free rate and then make an adjustment to allowed revenue for the actual cost of debt to the extent it is outside the threshold. The same mechanism could equally be applied to the total cost of debt benchmarks.

The adjustment to allowed revenues could be all or some proportion of the cost of debt at notional gearing in excess of the threshold costs.

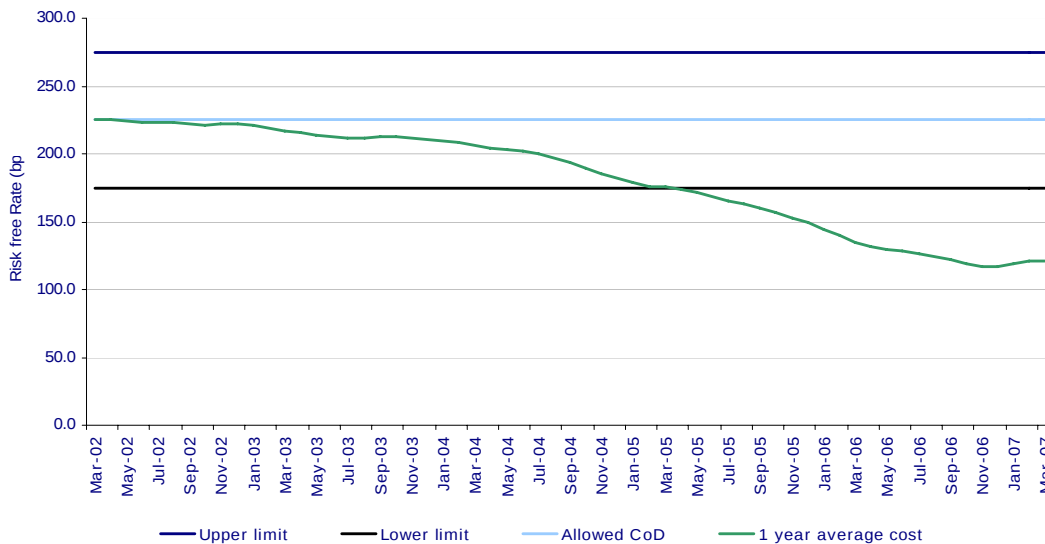
This approach is illustrated below:

Figure 5.1: Log up/down mechanism



Using data from 2002 to 2007, the chart below illustrates the movements in risk free rate that would have been applied in adopting this approach.

Figure 5.2 Log up/down mechanism – movements in risk free rate



5.4.4. Incentives around the application of the revised cost of debt

The revised cost of debt component could be applied to either the whole of the notional debt or only the incremental capex for the balance of the control period only. Applying the revised cost of debt to the whole of the notional debt may be simpler and more transparent.

Currently, companies have an incentive to achieve an efficient financial structure as they keep the benefits, at the very least for the balance of the control, of beating the allowed cost of debt. A cost of debt adjustment mechanism might give a very slight reduction in the incentive to minimise the cost of debt (because the company does not keep all the gain), but this would be offset by lower prices for users and reduced risk for shareholders should debt market tighten sharply.

5.4.5. Transparency

In order for the trigger mechanism to be transparent and predictable, examples of the mechanics would need to be made clear ex ante to investors. It will be important to brief investors at an early stage in order not to surprise the market.

5.5. Conclusion

This section has argued that transparent, predictable, efficient mechanisms can be devised to adjust for unanticipated changes in the actual cost of debt. The potential benefits, in terms of lower prices for users, exceed (in our judgement) the disbenefits of reduced incentives and the need to explain the innovation to the markets. Since this would be a significant step, in terms of change of regulatory approach, Ofgem should consult widely before adopting it.

6. COST OF EQUITY

6.1. Introduction

In this section we consider the background to recent decisions on the cost of equity, the weakness of a purely CAPM-derived technical approach, and the market evidence on the actual cost of equity.

6.2. Background

Ofgem, as with most regulators, recognise that there are practical and theoretical limitations of a purely technical, CAPM-based approach to setting the cost of equity. CAPM assumes that parameter values estimated from historic data are valid indicators of prospective values. However, CAPM is a poor predictor of historic excess returns¹⁵. Parameter value estimates have high standard errors and selection of ‘central’ or ‘most likely’ values is subject to considerable uncertainty. Uncritical use of historic values often result in prospective cost of equity estimates that are implausible when regard is had to direct market evidence.

The failure of CAPM to generate robust estimates of the cost of capital is highlighted by both Ofgem and Ofwat in their 2004 price control determinations.

‘In determining its cost of equity assumption for the final proposals, Ofgem has had regard to traditional methods such as CAPM as well as wider market evidence, including data on the aggregate return on equity over time. As part of this review, Ofgem commissioned Smithers & Co to present a report on beta estimates for a range of companies in the electricity and water sectors¹⁶. Smithers & Co found strong evidence of parameter instability for several of the companies. This was problematic given that a fundamental assumption underlying the traditional CAPM approach is that beta remains stable over time...Given this background, Ofgem decided also to have regard to other methods in determining the appropriate cost of equity.’

Source: Ofgem (2004), pp105-6

‘It is apparent that applying the CAPM framework on its own could produce a very wide range for the cost of capital. This arises principally because of an extended period of volatility in the capital markets worldwide and the impact of this on some of the components underlying CAPM, particularly the risk-free rate and equity beta factors. For example, currently beta factors for the listed water companies are around 0.4 – a significant decline since the last review. They were as low as 0.3 in 2002-03. This decline is likely to reflect wider market influences rather than a fundamental change in the business risk faced by the water companies. Another component of CAPM, the equity risk premium, has always been difficult to measure with any precision. In our methodology paper, we recognised that in assessing the cost of capital, it was possible that we would need to supplement a CAPM-based approach using current market data with other techniques and evidence.’

¹⁵ See Fama & French (1989)

¹⁶ Smithers (2003)

‘At the lower end of the range, the CAPM evidence appears to conflict with market reality, and we have discounted it. This is a similar approach to that taken by Ofgem, which in its March 2004 consultation document on its review of price controls for distribution network operators, proposed a cost of capital range of 4.2% to 5.0% on a post-tax basis. Ofgem’s range excluded the bottom of a very wide range ‘supported by the available data’ of 3.0% to 5.0%.

‘Such volatility in the capital markets means that, in our view, and in the view of our advisers, less reliance than at previous price reviews should be placed on the conventional methods of assessing the cost of equity such as CAPM.’

Source: Ofwat (2004) pp220-1

Nevertheless CAPM remains, as stated, the framework of choice of almost all regulators when determining the cost of capital.

In line with Ofgem’s approach in the TPCR, our approach is to place weight on market evidence of the **aggregate** return on equity, rather than each component specified in CAPM. The next section summarises the market evidence we examined and the conclusions we have drawn.

6.2.1. TPCR 2006

In the Transmission Price Control Review 2006, key considerations for Ofgem’s cost of equity were as follows:

- The Smithers report substantially confirmed the range of 6.5% -7.5% for the long-term aggregate market return on equity that was estimated in 2004, even though the evidence that the beta estimates are lower than 1 would suggest a lower equity return.
- In setting the cost of equity, Ofgem considered, among other factors, the difficulty of assessing whether the estimates suggested by the Smithers report are representative of long-term trends and decided to rely more on the range of total market returns than on the component parts of the CAPM. The cost of equity was set at 7%.

6.3. Market evidence

In this section we present the findings of analysis that we have undertaken of the market evidence for the cost of equity.

The evidence comes from three main sources:

- The overall state of the equity market.
- Market valuations to RAB ratios (MR ratios) for listed regulated companies and from asset sales and disposals.
- Evidence of the required cost of equity of infrastructure funds.

6.3.1. Overall state of the markets

The overall state of financial markets are important context for Ofgem in setting the cost of capital. Key features include:

- a global excess in liquidity;
- macro savings / investment balances; and
- UK pension fund appetite for bonds.

These factors are driving down returns on cash and bonds and are also driving down alternative assets including equities. Portfolio investors must choose between cash, bonds, property and equities. With the available returns on two asset classes – cash and bonds - having fallen sharply portfolio investors are forced to accept lower expected returns on property and equities. This is evident in property price inflation and high equity prices. The implications of this for Ofgem are two-fold. First, it points toward a level of equity risk premiums that are currently lower than the long-run average. Second, it underlines the importance of consistency in the direction of change of required returns for the cost of debt and equity in the price determination.

6.3.2. The MR ratio

The MR ratio of a listed regulated business is the ratio of its market capitalisation to its RAB. The MR ratio can provide useful additional information about a company's 'true' WACC.

The premise on which MR analysis is based is that if the market expects a regulated company to achieve operating and capital performance in line with the regulator's assumptions and if the allowed WACC equals the 'true' WACC then the MR ratio will be 1.0. This is because the NPV of expected net cash flows should, if the regulator's assumptions hold, equal the value of the RAB.

Equally if the allowed WACC is higher or lower than the 'true' WACC, and the market expects the regulated company to perform in line with the regulatory assumptions, then the MR ratio will be greater or less than 1.0, respectively.

In assessing the market evidence we considered the market/RAB ratio, which is used to compare the regulator allowed WACC with the market WACC. The ratio is set out below:

$$\text{MR ratio} = \frac{\text{Enterprise Value of regulated entity}}{\text{Regulatory Asset Base}}$$

Once an MR ratio is calculated, an implied cost of equity can be derived, given an assumption about the cost of debt. For example, if an MR ratio of 1.2 is observed, and if the figures for the components of the cost of capital are as assumed in Table 6.1 below, then the implied market WACC is 4.00% (or 5.00% - (5.00%*0.2)). Then substituting an observed cost of debt (to strip out the differential caused by the actual rather than

allowed cost of debt) of 3.00%, and rerunning the WACC calculator, gives an implied ‘correct’ cost of equity of 5.00%.

Table 6.1: MR ratio example

	Illustrative determination
Allowed cost of debt	3.50%
Allowed cost of equity	6.50%
Notional gearing	50%
Vanilla WACC	5.00%

MR ratios for certain companies may be higher or lower than the values for other companies reflecting differential operating and capital efficiency, but the sector average MR ratio provides a useful cross-check on the CAPM derived WACC.

Applying the MR analysis in the gas distribution sector is problematic because of the lack of ‘clean’¹⁷ listed gas distribution companies (i.e. since most are owned as part of a wider corporate group including non-regulated assets). MR analysis is most readily applied in other industries where there are broadly comparable and relatively ‘clean’ regulated companies. The water sector in the UK is a good such example.

In our analysis, we have observed the MR ratio for:

- GDN disposals; and
- other recent transactions in the water sector.

We have also summarised analysts’ view of the MR ratios implied by the market valuations in the water sector.

6.3.3. Evidence from GDN disposals

Analysis of the GDN acquisitions shows that all four were acquired on very similar MR ratios. Northern was acquired for the lowest premium of slightly under 13%, Scottish and Southern were acquired for around 13% and Wales & West was acquired for around 14%. These percentages are based on 2005 RABs - they are higher for 2004 RABs.

¹⁷ By ‘clean’ we mean businesses that are dominated by a single regulated business

Figure 6.1: GDN sales

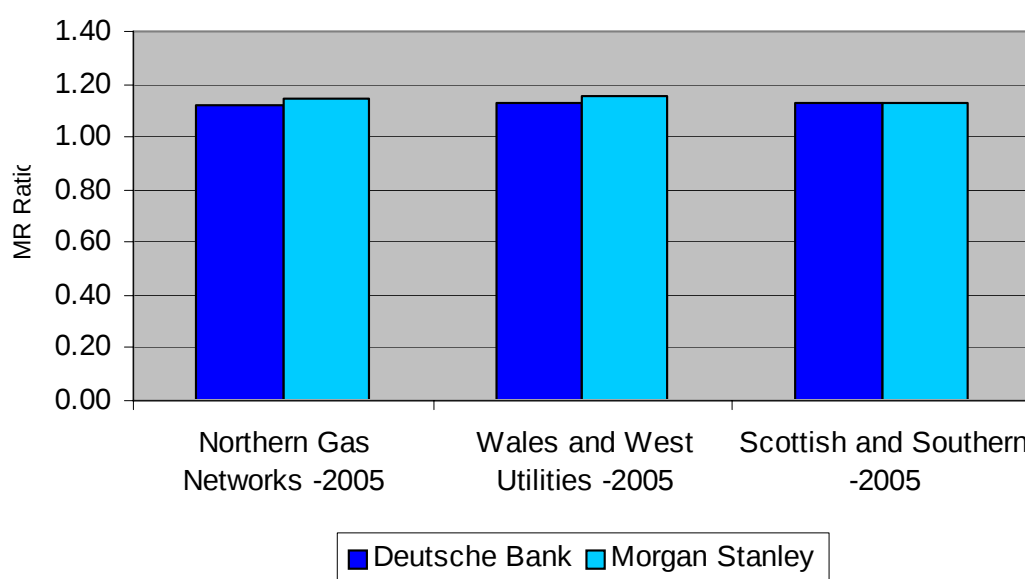


Table 6.2 below shows the cost of equity implied in the GDN sales for a range of different scenarios:

- Scenario 1: the allowed pre-tax cost of debt was as determined by Ofgem for the 2002-07 price control i.e. 4.65%.
- Scenario 2: the allowed pre-tax cost of debt was as determined by Ofgem in DPCR 2004 i.e. 4.10%. Whilst this was not the actual allowed cost of debt for the GDNs, this information was in the public domain and it can be assumed that investors assumed that this would be the actual allowed cost of debt in the next GDN review.
- Scenario 3: allowed pre-tax cost of debt was as allowed by Ofgem in TPCR 2006 i.e. 3.75%.

Of these scenarios our judgement (for the reasons outlined above) is that the most appropriate comparator is likely to have been Scenario 2. The mid point for this scenario is 6.8%.

Another determinant of the results of this analysis is the assumption that is made about the actual cost of debt at the time of the asset disposal / valuation. The lower the assumed actual cost of debt at the time, the greater the implied cost of equity would be.

Given this, for each of the scenarios we have also considered two variants of the actual cost of debt at the time. The low cost of debt is based on the average risk free rate derived from a range of maturities of index-linked gilts at that time and a debt premium of 100 basis points. The higher cost is based on the average real risk free rate from a range of maturities of deflated¹⁸ nominal gilts and a debt premium of 100 basis point.

These ranges are intended to be illustrative only.

¹⁸ Assuming inflation expectations of 2.5%.

Table 6.2: Implied cost of equity in GDN acquisitions

	Scenario 1	Scenario 2	Scenario 3
MR premium	14%	14%	14%
Allowed by Ofgem			
Pre-tax Cost of Debt	4.65%	4.10%	3.75%
Post-tax Cost of Equity	6.25%	6.25%	6.25%
Gearing	62.5%	62.5%	62.5%
Vanilla WACC	5.25%	4.91%	4.69%
Market view			
Implied Vanilla WACC	4.52%	4.22%	4.03%
Observable Cost of Debt - Low	2.62%	2.62%	2.62%
Observable Cost of Debt - High	2.73%	2.73%	2.73%
Implied view on Cost of Equity - High	7.67%	6.89%	6.38%
Implied view on Cost of Equity - Low	7.49%	6.70%	6.20%
Implied view on Cost of Equity- Average	7.58%	6.79%	6.29%

6.3.4. Evidence from other asset sales and disposals

We have also looked at recent transactions in the water sector. The analysis of five recent transactions shows that companies have been acquired on MR ratios in excess of 20%: Thames was acquired at a premium of 25%; Mid Kent at around 26%; Anglian, Sutton and East Surrey and South East at round 30%.

Figure 6.2: Water company disposals

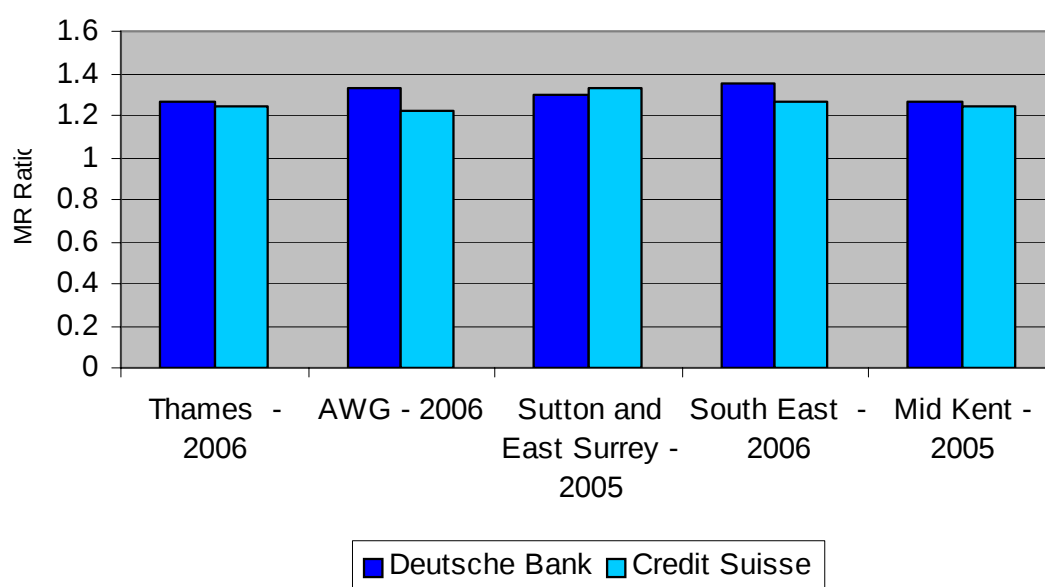


Table 6.3 below illustrates the calculation of the implied cost of equity for the recent acquisitions in the water sector. Given the above estimate of the MR ratio for the five acquisitions, the implied range for the cost of equity is 5.4 - 6.6%.

Table 6.3: Implied cost of equity from water asset sales

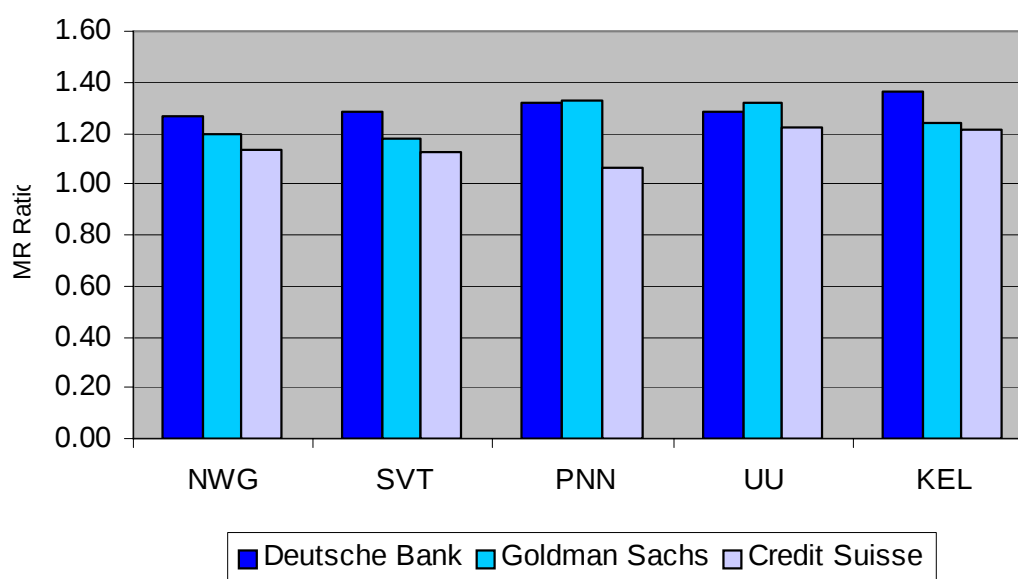
Transaction	Mid Kent	Sutton and East Surrey	Thames	AWG	South East
MR premium	26%	32%	26%	28%	31%
Allowed by Ofwat					
Pre-tax Cost of Debt	4.30%	4.30%	4.30%	4.30%	4.30%
Post-tax Cost of Equity	7.70%	7.70%	7.70%	7.70%	7.70%
Gearing	55%	55%	55%	55%	55%
Vanilla WACC	5.83%	5.83%	5.83%	5.83%	5.83%
Market view					
Implied Vanilla WACC	4.34%	3.99%	4.34%	4.23%	4.02%
Observable Cost of Debt - Low	2.93%	2.48%	2.53%	2.53%	2.53%
Observable Cost of Debt - High	2.81%	2.81%	2.81%	2.81%	2.81%
Implied view on Cost of Equity - High	6.07%	5.84%	6.56%	6.30%	5.85%
Implied view on Cost of Equity - Low	6.22%	5.44%	6.22%	5.96%	5.50%
Implied view on Cost of Equity- Average	6.14%	5.64%	6.39%	6.13%	5.68%

6.3.5. Analyst view of MR ratios

For National Grid, there are considerable complexities around the value of the US and non-regulated businesses in deriving an MR ratio. Against this background, analysts view the underlying value of the regulated business at a premium of around 15% above the RAB. Taking the allowed WACC as per TPCR 2006, and taking an observed cost of debt of 3.0%, gives an implied cost of equity of 6.2%.

We also looked at recent analyst views on the implied premium to RAB based on the market price for November 2006 for water companies. The MR ratio averages around 1.24 for water companies.

Figure 5.2: MR ratios for water companies



This MR ratio, again given an observed cost of debt of 3.0%, implies a cost of equity of around 6.2%.

6.3.6. Market intelligence from private equity funds

Another source of market information about the required cost of equity is evidence of the required rates of return that private equity and infrastructure fund investors are currently seeking.

Anecdotal evidence (based on conversations with City contacts) suggests that infrastructure fund investors are currently targeting 12% post tax nominal returns (so assumed to be 10% real) on 85% geared investments in comparable utility investments. Analysts commentary supports this assessment:

- For instance, according to Credit Suisse¹⁹, Macquarie's MIFL infra-fund declared that it targets a yield for investors of 8.6% after management charges and the Ontario Teachers' Pension Plan Board, which own 25% of NWG, has delivered a long-term return on equity of 11.7%.
- In the UK water sector, one analyst's view is that *"the indicative returns sought by recent buyers support a sensible minimum IRR currently acceptable to infra-funds investing in UK water of 10% .. and any infra-fund seeking a 12% IRR would be priced out based on the current market prices and would be stretched to offer a premium, unless they were willing to anticipate receiving a high exit multiple or be prepared to risk holding an unrealised loss for a long period of time"*²⁰.

Given an assumed 12% required nominal, post-tax return at high level of gearings, it is possible to impute the notional returns to equity at the assumed notional gearing.

Table 5.4 illustrates the notional returns for a 62.5% geared investment, which are calculated by de-levering the financing structure and assuming that notional earnings before interest and taxation of £47m on a notional RAB of £1bn remains constant. This calculation gives a 5.3% real post tax return on equity.

Table 5.4: implied return on equity for private equity funds

Notional RAB	Low	Mid
Notional RAB	£1,000m	£1,000m
Gearing	85%	62.5%
Notional EBIT	£47	£47m
Interest Cost (3%)	£26m	318m
Profit after tax (30%)	£15 m	£20m
Return on Equity	10%	5.3%

¹⁹ As reported by Credit Suisse, 31st January, 2007.

²⁰ Ibid, page 22.

6.4. CAPM

Notwithstanding its theoretical and practical limitations, CAPM is the framework of choice of almost all regulators when determining the cost of capital.

For completeness, in this section we summarise recent regulators' assumptions on the components of the cost of equity required for CAPM and, for illustrative purposes only, we give our assessment of the cost of equity derived by applying CAPM to the gas distribution sector.

6.4.1. Other regulators' decisions

Table 6.1 summarises the recent regulators' assumptions on the cost of equity in the UK. We are aware of the CAA's recent referral of their price review proposals to the Competition Commission. Given the Competition Commission's remit on this we have not included the referral in the table at this point. However, for context the CAA have recommended a cost of equity of 7.7% together with a cost of debt of 3.0%.

Table 6.1: Recent regulators' assumptions on the cost of equity

Regulator	Case	R _f	ERP	β	CoE Range	CoE Used
CAA	BAA (2003)	2.5-2.75%	2.5-4.5%	0.8-1.0	4.5%-7.25%	5.88%*
CAA	Manchester Airport (2003)	2.75-3.25%	3.5-4.0%	0.7-0.9	5.2-6.85%	6.2%*
Postcomm	Royal Mail (2005)	2.5%	3.5%-5.0%	0.81-0.94	7.63-10.27%	9.25%
Ofwat	Water & sewerage (2004)	2.5-3.0%	4.0-5.0%	1.0	6.5-8.0%	7.7%

**denotes mid-point of range prior to any additional 'uplift', for example of 0.5% on the WACC for BAA (2003), Source: CEPA review of regulatory determinations*

6.4.2. CAPM

Given the uncertainties associated with this exercise, we have used a wide range of market evidence and we provide a range of estimates.

Risk free rate

As noted in our analysis on cost of debt our assumed range for the risk free rate is around 1.5% to 2.25%.

Equity Risk Premium

For the equity risk premium we selected the range of 4.0% - 5.0% which is in line with Smithers.²¹

Beta

For the *Beta* component of the CAPM, we again selected the analysis provided by Smithers, which estimated a range of 0.40-0.75.

Table 6.2 below illustrates the results of the CAPM, given the above parameters. As expected, this, in our view, gives an implausibly wide range.

Table 6.2: CAPM calculations

CAPM Calculations	Low	Mid	High
RfR	1.5%	1.87%	2.25%
ERP	4%	4.5%	5.0%
β	0.4	0.575	0.75
CoE= RfR + β (ERP)	3.1%	4.5%	6.0%

²¹ The Smithers Report, September 2006.

6.5. Conclusion on cost of equity

In common with Ofgem's proposed approach to estimating the cost of equity CEPA places greater reliance on available market information. This section has reviewed the available market evidence on the cost of equity.

Key points to note are as follows:

- Global liquidity is currently driving returns on all risk bearing assets down. This has two particular implications for Ofgem's price determination. First, there is a clear implication that the current equity market risk premium is likely to be lower than the long run average of 4-5%. Second, this context underlines the importance of consistency in the directions of change compared with the last price review for both cost of debt and equity. The same factors that are pushing down the cost of debt are also pushing down the required returns on equity.
- The trading valuations of listed regulated companies with few non-regulated assets are at a significant premium to their RABs. Adjusting for the 'arbitrage opportunity' arising from the allowed cost of debt being higher than the actual cost of debt suggests the current cost of equity is currently significantly below 7%. Valuations of asset transactions support this assessment. Based on the analysis in this section the range of actual required returns are as low as 6%.
- Analysis of the returns required in recent disposals of regulated assets, including to infrastructure funds, suggests that the actual cost of equity in these transactions may be much lower. The examples that we have looked at go as low as 5.5%.

A key issue for Ofgem is whether or not to take account of the lower cost of equity that is currently required by infrastructure funds when setting the allowed cost of equity. On the one hand there is clearly risk in basing the determination on these very low costs of equity, without taking account of the possibility of mean reversion over the next price control period.

On the other hand if infrastructure funds have a great deal of institutional funds under management and those institutions are content to earn a lower return on equity then this genuinely reflects a lower market cost of equity.

Our view is that Ofgem should give greatest weight to market evidence of the cost of equity from trading and asset valuations, and that given the risk of mean reversion, it is appropriate to aim for the lower end of our market-based estimates.

This indicates a cost of equity range for GDNs of 6.5-7%. However, when forming its judgement about the 'point estimate' we are of the view that it is reasonable to take account of the entry of infrastructure funds with a low cost of capital. This may suggest adopting a point estimate towards the lower end of this range.

7. TAXATION

We agree with the Ofgem approach of allowing a post-tax WACC and the use of an ex ante tax allowance. We agree with the principle of an ex post adjustment to reflect unanticipated changes in the tax rules that are outside the control of the GDNs. Such adjustment should be symmetric i.e. upwards or downwards depending on the changes to the tax regime.

Ofgem proposes to allow a re-opener only if companies are able to demonstrate that they have taken all reasonable steps to mitigate the cost. We support this approach.

In addition, if the GDNs apply for a re-opener, we believe that this process and the amount of any adjustment must be transparent and communicated to industry participants, together with the likely effect on transportation charges, both via K and in future years of the control.

8. SUMMARY ASSESSMENT OF THE COST OF CAPITAL

8.1. Assessment of notional gearing

Our assessment is that the 62.5% currently used by Ofgem is not inappropriate, but is relatively conservative.

8.2. Assessment of pre tax cost of debt

Assuming that it is reasonable for a GDN to finance itself with 25% index-linked debt, our judgment is that an appropriate range for the pre-tax cost of debt is 2.5% - 3.25%, with a most likely figure of 3.0%.

8.3. Assessment of post tax cost of equity

Based on market evidence, our assessment is that the post tax cost of equity is 6.5% - 7.0%, with a point estimate towards the lower end of this range.

8.3.1. WACC

Taking the above values for the components of the cost of capital, and assuming the most likely figure of 3% for the cost of debt holds but using a range for the cost of equity of 6.5-7%, gives a range for the Vanilla WACC of 4.3-4.5%. The market evidence may suggest a point estimate towards the lower end of this range. This range does not take account of the possibility of Ofgem adopting a trigger mechanism on the cost of debt.

APPENDIX: COST OF DEBT ADJUSTMENT MECHANISMS

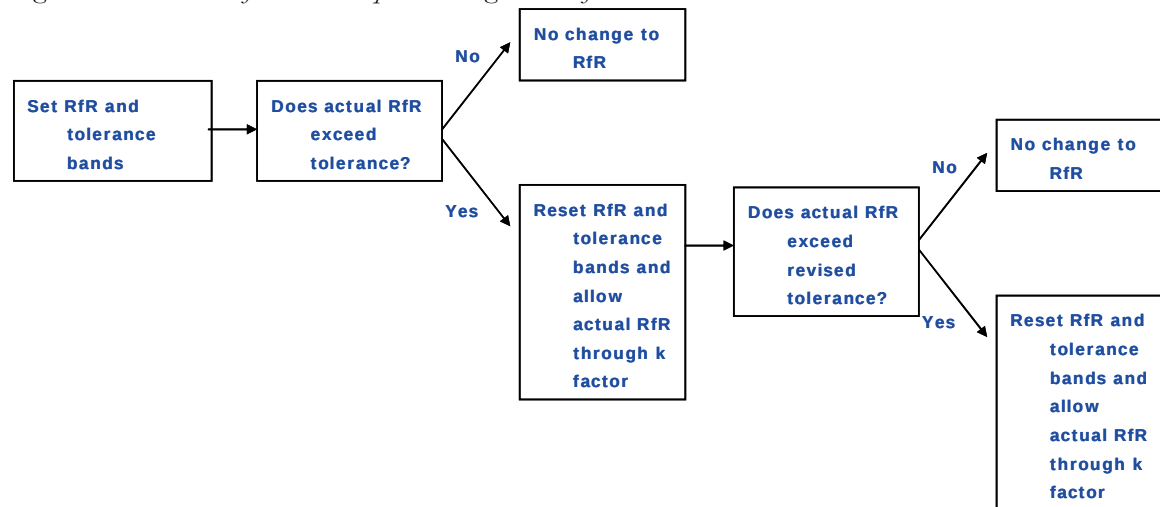
This appendix sets out further variants of automatic cost of debt adjustment mechanisms, purely for illustrative purposes.

Variant 2: Correction factor and in period change in risk free rate

In this variant, the approach in Section 5 is combined with a revision of the allowed risk free rate in period, with resulting movement in tolerance bands.

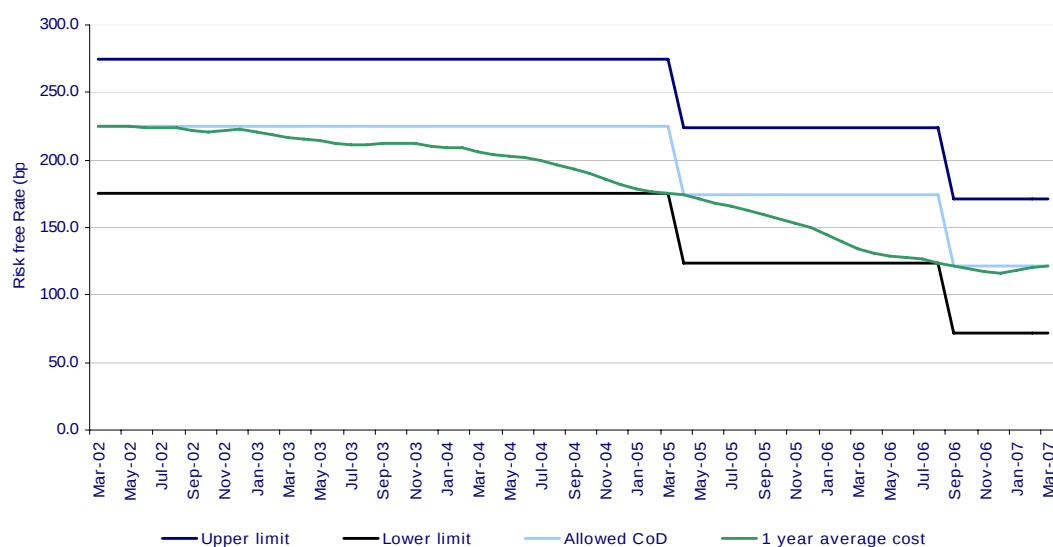
This approach is illustrated below:

Figure A.1: Correction factor and in period change in risk free rate



Again using data from 2002 to 2007, the chart below illustrates the movements in risk free rate that would be applied in adopting this approach.

Figure A.2: Correction factor and in period change in risk free rate – movements in risk free rate

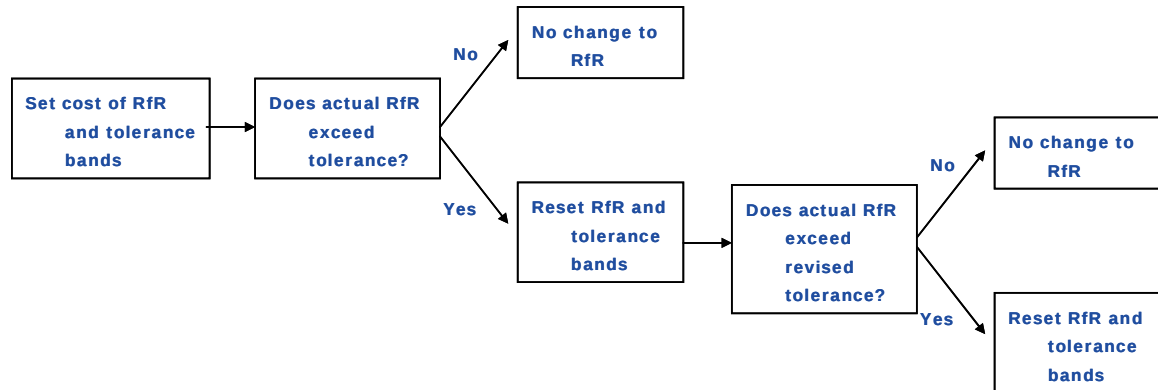


Variant 3: in period change in risk free rate

In this variant, the allowed risk free rate would be re-set in period, with resulting movement in tolerance bands, but there would be no backward looking correction factor.

This approach is illustrated below:

Figure A.3: in period change in risk free rate



As noted above, all three mechanisms could be applied to a combination of the risk free rate and the debt premium or an alternative measure of the cost of debt.