Electricity Distribution Price Control Review

Background information on the cost of capital

March 2004

Summary

The cost of capital is the level of return required by the financial markets – both debt and equity - to provide capital to a firm.

Ofgem's estimated range for the real pre-tax cost of capital for the next price control period (2005-2010), based on the latest available data, is 4.3%-7.2%, compared with a range of 6%-6.9% at the last price control review. Ofgem proposes to adopt a 'Vanilla' WACC (i.e. WACC without a tax adjustment) in the range of 5.1%-5.9% for the financial modelling for this price control (allowances for tax will be made separately). This is equivalent to a real pre-tax cost of capital in the range of 6% - 7.2%.

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1. Introduction

This document sets out background information and analysis that Ofgem has used to develop its initial range for the allowed cost of capital for setting revised price controls (from April 2005) for the electricity distribution network operators (DNOs). Publishing this information should increase the level of understanding and transparency in the way in which the cost of capital is estimated.

The main policy document for the price control review[1] sets out Ofgem's views and proposals across a number of key policy issues for the price control review.

Views are welcomed on the information and analysis set out in this document by 5 May 2004. They should be sent to:

Nienke Hendriks
Senior Price Control Review Manager
Ofgem
9 Millbank
SW1P 3GE

Email Nienke.Hendriks@ofgem.gov.uk

Fax 020 79017075
Tel 020 79017329

[1] Electricity Distribution Price Control Review, Policy document, March 2004, available at www.ofgem.gov.uk

2. Components of the cost of capital

2.1. The Weighted Average Cost of Capital (WACC) is the weighted average of the *expected* cost of equity and the *expected* cost of debt.

$$WACC = g*(r_f + \rho) + (1-g)*(r_f + (\beta * ERP))$$

where

g	=	gearing (net debt:RAV)
r_f	=	risk-free rate
ρ	=	debt premium
β	=	equity beta
ERP	=	Equity Risk Premium

Cost of equity

2.2. The Capital Asset Pricing Model (CAPM) is one of the most widely used models to estimate the *expected* cost of equity. Under CAPM the cost of equity is defined as the risk-free rate and the product of an individual firm's equity beta and the Equity Risk Premium (ERP).

$$E(R_i) = r_f + \left(E(R_m) - r_f\right)\beta_i$$

where

$E(R_i)$	=	expected return on firm i
r_f	=	risk-free rate
$E(R_m)$	=	expected return on the market portfolio
β_i	=	the firm's systematic risk

2.3. The risk-free rate and the ERP are market-wide parameters and apply to all firms. The ERP represents the market premium which equity investors require in order to invest in (higher risk) equity rather than (lower risk) government bonds.

Equity beta

2.4. The equity beta measures the non-diversifiable business risk which investors face when investing in a specific stock relative to the risk on the market portfolio. Examples of non-diversifiable risk are macro-economic factors such as inflation and interest rate movements, i.e. factors that affect all firms in the market, albeit to a different degree, and which cannot be diversified away by adding additional securities to a portfolio.

2.5. Equity beta also captures financial risk. This is reflected in equity beta, because debt holders have a prior claim on the firm's cash flows over equity holders. Thus, all else being equal, a highly geared firm might be expected to have a higher equity beta than a lower geared firm.

Asset beta

2.6. A firm's asset beta, also known as the unlevered beta, aims at providing a measure of the underlying business risk faced by the whole firm independent of its level of gearing.

2.7. A firm's asset beta can be seen as a function of its equity beta, debt beta, and its capital structure. The asset beta depends on the firm's assets alone and hence enables a comparison of:

- the impact of different gearing levels; and
- operational risk (i.e. non-diversifiable risk) faced by firms.

2.8. The relationship between asset beta, equity beta and debt beta is given by the following equation:

$$\beta_A = [\beta_D * \frac{D}{D+E}] + [\beta_E * \frac{E}{D+E}]$$

where

β_A	=	asset beta
β_D	=	debt beta
β_E	=	equity beta
D	=	market value of debt
E	=	market value of equity

2.9. The debt beta represents the sensitivity of the firm's debt premium to the overall debt market, i.e. it is used to de-lever or re-lever the asset beta to the gearing level assumed for the firm. The debt beta is not directly observable. However, an approximation of the asset beta is often obtained by assuming that the debt beta is zero (i.e. debt is riskless). This results in the following linear relationship between asset beta and equity beta:

$$\beta_A = \frac{\beta_E}{1 + \frac{D}{E}}$$

where

β_A	=	asset beta
β_E	=	equity beta
D	=	market value of debt
E	=	market value of equity

2.10. Estimating the asset beta involves obtaining the firm's equity beta and 'de-levering' it in order to obtain the asset beta (which is the value of the firm's beta if it had no debt). The next step is to then 'relever' the asset beta, by the assumed gearing level used by the regulator (but calculated as $\frac{D}{E}$).

2.11. There are several problems with this approach. It assumes a linear relationship between gearing and risk. It also requires a decomposition of the underlying equity beta, given that there are no beta estimates for 'pure play' UK DNOs, such a decomposition tends to be problematic and could be seen as arbitrary.

Cost of debt

2.12. The expected cost of debt consists of the expected (market) risk-free rate and expected (firm specific) debt premium. The debt premium is the premium on corporate debt over equivalent gilts which is required by financial markets to compensate for the greater risk of default on corporate debt compared with government debt. The expected cost of debt is a projection of the market cost of debt which is not necessarily the same as the historic cost of the existing debt.

Approach to tax

2.13. The cost of capital can be calculated pre-tax or post-tax or in its 'Vanilla' form (i.e. no tax).

2.14. When adopting a pre-tax approach the cost of equity is 'grossed up' by the tax shield (i.e. divided by 1- corporation tax rate).

$$\textit{Pre-tax WACC} = [g * (r_f + \rho)] + [(1-g) * \frac{(r_f + (\beta * ERP))}{(1-t_c)}]$$

where

g	=	gearing (net debt:RAV)
r_f	=	risk-free rate
ρ	=	debt premium
β	=	equity beta
ERP	=	Equity Risk Premium
t_c	=	corporation tax

2.15. In the post-tax approach the cost of debt is adjusted for the tax shield by multiplying the cost of debt by (1- corporation tax rate).

$$\textit{Post-tax WACC} = [g * (r_f + \rho) * (1-t_c)] + [(1-g) * (r_f + (\beta * ERP))]$$

2.16. If the same number for corporation tax is adopted and all else is equal, the pre-tax cost of capital translates in the post-tax cost of capital and vice versa, according to the following transformation:

$$\textit{Post-tax WACC} = \textit{Pre-tax WACC} * (1- t_c)$$

2.17. The 'Vanilla' WACC is the approach that Ofgem will use in its financial model. The Vanilla WACC does not contain a tax adjustment, neither in the cost of equity nor in the cost of debt. It therefore consists of the pre-tax cost of debt and post-tax cost of equity.

2.18. In adopting a post-tax approach to the cost of capital, Ofgem incorporates firm specific tax allowances directly in the financial model. Adopting the traditional post-tax cost of capital would double count the benefits of the interest tax shield and hence a Vanilla WACC is applied in the financial model.

Real or nominal cost of capital

2.19. The cost of capital can be calculated in real or nominal terms. Traditionally, Ofgem and most other UK regulators, have adopted a real cost of capital.

2.20. The relationship between the nominal risk-free rate and real risk-free rate is given by:

$$1 + r_{\text{nominal}} = (1 + r_{\text{real}})*(1 + \text{inflation rate})$$

3. Views of respondents

3.1. The second consultation document on the distribution price control review, published in December 2003, invited views on a range of cost of capital issues. This section sets out the views of respondents.

General method

3.2. Several respondents supported the use of CAPM with forward looking parameters based on long-term historical averages in order to overcome any potential biases. Two respondents considered that the allowed return should be set at the upper-end of the range rather than simply at the mid-point.

3.3. Two of the DNOs supported the use of methods other than CAPM to act as a cross-check on results.

3.4. One DNO was concerned about Ofgem's proposal to use an aggregate return on equity approach alongside CAPM, as in its view this would be less transparent and would create uncertainty.

Cost of debt

3.5. One DNO considered that the cost of debt should allow for issuing/hedging costs when raising new borrowings.

3.6. Six DNOs considered that efficiently incurred embedded debt should be allowed for either in the cost of capital or through some explicit adjustment.

Cost of equity

3.7. One DNO considered that an explicit allowance or premium should be allowed for new equity issuance costs.

Treatment of tax

3.8. Most DNOs expressed a preference for a post-tax cost of capital, with three of these supporting a firm specific approach to tax allowances.

3.9. Two respondents favoured a pre-tax approach, with one of these stating that any other approach would encourage a short-term approach to tax efficiency and introduce additional complexity and problems.

3.10. Two DNOs asked Ofgem to clarify what it means by a post-tax approach, while another requested Ofgem to provide further details on how it will allow for tax.

3.11. Several respondents supported the use of an industry-wide cost of capital.

Assumptions on gearing

3.12. The majority of respondents supported the use of a common assumed level of gearing for all DNOs. Several DNOs argued that there should be no change from the 50% level used for DPCR3. It was argued that a higher assumed gearing level in Ofgem's calculations might be perceived as an expectation by the regulator that companies should move to higher levels of gearing.

3.13. One DNO proposed a range for gearing of 55-60%. Another respondent proposed an upper limit of 60-65% for gearing levels.

Other

3.14. In the view of one DNO, a cost of capital of between 7% to 8% pre-tax real is strongly supported by market evidence and authoritative academic studies. It was argued that too low a cost of capital would have serious implications for the sustainability of the electricity infrastructure and the achievement of the Government's targets for renewable generation.

3.15. Another respondent argued that market evidence on the costs of equity and cost of debt indicates that the overall WACC has increased since the last price review.

4. Ranges for the inputs to the cost of capital

Market wide parameters

Risk-free rate

4.1. At the last price control review of the DNOs (DPCR3), Ofgem adopted a range for the risk-free rate of 2.25%to 2.75%. In its most recent decisions the Competition Commission[2] adopted a range of 2.5% to 2.75% compared with a range of 2.75% to 3.25%, which it adopted in the Water cases (2000).

4.2. The Competition Commission looked at the real yield for long-dated (20 year) index linked gilts, which was 2.2% and the yields for medium-term (ten year) and short-term (five year) index linked gilts which were both approximately 2.3% (June 2002). However, since the Competition Commission's decisions these yields have further declined to 1.99%, 1.92% and 1.65% respectively (January 2004).

4.3. It has been argued that current yields are at historically low levels. However, Dimson, Marsh and Staunton[3] estimate a return of 1.0% per annum on gilts over the 20th Century as a whole. But to put this in context, as pointed out by Wright, Mason and Miles[4], this figure might have been depressed due to one-sided errors in inflationary expectations in the last century. The Joint regulators' cost of capital study concludes that a reasonable assumption for the real risk free rate is 2.5%.

4.4. A recent report by National Economic Research Associates (NERA), estimates the current real risk-free rate as 2.6% using current market data and 3.1% using historic time series. NERA argues that the low current real risk-free rate corresponds to the

[2] Competition Commission report on Vodafone, O2, Orange and T-Mobile (2002), Competition Commission report on BAA plc (2001)
[3] Dimson, E., Marsh, P. and Staunton, M. (2001), Millenium Book II 101 Years of Investment Returns, ABN-AMRO and London Business School
[4] Wright, S., Mason, R., and Miles, D. (2003), A Study into certain aspects of the cost of capital for regulated utilities in the UK, Smithers & Co Ltd

current high equity market volatility, whereas the higher historic rate is consistent with a lower level of expected market volatility than currently observed.[5]

Expected risk-free rate

4.5. The issue for DPCR4 is the *expected* risk-free rate going forward. It is therefore important to come to a view whether current low market rates are likely to persist into the future or whether there are factors, which are not expected to persist, which depress rates at present.

4.6. At present, the UK yield curve is still slightly downward sloping at longer maturities. This has been attributed to institutional factors such as the minimum funding requirement (MFR) for pension funds and the health of public finances (resulting in low supply of government bonds).

Potential changes in demand and supply

4.7. The Government has indicated that it will reform the MFR, however it is too early to predict how this will impact on the yield curve.

4.8. There are several other reasons why many pension funds might have been limiting their equity exposure in the last few years, such as equity volatility, maturing funds and/or changes in accounting standards (FRS17 etc). Part of this move away from equity might have been into corporate bonds rather than gilts. It has also been argued that pension funds might switch to longer-duration securities to match the interest rate risk of their liabilities[6].

4.9. All these factors will affect the demand for gilts (albeit to different degrees) and hence might continue the downward pressure on interest rates. On the other hand, an increase in the supply of gilts, with all else being equal, would put upward pressure on interest rates.

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[5] NERA (2003), UK Water Cost of Capital, A final report for Water UK, p.119
[6] Bank of England Quarterly Bulletin: Winter 2003

4.10. The cost of capital is very sensitive to the risk-free rate with the risk-free rate being an important input both in the cost of debt and the cost of equity. Given this sensitivity and given the considerable uncertainty surrounding the *expected* risk-free rate, it seems appropriate to adopt a cautious approach and hence a relatively wide range at this stage.

4.11. Given the above, it seems appropriate to adopt a slightly wider range than the most recent Competition Commission range. Ofgem has widened the Competition Commission range symmetrically by 0.25%, which gives a range for the risk-free rate of 2.25% to 3.00%.

Equity Risk Premium (ERP)

4.12. Average returns on equity have been remarkably stable over long time horizons. However, stock markets are volatile and therefore there can be significant variation in year-to-year returns.

4.13. Wright, Mason and Miles[7] calculated the historical return on equity to be in the range of 4%-8% (geometric) and 6%-10% (arithmetic). The return on equity consists of the risk-free rate and the product of equity beta and the equity risk premium (ERP). The mean ERP can be estimated using a geometric or arithmetic approach[8]. If expected returns are constant and the estimation period is long, an arithmetic approach might be most appropriate. However, when periods of high returns are followed by periods of low returns and vice versa, arithmetic returns might be misleading. The more volatile the sequence of returns is, the greater the difference between the arithmetic and geometric mean will be. The 20th Century was characterised by high volatility in part due to inflationary periods.

[7] Wright, S., Mason, R., and Miles, D. (2003), A Study into certain aspects of the cost of capital for regulated utilities in the UK, Smithers & Co Ltd

[8] For example, the arithmetic mean of two returns of respectively $+25\%$ and -20% will be $(25\text{-}20)/2 = 2.5\%$ whereas the geometric mean is given by $\sqrt{(1+0.25)*(1-0.20)}-1=0\%$.

4.14. Dimson, Marsh and Staunton[9] calculate average real equity returns over the 1900-2000 period as 5.8% (geometric mean) and 7.6% (arithmetic mean). However, the standard deviation of real equity returns is very high (20%). This implies that if it is assumed that returns are normally distributed, it would be expected that in one year in three (two-tailed), equity returns would fall outside the range of 5.8% ± 20%.

4.15. In the Millenium Book, Dimson, Marsh and Staunton[10] calculate annualised ERP[11] relative to bond returns over the 1900-2000 period as 4.9% using a geometric mean approach and 5% using an arithmetic mean approach, with a standard deviation of 16.7%. In their recent update[12], they calculate the historical ERP for the UK to be 3.8% using a geometric mean approach and 5.1% using an arithmetic mean approach with a standard deviation of 17% over the 1900-2002 period relative to bonds.

4.16. Given the increasingly integrated nature of capital markets, Dimson, Marsh and Staunton[13] argue that there is a strong case to adopt a global rather than a country specific approach when determining the prospective ERP. They present a forward-looking ERP in the order of 3% on a geometric basis and in the order of 5% on an arithmetic basis. They argue that the ERP is almost certainly not as high as in the mid-1990s, and regard a 5%-6% geometric mean or 7.5%-8.5% arithmetic mean as excessive[14]. The reduction in the expected ERP is due to a range of factors, such as a more stable business environment (e.g. end of the Cold War, increased international trade and investment flows) and better opportunities for investors to diversify (both domestically and internationally).

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[9] Dimson, E., Marsh, P. and Staunton, M. (2001), Millenium Book II – 101 Years of Investment Returns, ABN/AMRO-London Business School, p.115-116
[10] Ibid, p.125
[11] The ERP is measured as [(1 + equity rate of return)/(1 + risk-free rate)] -1
[12] Dimson, E., Marsh, P. and Staunton, M. (2003), "Global evidence on the Equity Risk Premium", forthcoming paper in *The Journal of Applied Corporate Finance*
[13] Ibid, p.14
[14] Dimson, E., Marsh, P. and Staunton, M. (2001), Millenium Book II – 101 Years of Investment Returns, ABN/AMRO-London Business School, p.144

Survey data

4.17. Another approach to determining the forward looking ERP is through using survey data. However, robustness of survey data tends to be an issue. In his 1997-1998 survey of 226 financial economists on the ERP, Welch[15] found the mean ERP based on a 1 year-forecast to be 5.8% (range -9.5%to 18%), which was mainly based on the Ibbotson data[16]. In his 2001 survey, the new consensus view resulted in a mean 1 year forecast of 3.4% (range -30% to 25%), in spite of the fact that the S&P 500 was at about the same level as during the previous survey. Welch inferred an average forecast risk free rate of about 5% (nominal) suggesting a real cost of equity in the area of 6.5%-7.5%.

4.18. Welch found evidence of a 'false consensus effect', i.e. respondents base their forecast on what they perceive the consensus to be. Welch also found that their perception of the consensus was actually 0.5%-1% above the actual consensus, especially on shorter horizons.

Prospective ERP

4.19. In its most recent decisions the Competition Commission adopted a range from 2.5%-4.5% for the ERP, this would result in a return on equity in the range of 5%-7.25% for the average firm (i.e. beta=1). In view of the above, there does not seem to be strong evidence to diverge from this range. However, arguably, the higher end of this range is at present more relevant than the lower end.

[15] Welch, I.(2000), "Views of Financial Economists on the Equity Premium and on Professional Controversies" in *Journal of Business*, 2000, vol.73, no.4, pp.501-537

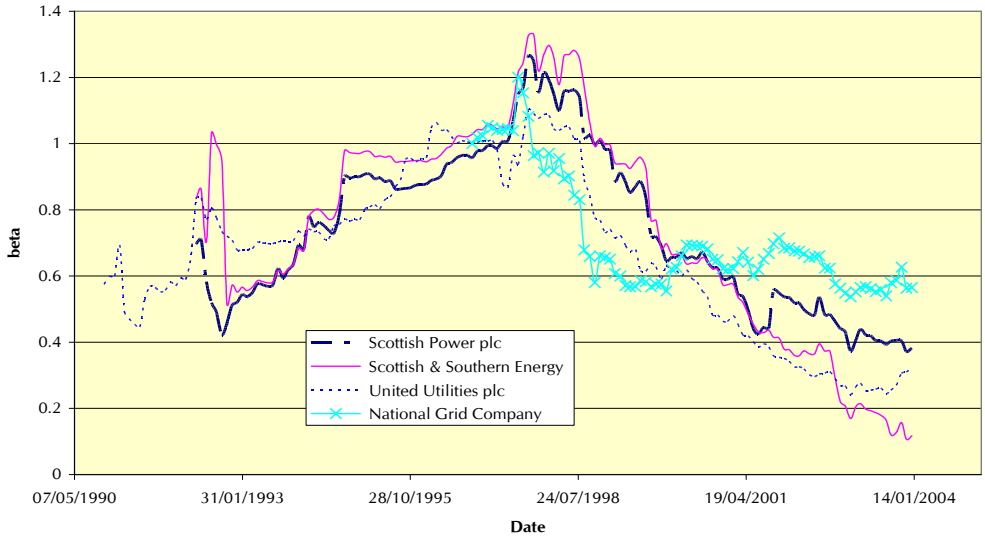
[16] The Ibbotson data set is a widely used US data set

Firm specific parameters

Equity beta

4.20. At the last price control review of the DNOs, Ofgem adopted an equity beta of 1. But as figure 1 demonstrates, monthly electricity betas have fallen from approx 1 in the 1993-1999 period to approx. 0.3 at present.

Figure 1 Monthly equity betas



(Source: LBS, 2004)

4.21. This raises the question whether the actual risk profile of these companies has changed or whether this decrease might be the result of other factors.

Smithers & Co report on Beta estimation

4.22. Ofgem commissioned Smithers & Co[17] to present beta estimates for a range of companies in the electricity and water sectors. The report presents estimates of daily, weekly and monthly betas. It also compares standard OLS errors with White

[17] Wright, S. (Birkbeck College) and Smithers & Co (March, 2004), Beta Estimates for: Scottish Power, Scottish & Southern Energy, Viridian Group, Centrica, International Power, National Grid Transco, United Utilities, Kelda

standard errors and Newey-West standard errors, as recommended in the Smithers & Co report for the joint regulators and it uses both the FTSE Allshare index and a broader index as a proxy for the market portfolio for beta estimation.

Table 1 Daily, weekly and monthly beta estimates[18]

Company	Daily beta	Weekly beta	Monthly beta
Scottish Power	0.6978 (0.0781)	0.6861 (0.1212)	0.7311 (0.2881)
Scottish & Southern	0.4872 (0.0844)	0.6349 (0.3475)	0.4596 (0.1900)
United Utilities	0.5907 (0.0718)	0.5466 (0.1309)	0.5409 (0.1857)

(Source: Smithers & Co report on Beta estimates for Ofgem, March 2004)

4.23. The main findings of the report are:

- in virtually all cases there is a clear ranking of the precision of beta estimates with higher frequency data increasing precision;
- using a broader market index makes little difference to the results;
- beta estimates using daily data are very well-determined, hence Bayesian adjustments make a very small difference – i.e. pushing beta estimates only marginally closer to unity; and
- for a number of companies there is strong evidence of parameter instability as shown by rolling regressions.

Group, Severn Trent. This study is available at the Ofgem website.
[18] Newey West standard errors are given in brackets

4.24. The CAPM approach to beta estimation assumes that beta is stable over time. If beta is not stable over time, these estimates would have to be approached with a degree of caution. As pointed out in the Smithers & Co report there is strong evidence of parameter instability for several of the companies. This could be a problem, even when standard errors are relatively small.

4.25. The Smithers & Co report presents two issues for consideration, which have to be weighed when interpreting the data. These two factors point in opposite directions:

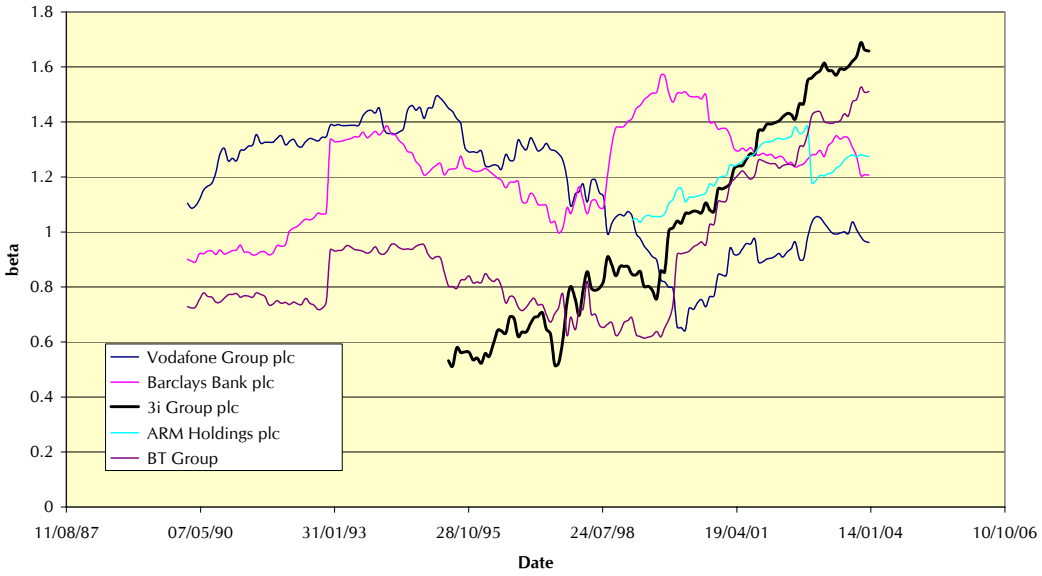
- all other things being equal, parameter instability might make beta estimates more uncertain into the future and hence more weight might be given to the unconditional expectation of unity (beta = 1); or
- parameter instability is mainly an issue early in the sample, which might be related to 'markets learning' about these companies.

Interpretation of beta estimates: the impact of the TMT bubble

4.26. The first factor is in line with the observation by several commentators that there might be a potential bias in the data due to the TMT[19] bubble. This might have resulted in regulated utilities being treated as 'safe haven' stocks. Figures 2 and 3 compare betas of different sectors.

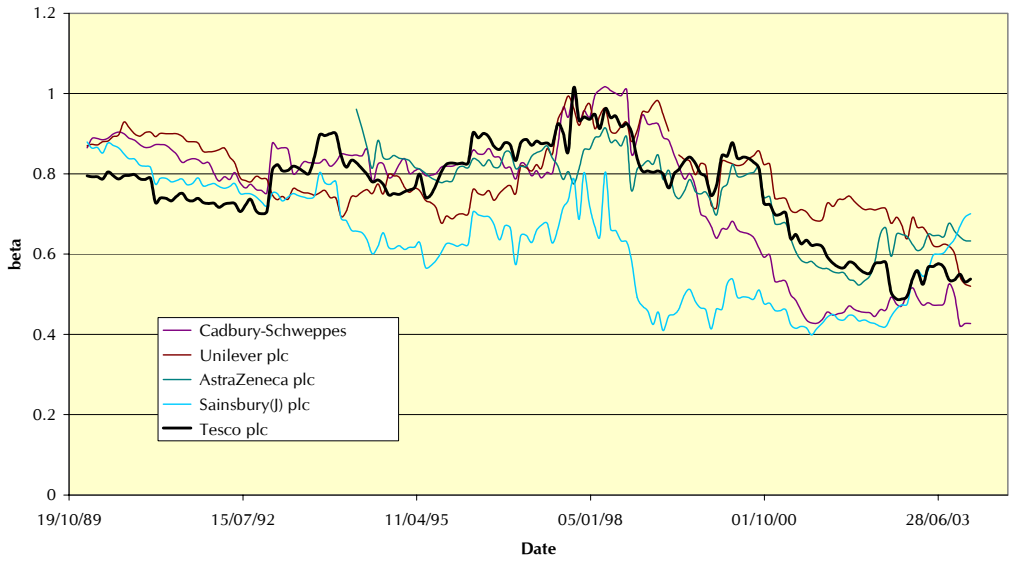
[19] TMT refers to Technology, Media and Telecommunications

Figure 2 Monthly beta estimates of "high tech" stocks



(Source: LBS, 2004)

Figure 3 Monthly beta estimates of 'safe' stocks



(Source: LBS, 2004)

4.27. Figures 2 and 3 illustrate that since the peak of the stock market in early 2000 there has been a decline in the betas of what might be regarded as 'safe stocks' and an increase in the betas of what might be regarded as 'high tech stocks'.

4.28. Several studies have attempted to estimate the impact of the TMT bubble on 'safe haven' stocks. Hern and Zalewska[20] find a statistically significant impact in the order of 0.29 (standard error 0.11) in times of excess market volatility – i.e. the TMT bubble depressed the betas of 'safe haven' stocks by around 0.29. Annema and Goedhart[21] calculate the impact of the TMT bubble on the betas of non-TMT stocks to be in the order of 0.25 for integrated oil and chemicals, 0.5 for electricity and food and 0.7 for pharmaceuticals (all based on US data). This would increase the observed US beta for the electricity sector from 0.13 to 0.62.

4.29. In case of the DNOs, no data is available on the beta at the level of the licensee as all companies are part of wider corporate groups. This means that the observed betas are based on the parent company's activities, which include both regulated and unregulated activities. These observed betas are likely to overstate the risk of the regulated entity given that the non-distribution activities are likely to be more risky.

4.30. Gearing at licensee level is in the case of the listed companies higher than gearing at the parent company level. Nevertheless, an approach based on delevering the parent company beta in order to obtain an asset beta and relevering it for the regulator's gearing assumption is unlikely to be appropriate unless the parent company beta has been decomposed. However, to decompose these betas in order to obtain an equity beta for the regulatory entity is complex and would need to be based on assumptions which may not yield robust estimates given the lack of 'pure play' companies.

Range for equity beta

4.31. Given the Smithers & Co report and Ofgem's own analysis of the evidence, Ofgem has adopted a range for equity beta of 0.6 – 1 for its cost of capital calculations.

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[20] Hern, R. and Zalewska, A. (October 2001), Recent Evidence on Beta and the Cost of Capital for UK Electricity Companies, n/e/r/a Topics

[21] Annema and Goedhart (Winter 2003), Better betas, McKinsey on Finance

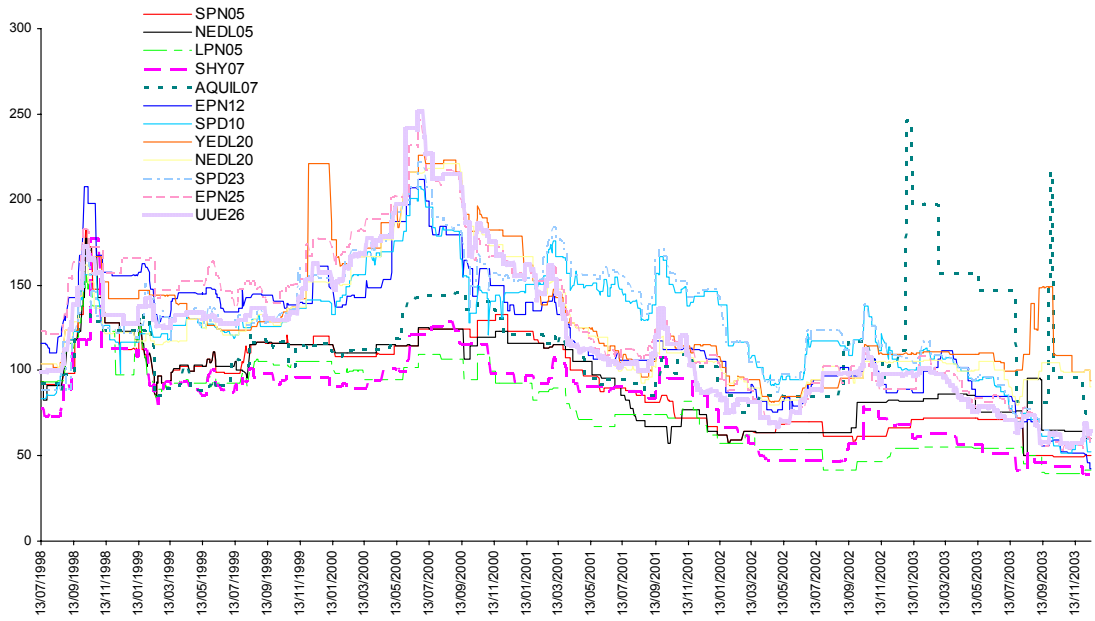
Debt premium

4.32. At the last price control review, Ofgem adopted a debt premium in the range of 1.65% to 1.85%, which included an adjustment for embedded debt.

4.33. A debt premium based on the last two years of data would be 0.93% for UK debt, 1.60% for US debt and 0.88% for Euro bonds over a similar government bond. A more long-term approach indicates an average debt premium of 1.36% for UK debt.

4.34. Figure 4 shows that the debt premium has been volatile during the year 2000 but become more stable over the last few years.

Figure 4 Debt premiums at DNO level over equivalent government benchmark



(Source: HSBC Sterling Bond Daily, 2004)

4.35. The current debt premium especially for DNO's UK debt seems to be relatively low and it is possible that this is due to increased demand for corporate debt by pension funds. If for example, over the next five years, issuance of UK government debt increases (with demand staying constant), it might be expected that the yield on UK government debt increases. If demand for bonds stays constant, this could potentially also increase the yield on corporate debt.

4.36. Figure 5 shows both the average debt premium of all the licensees' bonds at a given point in time and the (longer-term) average debt premium of licensees' bonds over time. The former shows that the average debt premium has been relatively volatile. The longer-term average debt premium of DNO bonds is given by the horizontal line.

4.37. **Figure 5 Average debt premium**

(Source: HSBC Sterling Bond Daily, 2004)

Range for the debt premium and expected cost of debt

4.38. Given that there seems to be considerable uncertainty surrounding the *expected* cost of debt, Ofgem has adopted a relatively wide range for the debt premium of 1.0% - 1.8% in its cost of capital calculations.

4.39. Together with the range set out for the risk-free rate, this implies a real cost of debt of 3.25% to 4.80%. If inflation is assumed to be 2.5% this would imply a nominal interest rate in the range of 5.80% to 7.4%.

Gearing

4.40. At the last price control review, Ofgem assumed a gearing level of 50%. Since 1999, the average gearing level of DNOs has increased. As pointed out in the December document, recent evidence[22] indicates that one of the leading credit rating agencies considers that debt to RAV gearing in the range of 60%-65% is consistent with target A3 (A-) ratings for comparable regulated network businesses.

4.41. Ofgem has adopted a range for gearing of 50%-60% for its cost of capital calculations.

[22] 'UK Water Industry Sector Update', Moody's, December 2003

5. Alternative approaches

5.1. This chapter first discusses an alternative approach to the risk free rate and ERP, which could provide an explanation why aggregate market returns tend to be stable over long time horizons. In this context, Ofgem considers an aggregate return on equity approach, as suggested in the Smithers & Co report for the joint regulators. Ofgem indicated in the December 2003 second consultation document, that it would see merit in using the aggregate return on equity approach alongside the CAPM approach.

5.2. In the December document, Ofgem also indicated that it would use the dividend growth model (DGM) as a cross-check for the cost of equity calculations. This is discussed in the second part of this chapter.

An alternative approach to the risk-free rate and ERP

5.3. In previous reviews, regulators and companies have presented a 'high' and 'low' case for their cost of capital estimates. The 'high' ('low') case included a 'high' ('low') ERP and 'high' ('low') risk-free rate. However, this approach is increasingly being questioned.

5.4. The key issue is how to interpret the decline in the dividend/price ratio and what the implications might be on the future return on equity. Campbell[23] argues that there are two possible interpretations. Either current valuations are a new steady state or they are transitory. In case of the former, this would imply a very low prospective ERP. In case of the latter, this would imply that earnings and dividends are below their long-run trend levels. This is likely to result in rapid earnings and dividend growth resulting in equity returns returning to their historical levels (i.e. approximately 7%). The latter would suggest that stock prices will decline/stagnate until traditional valuations are restored. This could imply extremely poor returns in the near future, but higher returns in the more distant future. In this case, it is to be

[23] Campbell, J.Y. (2001), "Forecasting U.S. Equity Returns in the 21st Century", Harvard University

expected that short-term and long-term interest rates would be higher than their historical averages. This implies that a 'low' ('high') risk-free rate should be seen in the context of a 'high' ('low') ERP. The reason for this is that high equity market volatility leads to equities being less desirable, resulting in investors demanding a higher return and resulting in a flight to quality (depressing the yield on government bonds).

5.5. Using the previously proposed ranges for the risk-free rate and ERP, this would suggest a cost of equity in the range of 5.5% to 6.75% for the average firm (i.e. firm with an equity beta of 1).

Aggregate Return on Equity approach

5.6. As observed by Smithers & Co[24], among others, aggregate equity returns have been remarkably stable over time.

5.7. The Smithers & Co report for the joint regulators therefore argues that in situations where there is considerable uncertainty with respect to the risk free rate and ERP, an aggregate equity return approach might be more appropriate. This would not require judgments with respect to key inputs to the cost of equity (i.e. ERP and risk-free rate), but it would require an assumption that equity beta is approximately 1.

5.8. The central estimate of the cost of equity presented by Smithers & Co is around 5.5% (geometric average) and 6.5% to 7.5% (arithmetic average). This would indicate a range for the cost of equity of 3.5%-7.5% (geometric) and 4.5%-9.5% (arithmetic).

[24] Wright, S., Mason, R., and Miles, D. (2003), A Study into certain aspects of the cost of capital for regulated utilities in the UK, Smithers & Co Ltd

Dividend Growth Model

5.9. The Dividend Growth Model (DGM) in its basic form states that the cost of equity is the sum of the dividend yield and the future (expected) dividend growth rate:

$$R = \frac{D}{P} + G$$

where

R	=	cost of equity
D	=	dividend
P	=	share price
G	=	expected dividend growth rate

5.10. In its report on BAA plc, the Competition Commission assumed future expected dividend growth rate at par with GDP growth. However, a recent study by Dimson, Marsh and Staunton[25] finds that real dividends have generally grown slower than real GDP per capita. They also find that real dividend growth does not appear to be positively correlated with GDP growth but instead, if anything, correlation might be negative. This also applies to the correlation between real dividend growth and total equity returns.

5.11. The long-term dividend growth rate of quoted UK companies has been in the region of 0.4% per annum over the 20th Century[26]. However, the stock market does not capture the dividend growth rate of unquoted companies.

5.12. It could be argued that in the case of DNOs the main issue what guides dividend growth is load growth, which has been in the range of 1% to 2%. The range of average dividend yields calculated from the sample of companies which directly fall within the current price control is 5.3% to 5.6%. Assuming a dividend growth rate in the order of 1% to 2% (in line with load growth) would suggest a range for the cost of equity of 6.3% to 7.6%.

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[25] Dimson, E., Marsh, P. and Staunton, M. (2002), Triumph of the Optimists, 101 years of global investment returns, US: Princeton University Press

[26] Ibid, p.154

5.13. DGM could also be applied to obtain the cost of equity of the 'average' listed firm by using the average dividend yield on a market index. Analysis of data over the period June 1996 to January 2003 shows that the dividend yield on the FTSE 100 has been in the range of 2.59 (5-year average) to 2.84 (7 year average). If a dividend growth rate in line with GDP is assumed (i.e. 2.25% to 2.5%) this would indicate a cost of equity for the 'average' listed firm in the order of 4.84% to 5.34%. The latest data (2003) shows an increase in the average dividend yield to 3.5% on the FTSE 100. This would imply a cost of equity in the range of 5.75% to 6% for 2003.

6. Proposed range for consultation

6.1. Ofgem's initial view is that the appropriate value for the Vanilla WACC is in the range of 5.1%-5.9%. This figure consists of a pre-tax cost of debt and post-tax cost of equity adjusted for gearing.

6.2. For financial modelling purposes, Ofgem is presently using figures equivalent to a 6.5% pre-tax real cost of capital. This will be reviewed in the light of the consultation responses.

6.3. Table 1 compares the inputs to the cost of capital applied by Ofgem in 1999 and the proposed inputs for the DPCR4 cost of capital.

Table 1 Cost of capital inputs and ranges

		OFGEM 1999		OFGEM 2004	
		LOW	HIGH	LOW	HIGH
A	risk-free rate	2.25	2.75	2.25	3
B	debt premium	1.85	1.7	1	1.8
C	pre-tax cost of debt = A+B	4.10	4.45	3.25	4.80
D	post-tax cost of debt = C x (1-K)	2.87	3.12	2.28	3.36
E	gearing	0.5	0.5	0.5	0.6
F	Equity Risk Premium	3.25	3.75	2.5	4.5
G	equity beta	1	1	0.6	1
H	pre-tax cost of equity = J / (1-K)	7.86	9.29	5.36	10.71
J	post-tax cost of equity = A + (F x G)	5.50	6.50	3.75	7.50
K	corporation tax	0.30	0.30	0.30	0.30
L	pre-tax CoK = (C x E) + (H x [1-E])	5.98	6.87	4.3	7.2
M	post-tax CoK = (D x E) + (J x [1-E])	4.19	4.81	3.0	5.0
N	'Vanilla' WACC = (C x E) + (J x [1-E])	4.80	5.48	3.5	5.9
	Proposed Range Vanilla WACC			**5.1**	**5.9**
	Equivalent Range pre-tax			6.0	7.2
	Equivalent Range post-tax			4.2	5.0