Estimating the cost of capital of the Dutch water companies

Prepared for the Dutch Ministry of Infrastructure and Environment

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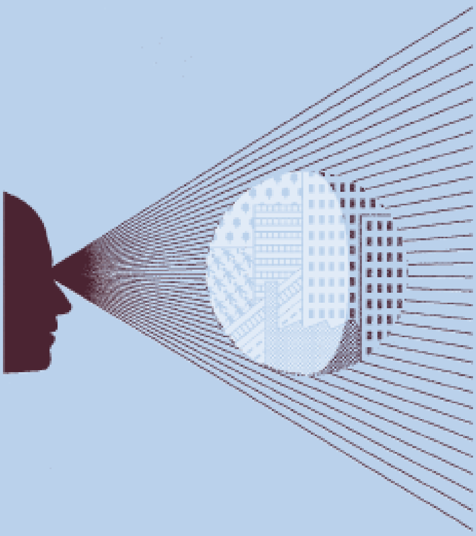

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1 Introduction

Oxera has been commissioned by the Dutch Ministry of Infrastructure and Environment (I&M) to estimate a range for the cost of capital for the Dutch water companies.[1] This estimate will be used to determine the maximum allowable profits for the Dutch water companies over the forthcoming price control, which will start in January 2012 and last for a period of two years.

It is understood that this is the first time that regulation has been introduced into the Dutch water market. The introduction of an allowed cost of capital to determine a cap on profits will be accompanied by benchmarking analysis, in order to provide incentives for efficiency.

For the purposes of the calculation of the cost of capital, Oxera has been required by the I&M to follow the methodology used by the NMa to estimate the parameters that are not specific to the Dutch water companies—ie, the generic parameters: namely, the risk-free rate and equity risk premium (ERP). In addition, the methodology recommended that the midpoint of the range be adopted by the NMa. The NMa's approach is based on the methodology developed by Frontier Economics, which was previously applied to calculate the cost of capital for the Dutch energy networks.[2]

In order to determine the parameters that are specific to the Dutch water companies—ie, the beta, debt premium and gearing—Oxera has been required by the I&M to follow the NMa's methodology as closely as possible, with modifications to reflect the differences between the characteristics of the Dutch water companies and the Dutch energy networks.

In particular, the Dutch water companies are both publicly owned and non-taxpaying. In contrast, although they are publicly owned, the Dutch energy networks are required to pay corporation tax. Depending on the objectives of regulation in the Netherlands, for the purposes of calculating the cost of capital, the Dutch water companies could be treated as if they were privately owned and taxpaying. The approach that is adopted would need to be driven by the objectives behind the regulatory framework in the Netherlands. The approach that is adopted will affect the cost of debt, and hence, the overall estimate of the cost of capital.

– **Publicly owned and non-taxpaying**. This approach would reflect the fact that the Dutch water companies are owned by municipal or regional authorities. Therefore, the Dutch water companies are likely to be able to borrow at lower interest rates, as their debt payments are likely to benefit from implicit guarantees from the Dutch authorities. As a result, it is unlikely that the Dutch water companies would be allowed to default on their debt.

  However, the reduction in the cost of debt as a result of the status of Dutch water companies as publicly owned entities may be partly mitigated by the treatment of the water companies as non-taxpaying. In the absence of corporation tax, no tax benefits are associated with raising debt.

– **Privately owned and taxpaying**. This approach would treat the water companies as if they were stand-alone companies without any implicit support in the event of financial difficulties from the Dutch authorities. The rationale behind this approach is to ensure

[1] As part of this study, advice has been received from Aad Correljé and Jan Jaap Bouma, Associate Professors at Delft University of Technology.
[2] Frontier Economics (2005), 'The Cost of Capital for Regional Distribution Networks, a report for DTe', December.

that the return allowed by the regulator reflects the risks of the companies' assets, irrespective of who owns them. To best estimate this risk, it is assumed that the assets are traded in the public capital markets and owned by private investors.

Since this implies that the water companies would be exposed to greater risks, the cost of debt would be expected to be higher than if the Dutch water companies were treated as publicly owned, and hence benefited from implicit support from the Dutch authorities.

In order to reflect the treatment of Dutch water companies as stand-alone companies, this approach assumes that the water companies pay corporation tax at the statutory tax rate. Under this approach, companies therefore benefit from the tax advantages of raising debt. This may partly offset the increase in the cost of debt as a result of the absence of any implicit support from the government in the event of financial difficulties under this scenario. The approach of treating the Dutch water companies as privately owned and taxpaying would be consistent with the NMa's approach for the Dutch energy networks, as well as the approach adopted by UK regulators.[3]

The tax treatment will also affect the Dutch water companies' allowed profits. Under the publicly owned and non-taxpaying scenario, a separate allowance for corporation tax payments would not be required. However, under the privately owned and taxpaying scenario, a separate allowance would be needed for tax payments to ensure that the companies are remunerated appropriately for tax.

For the purposes of this report, estimates of the cost of capital are presented under both scenarios.

1.1 Estimates of the cost of capital

Under the publicly owned and non-taxpaying scenario, the estimate of the nominal cost of capital is 4.57–6.90% (midpoint: 5.74%). In contrast, under the privately owned and taxpaying scenario, the estimate of the nominal cost of capital is 4.33–6.51% (midpoint: 5.42%). The midpoints of the ranges are reported to reflect the methodology adopted by the NMa.

The estimate of the cost of capital is slightly lower under the privately owned and taxpaying scenario as the tax advantages to debt outweigh the slight increase in the cost of debt as a result of the Dutch water companies being treated as stand-alone companies (without any implicit guarantee) under this scenario. This can be seen in Table 1.1 by the lower estimate of the cost of debt after tax under the privately owned and taxpaying scenario compared with the publicly owned and non-taxpaying scenario.

[3] It is understood that, in contrast to the Dutch water companies, the Dutch energy networks are required to pay corporation tax.

Table 1.1 Estimates of the nominal costs of capital

Component	Publicly owned and non-taxpaying	Privately owned and taxpaying
Risk-free rate (%)	3.30–3.80	3.30–3.80
Debt premium (%)	0.79–1.23	1.23–1.72
Issuance fees (%)	0.10–0.20	0.10–0.20
Cost of debt before tax (%)	**4.19–5.23**	**4.63–5.72**
Cost of debt after tax (%)	**4.19–5.23**	**3.45–4.26**
Asset beta	0.24–0.41	0.24–0.41
Equity beta	0.37–0.75	0.44–0.91
ERP (%)	4.00–6.00	4.00–6.00
Cost of equity after tax (%)	**4.78–8.27**	**5.05–9.27**
Corporation tax (%)	0.00	25.50
Gearing (%)	35.00–45.00	45.00–55.00
Cost of capital (%)	**4.57–6.90**	**4.33–6.51**
Midpoint (%)	**5.74**	**5.42**

Note: In order to derive the equity beta from the asset beta, following the NMa's approach, a debt beta of zero has been assumed. Inflation is included in the estimates of the cost of capital reported in the table.
Source: Oxera analysis.

The assumptions on the individual parameters are as follows.

– The range for the **asset beta** is 0.24 to 0.41. The low end reflects raw beta estimates, while the upper end reflects adjusted beta estimates across a sample of comparable companies. The range is also consistent with the UK Competition Commission's (CC) decision in the appeal by Bristol Water of Ofwat's final decision for UK regulated water and sewerage companies.

– The estimate of the **debt premium** varies according to whether the water companies are treated as publicly or privately owned companies.

  Under the public ownership scenario, the debt premium reflects traded data on AA and A rated bonds. The resulting estimate of the debt premium has been cross-checked through the actual cost of debt from a sample of the Dutch water companies.

  Under private ownership, it is assumed that the Dutch water companies are stand-alone companies, and any debt is not implicitly guaranteed by the Dutch authorities. Under this approach, the debt premium reflects traded data on A rated bonds. A target credit rating of A is in line with approaches adopted by the NMa as well as UK regulators to ensure that the regulated companies can comfortably maintain an investment grade credit rating.

  As a result of the higher credit rating under the public ownership scenario, the debt premium (excluding any allowance for fees associated with raising debt) ranges from 79–123bp. Under the private ownership scenario, the debt premium (excluding any allowance for fees associated with raising debt) ranges from 123–172bp.

  Under both scenarios, an allowance of 10–20bp for fees associated with debt issuance will be included. In the absence of information on the cost to the Dutch water companies of raising debt, this allowance reflects the approach adopted by the NMa.

– The **gearing** range is 35–45% under the public ownership scenario, which reflects the market value of gearing for comparators with a credit rating of AA to A. Under the private ownership scenario, the gearing range is 45–55%, reflecting the market value of gearing of a sample of comparators with a credit rating of A.

- The **risk-free rate** ranges from 3.3% to 3.8%. This reflects the approach followed by the NMa, based on nominal yields on ten-year Dutch sovereign bonds averaged over the last two and five years. The approach of deriving the risk-free rate from yields averaged over the last two and five years effectively incorporates a degree of headroom of around 20–70bp above prevailing spot rates.
- The **ERP** ranges from 4.0–6.0%. As Oxera has been required to follow the NMa's approach, this range is consistent with the NMa's decision in 2010, which is based on the methodology developed by Frontier. [4]

1.2 Structure of the report

The remainder of the report is structured as follows.

- An overview of the approach to calculating the cost of capital is presented in section 2, together with the treatment of corporation tax and public ownership; an overview of the regulatory framework for the Dutch water companies; as well as details on the approach to estimating the components of the cost of capital.
- Estimates of the beta for the Dutch water companies are outlined in section 3, with the debt premium and gearing discussed in section 4.
- The generic parameters—the risk-free rate and ERP—are discussed in section 5.
- An overall estimate of the cost of capital is presented in section 6.
- Appendix 1 presents further detail on the estimates of the asset beta.
- Appendix 2 contains details on an appropriate solvency ratio for the Dutch water companies.

[4] Energiekamer (2010), 'Bijlage 2 Uitwerking van de methode voor de WACC', *Methodebesluit voor de systeemtaken van TenneT vastgesteld*, September.

2 Overall framework

This section provides an overview of the approach that has been followed to estimate the cost of capital of the Dutch water companies. This includes the methodology that has been followed in order to take into account the fact that the Dutch water companies do not pay corporation tax and are publicly owned. In addition, this section discusses the nature of the regulatory regime under the Drinking Water Act (2009), before outlining further details on the approach to estimating the parameters of the cost of capital.

2.1 Overview of the calculation of the cost of capital

The cost of capital represents the average return across the different components of a company's capital structure, weighted by the proportion of each component in the capital structure. The cost of capital represents the cost to companies of raising funds to finance existing operations and to undertake new investment.

The estimation of the cost of capital requires an assessment of the different components of a company's capital structure. For simplicity, these are typically limited to the cost of debt and equity, weighted by the market values of debt and equity respectively.

Box 2.1 Calculation of the cost of capital

The cost of capital is calculated as the average cost of debt and cost of equity, weighted by gearing.

It is calculated as (rd x g) + re x (1–g),

where rd represents the cost of debt, re represents the cost of equity, and g represents gearing.

Under the terms of the Dutch Water Act (2009), it is understood that the cost of capital for water companies will be reviewed every two years.

It is important that the regulatory regime provides appropriate remuneration to the water companies for inflation. Inflation can be taken into account by incorporating it in the cost of capital or by uplifting the opening value of the asset base each year. To avoid double-counting the allowance for inflation, it is important that inflation is not incorporated in both the cost of capital and the asset base. It is understood that, under the specifics of the regulatory regime in the Netherlands, the estimate of the cost of capital will include an allowance for inflation.

Since the Dutch water companies are not publicly listed on either the equity or debt capital markets, some of the parameters to estimate both the cost of equity (eg, the equity beta) and the cost of debt (eg, the debt premium) need to be estimated based on comparable companies that are likely to face similar business risks.

2.1.1 Cost of equity

The cost of equity has been estimated using the capital asset pricing model (CAPM), which is typically used by regulators as well as industry practitioners. The CAPM relates the cost of equity of a particular company to its exposure to systematic or non-diversifiable equity market risk. Investors do not require compensation for non-systematic risk because this risk can be eliminated through holding a diversified portfolio of assets.[5]

[5] Investors will still require compensation for non-systematic risk through an extra premium in cash flows.

Box 2.2 Calculation of the cost of equity

The cost of equity is the return required by investors from investing in the equity of a company.

It is calculated as:

the risk-free rate + (equity beta x ERP)

where:

- the risk-free measures the return required by investors from investing in a security that is judged to be relatively risk-free. It is a generic parameter, and therefore not specific to the company being assessed;
- the equity beta provides a measure of the risk of the asset relative to the market as a whole. It is specific to the company being assessed;
- the ERP is estimated as the excess return on the market portfolio over the risk-free rate. It is a generic parameter, and therefore not specific to the company being assessed.

The cost of equity represents the premium required by investors (equity beta x ERP) over and above the risk-free rate when they invest in equities.

2.1.2 Cost of debt

The cost of debt represents the return required by investors in company's debt.

Box 2.3 Calculation of the cost of debt

The cost of debt can be estimated as the risk-free rate plus the debt premium.

- The risk-free rate is a generic parameter, and is not specific to the company being assessed.
- The debt premium is specific to the company being assessed. The debt premium is the difference between yields on a company's bonds and the risk-free rate.

2.2 Treatment of corporation tax and public ownership

It is understood that the Dutch water companies are exempt from corporation tax, and are publicly owned.

Depending on the objectives behind the introduction of regulation in the Netherlands, this raises a question around how to treat the Dutch water companies' exemption from corporation tax and their status as publicly owned companies in the calculation of the cost of capital.

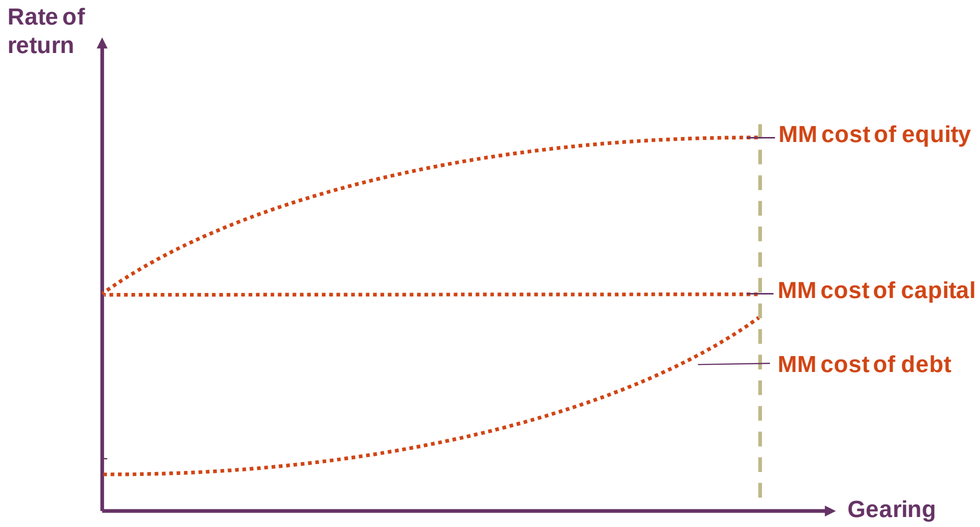
2.2.1 Exemption from corporation tax

Under well-known finance theory, in the absence of any corporation tax (and assuming no costs associated with bankruptcy), an increase in gearing leads to an increase in the cost of equity, as equity become more risky.[6] Under these assumptions, the overall cost of capital is unchanged, because although the cost of equity increases with gearing, this is offset by the lower cost of debt compared to the cost of equity.[7]

[6] For further details, see Modigliani, F. and Miller, M. (1958), 'The Cost of Capital, Corporate Finance and the Theory of Investment'. *American Economic Review,* **48**:3, pp. 261–97.

[7] This result, that the overall cost of capital is unchanged with changes in gearing, holds even if the cost of debt increases, providing that any increase is not associated with any deadweight costs associated with bankruptcy.

Figure 2.1 Impact of gearing on the cost of capital under well-known finance theory



Note: MM, Modigliani–Miller.
Source: Oxera analysis, based on Modigliani, F. and Miller, M. (1958), 'The Cost of Capital, Corporate Finance and the Theory of Investment'. *American Economic Review,* **48**:3, pp. 261–97.

In the case of the Dutch water companies, given that there are no corporate taxes, the benefits of a highly geared capital structure in terms of a reduced cost of capital are likely to be low, as there are no expected tax benefits from debt financing.

In contrast, in those countries where regulated companies are required to pay corporation tax, the advantage of increasing gearing is that interest payments can be deducted from profits for the purposes of estimating companies' tax payments. Hence, companies' tax payments will be lower. This is likely to lead to an incentive on companies to increase their level of gearing. However, through determining a notional gearing level, regulators attempt to claw back some or all of the tax advantages of debt.[8]

There are two potential approaches to the treatment of corporation tax within the cost of capital.

– **Taxpaying case**. This approach would assume that the Dutch water companies pay corporation tax. The approach would incorporate the tax advantages of raising debt, and, as a result, the cost of debt would be lower. This approach would therefore lead to a lower cost of capital. This approach would be consistent with that adopted by the NMa for the Dutch energy networks, which are required to pay corporation tax.

– **Non-taxpaying case**. This approach would reflect the fact that the Dutch water companies do not pay any corporation tax. In the absence of corporation tax, no tax benefits are associated with raising debt. As a result, this approach would lead to a higher cost of capital.

The overall impact of both approaches on prices is not clear-cut. This will depend on companies' pricing decisions under the profit cap regime in the Netherlands. The impact on prices will depend on differences in the cost of capital under both scenarios, as well as

[8] If notional gearing is set higher than the actual level, the company may under-recover its cost of capital unless it increases gearing to take advantage of tax shields implicitly assumed in the cost of capital set by the regulator. If the notional gearing level is set lower than the actual level, the regulated company may be able to over-recover its cost of capital compared with what it would incur under the notional capital structure. This is because the company would receive more remuneration for tax than the tax expense actually incurred, on average.

differences in how capital allowances and estimates of depreciation for regulatory purposes interact and affect corporate taxes.[9]

A summary of both approaches is shown in Table 2.1.

Table 2.1 Approaches to the treatment of corporation tax

	Taxpaying case	Non-taxpaying case
Corporation tax (%)	25.5	0.0
Cost of debt (r_{VV})	Lower than under the non-taxpaying case (as a result of the tax advantages of raising debt)	Higher than under the taxpaying case
Cost of equity (r_{EV})	Same as under the non-taxpaying case	Same as under the taxpaying case
Cost of capital	Lower than under the non-taxpaying case	Higher than under the taxpaying case
Prices	Impact is not clear-cut	Impact is not clear-cut

Note: The cost of equity is not affected, since earnings that are distributed are always after-tax.
Source: Oxera analysis.

2.2.2 Public ownership

In addition to the treatment of corporation tax, there is an additional consideration around whether to treat the Dutch water companies as if they were privately or publicly owned for the purposes of estimating the cost of debt. Although the risks of the Dutch water companies would be expected to be relatively low compared with other sectors as a result of the nature of the regulatory regime, as well as the relatively stable demand (as outlined in section 2.3), investors will view the debt of the Dutch water companies as likely to be subject to implicit guarantees by local authorities.

Privately owned

Under this approach, the cost of debt would reflect the interest rate on debt as if the water companies were stand-alone entities without any implicit guarantee from the Dutch authorities. The cost of debt would be slightly higher than if the Dutch water companies were treated as publicly owned, and hence, benefited from implicit support from the Dutch authorities in the event of financial difficulties.

The approach of treating publicly owned entities as though they were stand-alone companies for the purposes of calculating their cost of capital is consistent with the NMa's approach to energy networks. It is understood that the Dutch energy networks are publicly owned and are required to pay corporation tax. In addition, the NMa estimates the cost of capital as if the energy companies are privately owned and pay taxes. Therefore, the cost of capital estimated by the NMa reflects the cost of finance that would be borne by a private investor. As such, the NMa derives estimates of the cost of capital from private companies of similar risk in the debt markets and the equity markets.

The approach of treating the companies as privately owned is also consistent with the methodology adopted by UK regulators—eg, the Water Industry Commission for Scotland's (WICS) approach to Scottish Water, the Office of Rail Regulation's (ORR) approach to Network Rail and Postcomm's approach to Royal Mail. For example, although Scottish Water is publicly owned, WICS determined the cost of equity and cost of debt on the basis that Scottish Water was a private company. This approach was undertaken to ensure that the return allowed by WICS was commensurate with the risks faced by companies in financial markets.[10] Furthermore, Network Rail's debt is guaranteed by the government. However, the

[9] Usually the tax code allows capital allowances to be claimed by companies that undertake investment projects. The capital allowances reduce the corporation tax that companies are required to pay on their profits.
[10] Water Industry Commission for Scotland, 'Financing Scottish Water' Staff Paper 3. For further details, see: http://www.watercommission.co.uk/UserFiles/Documents/Staff%20paper%203.pdf.

ORR estimated the company's allowed cost of debt on the basis of the cost of debt that could be achieved by an efficiently financed, regulated and privately owned utility.[11] When setting a cost of capital for Royal Mail, Postcomm treated the company as if it were a private company, and did not make any adjustments for its status as 100% government-owned. Postcomm considered that this approach best met the objectives of sending efficient price signals to the company and the market.[12]

Publicly owned

This approach would reflect the fact that the Dutch water companies are owned by municipal or regional authorities, and are therefore likely to benefit from implicit guarantees from the Dutch authorities. As a result, it is assumed that there is little chance of default on their debt. Therefore, the cost of debt would be expected to be somewhat lower than under the private ownership approach.

2.2.3 Scenarios for the cost of capital

The cost of capital has been estimated under the following two scenarios.

– **Publicly owned and non-taxpaying**. This approach more closely reflects the current characteristics of the Dutch water companies—eg, the tax exemption and the public ownership.

– **Privately owned and taxpaying**. This approach treats the Dutch water companies as both paying corporation tax and privately owned. This approach is more likely to ensure appropriate pricing signals for investment, and reflects the NMa's approach, as well as the approach typically adopted by regulators in the UK.

2.3 Approach to regulating the Dutch water companies

In light of the Dutch water companies not being publicly listed, for the purposes of estimating the cost of capital, comparator firms that are listed and face similar business risks to the Dutch water companies need to be identified. In order to ensure that the comparator firms are chosen appropriately, it is important to assess the risks that are likely to be faced by the Dutch water firms under the regulatory regime.

Under the terms of the Drinking Water Act (2009), it is understood that the I&M will set an industry cost of capital, which is used by individual water companies to set their own tariffs. In setting the tariff, the individual company includes a component for the cost of capital and a component for operating costs. The company is responsible for estimating its own operating costs and setting that component in the tariff; however, it is understood that the I&M undertakes benchmarking of companies' operating costs with the aim of promoting efficiency incentives.

If the company's realised returns exceed the cost of capital over a two-year period, there is no direct penalty associated with this; although, the company must return the excess via lower tariffs in the next price control period. If, however, the company realises returns below the cost of capital, it cannot set tariffs in the future to claw back the under-recovery in the cost of capital. However, it is understood that the introduction of a claw-back mechanism would not be prohibited under the terms of the Drinking Water Act (2009).

The proposed tariffs must be signed off by the owners, usually the local authorities. The tariffs are reviewed by the I&M, but not signed off by them. This contrasts directly with the framework for the water industry in the UK, where the regulator, Ofwat, sets the tariffs rather

[11] Office of Rail Regulation (2009), 'Periodic review 2008, Determination of Network Rail's outputs and funding for 2009–14', p. 230.
[12] Postcomm (2005), 'Royal Mail Price and Service Quality Review, Final Proposals for Consultation', December, p. 227.

than the company, and where the regulator must agree the tariffs, cost of capital and operating costs.

Under the Dutch regulatory regime, since companies set their own operating expense targets and the corresponding tariffs, it might be expected that the companies will set tariffs so that they over-recover their cost of capital. In practice, ahead of the start of the price control, there may be a tendency by the companies to overestimate their forecasts of costs. This is because there is no penalty for over-recovery (any over-recovery must simply be returned to consumers via lower tariffs) whereas there is a penalty for under-recovery (firms cannot recover it).

An important question is to what extent the company has discretion to set tariffs above the cost of capital in order to avoid the risk of under-recovery. If its discretion is not limited then it has the incentive to set tariffs to over-recover so that it incurs little risk of failing to meet its cost of capital targets.

2.3.1 Implications of the regulatory framework for the cost of capital

If the risk of under-recovery is low, this may point towards a business with a low asset beta. There is of course some demand risk, although this will be small since water's elasticity of demand is typically low. There is also an absence of competition in the Dutch water sector. If, however, the discretion of the companies to set tariffs is limited by owners, which wish to see the lowest possible tariffs, or by regulators that have the ability to set or to sign off on any proposed tariffs, then the risk of the company achieving a below-average return will be greater, and this is likely to raise its asset beta.

There is also another implication of limited discretion. There is a risk that the company will, over time, under-recover its cost of capital. Setting tariffs to exactly target its cost of capital will, in a state of uncertainty with respect to costs, under-recover in some years and in other years over-recover. In those years it over-recovers the excess will be returned to consumers, whereas in those years it under-recovers, the losses will be borne by the company. Thus, the company will have to set a tariff to target a return above the cost of capital in order to be able to achieve a return over time that is equal to the cost of capital. It is desirable for the regulatory authorities to clarify this asymmetry of treatment since this will have a bearing on the appropriate cost of capital.

If a mechanism were to be introduced such that the Dutch water companies were able to claw back any under-recovery in the cost of capital through higher prices at the next price control, this would expose the Dutch water companies to less risk under the regulatory regime.

2.4 Methodology to calculate the cost of capital

Following the brief overview of the high-level approach to calculating the cost of capital, this section sets out the approach in further detail.

In line with the stipulations set out by the I&M, the methodology that has been adopted follows the NMa's approach as closely as possible. Specifically, in order to estimate the generic parameters—the risk-free rate and the ERP—the NMa's approach has been followed closely.

2.4.1 Equity and asset beta

Identifying comparators facing similar business risks

As the Dutch water companies are not publicly listed, an estimate of the equity beta cannot be obtained for these companies directly. Therefore, the equity beta of the Dutch water companies has been estimated using an indirect approach, based on publicly listed companies that are likely to face similar business risks.

To identify such companies, characteristics that affect companies' exposure to systematic risk have been considered. The most important of these characteristics are the company's business mix and the regulatory framework under which it operates.

The sample of comparators for Dutch water companies comprises other water companies and utility firms whose business portfolio predominantly focuses on regulated activities. To determine a set of comparators, the following steps were undertaken.

1) Information on all publicly listed European, Australian, Canadian, New Zealand and US utility and rail companies which could be potential comparators for Dutch utilities was obtained. These criteria yielded a universe of 360+ comparator utility companies.

2) From this universe of comparators, companies were excluded if they were judged not to face similar risks to the Dutch water companies. Specifically, renewable and low emissions businesses, as well as marketing or other ancillary and investment businesses, which are not involved in water distribution, were excluded from the sample.

3) From the resulting sample, companies were excluded if they were highly diversified businesses, and hence were not likely to represent close comparators for the Dutch water companies, and if their key business activities were primarily not regulated. This yielded a sample of companies that predominantly owned network assets, and as such, represent appropriate candidates for economic regulation. This included electricity pure-play comparators, gas pure-play comparators, comparators providing both electricity and gas, as well as water companies.

4) To refine the sample, following the approach adopted by the NMa, additional companies were excluded on the basis of high levels of gearing to ensure that the estimates are not influenced by excessive levels of financial risk (defined as gearing in excess of 65%); illiquidity (defined as the stock being traded on less than 90% of trading days in the past five years), as well as on the basis of size (defined as those companies with lower revenue than the smallest Dutch water company as of 2009).[13]

The final sample is therefore comprised of companies that are most likely to face business risks similar to those faced by the Dutch water companies.

Approaches to estimating the equity beta of comparators

The inherent uncertainty in estimating the equity beta, combined with the tendency for companies' equity betas to regress towards 1, has led some to argue in favour of applying adjustments to equity beta estimates. [14]

The two most common adjustments are the Blume adjustment and the Vasicek adjustment.

– The **Blume** adjustment applies a weight of 0.67 to the raw equity beta and a weight of 0.33 to the average equity beta across the market as a whole of 1. These weights may be considered to be somewhat arbitrary; however, this adjustment is more commonly used, since it is relatively straightforward to implement.[15]

– The **Vasicek** adjustment takes a weighted average of the estimated beta and a 'prior' beta, derived from assumptions relating to the distribution of the betas being estimated. This approach is more sophisticated than the Blume adjustment, since the weights vary

[13] The rationale behind adopting a threshold for illiquidity is to remove estimates of the beta that may be biased by relatively infrequent trading.

[14] Blume, M. (1971), 'On the assessment of risk', *Journal of Finance*, **26**, pp. 1–10.

[15] It should be noted that the adjustment is not intended to reflect a prior belief that the true value of the beta is 1, but rather than the value of the beta is expected to regress towards 1 over time. For example, there is evidence that the betas in the forecast period tend to be closer to 1 than the estimate obtained from historical data. For further details see Elton, E., Gruber, M., Brown, S. and Goetzman, W. (2007), *Modern Portfolio Theory and Investment Analysis*, chapter 7, p. 144, 7th edition, John Wiley & Sons.

depending on the precision of the betas being estimated. However, this approach is not straightforward to implement, as a result of the requirement to make a prior assumption about the distribution of the beta.

Beta estimates using the Vasicek adjustment typically lie between the Blume-adjusted and raw asset betas. There is no clear consensus on whether it is more appropriate to use raw or adjusted betas, and the issue has generated considerable debate.[16]

Estimating the asset beta of comparators

In order to control for differences in financial risk between the comparators and the Dutch water companies, adjustments have been made to the equity beta of comparators in order to calculate asset betas of comparator companies. This adjustment involves ‘de-levering’ the comparators’ equity beta to calculate an asset beta, which reflects the systematic risk associated with the comparator companies, independent of capital structure.

The asset beta of comparator companies is calculated using the following formula:

$$\beta_{asset} = (1 - g) * \beta_{equity} + g * \beta_{debt}$$

where g is equal to the level of gearing for the company to which the equity beta corresponds.[17]

Estimating the equity beta of the Dutch water companies

For the purposes of calculating the cost of capital for the Dutch water companies, once a range for the asset betas has been determined based on comparator companies, this is ‘re-levered’ to yield an equity beta that is unaffected by the different capital structures of the comparator companies compared with the Dutch water companies. This estimate of the equity beta is used to calculate the cost of capital of the Dutch water companies.

2.4.2 Debt premium

For the purposes of estimating the debt premium for the Dutch water companies, a methodology similar to the NMa’s approach has been followed.

In its decisions, the NMa estimated the debt premium for energy networks based on the five-year average debt premium for corporate bond indices and the two-year average debt premium on a sample of reference bonds issued by comparator companies (see Table 2.2 below). For the purposes of estimating the cost of capital for the Dutch water companies, the debt premium has been estimated based on the five-year average debt premium for corporate bond indices. This has been cross-checked through information on the debt premium on bonds issued by comparator companies that are likely to face similar business risk, as well as average spreads on loans taken out by the Dutch water companies.

The NMa selected comparator companies on the basis of three criteria: business focus on energy networks; traded bonds with a maturity of around ten years at the time of the assessment; and a credit rating in the ‘single A’ category.

[16] See, for example, ComCom (2010), ‘Input Methodologies (Electricity Distribution and Gas Pipeline Services): Reasons paper’, December, Appendix H.
[17] This formula is commonly adopted by regulators, and is derived from Miller’s seminal article in *The Journal of Finance*—see Miller, M. H. (1977), ‘Debt and Taxes’, *The Journal of Finance*, May for further details.

Table 2.2 NMa's approach to estimating the debt premium

Estimation question	NMa's methodology
References	Debt premium on general corporate bond indices
	Debt premium on traded bonds for comparator companies
Maturity	Around ten years
Credit rating	Single A
Averaging period	Five years (bond indices)
	Two years (specific bonds)

Note: The use of an averaging period of ten years would reflect historical data that may not be representative of future conditions in financial markets over the forthcoming price control period—for example, averages calculated over a ten-year period are likely to be substantially different from current spot rates.
Source: NMa's decisions.

For the purposes of the analysis of the debt premium for the Dutch water companies, as mentioned in section 2.2, the debt premium has been estimated under two scenarios.

– **Public ownership**—under this approach, the debt premium reflects the implicit guarantee by the Dutch authorities to the water companies. Therefore, the debt premium is likely to be slightly lower under this approach than under the private ownership scenario. Under this approach, the low end of the range for the debt premium is based on companies with a credit rating of AA, consistent with the stipulations in the Drinking Water Act (2009). The high end of the range reflects companies with a credit rating of A.

  This estimate of the debt premium has been cross-checked against estimates of the debt premium for a sample of the Dutch water companies. However, it is important to bear in mind that this estimate of the debt premium may not be representative of the cost of debt under the new regulatory framework that will be introduced into the Dutch market.

– **Private ownership**—under this approach, the debt premium is estimated as if the Dutch water companies were stand-alone companies without any implicit guarantee from the Dutch authorities. This approach should lead to a slightly higher debt premium. Under this approach, the debt premium is based on companies with a credit rating of A, as well as information on the debt premium of comparators. The choice of an A rating reflects the approach typically followed by other regulators, including the NMa, where a credit rating comfortably within investment grade is targeted.

The NMa's approach to estimating the cost of debt includes an allowance for costs associated with the issuance of debt. This is to reflect the expense incurred in obtaining credit (including bank loans as well as bonds), both externally in fees to banks and internally in management costs. A similar approach has been followed for the purposes of this study.

2.4.3 Gearing

Assumptions on gearing have been considered for two purposes—as an input into the cost of capital calculation, and for the purposes of determining a maximum level of solvency (eg, equivalent to determining a minimum level of gearing) as defined by a maximum equity ratio.

The approach to determining an assumption for the maximum level of solvency is discussed in Appendix 2. This section focuses on discussing the approach that has been followed in order to estimate an appropriate gearing assumption for the purposes of the cost of capital. In order to estimate gearing, the following approaches have been followed:

– actual gearing of the Dutch water companies;
– actual gearing of comparator companies;
– gearing assumed by other regulators.

For companies that are publicly listed, actual gearing can be measured on the basis of either book or market value.

- **Under book value**, gearing is based on asset values as reported in the company's statutory accounts. However, since most companies report their asset values at historical costs (or only revalue their assets at infrequent intervals), estimates of gearing on the basis of book value may be higher than estimates of gearing defined according to the market value. Hence, estimates of gearing on the basis of book value might overstate the underlying gearing based on market value.

- **Under market value**, the estimate of gearing more closely reflects the movements in share prices, and hence the market's value of the company. This measure of gearing might provide a better estimate of the economic gearing of the companies, although it varies with short-term movements in equity prices. For example, average gearing of companies may have increased in 2008 due to the falls in equity prices. However, most regulators typically base estimates of gearing on the market value approach.

The approach to estimating gearing differs according to the treatment of the ownership status of the Dutch water companies.

- **Public ownership**. Under this approach, the estimate reflects the gearing of comparators with a credit rating of AA and A. The target of a credit rating of AA and A reflects the implicit guarantee by the Dutch State to the water companies.

- **Private ownership**. Under this approach, a similar methodology to the approach adopted by the NMa is followed. Although energy network firms are publicly owned, for the purposes of estimating the cost of capital the NMa treats the Dutch energy companies as though they were privately owned.

  The main sources are the gearing of comparators with a target credit rating of A, as well as regulatory precedent. The rationale behind this approach is that the level of gearing should reflect the capital structure of an efficiently run stand-alone company.

  This approach reflects the methodology followed by regulators. Regulators typically adopt an estimate of gearing that reflects a notional capital structure—ie, the assumption on gearing is consistent with what is judged to be an efficiently financed company. For example, in previous regulatory decisions, the NMa stated that the capital structure assumed in the cost of capital calculation should enable the Dutch regulated energy companies to maintain a healthy financial position, while minimising costs associated with higher levels of financial gearing. Most regulators satisfy themselves that a gearing assumption is efficient if it is consistent with a credit rating 'comfortably' within investment grade.[18] This is often interpreted as an A credit rating.

2.4.4 Risk-free rate

The risk-free measures the returns required on an investment that is free from default risk. In developed economies with minimal sovereign default risk, the risk-free rate is typically estimated with reference to yields on bonds issued by the government, as these instruments are assumed to be relatively risk-free.

As required by the I&M, the approach that is followed is based on the NMa's approach, developed by Frontier Economics. Under the NMa's approach, the risk-free rate is derived from nominal yields on Dutch sovereign debt with a maturity of ten years, averaged over a

[18] An alternative approach would be to base the gearing assumption on companies' actual capital structure. Under this approach, the assumption on gearing that is used in the cost of capital calculation would be the same as the company's actual capital structure, providing that the cost of debt and equity are correctly estimated. However, this approach is rarely followed by regulators.

period of two to five years.[19] This averaging period is consistent with the approach to estimate the debt premium.

Table 2.3 NMa's approach to estimating the risk-free rate

Estimation question	NMa's methodology
Type of debt	Conventional (nominal)
Nationality of debt	Dutch sovereign
Maturity	Ten years
Averaging period	Two to five years

Source: NMa's decisions and supporting documents.

2.4.5 Equity risk premium

The ERP represents the expected return by an investor over and above the risk-free rate for investing in the equity market as a whole. The ERP is not directly observable and must be estimated using indirect approaches.

Box 2.4 Approaches to estimating the ERP

Broadly, there are three approaches to estimating the ERP.

– **Ex post (realised) premium**—this measures the returns earned in the past on equities relative to riskless securities. This approach implicitly assumes that investors' expectations looking forward are based on past returns. This approach has the advantage of being widely understood, and relies on measurable data.

– **Ex ante (implied) premium**—this uses information on future cash flows to investors (such as dividends, earnings, or overall economic productivity) to estimate the ERP implied by the price of traded assets today.

– **Ex ante (stated) premium**—this involves surveying sub-sets of investors and managers to obtain their views on expectations about equity returns in the future.

In practice, regulators typically use both ex post and ex ante approaches to estimate the ERP, although regulators typically place less weight on surveys.

In previous decisions, the NMa has used both historical and forward-looking evidence to set the ERP (see Table 2.4 below). The NMa's methodology, developed by Frontier Economics, has been followed for the purposes of this report, as instructed by the I&M.

[19] The range for the risk-free rate, the debt premium and the beta reflects averages over the last 2 and 5 years, consistent with the NMa's approach. The impact of the financial crisis is therefore reflected in the estimates based upon a two-year averaging period, and is also partly reflected in estimated based upon a five-year averaging period. However, the use of this longer term averaging period avoids placing undue weight upon the financial crisis, in light of the uncertainty over the duration of the crisis.

Table 2.4 NMa's methodology for estimating the ERP

Estimation question	NMa's methodology
Ex post evidence	
Source of data	Focus on Dimson, Marsh and Staunton estimates
Averaging methodology	Both arithmetic and geometric means considered
Geographic scope	Dutch and 'world' returns
Ex ante evidence	
Dividend growth model	Review of academic studies
Surveys	Review of independent surveys
Current market data	Current earning yields in the Netherlands, UK and USA

Source: NMa's decisions and supporting documents.

3 Risk differentials and the beta

The equity beta measures the correlation between returns to equity holders for a particular asset and the returns to a broad equity index. It provides a measure of the exposure of an asset of a company to systematic risk, and reflects companies' financial and business risks.

As discussed in section 2, since the Dutch water companies are not publicly listed, the estimation of the beta first requires appropriate comparators to be selected. Following the NMa's methodology, the beta is estimated over two- and five-year periods for a set of comparators. Adjustments are applied, and equity betas are converted to asset betas (to remove the effect of the companies' actual financial gearing). These estimates of asset betas for comparator firms are used to estimate an appropriate range for the beta for the Dutch water companies.

3.1 Comparing risks of the Dutch water companies with comparators

In order to select appropriate comparators to estimate the beta, and to determine an appropriate point estimate within the range, the risks facing Dutch water firms have been compared with those risks facing comparator firms. An important element to consider is the extent of risk sharing between firms and their customers.

For the purposes of estimating the beta, private sector comparators have been used as a proxy for the risks of public sector comparators. This is due to the very limited availability of public sector comparators. However, the comparators have been selected carefully to ensure that they are representative of the risks faced by regulated companies.

The regulatory regime facing the Dutch water companies has much shorter regulatory periods, at two years, than most of its peers. This reduces their risk, since if costs turn out differently from the plan, prices can be reset earlier. Moreover, the I&M does not determine allowed operating costs, so firms need only meet their own plans, which reduces regulatory risk, albeit subject to efficiency incentives provided by the I&M.

There is also some evidence to suggest that the price elasticities of demand and income elasticities are a little lower for water compared with energy. For example, estimates of the price elasticity of demand for water range from –0.1 to –0.7, while estimates of the income elasticity range from +0.2 to +0.6.[20] For electricity and natural gas, price elasticities range from –0.1 to –0.4, while income elasticities range from +0.1 to +0.5.[21]

Finally, if Dutch water companies do have more discretion to set tariffs than their counterparts in, for example, the UK or USA, this suggests that the risk of undershooting their cost of capital is likely to be lower.

These factors point towards a somewhat lower estimate of the beta for the Dutch water companies compared with the estimate of the beta for comparator firms.

[20] The estimates of the price and income elasticities of demand for water suggest that a 10% price increase would be expected to lead to a 1–7% reduction in demand, while a 10% increase in income would be expected to lead to a 2–6% increase in demand. For further details, see Waddams, C. and Clayton, K. (2010), 'Consumer Choice in the Water Sector', Centre for Competition Policy and University of East Anglia. Olmstead, S.M. and Stavins, R.N. (2007), 'Managing Water Demand', A Pioneer Institute White Paper, Public Policy Research, July.

[21] Reiss, P.C. and White, M.W. (2002), 'Household Electricity Demand Re-visited', Stanford University, June 14th. Liu, G. (2004), 'Estimating Energy Demand Elasticities for OECD Countries, A Dynamic Panel Data Approach', Statistics Norway Research Department, Discussion Papers No. 373, March.

3.2 Comparators' asset betas

Across the whole sample of publicly listed companies that have been found to be comparable to the Dutch water companies, which includes electricity, gas and water comparators, asset beta estimates vary from 0.24 to 0.41.

There are very few publicly listed water companies in countries that are likely to face similar regulatory regimes to that faced by the Dutch water companies.[22] However, based on the three listed water companies in the UK, as shown in Table 3.1, asset beta estimates for UK water companies are around 0.19–0.33. Asset beta estimates for the listed North American water firms are significantly higher, and range from 0.52 to 0.69 (based on two listed water companies). The estimates of the beta for the two North American water firms are likely to be driven by the higher business risks of non-regulated assets.

Both raw and adjusted asset betas are presented in Table 3.1, with a more detailed breakdown of the asset beta estimates shown in Appendix 1.

Table 3.1 Asset betas for the initial set of comparators

	Raw beta estimates		Blume-adjusted beta estimates	
	Two-year daily	Five-year daily	Two-year daily	Five-year daily
Electricity (six comparators)				
Europe, excluding the UK	0.19	0.24	0.35	0.39
North America	0.24	0.29	0.33	0.37
Average	**0.22**	**0.27**	**0.34**	**0.38**
Electricity and gas (seven comparators)				
UK	0.20	0.30	0.27	0.36
Europe, excluding the UK	0.23	0.36	0.32	0.49
North America	0.32	0.35	0.40	0.43
Australia	0.14	0.16	0.21	0.24
Average	**0.22**	**0.29**	**0.30**	**0.38**
Gas (seven comparators)				
Europe, excluding the UK	0.19	0.25	0.31	0.37
North America	0.21	0.30	0.34	0.40
Average	**0.20**	**0.27**	**0.33**	**0.39**
Water (five comparators)				
UK	0.19	0.27	0.27	0.33
North America	0.52	0.68	0.56	0.69
Average	**0.35**	**0.47**	**0.41**	**0.51**
Average across sample	**0.24**	**0.32**	**0.35**	**0.41**

Source: Oxera analysis, based on Bloomberg.

[22] Three publicly listed UK water firms and two publicly listed North American water firms have been identified and included in the final sample, as shown in Table 3.1. Initial investigations highlighted an additional ten publicly listed water companies across France, Italy and Greece, as well as Canada. These companies were not included in the final sample as a result of not meeting the thresholds adopted by the NMa for including companies in the sample to estimate the beta. Specifically, these companies did not meet the criteria for liquidity, gearing or size (as measured on the basis of revenues).

3.2.1 Vasicek-adjusted asset beta estimates

These asset beta estimates have been cross-checked with Vasicek-adjusted asset beta estimates for UK companies, as reported by London Business School.

Table 3.2 shows asset beta estimates across utilities, derived from equity beta estimates reported by London Business School. Asset betas for water companies are around 0.31–0.35, which are broadly consistent with the Blume-adjusted beta estimates reported in Table 3.1. These estimates are similar to London Business School's asset beta estimates reported for multi-utilities and gas distribution; however, these are lower than asset beta estimates reported for electricity companies.

Table 3.2 Vasicek-adjusted asset beta estimates derived from London Business School's equity beta estimates

	Equally weighted	Weighted by market capitalisation
Electricity	0.56	0.55
Gas distribution	0.36	0.36
Multi-utilities	0.31	0.31
Water	**0.35**	**0.31**

Note: The equity beta estimates reported by London Business School have been converted from equity betas into asset betas using five-year average gearing.
Source: London Business School (2011), *Risk Measurement Service*, **33**:1, January–March.

3.3 Comparisons with regulatory precedents

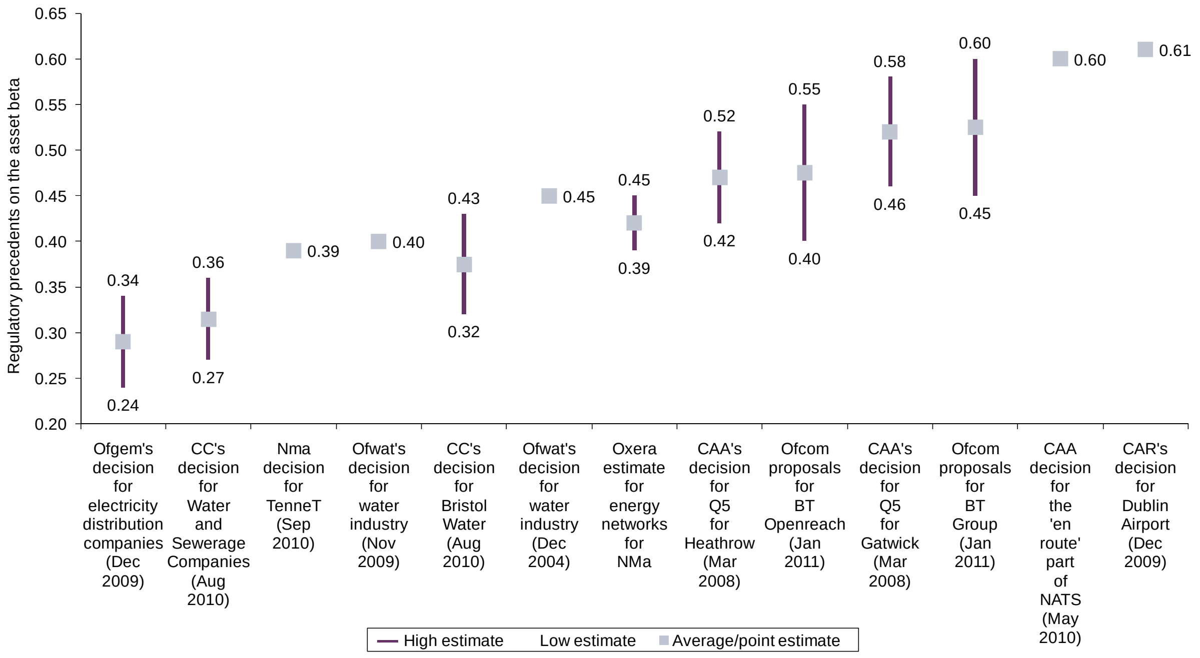
As well as estimating the asset beta for comparator companies, previous regulatory decisions on the asset beta have also been considered. The purpose of considering the beta assumptions adopted by other regulators is to provide a cross-check on the range of beta estimates reported in Tables 3.1 and 3.2. The regulatory decisions on the asset beta are important as these provide an indication of the range allowed by regulators across different sectors.

A summary of asset beta estimates adopted by regulators is shown in Figure 3.1 below. In 2004, Ofwat adopted an asset beta of 0.45 for the UK water companies, which was lowered to 0.40 in its most recent decision in 2009. However, Bristol Water appealed Ofwat's decision, and this appeal was referred to the CC, which subsequently estimated a range for the asset beta for Bristol Water of 0.32–0.43 in August 2010. In this appeal, the CC indicated the appropriateness of an asset beta for Bristol Water towards the top end of the range in order to reflect the higher risks associated with the smaller companies.[23] In the Bristol Water decision, the CC also estimated a range for the asset beta of 0.27–0.36 for the relatively larger water and sewerage companies.

This indicates that, based on UK regulatory precedent, an appropriate range for the asset beta for water companies would be around 0.3 to 0.4.

[23] Competition Commission (2010), 'Water Services Regulation Authority, Water Industry Act 1991, Section 12, Bristol Water plc, Appendix A', February 8th, p. 54.

Figure 3.1 Asset beta estimates adopted by regulators



Note: The range for the asset beta of 0.39–0.45 for energy networks reflects Oxera's estimates for the NMa, as reported in Oxera (2010), 'Updating the WACC for energy networks, Quantitative analysis', prepared for Energiekamer, February 5th.
Source: Oxera, based on regulatory precedents.

3.4 Conclusions

Based on the above estimates, an initial range for the asset beta for the Dutch water companies is 0.24–0.41. The low end of the range reflects the raw beta estimates across the sample of water, electricity and gas comparators. The upper end of the range reflects the Blume-adjusted beta estimates across the sample of water, electricity and gas comparators, as well as Ofwat's decision on the beta for the UK regulated water companies.[24]

The midpoint of the range is broadly consistent with Vasicek-adjusted beta estimates for the water sector, as well as the midpoint of the range estimated by the CC in the UK for water and sewerage companies in its decision on the Bristol Water appeal (0.27–0.36). The midpoint is lower than Oxera's estimates of the asset beta for the Dutch energy networks in December 2009 (0.39–0.45).[25] This can be explained by the relatively lower risks faced by the Dutch water companies under the regulatory regime compared with the Dutch energy networks. In contrast to the Dutch energy networks, the Dutch water companies are able to determine their own tariffs based on full cost recovery. The duration of the regulatory period is also shorter in the case of the Dutch water companies, which means that there is greater scope for prices to be re-set, if rates of return prove inadequate.

However, if the Dutch water companies are subject to both a shorter regulatory price review of two years and a claw-back mechanism is introduced to allow compensation for under-recovery of the cost of capital through higher prices at the next price control, it might be argued that an appropriate point estimate is likely to be towards the lower end of the range.

[24] Given the small sample size of the listed water comparators, estimates of the beta for the Dutch water companies have been derived from the asset betas of water, electricity and gas companies.
[25] Oxera (2010), 'Updating the WACC for energy networks, Quantitative Analysis', prepared for Energiekamer, February 5th.

The same range for the asset beta is adopted across both scenarios, as shown in Table 3.3. This assumes that the payment of corporation tax is unlikely to significantly affect the underlying riskiness of companies' assets.

Table 3.3 Range for the asset beta

	Publicly owned and non-taxpaying	Privately owned and taxpaying
Asset beta	0.24–0.41	0.24–0.41

Source: Oxera analysis.

4 Debt premium and gearing

4.1 Debt premium

The debt premium represents the additional return required by investors over and above the risk-free rate from investing in company's bonds.

As described in section 2, the approach to estimating the debt premium depends on the ownership status of the Dutch water companies.

– **Under the private ownership scenario**, the debt premium is based on A rated corporate bond indices as well as comparators. This is consistent with the NMa's approach to the Dutch energy networks.

– **Under the public ownership scenario**, the estimate of the range for the debt premium reflects estimates from companies with an AA credit rating, which is the target rating for Dutch water companies as prescribed by the Drinking Water Act, as well as A rated companies. This approach provides an indication of the debt premium that the Dutch water companies would be required to pay following the introduction of regulation.

  The estimate of the debt premium has been cross-checked based on information received on the cost of debt for a sample of the Dutch water companies.[26] However, this assessment needs to take into account the fact that estimates of the debt premium may differ following the introduction of regulation into the Dutch drinking water market.

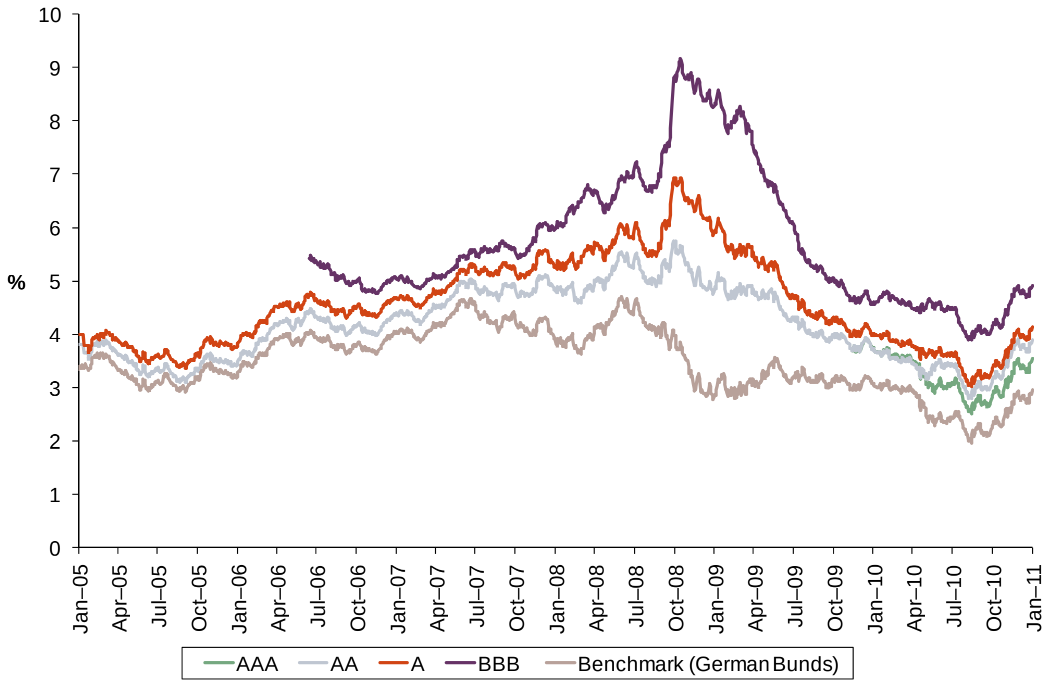
This section first discusses the evolution of the debt premium on corporate bond indices, comparator companies and estimates for the Dutch water companies, before outlining an indicative range for the debt premium of the Dutch water companies under the private and public ownership scenarios.

4.1.1 Debt premium on general corporate bond indices

Yields and the debt premium on euro-denominated corporate bonds increased markedly in 2008 following the onset of the financial crisis, before decreasing again after March 2009. Currently, on euro-denominated corporate bonds, yields are close to levels prior to the start of the financial crisis; however, because of the decline in government bond yields the debt premium is still above levels prior to the start of the crisis (see Figures 4.1 and 4.2 below).

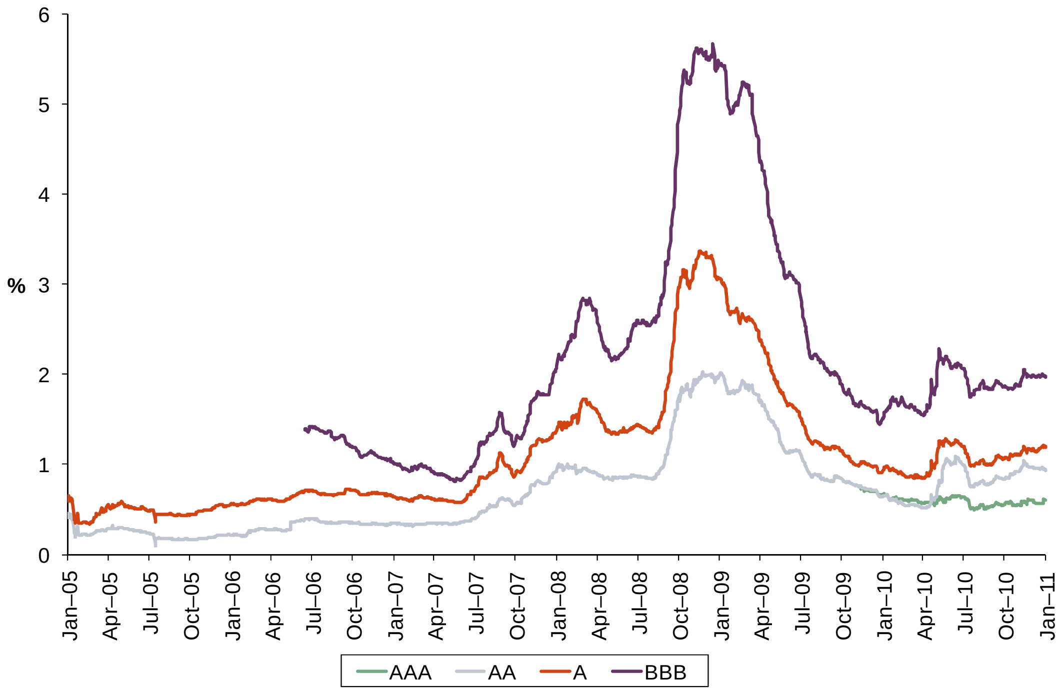
[26] As information on the debt premium is only available for a sample of the Dutch water companies, this data is only used to inform the range for the debt premium.

Figure 4.1 Yields on indices of euro-denominated corporate bonds with maturities of 7–10 years



Source: Oxera analysis, based on Datastream.

Figure 4.2 Debt premiums of indices of euro-denominated corporate bonds over a German Bund index, with maturities of 7–10 years



Source: Oxera analysis, based on Datastream.

Yields and the debt premium on BBB-rated debt are significantly higher than those on A and AA rated debt. Figure 4.1 shows that the difference between BBB and A yields is much wider than was the case before the financial crisis, which reflects investors' increased risk aversion. As shown in Table 4.1 below, the debt premium for BBB rated debt averaged over the last two to five years ranges from 223bp to 255bp. In contrast, the comparable range for AA and A rated debt is 123–142bp and 79–102bp, respectively.

Table 4.1 Averages of debt premium on AA, A and BBB euro-denominated bonds (bp)

Averaging period	AA	A	BBB
Spread at end 2010	96	115	197
Six months	89	109	191
One year	78	104	184
Two years	102	142	255
Three years	106	157	275
Five years	**79**	**123**	**223**

Note: Iboxx bond indices, non-financial corporate 7–10 year bonds, spreads over German sovereign bonds.
Source: Oxera analysis, based on Datastream.

4.1.2 Debt premium on traded bonds for comparator companies

The debt premium on bonds issued by water companies facing similar business risks to the Dutch water companies has also been examined.

The following methodology was followed.

– An original sample comprised firms designated as 'water utilities' by Standard & Poor's, which were based in Europe, North America, Australia and New Zealand. This produced a sample of 21 companies.

– Based on this sample, the debt premium on bonds with maturities of under 20 years (as well as information on their credit ratings), but without embedded options, were downloaded from Bloomberg.

– This produced a sample of 52 individual bonds. No data was available for 15 of these bonds. Data on the remaining 37 bonds was examined and cleaned, which led to a sample of 26 bonds from seven companies (as reported in Table 4.2 below).[27]

The average debt premium across the whole sample was 183bp, with an average maturity of 11.2 years. The average debt premium on US bonds was significantly higher, at 216bp, than that on non-US bonds, which was 151bp. This is likely to be explained by the longer average maturity of the US bonds.[28] As shown in the table, on the basis of the NMa's approach, the debt premium on the sub-sample of bonds with a maturity of between 8–13 years is 172bp.

[27] Specifically, bonds were removed that had significant discontinuities in the time series of data.
[28] It is also possible that spreads may be generally higher in the USA on a like-for-like basis.

Table 4.2 Debt premium on bonds of comparable water companies (bp)

Company	Rating	Country	Issue date	Years to maturity (at end 2009)	Two-year averages of the debt premium
Watercare Services	A	New Zealand	18/05/2009	6.4	134
United Waterworks	A–	USA	06/02/1998	8.0	189
			03/02/1998	13.1	220
			09/02/1998	18.1	237
York Water	A–	USA	01/08/1989	9.1	182
			15/02/1989	9.1	181
			15/08/1990	10.7	188
			15/12/1992	13.0	202
Golden State Water	A+	USA	10/03/2009	9.2	201
			23/03/1998	18.2	259
			11/10/2005	19.0	228
			25/01/1999	19.1	258
			26/01/2001	20.9	263
American Water	BBB+	USA	15/05/2008	8.4	194
Veolia	BBB+	International	26/05/2005	5.5	219
			12/12/2005	6.1	140
			24/11/2006	7.0	152
			29/06/2009	7.5	116
			28/05/2003	8.4	146
			24/04/2009	9.3	136
			12/12/2005	10.9	163
United Utilities	BBB+	UK	29/12/2008	6.0	159
			14/05/2003	8.4	159
			24/01/2005	10.1	136
			25/03/2009	12.2	154
			20/12/2002	18.0	154
Averages		USA		13.5	216
		Non-USA		8.9	151
		Whole sample		11.2	183
		8–13 years		**9.8**	**172**

Note: The average debt premium has been estimated over a two-year period. In some cases, the bond has not been in issue for a full two years, and the average has been calculated over the period for which data is available. A bond issued by Severn Trent was omitted due to having an anomalously low average spread of 45bp.
Source: Oxera analysis, based on Bloomberg (option-adjusted spreads, although bonds with options were excluded).

4.1.3 Debt premium on loans taken out by the Dutch water companies

Information received from I&M suggests that the interest spreads on five-year loans taken out by a sample of the Dutch water companies range between 105bp and 135bp, as shown in Table 4.3.

It should be noted that these spreads might not be indicative of the debt premium when regulation is introduced into the market. However, the information shown in Table 4.3 is useful in providing an indication of the top end of the range for the debt premium paid by the Dutch water companies.

Table 4.3 Spreads on loans taken out by a sample of the Dutch water companies (bp)

Bank	Five-year IRS/Euribor	Ten-year IRS/Euribor
ING	135	165
Rabo	105	140
Average	**120**	**153**

Source: Based on information provided by I&M on February 14th 2011.

4.1.4 Debt issuance fees and debt-related overhead costs

For the private ownership scenario, the NMa's estimate of the allowance for debt issuance fees of 10–20bp has been adopted, on the basis that the evidence available on costs of raising debt is as applicable to notional private sector water companies, as to energy network companies. For the public ownership scenario, the same allowance has been used, on the assumption that debt would be raised from similar sources.

4.1.5 Conclusions

The estimates of the debt premium vary according to whether the Dutch water companies are treated as publicly owned or privately owned companies, and hence whether water companies' debt is assumed to be implicitly guaranteed by the Dutch authorities.

– **Under public ownership**, it is assumed that the debt of the Dutch water companies is seen as being of AA to A rated quality by investors, to reflect the likelihood of support from the Dutch authorities in the event of a water company suffering from financial difficulties. The debt premium reflects market data on A and AA rated bond indices. The low end reflects five-year averages on AA rated corporate bonds. The upper end reflects five-year averages on A rated corporate bonds, and is also consistent with average five-year spreads paid by the Dutch water companies.[29] On the basis of these assumptions, the debt premium ranges from 79bp to 123bp (prior to allowances for debt issuance costs).

– **Under private ownership**, the Dutch water companies are treated as stand-alone companies, without the potential for support from the Dutch authorities. The debt premium reflects market data on A rated bond indices and from industry comparators, consistent with target credit ratings adopted by other regulators for their own regulated water industry. Under these assumptions, and prior to allowances for debt issuance costs, the debt premium ranges from 123bp from the bond index data to around 172bp based on bonds issued by comparators.

These assumptions are combined with the 10–20bp allowance for debt issuance fees, to provide an indication of the debt premium under both scenarios, as shown in Table 4.4.

[29] It has not been possible to obtain information on spreads on loans taken out by the Dutch water companies averaged over the last two years. Therefore, the range for the debt premium under the public ownership scenario has been cross-checked based on spreads on loans taken out by the Dutch water companies averaged over the last five years.

Table 4.4 Range for the debt premium

	Publicly owned and non-taxpaying	Privately owned and taxpaying
Debt premium (bp)	79–123	123–172
Debt issuance fees (bp)	10–20	10–20
Total (bp)	**89–143**	**133–192**

Source: Oxera analysis.

4.2 Gearing

As discussed in section 2, a number of sources of evidence have been considered for the purposes of determining an appropriate assumption on gearing:

- actual gearing of the Dutch water companies (on book value basis);
- actual gearing of comparator companies (on the basis of both book and market value);
- regulatory precedents.

4.2.1 Actual gearing of the Dutch water companies

On a book value basis, the gearing of Dutch water companies varies from around 57% for BW to 102% for Waternet.

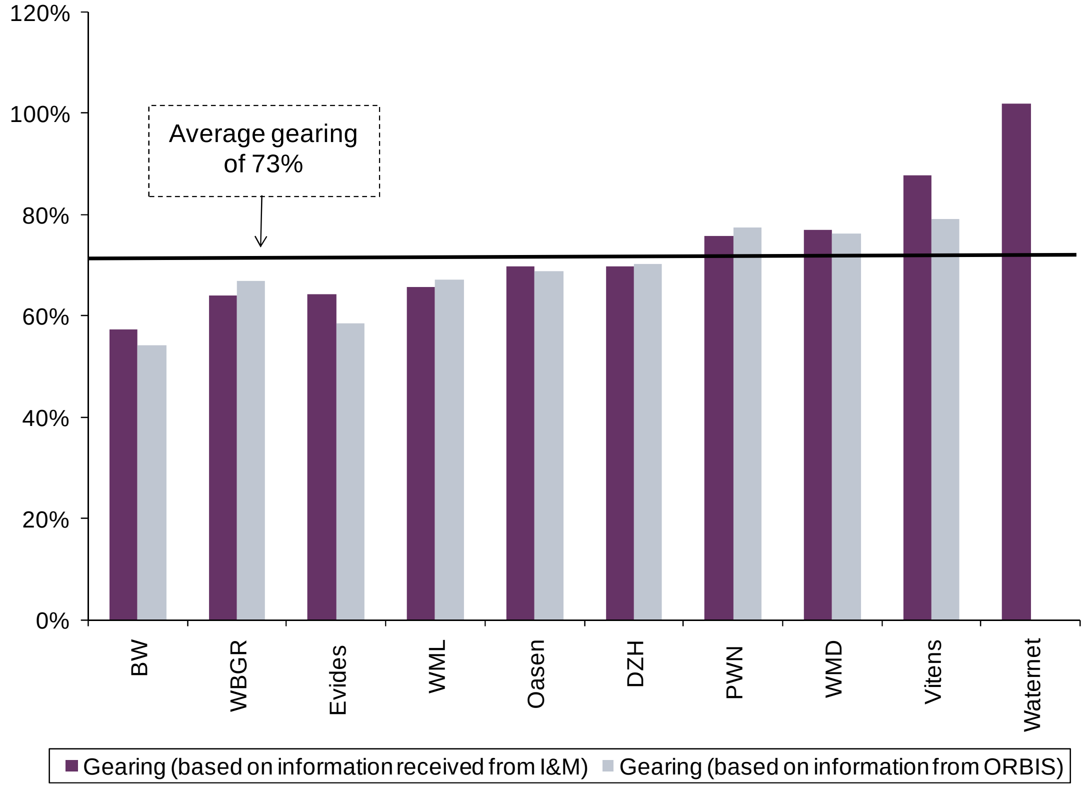
Figure 4.3 below shows two measures of gearing for each of the Dutch water companies.

- Gearing based on information received from the I&M. Here, gearing is defined as owners' liabilities, relative to the sum of owners' equity and liabilities. This is equivalent to debt over assets.[30]

- Gearing based on information available for the Dutch water companies from a financial database package, ORBIS. Here, gearing is defined as total assets less equity, relative to total assets, as measured on the basis of the statutory accounts reported in ORBIS.

[30] Based on information received from the I&M on December 7th 2010.

Figure 4.3 Gearing of the Dutch water companies (book value)



Note: Information for Waternet is not available on ORBIS.
Source: Oxera analysis, based on information received from the I&M and ORBIS.

As shown in Figure 4.3, the estimates are consistent across the two measures of gearing, with average levels of gearing across the Dutch water companies at around 73%.

It might have been expected that the absence of corporation tax would have pointed towards a lower level of gearing, as a result of the Dutch water companies not benefiting from tax advantages of debt financing. However, the estimates of gearing presented in Figure 4.3 suggest that companies may have chosen relatively high levels of gearing for other reasons.

Possible explanations include:

– the relatively low cost of debt as a result of the implicit guarantee from the Dutch authorities; and
– the Dutch water companies' lower risk exposure under the regulatory regime compared with regulated companies in other sectors.

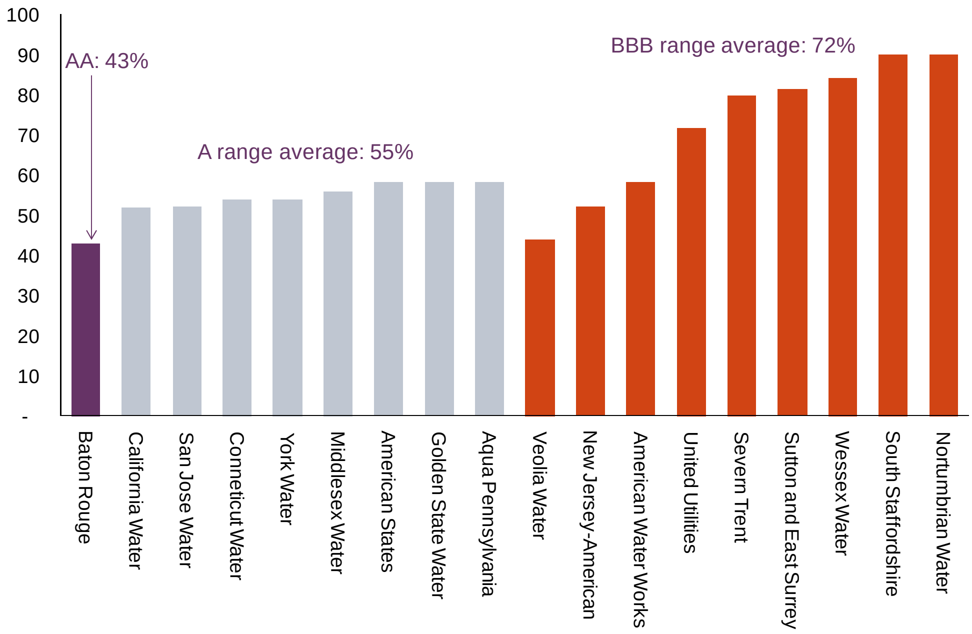
4.2.2 Actual gearing of comparator companies

The book gearing of water companies that are likely to face similar business risks to the Dutch water companies has been examined for those water companies with an investment grade rating. In the absence of information on the credit ratings of the Dutch water companies, it is assumed that the companies would be of an investment grade status.

Water comparators

As shown in Figure 4.4 below, on a book value basis, average gearing is around 72% for water companies with a BBB rating, and this declines to around 55% for those companies with an A rating. Only one rated water company with an AA credit rating has been identified whose risks are judged to be comparable to those facing the Dutch water companies—the gearing of this company is around 43% (as shown in Figure 4.4). This does suggest that in comparison with the water companies, Dutch water companies are either lower risk with consequently greater debt capacity or the debt is subject to implicit guarantees.

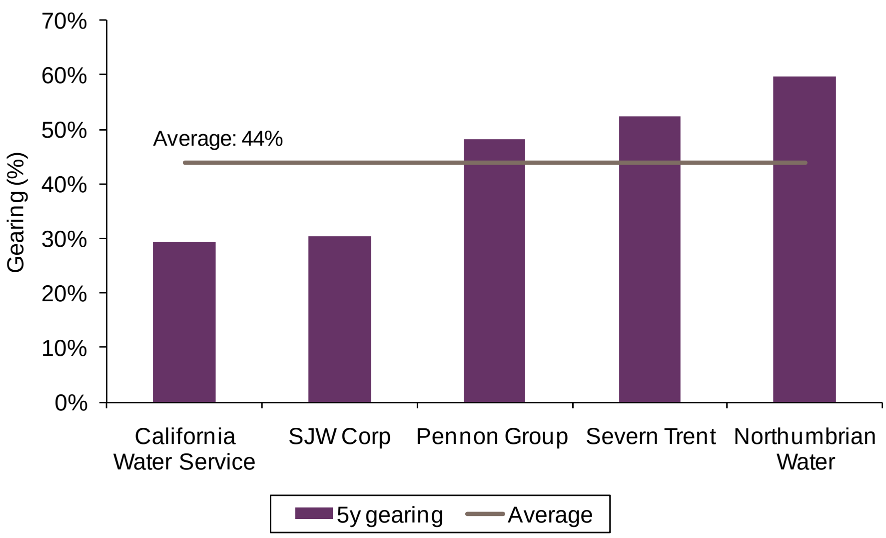
Figure 4.4 Average gearing levels for rated water companies—book value (2007–10)



Note: All credit ratings are reported as at December 2009.
Source: Oxera analysis, based on Standard & Poor's reports.

On the basis of market value, the average level of gearing for water companies facing similar business risks to the Dutch water companies is significantly lower—at around 44%, as shown in Figure 4.5. The differences may be due to three reasons: (i) market gearing is typically lower than book gearing measures because market values stand at a premium over the asset base; (ii) the estimates of gearing reported for the Dutch water companies are before the introduction of regulation, and therefore the industry may be seen as lower risk; and (iii) the presence of implicit guarantees for Dutch water companies' debt.

Figure 4.5 Average gearing levels for water comparators—market values

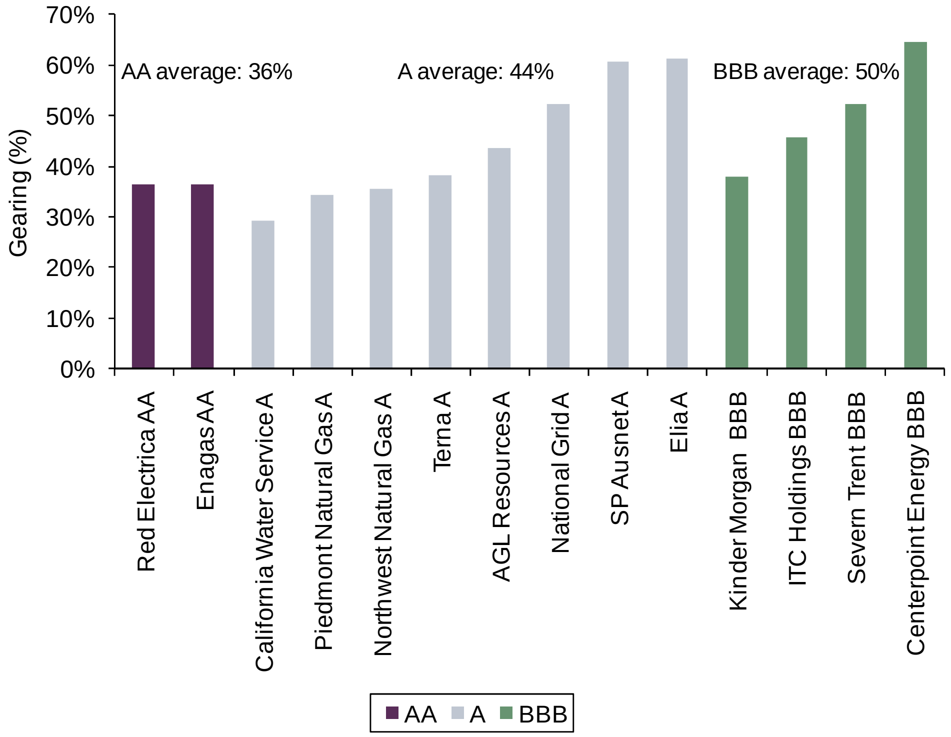


Note: Five-year averages of gearing between January 2006 and January 2011 are reported.
Source: Oxera analysis, based on Bloomberg.

Energy and water comparators

In order to assess how the assumption on gearing for comparator companies varies by credit rating, the sample has been broadened to include electricity and gas comparators, as well as water comparators, where information is available on the credit rating. The sample has been extended to include energy comparators as limited information on the credit rating is available for water comparators. As shown in Figure 4.6, average gearing (on the basis of market value) varies from 50% for BBB-rated companies, to 44% for A rated companies and 36% for AA rated companies.

Figure 4.6 Average gearing of energy and water comparators—market value



Note: Average levels of gearing have been measured over a five-year period. The Dutch energy network companies are not included in this figure since these companies are not publicly listed; hence, it has not been possible to estimate gearing for these companies on the basis of market value.
Source: Oxera analysis, based on Standard & Poor's and Bloomberg.

4.2.3 Gearing levels assumed by other regulators

Regulators typically set gearing based on an assessment of the level of debt that could be sustained by a regulated company, consistent with maintaining a credit rating comfortably within the investment grade range. A 'comfortable' credit rating should enable companies to absorb some downside shock and still retain a credit rating within the investment grade category. It should also enable companies to access finance on reasonable terms over a range of market conditions. The credit rating that is targeted by regulators is typically around an A credit rating, since the start of the financial crisis.

However, it should be noted that credit rating agencies assess a number of factors in their rating decision, of which gearing is only one, and companies' credit ratings are not determined solely by their level of gearing. For example, Moody's assigns a weight of 15% to gearing in its methodology for rating water firms.[31] The gearing range it specifies is between 40% and 55% for an A rating, and between 55% and 70% for a BBB rating.[32]

A summary of assumptions on gearing adopted by regulators is shown in Table 4.5. This illustrates that most European regulators have adopted gearing assumptions between 50%

[31] Moody's assigns a further 25% to other financial ratios, such as interest cover. Of the remaining 60%, 40% is allocated to the regulatory environment and the asset ownership model. The final 20% is allocated to factors such as operational efficiency, scale of the CAPEX programme and the stability of the business model.
[32] Moody's (2009), 'Moody's Global Infrastructure Finance, Global Regulated Water Utilities', December.

and 60% in recent years. For example, for the Dutch energy networks, the NMa assumed gearing of 60% in its decisions in 2006 and 2008, and 50–60% in its 2010 decision. In the water sector, Ofwat recently adopted a gearing assumption of 57.5% for the current price control period, up from 55% in its last determination.

Table 4.5 Summary of regulators' decisions on gearing

Review	Year	Gearing (%)
Ofgem fourth electricity distribution review (UK—electricity distribution)	2004	57.5
Ofwat (UK—water)	2004	55
Ofgem fourth electricity transmission review (UK—transmission)	2006	60
NMa (Netherlands—energy networks)	2006	60
AEEG (Italy—energy networks)	2007	44–47
CER (Ireland—gas transmission and distribution)	2007	55
Ofgem gas distribution price control review (UK—gas distribution)	2007	62.5
NMa (Netherlands—energy networks)	2008	60
ComReg (Ireland—telecoms)	2008	40
CC/CAA (UK—Gatwick and Heathrow Airports)	2008	60
Ofcom (UK—telecoms)	2009	35
CC/CAA (UK—Stansted Airport)	2009	50
CRE (France—electricity transmission and distribution)	2009	60
Ofwat (UK—water)	2009	57.5
Ofgem(UK—energy)	2009	65
NMa (Netherlands—energy networks)	2010	50–60
CC (UK—Bristol Water)	2010	60

Note: Gearing estimates by Ofwat and Ofgem in 2009 are taken from their final determinations, published in November and December 2009, respectively. Ofwat's rating reference is updated to reflect its view in the final determination. Ofgem's stated rating reference in 2009 reflects its view from the final determination of the electricity distribution price control review published in December 2009.
Source: Oxera analysis, based on various regulatory documents.

Few regulators outside the UK (and, indeed, not all regulators in the UK) make their targeted credit rating explicit. In its recent final determination, Ofwat retained a minimum of BBB+ for its assessment, but noted that it targets financial ratios consistent with an A–/A3 credit rating under a notional capital structure.

> For our final determinations, at the point at which we consider financeability, we have targeted financial ratios under our notional structure that are consistent with an A-/A3 credit rating. Most companies are in this position. If one particular indicator (and in a small minority of cases, two key indicators for one rating agency) does not meet our required threshold, we ensure that it meets the criteria for a strong BBB+/Baa1 credit rating as a minimum. Our approach is consistent with a view expressed to us that the capacity of investors to invest appears to be less sensitive to the difference between high BBB and low A range ratings where utilities are concerned.[33]

4.2.4 Conclusions

Estimates of gearing under the two scenarios around the treatment of the ownership of the Dutch water companies are set out below.

[33] Ofwat (2009), 'Future Water and Sewerage Charges 2010–2015: Final Determinations', November, pp. 137–8.

– **Public ownership**. Under the public ownership scenario, on the basis of book values, average gearing for AA and A rated water comparators is around 43% and 55% respectively. On the basis of market value, average gearing of AA and A rated energy and water comparators is around 36% and 44% respectively.

– **Private ownership**. Under the private ownership scenario, on the basis of book values, average gearing for A rated water comparators is around 55%. On the basis of market value, average gearing of A rated energy and water comparators is 44%, which is broadly consistent with a range for gearing of 40% to 55% specified by Moody's for an A rating.

A summary of the assumptions for gearing under the two scenarios is shown in Table 4.6. The range for gearing under each scenario reflects the market value of gearing, as conceptually, this provides a better estimate of the economic gearing of companies.[34]

Table 4.6 Range for gearing

	Publicly owned and non-taxpaying	Privately owned and taxpaying
Gearing (%)	35–45	45–55
Debt premium (bp)	79–123	123–172

Note: For the purposes of providing a range for gearing, estimates from the data have been rounded.
Source: Oxera analysis.

[34] This is because conceptually the asset base is measured at market value, as it is the driver of future cash flows. For example, if market discount rates change, the allowed return is reset and the future stream of cash flows will change.

5 Generic parameters

The assumptions on the generic parameters—the risk-free rate and the ERP—that are not specific to the Dutch water companies are outlined in this section.

For the purposes of the calculation of the cost of capital, Oxera has been required by the I&M to follow the methodology used by the NMa to estimate the generic parameters. The NMa's approach is based on the methodology developed by Frontier Economics, which was previously applied to calculate the cost of capital for the Dutch energy networks.

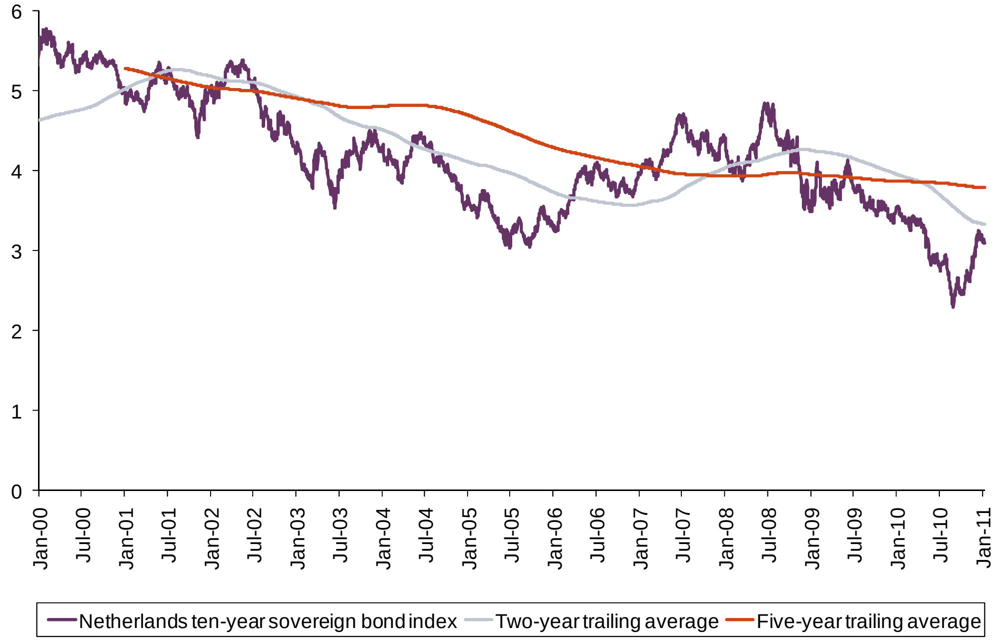
5.1 Risk-free rate

In estimating the risk-free rate, the I&M instructed Oxera to follow the NMa's approach developed by Frontier Economics.

5.1.1 Market evidence

Since the start of 2008, sovereign yields have declined, despite a slight increase since July 2010 (see Figure 5.1). The decline in nominal yields on debt issued by the Dutch government may be due to increased demand for government bonds, as a result of a reduction in investors' risk appetite, and may also partly reflect sovereign debt concerns elsewhere in continental Europe. It is possible that Dutch government bonds may be perceived as less risky than bonds issued by other European economies that have more severe public debt concerns.

Figure 5.1 Nominal yields on ten-year Dutch sovereign and trailing averages (%)



Source: Oxera analysis, based on Datastream.

The general downward trend in nominal yields, notwithstanding the recent volatility, is apparent in Table 5.1 below. This shows that average nominal yields on Dutch sovereign bonds over the last six months—2.7%—have been considerably lower than the longer-term average over the last five years—3.8%.

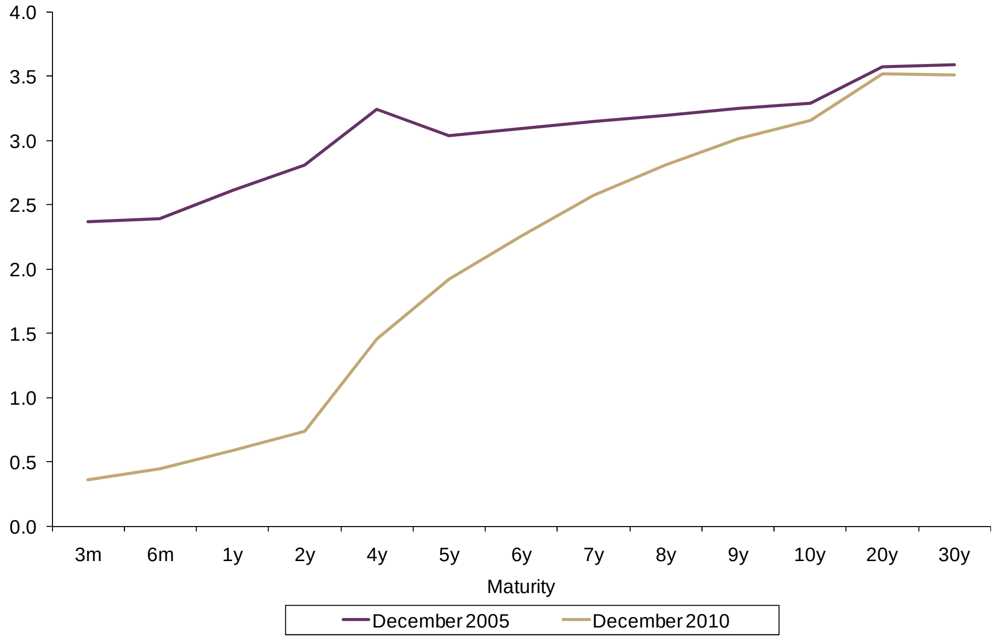
Table 5.1 Nominal yields on ten-year Dutch sovereign benchmark index (%)

Averaging period	Nominal yields (%)
Spot (as at end of year)	3.1
Six months	2.7
One year	3.0
Two years	**3.3**
Three years	3.6
Five years	**3.8**

Note: Based on redemption yields on the ten-year Dutch government benchmark index.
Source: Datastream, and Oxera calculations.

The reduction in yields can be seen by comparing the sovereign yield curve as at December 2010 with the yield curve as at December 2005 (as shown in Figure 5.2). This clearly shows the reduction in yields, with the reduction being far greater for shorter-term government debt. However, it is not clear whether the trend in current yields reflects a structural shift in capital markets, or whether it reflects a short-term deviation relative to pre-crisis levels.

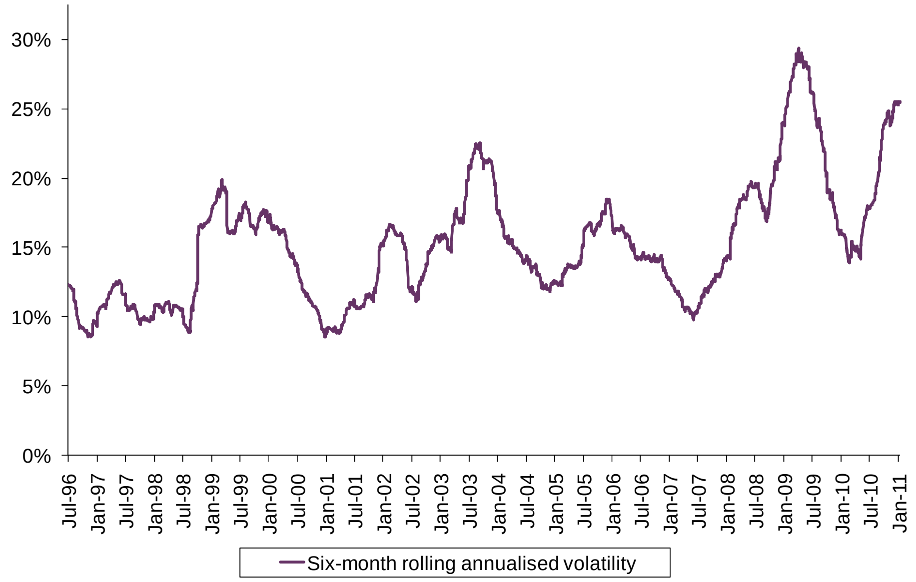
Figure 5.2 Dutch sovereign yield curve as at December 2010 (%)



Source: Oxera analysis, based on Datastream.

The recent turbulence in capital markets has led to an increase in volatility in yields on Dutch government debt over 2008 and 2009 (see Figure 5.3 below). Although volatility in yields declined considerably by the first quarter of 2010, since April 2010 volatility has increased again. Such levels of volatility present a significant challenge for regulators seeking to determine the risk-free rate to use in a price control. The concern is that the risk free rate will rise during the price control, raising the company's cost of capital and deterring capital investment. However, the shortness of the price control—ie, two years—significantly mitigates this problem.

Figure 5.3 Annualised volatility in ten-year Dutch sovereign yields (%)



Source: Oxera analysis, based on Datastream.

The volatility in the risk-free rate suggests that there is a relatively high risk of either under- or over-estimating the risk-free rate over the price control period. In part, the volatility could be due to current market data being reflective of short-term distortions, and hence there could be increased potential for rates to revert towards longer-term averages.

If the costs of under-estimating the risk-free rate—principally, the risk of discouraging investment—exceed the costs of over-estimating the risk-free rate—principally the risk of setting prices higher than necessary to cover efficient costs—it would be prudent to reflect this either in cash-flow forecasts or to allow a limited amount of headroom by selecting a risk-free rate in excess of current yields.

To address the uncertainty in forecasting the risk-free rate and reduce the risk of significantly under-estimating the risk-free rate that will prevail during the price control period, regulators have tended to set the risk-free rate substantially above current market rates. As yields on government gilts have fallen since the financial crisis, the allowed degree of headroom has tended to increase in recent regulatory decisions.

5.1.2 Conclusions

The range for the risk-free rate is based on nominal yields on Dutch sovereign debt with a maturity of ten years, averaged over the last two to five years, in order to reflect the approach followed by the NMa. This approach leads to a range for the risk-free rate of 3.3% to 3.8%. This approach effectively incorporates headroom of 20–70bp above current spot rates.

Table 5.2 Range for the risk-free rate

	Publicly owned and non-taxpaying	Privately owned and taxpaying
Risk-free rate (%)	**3.3–3.8**	**3.3–3.8**

Source: Oxera analysis.

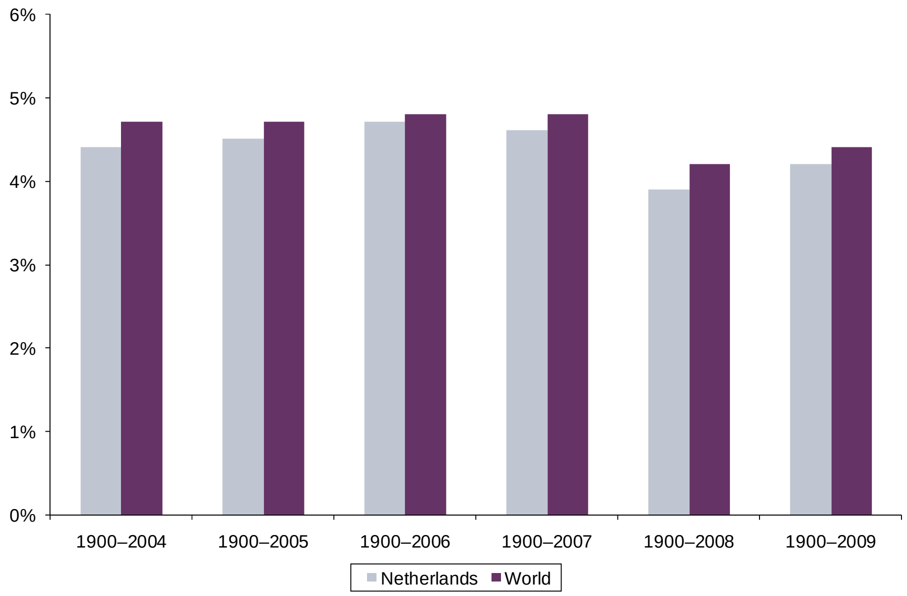
5.2 Equity risk premium

In estimating the ERP, the I&M instructed Oxera to follow the NMa's approach developed by Frontier Economics. This approach places weight both on ex post historical evidence as well as ex ante evidence.

5.2.1 Ex post evidence

One of the most common sources of evidence to estimate the ERP is based on long-run returns from Dimson, Marsh and Staunton. Figure 5.4 illustrates Dimson, Marsh and Staunton's estimates of the ERP for both the Dutch and the world market, beginning in 1900 up to 2009. This shows that long-term returns for both the 'world' and 'Dutch' market have fallen when measured over 1900–2008 and 1900–2009 compared with previous periods. This is due to the more recent estimates incorporating the negative performance of capital markets.

Figure 5.4 Historical estimates of the ERP from Dimson, Marsh and Staunton



Source: Dimson, E., Marsh, P. and Staunton, M. (2010), 'Credit Suisse Global Investment Returns Sourcebook 2010'. Dimson, E., Marsh, P. and Staunton, M. (2009), 'Credit Suisse Global Investment Returns Sourcebook 2009'. Dimson, E., Marsh, P. and Staunton, M. (2008), 'Credit Suisse Global Investment Returns Yearbook 2008'; ABN AMRO (2006), 'Global Investment Returns Yearbook', February. ABN AMRO (2005), 'Global Investment Returns Yearbook', February. Frontier Economics (2008), 'Updated cost of capital estimate for energy networks', prepared for DTE, April.

The ERP can be estimated on the basis of either geometric or arithmetic averages. By construction, geometric averages are lower than arithmetic averages, as they do not take into account the volatility of annual excess returns over the averaging period.

There is some debate around the most appropriate averaging method; however, consensus supports the use of arithmetic averages. For example, Dimson, Marsh and Staunton (2010) recommend the arithmetic average: 'for use in asset allocation, stock valuation, and corporate budgeting applications'.[35] This is consistent with analytical studies, such as Cooper (1996), which suggest that greater weight should be placed on arithmetic than on geometric estimates of returns.[36]

[35] Dimson, E., Marsh, P. and Staunton, M. (2010), 'Credit Suisse Global Investment Returns Sourcebook', p. 34.

[36] Cooper, I. (1996), 'Arithmetic versus geometric mean estimators: Setting discount rates for capital budgeting', *European Financial Management*, **2**:2, p. 157.

As shown in Table 5.3, estimates of the ERP reported by Dimson, Marsh and Staunton (2010) for the Netherlands range from 3.5–4.2% on the basis of geometric averages, and from 5.9% to 6.4% on the basis of arithmetic averages.

Table 5.3 Historical estimates of the ERP by Dimson, Marsh and Staunton (%)

	Over Treasury bills		Over bonds	
	Geometric average	Arithmetic average	Geometric average	Arithmetic average
Netherlands	4.2	6.4	3.5	5.9
Europe	3.8	5.9	3.9	5.2
World ex-USA	4.0	5.9	3.8	5.0
World	4.4	5.9	3.7	4.9

Source: Dimson, E., Marsh, P. and Staunton, M. (2010), 'Credit Suisse Global Investment Returns Sourcebook 2010'.

5.2.2 Ex ante evidence

The approach to estimate the ERP based on historical estimates is essentially backward-looking. As such, the resulting estimates may not represent an accurate indicator of the risk premium required by investors to hold equities over the duration of the price control. Therefore, ex ante evidence has also been considered.

Recent surveys of market practitioners and academics suggest an ERP of around 5% to 6.4%; however, the estimate from Graham and Harvey's (2010) recent survey is significantly lower, at 3%, as shown in Table 5.4.

Table 5.4 Survey evidence of ERP expectations

Survey	Survey	Most recent value
Fernández (2009)	Survey of MRP used by European finance and economics professors (224 answers)	5.3% (2008)
	Survey of MRP used by Dutch finance and economics professors (487 answers)	5.3% (2008)
	Survey of MRP used by European companies (416 answers)	6.4% (2008)
Graham and Campbell (2009)	Survey of MRP used by US CFOs conducted in February 2009 (452 answers)	4.7% (2009 Q2)
Graham and Harvey (2010)	Quarterly survey of US CFOs (June 2010)	3.0% (June 2010)
Welch (2009)	Survey of finance or economics professors (143 answers)	5–6%

Sources: Fernández, P. (2009), 'Market Risk Premium used in 2008 by Professors: a survey with 1,400 answers', April, pp. 1–21. Graham, J. and Campbell, H. (2009), 'The Equity Risk Premium Amid a Global Financial Crisis', May, pp. 1–18. Welch, I. (2009), 'Views of Financial Economists On The Equity Premium And Other Issues', *The Journal of Business,* October, unpublished working paper available at: http://welch.econ.brown.edu/academics/equpdate-results2009.html. Graham, J.R. and Harvey, C.R. (2010), 'The Market Risk Premium in 2010', August 9th.

The evolution of investors' expectations of the ERP over the course of the economic cycle can be seen in the results reported by Graham and Campbell (2009). This shows that the ERP increased following the onset of the financial crisis, as a result of the uncertainty around future equity returns.

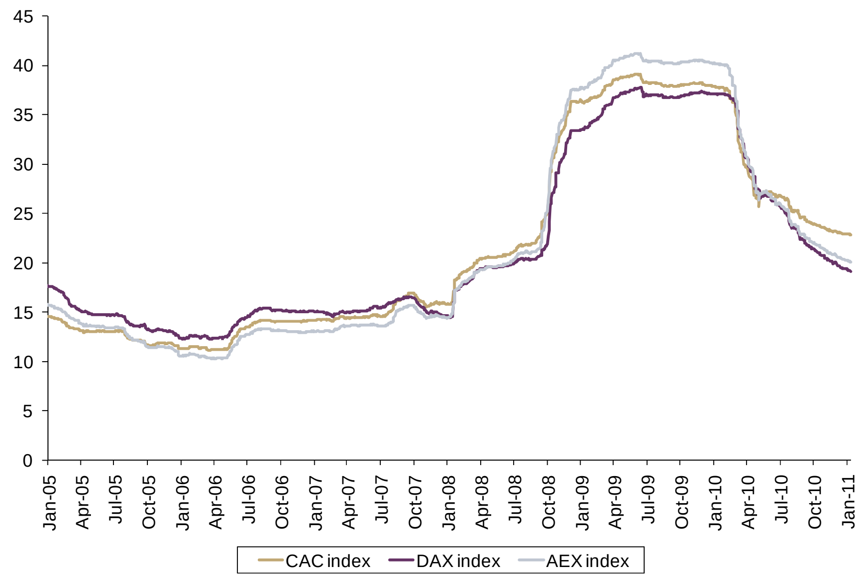
Figure 5.5 ERP expectations surveyed by Graham and Campbell (2009)

Note: The 'disagreement' indicator refers to the standard deviation in survey responses.
Source: Graham, J. and Campbell, H. (2009), 'The Equity Risk Premium amid a Global Financial Crisis', May, pp. 1–18. Graham, J. and Campbell, H. (2010), 'The Equity Risk Premium in 2010', p. 5.

The pattern of estimates of the ERP over time reported above broadly reflects both historical and implied measures of volatility on European indices, as shown in Figures 5.6 and 5.7 respectively. This is consistent with both academic and theoretical literature that higher volatility in equity markets is associated with an increase in the ERP.[37] As shown in Figures 5.6 and 5.7, equity market volatility has decreased from the levels observed in June 2010; however, levels of volatility are still somewhat higher than prior to the start of the financial crisis.

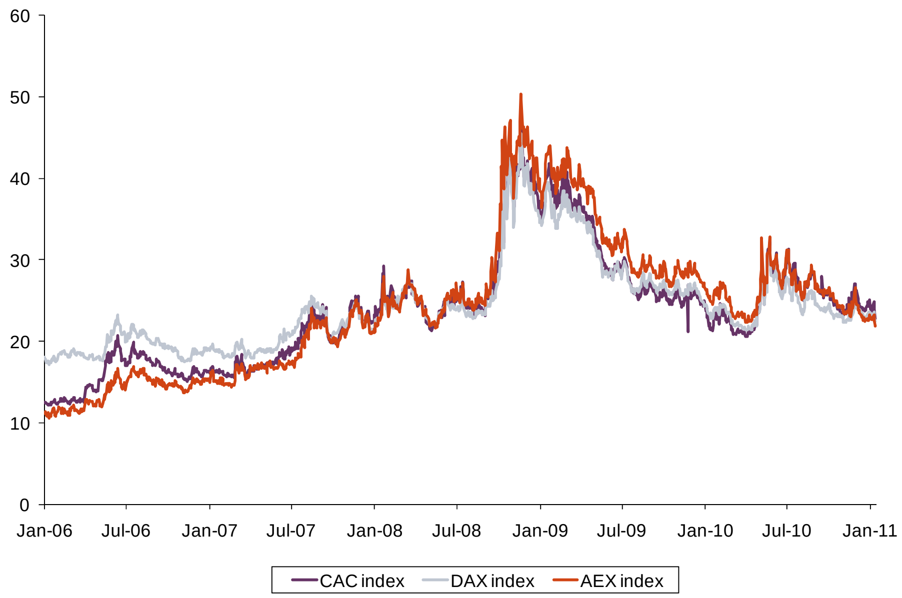
[37] Campbell, J.Y. and Hentschel, L. (1992), 'No News is Good News. An Asymmetric Model of Changing Volatility in Stock Returns', *Journal of Financial Economics*, **31**, pp. 281–318. Scruggs, J.T. (1998), 'Resolving the Puzzling Intertemporal Relation Between the Market Risk Premium and the Conditional Market Variance: A Two Factor Approach', *Journal of Finance*, **53**:2. Copeland, M. and Copeland, T. (1999), 'Market Timing: Style and Size Rotation Using the VIX', *Financial Analysts Journal*, **55**, pp. 73–81. Guo, H. and Whitelaw, R. (2006), 'Uncovering the Risk–Return Relationship in the Stock Market', *Journal of Finance*, **61**, pp. 1433–63. Graham, J.R. and Harvey, C.R. (2007), 'The Equity Risk Premium in January 2007: Evidence from the Global CFO Outlook Survey', working paper, Duke University. Banerjee, P.S., Doran, J.S. and Peterson, D.R. (2007), 'Implied volatility and Future Portfolio Returns', *Journal of Banking & Finance*, **31**:10, pp. 3183–99, October.

Figure 5.6 Volatility on European indices—historical (%)



Source: Oxera analysis, based on Bloomberg.

Figure 5.7 Volatility on European indices—implied over 18 months



Source: Oxera analysis, based on Bloomberg.

Regulatory precedents

Recent regulatory determinations also provide an important source to estimate the ERP.

In 2006, the NMa estimated the ERP for energy networks at a range of 4.0–6.0%. The same assumption was adopted by the NMa in its decisions in 2008 and 2010. It was judged that the likely increase in the ERP as a result of the financial crisis did not invalidate the range. Two years later, in its 2010 decision, the same range was recommended for the ERP on the basis that equity markets had largely stabilised from the impact of the financial crisis.[38]

[38] In its decision, the NMa considered both ex post and ex ante estimates, as well as regulatory determinations. In light of mixed evidence, it was concluded that there was insufficient evidence to depart from the ERP range used in previous determinations.

However, the NMa's approach contrasts with other regulators that have recognised the impact of the financial crisis on estimates of the ERP. For example, in January 2011, Ofcom, the UK telecommunications regulator, recognised that there might have been an increase in the ERP in the last few years:

> We [...] believe that the prolonged downturn in equity markets and high levels of volatility suggest that the equity risk premium may have increased in recent years. We maintain our belief that the downside of setting an ERP too low is worse than the downside of setting the ERP too high.[39]

A summary of regulatory decisions on the ERP is shown in Table 5.5.

Table 5.5 Regulatory decisions on the ERP

Country	Regulator	ERP estimate	Date of decision
Netherlands	Energy networks	4.0–6.0	2010
Netherlands	Energy networks	4.0–6.0	2008
Netherlands	Energy networks	4.0–6.0	2006
Netherlands	OPTA, KPN	6.0	2003
UK	Ofwat, water companies	5.4	2009
UK	Ofcom, Electricity distribution network operators	4.5–5.0	2009
UK	Ofgem, Electricity distribution network operators	3.0–5.0	2009
UK	CAA, Stansted Airport	3.0–5.0	2009
UK	CAA, Gatwick and Heathrow Airports	3.0–5.0	2008
UK	Ofcom, BT Openreach	4.5–4.75	2008
UK	Ofgem, TPCR (2007)	4.5 (inferred)	2007

Source: Oxera, based on various regulatory documents.

5.2.3 Conclusions

For the purposes of this report, Oxera is required to follow the NMa's approach. Therefore, the range for the ERP—4.0% to 6.0%—reflects the NMa's most recent decision in 2010 for TenneT.

Lower levels of volatility, combined with evidence from ex post estimates of the ERP, do not justify a deviation from NMa's original range of 4–6%. This does not necessarily imply that the resulting ERP point estimate would be the same as before the crisis. The recent crisis is likely to have increased investors' aversion to equity risk, which would put upward pressure on the ERP. At the same time, equity returns have fallen, and it has been argued that investors may have incorporated this into their expectations.

Table 5.6 Range for the ERP

	Publicly owned and non-taxpaying	Privately owned and taxpaying
ERP (%)	4.0–6.0%	4.0–6.0%

Source: Oxera analysis.

[39] Ofcom (2011), 'Proposals for WBA charge control: Consultation document and draft notification of decisions on charge control in WBA Market 1', January 20th.

6 Estimates of the cost of capital

The range for the cost of capital varies according to each of the following scenarios.

– **Under the non-taxpaying and public ownership scenario**, the range for the nominal cost of capital is 4.57–6.90%, with a midpoint of 5.74%.

– **Under the taxpaying and private ownership scenario**, the range for the nominal cost of capital is 4.33–6.51%, with a midpoint of 5.42%.

The slightly lower estimate of the cost of capital under the taxpaying and private ownership scenario suggests that the tax advantages to debt outweigh any increase in debt as a result of the Dutch water companies being treated as stand-alone companies under this scenario.

Table 6.1 Estimates of the nominal costs of capital (%)

Component	Publicly owned and non-taxpaying	Privately owned and taxpaying
Risk-free rate (%)	3.30–3.80	3.30–3.80
Debt premium (%)	0.79–1.23	1.23–1.72
Issuance fees (%)	0.10–0.20	0.10–0.20
Cost of debt before tax (%)	**4.19–5.23**	**4.63–5.72**
Cost of debt after tax (%)	**4.19–5.23**	**3.45–4.26**
Asset beta	0.24–0.41	0.24–0.41
Equity beta	0.37–0.75	0.44–0.91
ERP (%)	4.00–6.00	4.00–6.00
Cost of equity after tax (%)	**4.78–8.27**	**5.05–9.27**
Corporation tax (%)	0.00	25.50
Gearing (%)	35.00–45.00	45.00–55.00
Cost of capital (%)	**4.57–6.90**	**4.33–6.51**
Midpoint (%)	**5.74**	**5.42**

Note: In order to derive the equity beta from the asset beta, following the NMa's approach, a debt beta of zero has been assumed. Inflation is included in the estimates of the cost of capital reported in the table.
Source: Oxera analysis.

The assumptions on the individual parameters are as follows.

– The range for the **asset beta** is 0.24 to 0.41. The low end reflects raw beta estimates, while the upper end reflects adjusted beta estimates across a sample of comparable companies. The range is also consistent with the CC's decision in the appeal by Bristol Water of Ofwat's final decision for regulated water and sewerage companies in the UK.

– The estimate of the **debt premium** varies according to each scenario.

Under public ownership, it is assumed that debt issued by the Dutch water companies is implicitly guaranteed by the Dutch authorities. The debt premium of 79–123bp (prior to any allowance for fees associated with raising debt) reflects traded data on A and AA rated bonds, consistent with the target credit ratings stipulated in the Drinking Water Act.

Under private ownership, it is assumed that the Dutch water companies are stand-alone companies without an implicit guarantee from the Dutch authorities. Under this approach, the debt premium ranges from 123bp to 172bp, reflecting traded data on A rated bonds, as well as information from comparators.

Under both scenarios, an additional allowance of 10–20bp has also been incorporated for issuance fees.

– The **gearing** range under the non-taxpaying and public ownership scenario is 35–45%, which reflects the gearing of comparators with a credit rating of AA to A. Under the taxpaying and private ownership scenario, the range of 45% to 55% reflects the gearing of comparators with a credit rating of A.

– The **ERP** ranges from 4.0–6.0% to reflect the NMa's decision in 2010. Following Frontier Economics's approach, this range was based on evidence from long-run historical returns and on expectations of the ERP from surveys of academics and CFOs.[40]

– The range for the **risk-free rate** is 3.3–3.8%. Following the NMa's approach, this range is based on nominal yields on Dutch sovereign bonds averaged over the last two to five years.

[40] Energiekamer (2010), 'Bijlage 2 Uitwerking van de methode voor de WACC', *Methodebesluit voor de systeemtaken van TenneT vastgesteld*. September. Oxera (2010), 'Updating the WACC for energy networks: Quantitative analysis', February.

A1 Appendix 1: asset beta estimates

This appendix contains details of the estimates of the raw and Blume-adjusted asset beta estimates presented in section 3.

A1.1 Raw asset beta estimates

Table A.1 Raw asset betas estimates for comparators

Company	Country	Two-year daily	Two-year weekly	Five-year daily	Five-year weekly
Electricity					
Elia	Belgium	0.03	0.04	0.06	0.09
Electricité de Strasbourg	France	0.29	0.32	0.36	0.40
Terna	Italy	0.11	0.10	0.20	0.19
Red Electrica	Spain	0.33	0.35	0.36	0.39
Emera	Canada	0.15	0.22	0.15	0.21
ITC Holdings	USA	0.32	0.41	0.42	0.47
Average		**0.21**	**0.24**	**0.26**	**0.29**
Electricity and gas					
SP Ausnet	Australia	0.14	0.13	0.16	0.09
Poweo	France	0.23	0.32	0.36	0.38
National Grid	UK	0.20	0.16	0.30	0.32
Centerpoint Energy	USA	0.24	0.35	0.27	0.33
CH Energy Group	USA	0.41	0.40	0.46	0.42
AGL Resources	USA	0.32	0.40	0.36	0.38
TC Pipelines	USA	0.31	0.35	0.33	0.52
Average		**0.26**	**0.30**	**0.32**	**0.35**
Gas					
Pacific Northern	Canada	0.07	0.20	0.06	0.12
Snam Rete Gas	Italy	0.09	0.06	0.13	0.14
Gas Natural	USA	–0.01	0.17	0.20	0.53
Enagas	Spain	0.30	0.28	0.38	0.38
Kinder Morgan	USA	0.28	0.34	0.31	0.38
Piedmont Natural Gas	USA	0.37	0.40	0.49	0.40
Northwest Natural Gas	USA	0.34	0.41	0.42	0.35
Average		**0.21**	**0.27**	**0.28**	**0.33**
Water					
Severn Trent	UK	0.17	0.18	0.29	0.34
Pennon Group	UK	0.22	0.26	0.28	0.38
Northumbrian Water	UK	0.17	0.15	0.22	0.27
California Water Service	USA	0.37	0.37	0.55	0.49

Company	Country	Two-year daily	Two-year weekly	Five-year daily	Five-year weekly
SJW Corp	USA	0.66	0.76	0.81	0.75
Average		**0.32**	**0.34**	**0.43**	**0.45**
Average for whole sample		**0.24**	**0.28**	**0.32**	**0.35**

Source: Oxera analysis, based on Bloomberg and Datastream.

A1.2 Adjusted asset beta estimates

Table A.2 Blume-adjusted asset betas for comparators

Company	Country	Two-year daily	Two-year weekly	Five-year daily	Five-year weekly
Electricity					
Elia	Belgium	0.14	0.14	0.17	0.19
Electricité de Strasbourg	France	0.57	0.59	0.59	0.62
Terna	Italy	0.26	0.25	0.34	0.33
Red Electrica	Spain	0.44	0.45	0.45	0.47
Emera	Canada	0.27	0.31	0.28	0.32
ITC Holdings	USA	0.39	0.45	0.46	0.49
Average		**0.34**	**0.37**	**0.38**	**0.40**
Electricity and gas					
SP Ausnet	Australia	0.21	0.21	0.24	0.19
Poweo	France	0.32	0.38	0.49	0.50
National Grid	UK	0.27	0.25	0.36	0.37
Centerpoint Energy	USA	0.28	0.35	0.30	0.34
CH Energy Group	USA	0.48	0.47	0.52	0.49
AGL Resources	USA	0.39	0.45	0.43	0.44
TC Pipelines	USA	0.46	0.48	0.46	0.59
Average		**0.34**	**0.37**	**0.40**	**0.42**
Gas					
Pacific Northern	Canada	0.21	0.29	0.20	0.24
Snam Rete Gas	Italy	0.25	0.22	0.28	0.29
Gas Natural	USA	0.21	0.34	0.36	0.58
Enagas	Spain	0.38	0.37	0.46	0.47
Kinder Morgan	USA	0.39	0.43	0.41	0.46
Piedmont Natural Gas	USA	0.47	0.48	0.55	0.49
Northwest Natural Gas	USA	0.44	0.48	0.49	0.45
Average		**0.33**	**0.37**	**0.39**	**0.42**
Water					
Severn Trent	UK	0.25	0.26	0.35	0.39
Pennon Group	UK	0.31	0.34	0.36	0.42
Northumbrian Water	UK	0.24	0.23	0.28	0.32
California Water Service	USA	0.47	0.47	0.60	0.56
SJW Corp	USA	0.65	0.71	0.77	0.73
Average		**0.38**	**0.40**	**0.47**	**0.48**
Average for whole sample		**0.35**	**0.38**	**0.41**	**0.43**

Source: Oxera analysis, based on Bloomberg and Datastream.

A2 Appendix 2: solvency ratio

It is understood that under Section 10 of the Drinking Water Act 2009, the I&M must specify the maximum solvency ratio for the drinking water companies—ie, the I&M will determine the maximum level of equity, or conversely, the minimum gearing ratio, for the Dutch water companies. The objective is to fix a maximum amount of equity that must be held by the Dutch water companies, in order to ensure that the companies do not hoard cash.

It is understood that the maximum ratio will be based on a combination of the following criteria.

– **Creditworthiness**—the solvency ratio will be determined based on companies with an AA credit rating, in order to avoid potential financing problems associated with high levels of gearing.

– **Scope for investment**—companies may be allowed to exceed the solvency ratio if the company plans to undertake significant levels of investment.

– **Ability to finance downturns**—companies facing higher businesses risks are likely to have a higher solvency ratio.

It is understood that the maximum ratio is to be determined based on an appropriate solvency ratio for an AA-rated firm facing comparable risks. This ensures that the maximum solvency ratio is comfortably above the notional solvency ratio (or conversely, that the minimum gearing ratio is comfortably below the notional gearing).

Similar approaches are available for determining the maximum solvability as for determining the gearing assumption. However, regulators have not specified AA-rating as their target rating, and few regulated utility firms are rated AA. Thus, most of the evidence can only be used as evidence that the maximum should be set higher than a particular level.

The evidence that is available is as follows.

– **Water comparators**. One comparator pure-play water firm is available that is rated AA, namely Baton Rouge. It does not have listed equity, so only a book value gearing can be calculated, and this is 43% (see Figure 4.4). This is below the average gearing for A and BBB rated water firms.

– **Utility comparators**. There are two listed regulated utility firms rated AA. These are Red Electrica and Enagas, and the market value gearing of both of these has averaged 36% over five years (see Figure 4.6). Again, this is lower than averages for both A-rated and BBB-rated utility firms.

– **Moody's** criterion for an AA-rated firm's gearing is 25–40% (where gearing is defined as net debt relative to the regulatory asset base).[41]

– **Regulatory precedents**. Among regulators of utilities (ie, excluding telecoms and airports, which face greater risks), the majority of regulatory precedents adopt a range for gearing between 50% and 60% (see Figure 4.5). This is equivalent to a solvency ratio of 40–50% solvency.

[41] Moody's rating of Aa is equivalent to Standard and Poor's AA rating. Moody's (2009), 'Moody's Global Infrastructure Finance, Global Regulated Water Utilities', December.

Taken together, the evidence broadly suggests a solvency ratio of around 60–70%. Given the lower levels of risk borne by water companies than their peers, the implied level of gearing under this assumption would appear to be consistent with an AA credit rating. However, it is understood that there may be circumstances when drinking water companies' solvency ratios may exceed this level. For example, if investment is expected to be high in the future, it might be appropriate for drinking water companies to maintain a higher solvency ratio.

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