Final Report

OFWAT

THE CAPITAL STRUCTURE OF WATER COMPANIES

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OXERA

Strictly confidential

Policy Issues and Implications

- Should water companies be highly leveraged? Do highly leveraged firms have low costs of capital? Should regulators set charges on water and sewerage on the basis of these high levels of leverage and low costs of capital?

  These are the issues that have risen to the fore in the regulation of the water and sewerage industry in England and Wales. The background to this is a substantive increase in the level of leverage of several companies in the regulated water industry in England and Wales over the past two years, which has raised fundamental questions about the financing and regulation of the industry, including the following.

  – How do these high levels of leverage affect firms' costs of capital? Are they justified by the fact that they reduce firms' overall costs of capital and thereby raise firms' valuations?

  – What is an appropriate level of leverage? Theory points to several factors that encourage leverage, and several that deter against it. How do these conflicting considerations balance out, and at what level of leverage?

  – Are there any reasons for believing that a firm's chosen level of leverage may not be in the wider social interest? Are there any conflicts that might arise between the interests of firms and customers?

  – How should regulators respond to these high levels of leverage? In setting price caps at regulatory reviews, should they determine the cost of capital on the basis of these high levels of leverage or on lower levels? To what extent should the cost of capital be affected, if at all, by different leverage levels? Should the cost of capital be common to all firms in the water industry, or should it reflect the particular level of leverage chosen by a firm?

- The answer that standard finance theory would give to these questions is that, under certain assumptions, leverage levels and capital restructurings do not affect firms' cost of capital. According to the Modigliani and Miller theorem (the central paradigm of modern finance), there is no optimal level of leverage, and changes in leverage do not affect the cost of capital. Regulators should not therefore change their behaviour and there is no reason for altering the rate of return that firms are allowed to earn on their assets.

- However, once the stringent assumptions of the Modigliani and Miller theorem are relaxed, arguments for and against increases in leverage emerge. Firms can benefit from the tax advantages of the deductibility of interest payments against taxable profits; they can use debt to incentivise management and discourage them from wasting 'free cash flow'; and high leverage may encourage regulators to show greater consistency across time in determining the prices they are allowed to charge their customers. All of these are real potential benefits of leverage that

have to be set against the increased risks and costs of financial distress. An optimal level of leverage then emerges as a trade-off, for example, of the tax benefits of debt against the risks of financial distress.

- Traditionally, water companies have had low levels of leverage. In the early days of water privatisation, the regulator urged companies to move to higher levels of leverage from their, then modest, levels of 20% or less. Now, as noted above, some water companies are moving to levels of leverage of around 90% or more. In setting charges, the regulator has chosen to employ 50% as a central estimate of the level of leverage for the water industry. However, the dilemma the regulator faces is that, from being in a position of driving reluctant firms to higher levels of leverage, it now finds itself assuming levels of leverage that are very modest in relation to what some water companies are employing.

- Why have some companies increased gearing to such an extent? One straightforward explanation is that many of the relevant parameters have changed. For example, at the beginning of the 1990s, the UK had an imputation system of taxation which, from a tax perspective, treated dividends on a relatively similar basis to interest payments. While there was some tax incentive to employ debt finance, in general it was modest. In the second half of the 1990s, however, the UK government eliminated imputation and in the process drove up the tax wedge between equity and debt considerably. There is now, as there always has been in the USA, a significant tax incentive to use debt in preference to equity.

- One of the main motivations behind water privatisation was the considerable under-investment that had occurred for decades in the water industry. The transfer to the private sector was therefore associated with a substantial obligation to modernise and invest in infrastructure. The question of how this investment programme could be financed was a real concern, and the risks associated with doing this were perceived to be substantial. High levels of leverage were not regarded as appropriate in such a high-risk investment environment. Now, a substantial portion of that catch-up has taken place and companies have a proven track record of delivering the investment required of them. Hence, debt may be a more appropriate financing vehicle than before.

- Two new risks have emerged to replace these investment risks. The first is associated with the expansion of water companies into related and unrelated activities. Diversification had a mixed track record, and, in some instances, resources were wasted on projects that yielded low returns. The second emerging risk comes from the regulator. It was originally anticipated that, once the cost of capital, asset valuations, and expenditures had been determined, regulation would become a mechanistic process with little opportunity for regulatory discretion. In the event, this has been far from the case, and regulatory risk has emerged as a significant concern for both firms and investors. To the extent that debt can act as a pre-commitment device of both managers and regulators, it can mitigate some of these risks, and this has therefore encouraged firms to pursue higher levels of leverage.

- All these developments have therefore gone some way to explain increases in leverage from their very low levels at the beginning of the 1990s. However, they do not explain the recent sharp increases, which have been driven by another factor.

- There has also been a progressive reduction in the return that water companies have been allowed to earn. Average rates of return have fallen from 12% in the immediate post-privatisation period to less than 6% now. Initially, rates of return were sufficiently high to fund investments in the related as well as the core part of a water company's business. This is no longer the case, and companies have responded in two ways to declining allowed rates of return. First, they have restructured to separate the regulated parts of their business from the remainder through securitisation, ring-fencing and disposal. This allows regulated activities to be run as low-risk, self-funded activities in line with the low rates of return that companies are allowed to earn. It also frees the remainder of the business from regulatory constraints to pursue commercial opportunities. Second, by focusing the core, regulated businesses on low-risk activities, it has been possible to fund them through more debt financing than previously.

- Changes in capital structure are therefore a reflection of changes in the underlying risk of the business. Higher levels of leverage are a product of the isolation of low-risk and lower costs of capital of regulated activities. The fact that companies have been able to fund the restructurings by issuing debt is *prima facie* evidence that the allowed rate of return is sufficient to fund the regulated activities as stand-alone businesses.

- There are a number of caveats to this conclusion. First, since not many companies have been funded this way to date, it is possible that the risks have not been properly priced. The risks of the core utilities may yet turn out to be greater than the market is assuming. Second, the market may not be taking full account of the costs associated with financial failure. Evidence is cited in this paper from a survey showing that some investors believe that the regulator will bail out companies which encounter financial distress. While, in principle, this should not happen, in practice the regulator may have little option if presented with several companies simultaneously encountering financial failure. Leverage levels may therefore be excessive from a social perspective.

- There are several other issues that the regulator needs to consider. First, if low rates of return persist then other firms may wish to restructure their businesses along similar lines. This is beneficial in providing structural protection of low-risk regulated activities. However, it also reduces the potential for exploiting economies of scope between regulated and related activities. For example, the ability of water companies to apply their experience and skills to acquisition of other water companies, mergers with other utilities and provision of consultancy services overseas may be restricted. The creation of low-risk, low-cost-of-capital companies may therefore come at the expense of the ability of firms to compete in the international arena. However, it should be borne in mind that the regulator has said that the creation of national champions is not Ofwat's role.

- Second, a primary determinant of the cost structure of firms is the interest rate at which debt was financed on issue. Regulators frequently make allowance for the cost of embedded debt (ie, debt prudently issued when the risk-free rate was high); however, at high levels of leverage, this may be critical for the financial solvency of firms. If regulators do not pass through the costs of embedded debt or provide headroom for highly leveraged entities in other ways then firms will either have to borrow in the short term or hedge their interest-rate exposure.

- Third, regulators may wish to consider ways of mitigating risks of financial, and in particular systemic, failure. By analogy with financial services, possible approaches include minimum capital requirements (ie, maximum leverage levels) and maintenance of minimum credit ratings on junior debt. A potentially more attractive route is to set up a restructuring insurance fund, analogous to compensation funds in financial services, to which highly leveraged firms will be required to contribute.

- In summary, the questions that the study initially began by addressing—whether high levels of leverage imply low costs of capital, and whether these are the costs of capital that the regulator should adopt—may not be the most relevant. The results in this paper point consistently to the view that leverage is a derivative rather than a fundamental variable which reflects, rather than determines, the underlying risks and performance of a firm. While recent restructurings could be seen as providing *prima facie* evidence that existing allowed rates of return are sufficient to finance stand-alone water company activities, the regulator needs to give careful consideration to several caveats and policy implications.

- Furthermore, this evidence should be considered alongside that from traditional approaches to determining the cost of capital of utilities. To date, allowed rates of return have been significantly in excess of those on debt. For example, assuming equity betas of around 1 and asset betas of around 0.5[1] (consistent with leverage, defined as debt/(debt + equity) of 50%) then, with an equity risk premium of 4%, costs of capital are some 2% in excess of risk-free rates on a post-tax basis, and higher on a pre-tax basis. In some cases these higher costs of capital apply to utilities whose businesses are almost exclusively regulated activities. The two pieces of evidence on the cost of capital appear to be contradictory. Which is correct?

- One answer is that the caveats described above render the evidence from recent restructurings unreliable; namely, the market has mispriced risks associated with

[1] Note, also, the implicit assumption in this calculation that the beta of debt is zero.

the restructurings, and/or there is a social/private divergence that makes the social cost of capital greater than the private.

- A second answer is that the traditional evidence is unreliable. There are several possible reasons for this. First, it was suggested above that the tighter (debt) governance—in the form of debt covenants and monitoring by relatively concentrated bond investors—of the restructurings has allowed companies to finance their activities at a lower cost of capital than the traditional (equity) model of utilities. Pure water companies are low-risk, but restrictions on managerial discretion are required to ensure that they remain so. This implies that the traditional cost of capital is not necessarily the minimum that is achievable with appropriate governance arrangements.

- Second, it may not be managerial discretion alone that raises costs of capital, but also regulatory discretion. High levels of leverage may reduce the discretion of regulators. For example, a regulator may be more constrained by the prospect of their actions resulting in default on debt payments or the breaching of debt covenants than by the prospect of their actions lowering share prices. If this is the case, regulatory risk and the cost of capital may be lower. Again, it may not be possible to attain minimum costs of capital with the traditional equity model.

- Third, while 0.5 is not an unrealistic estimate of utilities' asset betas over the past few years, there is evidence from daily data that equity betas have been declining in water to numbers that are not much in excess of zero. This may well be a temporary aberration, and it would be a mistake to place much weight on it; however, it may also be indicative of the point noted above, that the riskiness of water companies' investments is declining.

- It is difficult to know where the balance of these arguments lies. On the one hand, it is hard to dismiss evidence from actual market transactions on restructurings; on the other, the true private and social costs of these may yet to be revealed. On balance, we would urge caution and not place too much weight on the recent water company restructurings. Over time, evidence may be accumulated of real benefits to the new governance arrangements and at that stage the costs of the equity model may legitimately be deemed to be too great. Until such evidence accumulates, there is no strong case to change the method by which the regulator determines the cost of capital (with an assumed leverage of around 50%). At worst, this could confer higher returns on firms that choose specific governance arrangements aimed at reducing business risk; at best, it will reduce potential risks of systemic failure and not force a more widespread move to an as yet untested model.

Summary of the report

- The report investigates capital structure in the water industry. As described in section 1, several pieces of analysis have been undertaken. First, section 2 describes the approach to leverage taken by UK regulators and the Competition Commission. Most regulators have made leverage assumptions, which have tended to be in the 50–60% range in energy, but lower in telecommunications. In contrast, the Commission has used actual leverage levels, which are in general lower. There is therefore no consensus as to whether optimal levels of leverage exist, nor whether they should determine firms' allowed rates of return.

- The report has then undertaken an extensive review of the academic literature on optimal levels of leverage and the effect of leverage on firms' costs of capital (see section 3). A framework for classifying the literature under four headings is described: these are the effect of taxation; agency and informational considerations; risk redistribution; and risk reduction.

- Taxation encourages leverage through the tax deductibility of interest payments, even after taking into account personal taxation. Debt can also be used to incentivise management and discourage excessive expenditures of free cash flow. High levels of leverage may transfer risk from shareholders to creditors, or from investors at large to customers. Debt may also reduce risk by encouraging a greater degree of regulatory commitment and discouraging firms from engaging in costly diversification. Firms may also be able to take advantage of the mispricing of risks when issuing debt. For all these reasons, leverage may affect firms' costs of capital.

- The empirical evidence on optimal capital structure is inconclusive. There are two widely cited views of how firms choose their capital structure in practice. The first picks up the idea mentioned above that there is a trade-off between various factors in establishing an optimal capital structure. Firms have a target level of leverage to which they adjust. There is some empirical support for such an adjustment process. However, there is only limited evidence that the factors which theory suggests are important, such as taxation and volatility of earnings, actually matter in practice.

- The second, more pragmatic, approach argues that firms have a pecking order of different types of finance. They will use internal finance as much as possible before resorting to external finance, and will then use debt sources in preference to equity. According to this theory, leverage changes in response to firms' earnings and their investment requirements, falling as earnings increase and rising as investment increases. There is evidence that is both consistent and inconsistent with this theory.

- In the context of the water industry, these considerations might be expected to justify high levels of leverage. The volatility of cash flows of water companies is inherently low in relation to most other, non-utility, industries. Since risk of financial failure is low, high levels of leverage involve lower risk of financial

distress than in most other industries. In the face of relatively secure income streams, high levels of leverage can then be used to incentivise management. Highly leveraged transactions tend to be associated with companies operating in industries with stable cash flows. This is because poor performance in these industries is often more readily attributed to bad management than just bad luck. Furthermore, there has been a tendency for water firms to engage in what have been perceived to be costly diversifications into related and unrelated activities. High levels of leverage may provide a commitment device to discourage this.

- Alternatively, in the context of the pecking-order theory, levels of leverage in the water industry can be viewed as a pragmatic response to the financing requirements of firms. According to this view, high leverage can be regarded not so much as a choice of an optimal capital structure, but more as a response to investment requirements and declining internal resources. As the regulatory regime has been tightened then debt has been raised to meet financing needs. In principle, new equity could have been issued, but in practice there are good reasons for believing that this might be an expensive funding option. Thus, financing requirements have been met from additional debt.

- Section 4 reports an extensive analysis of leverage levels in different industries around the world. It records capital structures in eight industries in seven countries over the period 1990–2001. The picture that emerges is one of a surprisingly high degree of consistency in chosen levels of leverage. These have been converging quite consistently to the range 40–50% in utilities in other countries, as well as companies in other comparable sectors. This suggests that high levels of leverage are not the norm either in the water sector or elsewhere, either domestically or overseas.

- This section then examines the relationship between these companies' leverage levels and their market-to-book asset ratios (MARs). In general, the relationship is a negative one, suggesting that high leverage is associated with weak, not strong, financial performance. This result says little about the impact of chosen levels of leverage on values or optimal levels of leverage, since a negative performance shock to companies both reduces their MARs and increases their leverage. Poor performance is therefore associated with low MARs and high leverage, thereby reinforcing the point made by the pecking-order theory that leverage may not be so much a choice variable of firms as a product of their performance and financing requirements.

- Section 5 records a survey of 33 water industry investors. In contrast to the above observation about other industries and utilities worldwide, a majority of investors believe that the UK water sector's optimal level of leverage is in excess of 65%, and one-third of investors believe that it is in excess of 85%. Views were sought on the factors affecting the decision to finance through debt. The main advantages of debt are perceived to be its tax benefits, reduced agency problems through tighter monitoring and controls on management (in particular their diversification strategies), and the fact that new equity is difficult to raise. These results suggest that investors perceive there to be value-enhancing benefits associated with high levels of leverage in water.

- However, there are two caveats: first, the range of optimal leverage cited by investors is wide, which suggests that there may not be a well-defined optimum target; second, some investors believe that the regulator will accommodate adverse shocks, which suggests that there is an anticipation of risk sharing between bondholders and customers in the event of financial failure.

- Section 6 describes three case studies of recent financial restructuring deals: the acquisition by Glas Cymru Cyfyngedig of Welsh Water, and the leveraged restructurings by Sutton & East Surrey Water and Anglian Water. The case studies describe the process of restructuring and examine its impact on firms' valuations. They then document the effect of the restructuring and changes in capital structure on the cost of firms' debt (including transactions costs and the cost of insuring bond issues), and (as far as the data allow) on their overall cost of capital. The results are mixed, but, based on the small number of available observations, there is some evidence that increasing leverage can result in a lower cost of capital.

- The riskiness of the firms' equity is unobservable, so it is not possible to provide a direct measure of their overall cost of capital. However, it is possible to derive indicative ranges for the costs of capital of the appointed businesses of Anglian Water and Sutton & East Surrey Water, given their observed cost of debt, on the basis of different assumptions about the riskiness of their equity. Table 1 reports real post-tax costs of capital for equity betas lying in the range of 0.5 to 1.5, which spans the beta coefficients of most companies recorded in, for example, the London Business School's Risk Measurement Service.

Table 1: Estimated total cost of capital (real post-tax, %)

	Equity beta assumption		
	0.5	**1**	**1.5**
Anglian Water	3.25–3.61	3.55–3.91	3.85–4.21
Sutton & East Surrey Water	3.42–3.48	3.92–3.98	4.42–4.48

Note: Equity risk premium assumption is 4%; risk-free rate assumption is 3%; marginal corporation tax rate assumption is 30%; assumed inflation range is 1.5–2.5%. Gearing is assumed to be 85% for Anglian Water, and 75% for Sutton & East Surrey Water.
Source: OXERA calculations.

- The implied costs of capital are low, in the range of around 3.25–4.25%. Furthermore, Table 1 illustrates that derived estimates of the cost of capital from the water company restructurings are not very sensitive to assumptions about the riskiness of their equity. The reason for this is clear. The proportion of equity in the capital structure of these highly leveraged firms is so small as to make assumptions about the equity cost of capital largely irrelevant to the calculation of the overall cost of capital.

- A further check on the reasonableness of the assumed range of betas can be provided under the assumption that the lowest-grade debt in recent highly leveraged transactions has many of the characteristics of equity. Implied equity betas can then be derived from the premium on junior debt and the equity risk

premium.[2] Table 2 reports implied betas for Anglian Water and Glas Cymru. It suggests that the range used in Table 1 is not unreasonable.

Table 2: Implied equity betas of low-grade debt

	Equity risk premium assumption		
Company, debt rating	**3%**	**4%**	**5%**
Anglian Water, BBB	0.92	0.7	0.55
Glas Cymru, BBB	0.86	0.65	0.51
Glas Cymru, unrated	1.84	1.25	1.1

Note: Implied equity betas are inferred using the debt premium on low-grade debt in the new capital structure of the two companies and a range for the equity risk premium.
Source: OXERA calculations.

- Finally, section 7 discusses divergences between private and social costs that might occur in the case of highly leveraged companies. A conflict could arise between the interests of investors and water companies, on the one hand, and the regulator and customers, on the other. It has already been noted that some investors believe that the regulator will accommodate adverse financial shocks. While it is credible for the regulator to assert that this would not be the case in the event of a single water company encountering financial distress, this may be less plausible in the face of several simultaneous failures. Faced with wide-scale financial distress, significant restructuring costs, and the potential detrimental effects on capital investment programmes and customer service, there would be strong pressure on the regulator to relax regulatory formulae. Such externalities of highly leveraged transactions may justify regulatory intervention to discourage too high a level of leverage, or to protect customers from financial failures. One approach could be to establish an industry insurance fund that is available to meet restructuring costs.

[2] In the capital asset pricing model (CAPM) framework, the cost of debt, r_d, is equal to the risk-free rate, r_f, plus the product of the beta of debt and the market (or equity) risk premium. Then, by rearranging, it may be seen that the beta of debt is equal to $(r_d - r_f)/ERP$. In other words, the beta of debt is equal to the debt premium divided by the equity risk premium. Now, under the assumption that the lowest-grade debt has many of the characteristics of equity, this debt beta may also be seen as an approximation of the equity beta.

Contents

1. Introduction

OXERA has been commissioned by Ofwat to undertake a study on 'An Assessment of the Optimal Capital Structure for Water Companies'.

1.1 Objectives of the research

The report addresses a number of questions in relation to the capital structure of water companies.

- What are appropriate levels of gearing for water companies?
- How do high levels of gearing affect firms' costs of capital?
- Are there any reasons to believe that firms' chosen levels of gearing may not be in the wider social interest? In particular, are there conflicts that can arise between the interests of firms and those of customers?
- How should regulators respond to these high levels of leverage? In setting price caps at regulatory reviews, should Ofwat seek to affect firms' chosen levels of leverage?

1.2 Methodology and structure of the report

To address these questions, OXERA has employed several forms of analysis, which involve both primary and secondary sources of information.

The starting point of the research in section 2 is a summary of recent regulatory determinations on capital structure. The approach that Ofwat applied to the 1999 periodic review (PR 99) is contrasted with recent Competition Commission cases and other regulatory determinations.

The next stage of the research is the derivation of a theoretical framework based on the existing academic literature. The issue of capital structure of companies has been much debated in the academic literature, particularly since the seminal work by Modigliani and Miller (1958). Section 3 relates the literature on capital structure to the utilities.

An important aspect of the research is an analysis of gearing ratios around the world and in different industries. Section 4 reports the results of an analysis of 172 companies over the period 1990–2001. Most of these companies are utilities, but some non-utilities are included for comparison. Various measures of gearing ratio were used in order to check the robustness of the results. To OXERA's best knowledge, this is one of the most comprehensive studies of international utilities' gearing ratios. The relationship between valuations of companies and gearing ratios was also examined to provide a characterisation of firms with different levels of gearing.

The next step of the analysis is a survey of investors' views on the issues covered in the report. In total, 33 investors provided responses on the advantages and drawbacks of debt financing, including highly leveraged structures. In addition, investors were asked to provide their views on the role that regulators should play where a highly leveraged water company encounters financial distress. The methodology followed in the survey was consistent with the theoretical framework described in section 3. The results of the survey are provided in section 5.

To shed further light on the question of whether debt restructurings can affect the cost of capital of water companies, three recent cases are analysed in section 6. The cases selected are the debt refinancing of Welsh Water, Anglian Water and Sutton & East Surrey Water. In the cases of Welsh Water and Anglian Water, information in the public domain has been augmented by input from the companies.

In section 7, the potential implications of a water company encountering financial distress are discussed. The analysis starts by summarising the procedures described in the Water Industry Act 1991. The section distinguishes between the social and private costs of bankruptcy and its potential implications for the behaviour of the regulator.

Appendix 1 reproduces the questionnaire sent to investors.

2. The Regulatory Framework

2.1 Regulatory determinations on gearing

Ofwat's approach to capital structure has been to apply a standardised assumption for the capital structure in the industry. In the last two periodic reviews, the value applied to both water and sewerage companies (WASCs) and water-only companies (WOCs) was around 50%.

Table 2.1: Ofwat's approach to capital structure at PR 99

Cost of capital			Low		High
Cost of debt					
Risk-free rate (%)			2.5		3
Debt risk premium (%)			1.5		2
Pre-tax cost of debt (%)			4		5.0
Cost of equity					
Equity risk premium (%)			3		4
Gearing (%)			45		55
Equity beta			0.7		0.8
Post-tax cost of equity (%)			4.6		6.2
Marginal tax rate (%)			30		30
Post-tax equity, post-tax debt weighted average cost of capital (WACC): (%)					
WASCs	Sum of the parts		3.79		4.72
		Allowance		4.75	
Large WOCs[1]	Sum of the parts		4.19		5.12
		Allowance		5.15	
Small WOCs[1]	Sum of the parts		4.54		5.47
		Allowance		5.50	
Embedded debt adjustment (%)[2]			0.0		0.4

Note: [1] For the three largest WOCs, Ofwat assumed a small-company equity premium of 0.4%, while, for the remaining WOCs, this figure was assumed to be 0.75%. [2] Embedded debt was an additional allowance, and not part of the cost of capital assessment.

While the majority of other regulators have also based the cost of capital calculations on an assumed capital structure, there are some cases where determinations have assumed companies' *actual* gearing levels in the WACC calculations. Table 2.2 shows other regulators' assumptions on capital structure since 1995, for all cases where explicit gearing assumptions are provided.

Table 2.2: Other regulatory approaches to capital structure

Sector	Regulator	Price-control review	Gearing (%)	Basis
Energy (England and Wales)	Offer	Electricity distribution 1995	Average 50 Maximum 65	Assumed
	Offer	National Grid Company (NGC), 1996	24	Assumed
	Offer	Electricity supply, 1997	n/a	n/a
	Ofgas	Gas transportation and storage, 1997	20.8	Actual
	Ofgem	Electricity distribution, 1999	50	Assumed
	Ofgem	NGC transmission, 2000	60–70	Assumed
	Ofgem	Transco, 2001	62.5	Assumed
Electricity (Northern Ireland)	OFREG	Northern Ireland Electricity (NIE), 1997	n/a	Actual
	OFREG	NIE, 2002	50	Assumed
Transport	CAA	BAA, 1996	n/a	Actual
	CAA	National Air Traffic Services, 2000	50	Assumed
	ORR	Railtrack, 2000	50	Assumed
	CAA	BAA, 2002		Actual
		Existing assets	25	
		Heathrow	45	
Telecommunications	Oftel	Mobile telecoms, 1997	0–20	Assumed
	Oftel	BT network and retail, 1997	n/a	Assumed
	Oftel	Mobile telecoms, 2001	10–30	Assumed
	Oftel	BT network and retail charges, 2001	20–40	Assumed

Note: n/a, not available.

Two points of interest can be seen from this table. First, regulators have made a range of *different* assumptions regarding capital structure, implying that regulators of different industries consider that the appropriate balance between debt and equity is industry-specific. This theme also emerges in the academic literature, where low-growth, cash-rich industries (such as natural monopoly utilities) are typically shown to have higher gearing levels than, for example, high-growth technology companies.

Second, two decisions stand out due to the use of actual, as opposed to assumed, gearing. Of these, the decision by the Civil Aviation Authority (CAA) in the recent airports review is perhaps the most interesting, in which the regulator stated:

> as far as the CAA is aware, there is no adequate theory and neither a normative model that would enable a regulator to establish this 'optimal' gearing level. The CAA will therefore use the actual (or projected) gearing as an input into calculating the cost of capital.[3]

In accordance with this viewpoint, the Competition Commission has also relied on estimates of companies' *actual* costs of capital.[4] Table 2.3 summarises the Commission's conclusions in a number of recent cases.

Table 2.3: Competition Commission decisions on capital structure

Case	Assumed gearing (%)	Projected or actual?
South West Water, 1995	n/a	n/a
Hydro-Electric, 1995	8	Actual
BAA, 1996	30	Actual
NIE, 1997	8	Actual
British Gas Transco, 1997	17.9	Actual
Cellnet and Vodafone, 1998	10	Actual
Mid Kent Water, 2000	35–50	Actual
Sutton & East Surrey Water, 2000	25–50	Actual

2.2 Recent developments

Over the past two years, a number of water companies in England and Wales have decided to restructure financially, leading to gearing levels well in excess of the 45–55% range adopted by Ofwat for PR 99. The value of the assets of these highly geared water companies corresponds to 27.5% of the total assets of the industry.[5] Table 2.4 sets out the details of these cases.

[3] CAA Economic Regulation Group (2001), 'Economic Regulation and the Cost of Capital: Annex', November, p. 25.

[4] Admittedly, the assumption of an actual, as opposed to an optimal, level of gearing has been in cases where the authority, be it the Competition Commission or a regulator, has had to make a judgement about one company, not a whole industry. However, the point made by the CAA is valid, *regardless* of whether the regulator is making a judgement about one company or a whole industry.

[5] *Source*: OXERA calculations using average regulatory capital values for 2001/02 from table 9 of Ofwat (2002), 'Financial Performance and Expenditure of the Water Companies in England and Wales: 2001–2002 report', August.

Table 2.4: Recent cases of financial restructuring

Case	Gearing level (% of regulatory asset base)	Type of deal
Glas Cymru acquisition of Welsh Water	93[1]	Acquisition by not-for-profit company
Sutton & East Surrey Water	75	Leveraged recapitalisation[2]
Swan Capital Group acquisition of Mid Kent Holdings	99	Leveraged buy-out[3]
Drummond Capital acquisition of Brockhampton Holdings (Portsmouth Water)	85	Leveraged buy-out
Acquisition by First Aqua of Southern Water	n/a	Leveraged buy-out
Anglian Water	85	Leveraged recapitalisation
South Staffordshire Water	70	Leveraged recapitalisation

Note: [1] Although 100% debt- and reserves-financed, the acquisition price paid was below Welsh Water's regulatory asset base (RAB). [2] A leveraged recapitalisation is defined as a financial restructuring where the company remains listed and under the same ownership but increases debt substantially. [3] As the name suggests, a leveraged buy-out involves a change of ownership financed by a substantial increase in gearing. The company typically de-lists.

Ofwat's reaction to these developments has been to protect customers from any adverse consequences arising from the transactions (relating in particular to efficiency incentives and long-term financial flexibility) via licence conditions, such as the requirement to maintain an investment-grade credit rating, while also recognising that any such risks can be evaluated over the long term only, and, hence, arguing that it is not for the regulator to dictate the structure of the industry.

> It is for companies to manage their own capital structure. Adopting higher levels of gearing could reduce the cost of finance at least temporarily—an important aim in an incentive based regime. But it is not costless and could reduce the financial flexibility of companies in the future. Any structure must be consistent with the long-term nature of the industry. If there is [an] increased level of financial risk (eg re-financing risk) it is a matter for the shareholders and lenders who adopt such structures. It is not a risk to be borne by customers and this is where Ofwat needs to play a role by making this clear from the outset to shareholders and lenders.[6]

Ofwat has also set out how this issue relates to its statutory duty to ensure that efficient companies can finance the proper discharge of their functions:

> The key here is how efficient the company has been in structuring and managing its finances. In this context an efficiently-financed company would be one that retains the flexibility to respond to changing conditions; it would be likely to have a balanced portfolio of debt, with a mix of term and interest rate structures that diversifies its risks, including refinancing risk as well as interest rate, currency and inflation risks. Given the exceptionally long lives of system assets, this would suggest the need for a relatively long

[6] Speech by Keith Mason, Ofwat City Briefing, March 22nd 2002.

average duration and an interest rate structure aimed at maintaining a broadly stable real interest cost over time.[7]

[7] Speech by Philip Fletcher, 'Restructuring—Glas', Schroder Salomon Smith Barney Sterling Bond Community Conference, February 9th 2001.

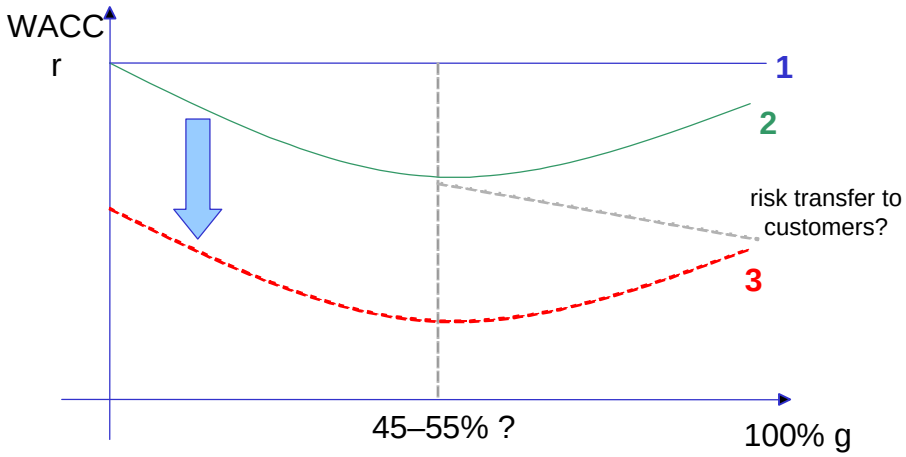
3. Factors that May Affect the Capital Structure Decision

This section provides a framework for considering the choice of capital structure by water companies. The section starts by providing a summary of the factors that may influence the impact of different capital structures on water companies' WACC (section 3.1). A summary of the main academic literature (theoretical and empirical) on optimal capital structures is then provided (section 3.2), following on from the framework of analysis set out in section 3.1.

3.1 A framework of analysis

The starting point of the analysis is the traditional Modigliani–Miller (MM) theory. The MM seminal 1958 paper stated that the overall WACC is fixed, irrespective of the level of debt.[8] Here, any attempt to substitute expensive equity for cheaper debt is ineffective since the equity beta (and hence cost of equity) increases by an amount sufficient to leave the WACC unchanged. Line 1 in Figure 3.1 demonstrates this effect.

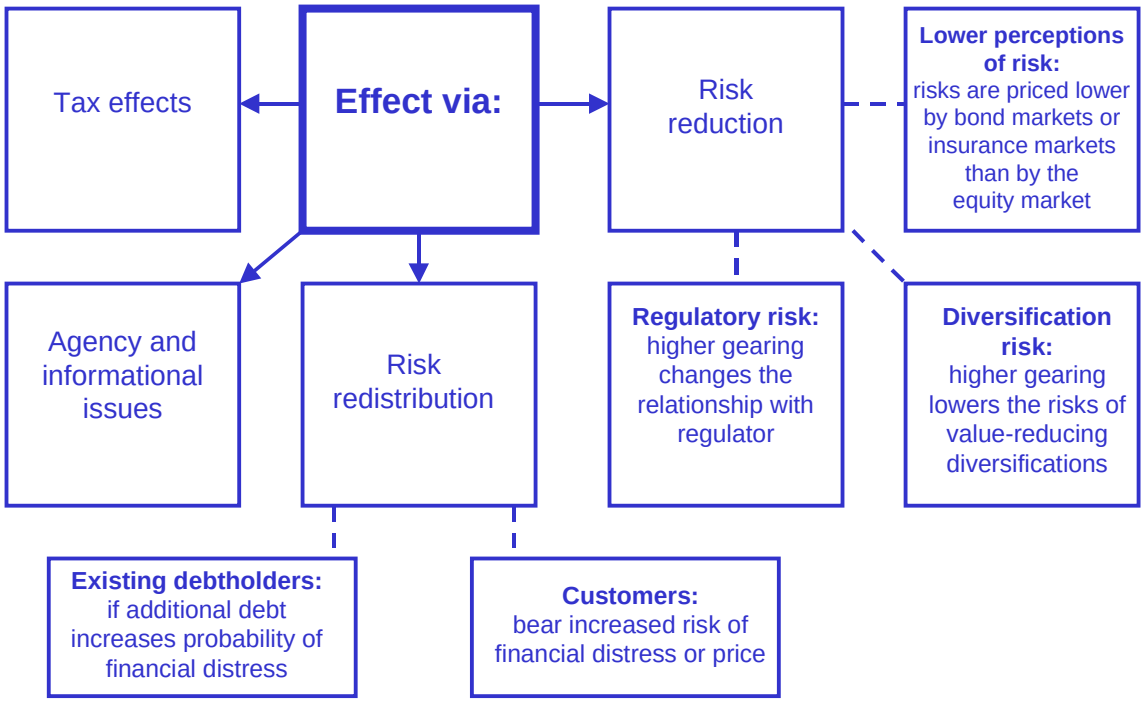
Figure 3.1: Reducing the cost of capital



As is well known, the MM theory depends upon a set of assumptions, including no taxes on investors or the company, no transaction costs, no information asymmetries—including no agency costs between principals (investors) and agents (managers)—and no costs associated with financial distress. In this report the analysis is structured around the various factors that could lead to the cost of capital, and firm value, being affected by the chosen capital structure. In large part these factors correspond to relaxations of the original MM assumptions. Figure 3.2 provides a schematic representation of the effects that different capital structures adopted by companies may have on their costs of financing.

[8] Modigliani, F. and Miller, M. (1958), 'The Cost of Capital, Corporate Finance, and the Theory of Investment', *American Economic Review*, June.

Figure 3.2: Factors influencing the impact of gearing on the WACC



The first way in which firm value may be affected by capital structure is via tax effects. This is, in many ways, the most obvious effect, given that most tax systems give preferential tax treatment to debt financing in comparison with equity financing. This is particularly true of the 'classical' corporation tax system seen in the USA, but also now in the UK. The relative tax treatment of debt and equity finance is more equal under imputation tax systems, and, in some countries' operating imputation systems, the tax treatment of debt and equity is identical.[9] These differences between tax systems are important and need to be kept in mind when interpreting the academic literature, much of which is based upon US evidence.

The second broad category of ways in which capital structure could affect firm value is through possible effects via agency and informational issues. In a hypothetical world of perfect information, managers' actions could be perfectly and costlessly observed by the providers of finance. Contracts with these managers could also be written to align the interests of the managers and owners. However, in a world of imperfect, and in particular asymmetric, information, capital structure may have an important influence on overcoming principal–agent problems and incentivising managers to act in the interests of shareholders. For example, imposing a capital structure with a greater proportion of debt on managers may increase managerial focus on profits (rather than perquisites), and hence

[9] The UK had an imputation system until 1997.

increase firm value. Many possible influences have been suggested which are discussed below.

The third way in which capital structure may affect firm value is if, as a result of the change in capital structure, risks are redistributed between the providers of finance, or, importantly in the case of regulated companies, from the financiers to the customers or the taxpayer. This redistribution could be done in various ways. At the simplest, a company might increase firm value by issuing a new set of bonds with higher seniority than existing bonds. In this case, assuming that the existing bondholders were not protected by covenants that prevented the issue of senior bonds, the existing bondholders would be assuming a greater proportion of the risks as senior bonds were issued, and hence there would be an element of risk redistribution.

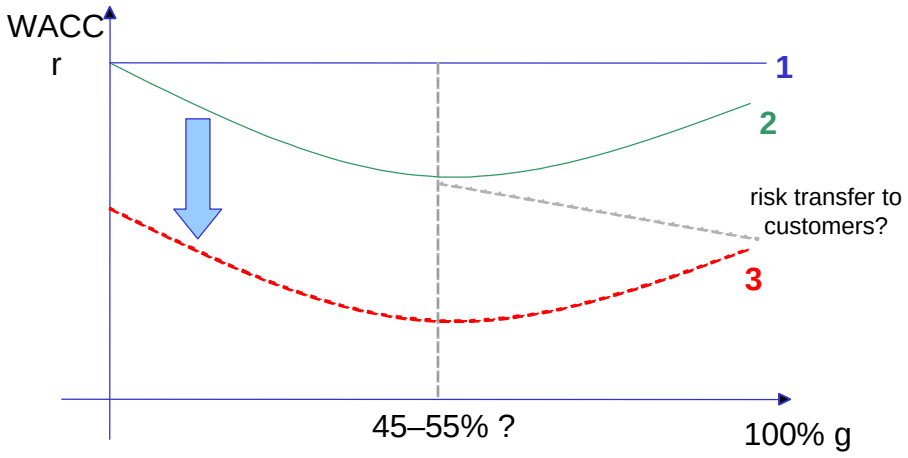
It is important to note in this case that the value of the firm might rise as a result of it being able to issue cheap senior debt, but that the incremental cost of capital would not have fallen, as any additional debt would now be more costly. A rather different effect occurs if increased use of debt results in customers (or taxpayers) implicitly bearing a greater proportion of risks. For example, the cost of a utility company getting into financial distress might be borne by customers in the form of higher prices (if the costs of rescuing the business and attracting new investors were significant). Alternatively, in such a situation, the government might intervene by injecting funds into the failed business. In either case, the impact of a more leveraged capital structure might not be entirely borne by the providers of finance, in which case the firm value might rise as a result of this redistribution of risk.

Finally, the fourth category considers effects where a change in capital structure might lead to a reduction in overall risk. The effects here are quite varied and logically distinct. One effect that is particularly relevant to regulated companies is the impact that capital structure may have on the relationship with their regulator. For instance, less reliance on equity finance might reduce the regulator's discretion and thus change the regulatory relationship. This might be the case if regulators felt more constrained in imposing regulatory decisions that would result in the company defaulting on its debt payments than if such decisions resulted in a reduction in dividends and shareholders' equity. A rather different impact of capital structure might be if higher leverage resulted in less discretion for management, in particular to undertake diversifications that might reduce future firm value. If such diversifications are generally viewed as a negative risk by the market, the reduction in such risks via increased gearing might increase firm value.

Finally, different investors might have different perceptions of risk. This point is the furthest from the original MM assumptions because, if this were the case, it would violate a fundamental principal of market efficiency—ie, that risks should be properly priced by markets (and that such pricing should not differ between different markets, such as bond and equity markets). However, different investors, including those who provide financial insurance, may view risks in different ways. Therefore, firms might enhance firm value by taking advantage of such pricing differences. It should be stressed, however, that such differences are unlikely to persist in the longer run, as arbitrage should occur. However, to the extent that some companies may be able to take advantage of windows of opportunity, the cost of capital may, at least temporarily, be affected by financial structure.

All these effects on the WACC can be illustrated using Figure 3.1. Tax effects combined with increased costs of financial distress produce the trade-off theory of capital structure. According to this, beyond a certain point, the increased financial distress on a company as a result of gearing up may outweigh the benefits (for example, tax benefits). Line 2 in the figure shows this potential trade-off.

Figure 3.1: Reducing the cost of capital[1]



Note: [1] This figure is repeated here for illustrative purposes.

Following the trade-off framework, the only way in which the cost of capital might be reduced by gearing up to levels approaching 100%—while keeping business risk constant—would be to *transfer* risk to another party (eg, to customers). In the figure, to reduce the cost of capital without transferring risk to another party requires a shifting down of line 2 to line 3, which can only be achieved by means of a genuine reduction in the business risk of the company (for example, through reduction of diversification or regulatory risk).

This broad classification of the ways in which capital structure might affect firm value is used throughout this report. The remainder of this section considers the academic evidence. Not surprisingly, there is much more evidence on some factors (such as tax effects) than others (such as different perceptions of risk). The results of a survey of investors are also reported, however, which shed interesting light on the relative importance that investors place upon the various factors.

3.2 Tax effects

3.2.1 Theoretical papers

One of the first theoretical challenges to MM's 1958 analysis came from MM themselves. In a paper published in 1963, they provided a 'correction' of their 'Proposition I' in order to reflect corporate income taxes. Importantly, both the US and UK tax systems allow debt interest payments to be made *before* corporation tax is paid out of earnings. This suggests there is a *tax advantage* to debt finance, or that debt provides a *tax shield*, since dividends are paid out *after* corporation tax. Hence, Proposition I recast states that:

$$V_L = V_U + \text{present value of the debt tax shield}$$

In other words, a firm with debt in its capital structure is valued more highly than an all-equity firm; the difference is the tax advantage from debt financing. However, following the implication of this equation to its (il)logical conclusion suggests that the implied optimal debt policy of a firm is 100% debt financing. However, this conclusion omits the following lines of argument.

First, personal taxation may affect a firm's decisions about capital structure. Miller (1977) argued that investors compare returns calculated *after all relevant taxes*. This will include the differential personal taxation of capital gains from debt and equity holdings, which will mitigate, or even eliminate, the tax advantage of debt for certain types of investor.

Second, firm's *effective* rates of taxation may be less than the *marginal* rate of corporation tax, perhaps due to their ability to take advantage of non-debt-related tax allowances and deferred tax credits from years in which losses were made. DeAngelo and Masulis (1980) extended Miller's analysis to allow for the existence of non-debt corporate tax shields, such as depreciation deductions or investment tax credits. The implication of this work is that the incentive to gear up to take account of the tax benefits of debt will be less in industries where there are substantial non-debt tax shields.

3.2.2 Empirical evidence

The general thrust of the empirical literature is that there is a tax advantage to debt financing, although its magnitude is unclear. For example, Givoly et al. (1992), Graham (2000), and Gropp (2002) all find strong evidence in support of the theoretical prediction that tax effects have an impact on debt financing.

Givoly et al. examine the effect on leverage of the implementation of the US Tax Reform Act of 1986, which radically changed the tax regime. They find a positive association between changes in leverage and changes in corporate tax rates. Moreover, they document a substitution effect between debt and non-debt tax shields, while their findings are consistent with the hypothesis that personal tax rates affect the leverage choice of firms.

Graham considers company-specific tax functions, defined as a series of marginal tax rates (which incorporate non-debt tax shields and other tax allowances), with each rate corresponding to a specific level of *hypothetical* interest deductions around the *actual* level of deductions. Integrating under each function up to the level of *actual* interest expense, he estimates that the capitalised tax benefit of debt equals 9.7% of company value. Net of personal taxes, this figure is around half the gross benefit, at 4.3% of company value. He also finds that the typical company could double tax benefits by issuing debt until the marginal tax benefit begins to decline.

Gropp considers the relationship between taxation and capital structure choice in Germany, where 'communities' levy local taxes on profits and long-term debt payments, in addition to personal and corporate taxes levied at the federal level. Local business taxes in Germany provide firms with substantial incentives to use debt financing because they impose significantly lower tax on debt than on equity. He finds support for the hypothesis that taxes matter for firms' financing decisions, even after controlling for other theoretical determinants of capital structure.

In contrast to the above papers, an article by Fama and French (1998) finds no evidence of a relationship between tax issues and debt financing. The authors use the premise that a

company's market value can be disaggregated into the market value of an all-equity, no-dividends company, with the same pre-tax expected net cash flows, plus the value of the tax effects of the company's expected dividend and interest payments. The authors then use variables designed to control for profitability in an attempt to isolate the tax effects, but find no reliable evidence of such effects. However, there is a concern that the paper cannot distinguish between there being little evidence of tax effects and the explanatory variables used being insufficient for controlling for profitability.

It should be noted that empirical evidence based upon the 'classical' corporation tax system of the USA needs to be interpreted carefully, given that the UK tax system is rather different—until 1997, it was an imputation system and is now a 'shareholder relief' system, with shareholders paying lower rates of personal income tax on dividend income. In general, the relative tax advantages to debt have been less in the UK, although this tax advantage has increased since 1997.

3.3 Agency and informational issues

3.3.1 Theoretical papers

This section of the literature review concerns issues arising from the inability of outside investors to monitor perfectly a company's management. One set of models (the agency cost literature, first set out by Jensen and Meckling in 1976) implies that the capital structure is optimal at the point where the marginal benefit of debt financing (derived from its ability to reduce conflicts between managers and shareholders by increasing managers' share of equity and decreasing free cash flow—see Jensen, 1986) is equal to its marginal cost (it incentivises equity-holders to invest sub-optimally). This gives rise to the above-mentioned trade-off theory of capital structure, which suggests that firms trade off the benefits of debt financing against its costs, reaching (or at least moving towards) an optimal capital structure.[10]

Another set of models (the asymmetric information literature) assumes that firms with a lower probability of bankruptcy are able to signal this to financial markets by gearing up. Incentives are set such that it is too expensive for the marginal firm with a high probability of bankruptcy to gear up.[11] An extension of this work, by Myers and Majluf (1984), suggests that managers, acting in shareholders' best interests, may pass up positive-net present value (NPV) projects if the equity necessary to finance them is sufficiently underpriced by the market. This will occur if there is an adverse selection problem, whereby low-quality firms can issue identical securities to high-quality firms, and have their securities overpriced. Hence, firms will prefer new projects to be financed by internal funds or riskless debt. This theory has evolved to suggest that there is a pecking order for financing investment:

[10] Note that the trade-off theory is not confined to the agency cost section of the literature. Rather, it should be seen as an amalgam of sections of the literature. For example, a trade-off can also be seen by setting the tax advantage to debt financing against the costs of financial distress and bankruptcy.
[11] See, for example, Ross (1977).

- a firm's first choice is to finance investment from internal funds;
- next, a firm will choose to issue debt finance;
- the final option is to issue equity, after all other avenues have been exhausted.

3.3.2 Empirical evidence

According to Myers (1998*a*, *b*), there is a strong inverse correlation between profitability and gearing. This is backed up by evidence from Titman & Wessels (1988), Rajan & Zingales (1995) and Fama & French (2002), to name but a few. This may be interpreted as evidence in favour of both the free-cash-flow theory (since debt is used to incentivise management effort in firms with low profitability and high free cash flow), and the pecking-order theory (since the least-profitable firms in an industry will have to borrow more, rather than finance investment from internally generated funds). However, it should be noted that this is also generally interpreted as evidence against the trade-off theory, since higher profits imply that there is a greater tax benefit to debt, and, hence, the optimal capital structure should lie at a higher level of gearing. Myers concludes that:

> there are really only two contenders in the race to explain capital structure: models such as the pecking order theory with asymmetric information as the chief underlying problem, and models [ie, agency cost models] which start from the proposition that organisations act in their own interests.[12]

There is further reinforcement of the free cash-flow theory in studies that attempt to explain gearing levels using proxy variables for free cash flow. For example, Chaplinsky and Niehaus (1993) use firm size and cash-flow variability as proxies for firms that are more costly to monitor, and operating income as a proportion of total assets to proxy for free cash flow. They find a significant negative relation between leverage and firm size, and leverage and free cash flow.

There is also support for more general agency models, with Parrino and Weisbach (1999), Vilasuso and Minkler (2001), and Crutchley and Hansen (1989) all providing evidence that the agency costs of debt are significant.

With regard to capital structure signalling models, Schmid Klein, O'Brien & Peters (2002) point to the event study literature being consistent with signalling models, since an implication is that, if managers believe that future profitability will be higher than current market expectations, they should increase leverage. On average, announcements of leverage-increasing (decreasing) transactions have been accompanied by share-price increases (decreases), except in the case of public debt issues, which have been accompanied by insignificant share-price changes. Furthermore, evidence from studies of share repurchases, exchange offers, forced conversion of debt into equity, and seasoned equity offers is consistent with this finding.

[12] Myers (1998), p. 130.

In contrast, however, the empirical literature lacks support for pecking-order-type models beyond the cross-sectional negative relationship between gearing and profitability, which is not necessarily evidence for the pecking-order theory. Recall from above that this evidence is also supportive of the free cash-flow theory.

The Fama and French (2002) paper is broadly typical of the literature on the cross-sectional test, finding some support for the pecking order, but the results could be subject to other interpretations. Shyam-Sunder and Myers (1999), both strong proponents of the pecking-order theory, find evidence supporting the pecking-order hypothesis by comparing its power against the trade-off theory using simulated data based on the two models. However, Chirinko and Singha (2000) and Frank and Goyal (2000) raise serious questions about their methods, and present conflicting results.

3.4 Risk redistribution

3.4.1 Theory

The literature relating to the issue of whether gearing up leads to a redistribution of risk among the stakeholders of a firm can again be split into two areas. The first deals with costs of bankruptcy and of financial distress. These imply limits on the extent to which a firm may choose to increase leverage. A recent case in point is the placing of Railtrack plc into Railway Administration in October 2001, the cost of which, in terms of professional fees alone, demonstrates that bankruptcy costs are non-trivial. However, even if a firm gets into financial distress, but avoids bankruptcy, there are still costs associated with the period of uncertainty. For example, with the focus of management and creditors on ensuring that contractual payments are met, positive-NPV projects may be passed up, despite the benefits that would accrue from them.

The second area of the literature considers examples of highly leveraged transactions (HLTs) and the rationale behind them. These largely fall into two categories: leveraged recapitalisations (LRs), where a company takes on high levels of debt but remains stock-market-listed; and leveraged buy-outs (LBOs), where a company is acquired by a highly geared acquisition vehicle and may also de-list.

3.4.2 Empirical evidence

Costs of bankruptcy

Altman (1984) takes a sample of 12 retailers and seven industrial firms that went bankrupt in the 1970s. For the whole sample, the average direct costs measured 6% of firm value (measured as the market value of preferred and common equity, plus the market value of debt, plus the book value of non-traded debt, plus the capitalised value of financial leases) five years prior to bankruptcy. However, the same figure emerged for the time just prior to bankruptcy. Altman argues that costs of this magnitude cannot be described as trivial.

Weiss (1990) considers a sample of 37 NYSE and AMEX firms that filed for bankruptcy between 1979 and 1986. He found that direct costs averaged 3.1% of the book value of debt plus the market value of equity. In contrast to Altman's conclusion, he points to previous research by Warner (1977), which suggests that such low direct costs will have little or no impact on the pricing of claims or capital structure prior to bankruptcy.

Interestingly, Weiss also discovered that the priority of claims was violated in 29 of the cases. This occurred primarily among unsecured creditors and between the unsecured creditors and equity-holders, while the contracts of secured creditors were generally upheld (34 out of 37 cases).

Costs of financial distress

Andrade and Kaplan (1998) took a sample of 31 large firms that undertook HLTs and subsequently became financially, but not economically, distressed. They estimate costs of financial distress amounting to 10–20% of pre-distress market value. Importantly, however, they isolate financial distress from economic distress (ie, they consider firms with positive operating margins in the years in which they are distressed). For the subset of firms that do not experience a negative shock, the costs of financial distress are estimated to be negligible. The implications of financial distress are most frequently a curtailment of capital expenditure (CAPEX), the sale of assets at depressed prices, and a costly delay before restructuring. They argue that 'to the extent that they generalise to mature firms, our results suggest the pure costs of financial distress are modest.'

However, other authors tend to disagree with this finding on the extent of costs. Chen and Merville (1999) found that the average loss of firms in their sample was 8% per annum of market value, although the maximum was 80%. Nevertheless, in accordance with Andrade and Kaplan, they found a significant positive relation between financial condition and investment capital growth, while leverage had a negative effect on the investment capital growth rate for financially distressed firms, but not for financially healthy ones. Meanwhile, Opler and Titman (1994) found that highly leveraged firms lose substantial market share to their more conservatively financed competitors in industry downturns, which they argued is consistent with the view that the indirect costs of financial distress are significant and positive.

Highly leveraged transactions

Denis and Denis (1995) report that 31% of the firms completing LRs between 1985 and 1988 subsequently encountered financial distress. Post-transaction, the distressed firms exhibited poor operating performance, linked to industry-wide problems; low proceeds from asset sales; and negative stock-price reactions to announcements associated with the demise of the junk bond market. The authors attribute the high rate of distress primarily to unexpected macroeconomic (recession, credit crunch) and regulatory developments (collapse of junk bond market), but not to poor deal structure.

Denis and Denis (1993) examine the impact of LRs on managerial investment policy. Consistent with the findings of the previous sub-section, they find significant *ex post* decreases in undistributed cash flow, CAPEX and total assets, while there is evidence of poor investment decisions on the part of the sample firms in the years leading up to the recapitalisations. It is worth noting that these results are consistent overall with the argument propounded by Jensen (1986) that one rationale for gearing up is to ensure high levels of managerial effort.

Denis (1994) compares the US cases of an LR by Kroger Co. with an LBO by Safeway Stores. In addition to large increases in leverage, the LBO altered managerial ownership, board composition and executive compensation, unlike the case of the LR. The author concludes that the improved incentive structure and increased monitoring provided by the LBO sponsor (large equity position, board member) at Safeway led managers to generate cash in a more productive manner than the organisational structure employed in the LR.

This conclusion is in contrast to the alternative view that LBOs are flawed for two reasons: first, sponsors typically cash out after 5–10 years, with the implication that the new entity is inherently short-termist; and, second, (unlike in the case of LRs), pre-buy-out shareholders cannot share in any increases in post-buy-out value.

3.5 Risk reduction

The academic literature is sparse in this area. However, two papers shed some light on why proponents of gearing up argue that it can reduce the cost of capital. The first, by Rao and Moyer (1994), provides a model in which utility companies will react to their regulatory climate by adjusting capital structure. Managers are able to mitigate the consequences of unfavourable regulation by increasing the proportion of debt in the capital structure. Empirically, the authors show that cross-sectionally higher debt ratios are associated with increased regulatory risk (in their terminology, referred to as reduced regulatory 'quality'). Moreover, increases in leverage over time are associated with increases in regulatory risk. This finding is consistent with the argument that levering up essentially 'ties the hands' of the regulator, who is unable to enforce a tough regulatory settlement while still ensuring that a company is able to finance its functions.

The second paper, by Hill (1997), argues that securitisation, a particular form of secured debt financing, may be seen as a solution to the asymmetric information problem attested to by Myers and Majluf (1984). Securitisation involves the true sale of firm receivables (eg, cash flows from utility bills) to a special purpose vehicle (SPV), which then issues debt backed by the receivables. Hill observes that tracking a firm's real performance is a difficult task, but that tracking receivables is far easier. Hence, securitisation mitigates the asymmetric information problem by giving investors additional potential for discriminating between healthy firms and firms in difficulty. In other words, securitisation acts as a low-cost signal of a firm's financial stability. Hill also points out that securitisation can provide additional gains since it broadens the range of options for financing investment.

4. International Comparison of Utilities' Gearing Ratios

This section presents evidence on levels of gearing over time for a large sample of utilities worldwide. A comparison is then drawn between UK water companies and other utilities.

4.1 Data and methodology

The data have been collated from Thompson Financial Datastream and cover 15 years (1987–2001). The data set comprises 172 companies from seven countries and eight industries (Table 4.1). Data were not available for all companies over the entire period.

Table 4.1: Sample

	Number of companies	Period of data
UK utilities		
Water	8	1990–2001
Energy	12	1992–2001
Multi-utility	2	1992–2001
Transport	23	1987–2001
Communications	10	1987–2001
US utilities		
Water	3	1987–2001
Energy	60	1987–2001
Communications	3	1987–2001
Multi-utility	3	1987–2001
Foreign utilities		
Australia	6	1987–2001
France	2	1987–2001
Germany	12	1988–2001
Italy	8	1987–2001
UK unregulated	20	1987–2001
Total	172	

All data collected were in the domestic currency and in nominal terms. Table 4.2 describes the data types collected, and their definitions for the purposes of the calculations of the gearing ratios.

Table 4.2: Data types collected

Data type	Definition
Market value of equity	Share price multiplied by the number of ordinary shares in issue
Net debt	The total of all long- and short-term borrowings, minus total cash and equivalent
Total assets employed	The sum of tangible fixed assets, intangible assets, investments (including associates), other assets, total stocks and WIP, total debtors and equivalent, cash and cash equivalents, minus current liabilities
Total share capital and reserves	The total share capital and reserves, including preference shares

The financial ratios calculated using the above data types are shown in Table 4.3. Two definitions are adopted: one based on the book value of assets and the other on market values. The latter can be highly volatile, but may be considered the most appropriate definition from a theoretical standpoint. The analysis focuses on group-level accounts.

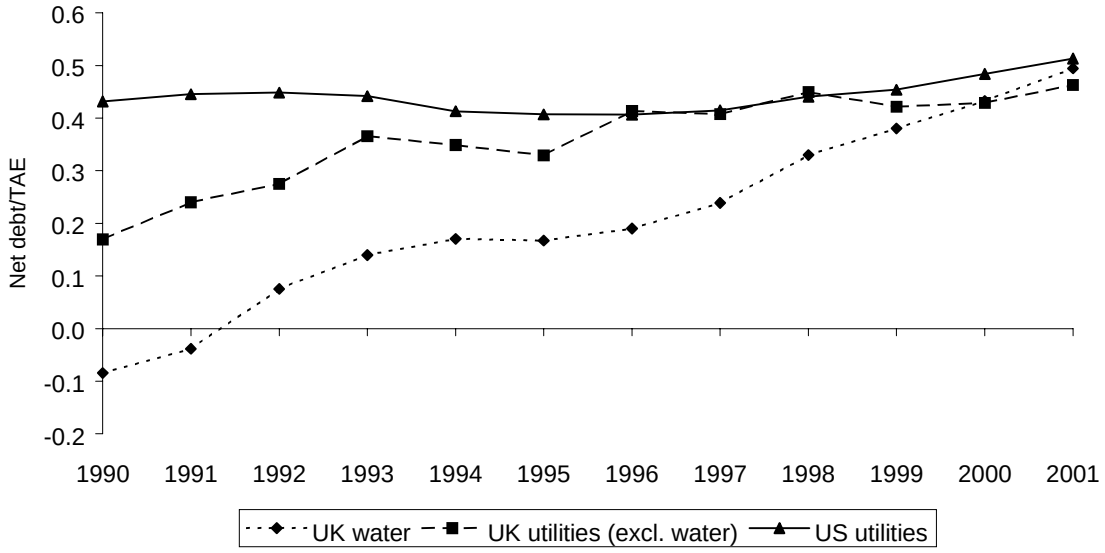
Table 4.3: Financial ratios

Ratio	Definition
Gearing 1	net debt / (total assets employed)
Gearing 2	net debt / (market value of equity + net debt)

4.2 Gearing ratios over time

This sub-section reports gearing ratios for various utilities over time. Figures 4.1 to 4.3 show the results of the gearing analysis for UK water companies, US utilities, and UK utilities excluding water companies. Figure 4.1 reports the levels of debt in relation to total assets employed. Although, in 1990, the three samples of firms exhibited significantly different levels of gearing, the figure shows that, by the end of the period (ie, 2000/01), the gearing ratios had converged to approximately 50%.

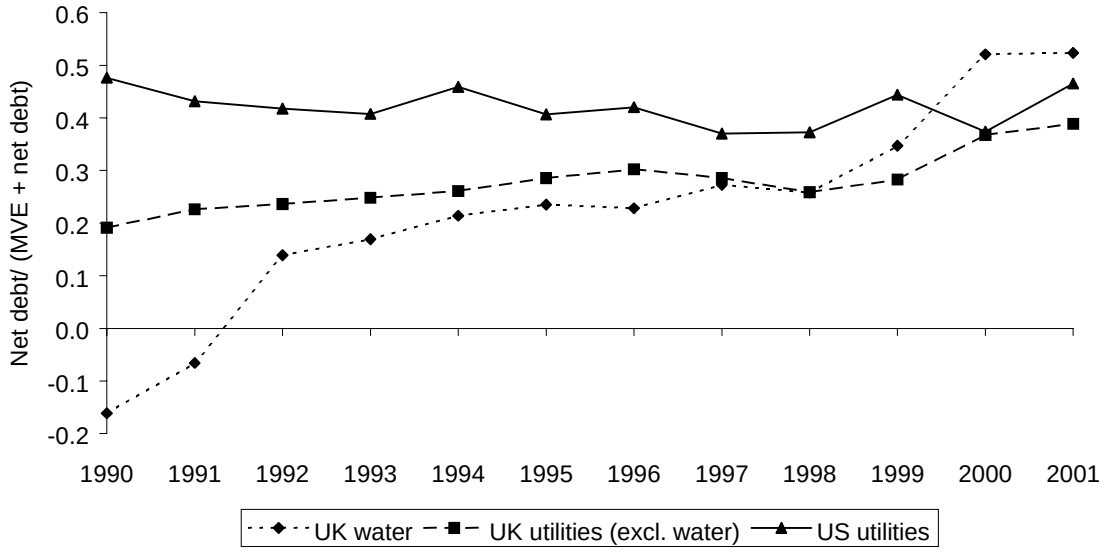
Figure 4.1: Net debt as a proportion of total assets employed, UK and US utility companies



Notes: TAE, total assets employed.

Figure 4.2 reports debt as a proportion of market value of equity and book value of debt. The results are similar to those reported for Figure 4.1.

Figure 4.2: Net debt as a proportion of the market value of equity plus net debt, UK and US utility companies

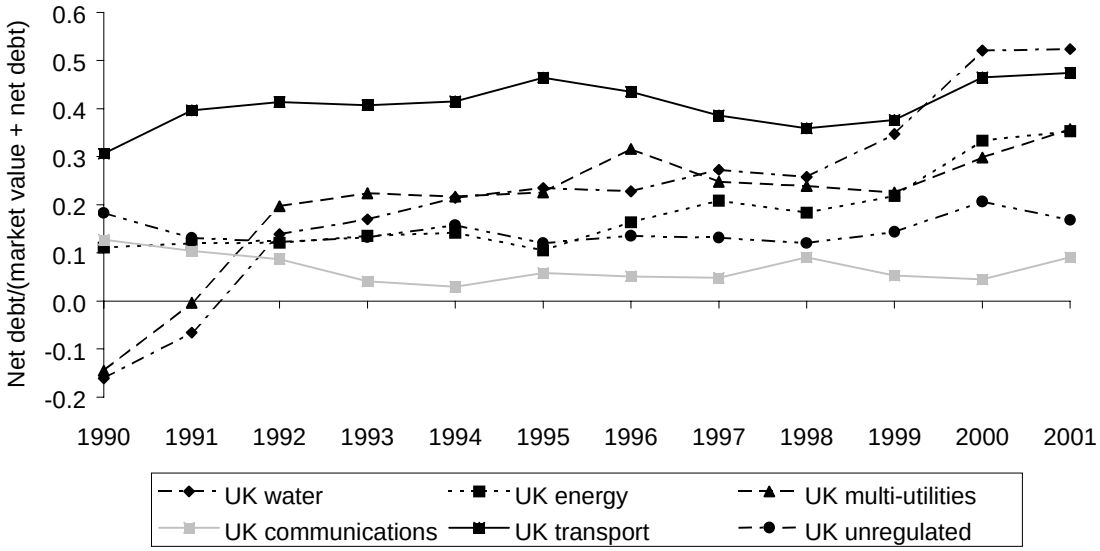


Notes: MVE, market value of equity.

The analysis was also replicated for other subsets of companies. Figure 4.3 reports the calculations over time (on the basis of market value of equity). It shows that the UK water

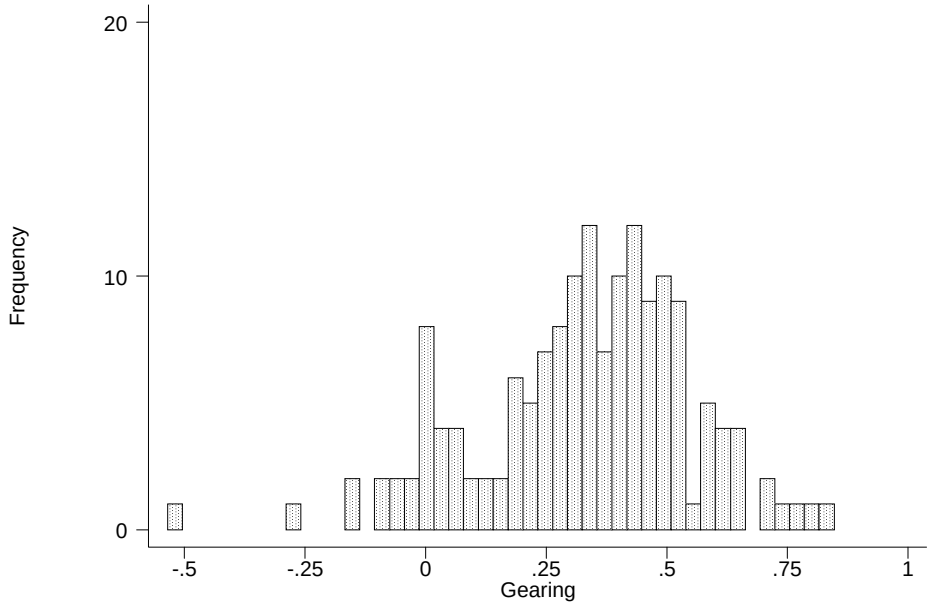
companies have the highest gearing ratios, at just below 50%, followed by UK transport companies, which exhibit a greater stability over time.

Figure 4.3: Net debt as a proportion of the market value of equity plus net debt, UK companies



So far, the analysis has concentrated on the *average* gearing level for different samples of firms. It is, however, worthwhile looking at the cross-sectional variation of utilities' gearing ratios. Figure 4.4 provides a histogram of frequency of different gearing ratios for UK and international utilities in 2000/01. Whilst the range of gearing levels is quite wide, there are very few examples of utilities with gearing ratios above 70%. The results are not sensitive to the year chosen.

Figure 4.4: The distribution of gearing ratios for UK and international utilities in 2000/01



4.3 Results from Moody's

The results in the previous sub-section are now checked by comparing them with data provided in the Moody's Investors Service January 2001 publication, 'Financial Ratio Medians for Global Investment Grade Corporates', which presents an estimate of gearing for a selection of US and non-US companies, including utilities. Moody's defines gearing as:

total debt / capitalisation, ((total long-term debt + total short-term debt + current maturities) / total capitalisation) × 100.

The results of the analysis are reported in Table 4.4. Moody's analysis confirms OXERA's estimates of the levels of gearing in international utilities—ie, that the average gearing for a utility appears to be around 50%.

Table 4.4: Moody's estimates of gearing for international utilities (fiscal year-end 1999)

Industry	Sample size	Mean (median) gearing (%)
International water	13	52.2 (52.6)
International electricity	144	52.0 (50.4)
International gas	37	53.8 (52.7)
International transportation	23	41.3 (40.8)
International telecoms	38	43.6 (42.5)

4.4 Relationship between market-to-asset ratios and gearing

This section looks at how gearing may affect firms' value, describing some correlations between market-to-asset ratios (MARs) of companies and gearing levels. A number of shortcomings of the analysis are also highlighted.

4.4.1 Data description and methodology

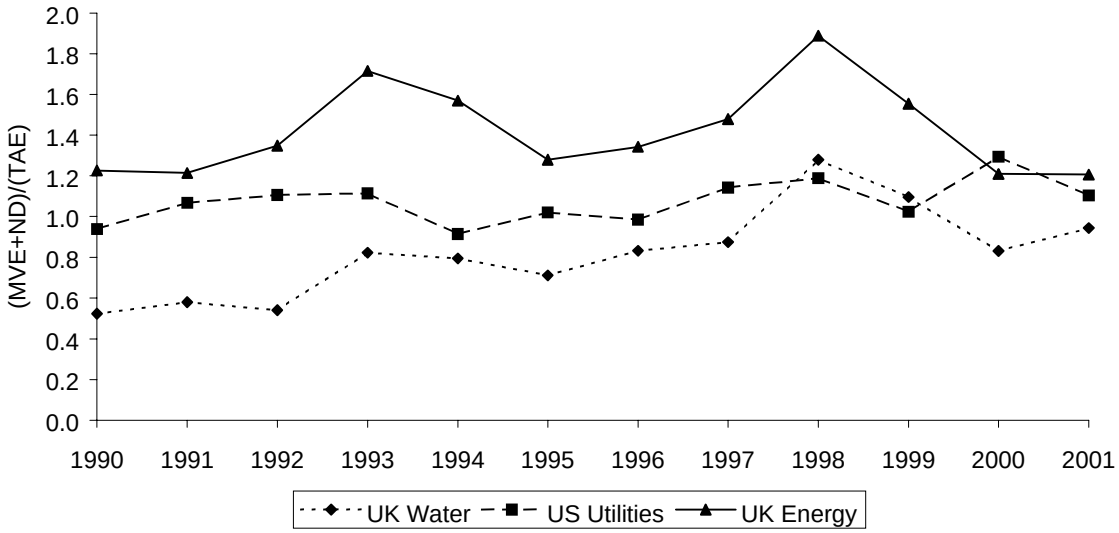
Table 4.5 describes the variables calculated for the sample. Two definitions were used to proxy for companies' MARs: the market value of the firm scaled by the value of the assets; and the market value of the firm scaled by the book value of equity plus net debt. These definitions can provide a proxy for the Tobin's q, which represents a potential measure of how profitable future investment is expected to be. All data are at the group level.

Table 4.5: Financial ratios

Ratio	Definition
Gearing 1	net debt / (total assets employed)
Gearing 2	net debt / (market value of equity + net debt)
MAR 1	(market value of equity + net debt) / (total assets employed)
MAR 2	(market value of equity + net debt) / (total share capital and reserves + net debt)

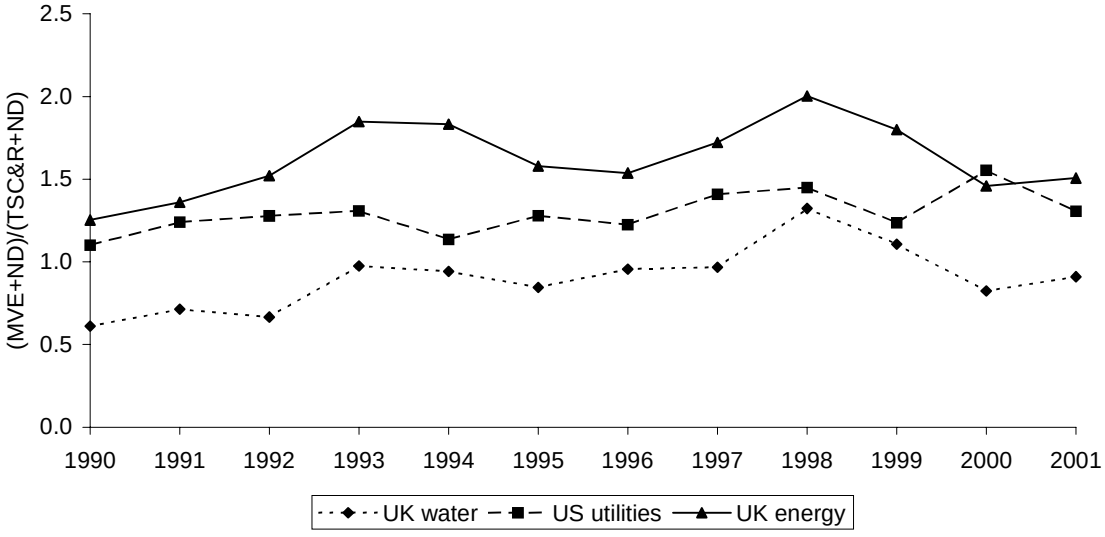
Figures 4.5 and 4.6 show the MARs for UK water companies, UK energy companies and US utilities. They show that UK energy companies exhibit the highest MARs over the period since 1990. US utilities exhibit MARs close to 1 and the UK water companies exhibit levels of MARs below 1 in 2000/01.

Figure 4.5: MARs—definition 1



Note: MVE, market value of equity; ND, net debt; TAE, total assets employed.

Figure 4.6: MARs—definition 2



Note: MVE, market value of equity; ND, net debt; TSHC&R (share capital and reserves).
Source: OXERA calculations.

4.4.2 Empirical results

Table 4.6 shows some basic correlations between MARs and gearing levels. In what follows, only a subset of the results is described. The definition of MARs reported here

corresponds to the second measure described in the previous section (MAR 2). The overall pattern of all the other results will be reported for cases where the patterns differ from the results reported here.

Table 4.6 shows that there is a negative correlation between gearing levels of various samples and their MARs. Therefore, firms with higher MARs exhibit lower levels of gearing. The results were broadly similar for the other definition of MARs against gearing 2, although the correlation between the first measure of MARs (ie, the market value of the firm scaled by the total assets employed) and the first definition of gearing (also expressed as a function of total assets employed) is positive.[13]

Table 4.6: Correlations between MARs and gearing measures

Sample	Gearing measure	Correlation with MARs
UK and international, all industries	Gearing 1	–0.1106
	Gearing 2	–0.0203
UK, all industries	Gearing 1	–0.0608
	Gearing 2	–0.1686
All countries, utilities only	Gearing 1	–0.1122
	Gearing 2	–0.0199
UK utilities only	Gearing 1	–0.0626
	Gearing 2	–0.1688

Note: Gearing 1 is defined as (net debt / (total assets employed)). Gearing 2 is defined as (net debt / (market value equity + net debt)).
Source: OXERA analysis.

[13] Such positive correlation may be spurious because both ratios have the same denominator.

One interpretation of this result[14]—consistent with, for example, Fama and French (2002)—is that firms with valuable future investment opportunities (ie, those with MARs higher than unity) exhibit lower levels of gearing. Good performance is therefore associated with both high MARs and low leverage. This result says little about either the impact of chosen levels of leverage on values or optimal levels of leverage. It does, however, emphasise the point made by the pecking-order theories that leverage may not be so much a choice variable of firms as a product of their performance and financing requirements.

[14]A number of regressions were also performed to control for industry, country or firm-specific effects that may be driving the negative correlations. In addition, regressions were performed with dummies included for those variables. Pooled ordinary least squares (POLS) and fixed-effects models were also run to check the correlation between gearing and MARs.

Table 4.7 presents the results of such regressions for all utilities in the sample. The results show a statistically significant negative relationship between gearing and MARs of utilities.

Table 4.7: Regressions for international utility companies (including UK utilities)

Method	Number of observations	Coefficient (t-statistic)	R^2 adjusted
POLS	1,089	–0.915 (–6.06)	0.245
OLS—fixed effects	1,089	–0.480 (–3.14)	0.664

Source: OXERA analysis.

Table 4.8 reports the results of the same regression analysis, but on a restricted sample of UK utilities. Although the coefficient remains negative, its statistical power is not strong in the case of the fixed-effects model. The POLS methodology provides a statistically significant negative relation between gearing and MARs. This suggests that the negative relationship between gearing and MARs is weaker for UK utilities than for US utilities, in particular.

Table 4.8: Regression results for UK utilities only

Method	Number of observations	Coefficient (t-statistic)	R^2 adjusted
POLS	374	–0.560 (–2.41)	0.289
OLS—fixed effects	374	–0.049 (–0.19)	0.657

Source: OXERA analysis.

The regression analysis was also undertaken for the whole sample of firms. The results do not change significantly—ie, there appears to be a negative relationship between gearing and MARs.

5. Survey of Investors

Having established the regulatory precedents, the lessons from the academic literature and evidence from other utilities on their gearing ratios over time, the next step is to seek evidence from market practitioners on a number of questions highlighted in the previous section, including their views on the following.

- What is an appropriate capital structure for water companies?
- Which factors determine the choice of mix of debt and equity?
- What are the advantages and limits of debt financing?
- What role should regulators play in mitigating risks to customers and investors?

This section presents the results of the survey.

5.1 Method

The stages of the survey analysis were as follows. A pilot questionnaire was prepared and sent out to a number of firms. The questionnaire followed the framework set out in Figure 3.2 in section 3. The responses to the pilot questionnaire helped in redrafting the final questionnaire, which is reproduced as Appendix 1. The questionnaire was then sent to approximately 80 financial organisations in the City of London. Where there were different relevant departments (for example, corporate finance, analyst and fixed income) in one organisation, more than one individual may have been targeted. In total, responses were received from 33 individuals. A large proportion of the respondents were utilities analysts.

5.2 Results

5.2.1 Survey views on factors affecting gearing

The first question posed was: in a steady-state situation, in which forward-looking investment of a WASC is broadly in line with depreciation, what do you consider to be an appropriate capital structure for a WASC? The purpose of the question was to identify what respondents considered an adequate gearing for a water company to be, abstracting from any short-term mismatch between cash flows and CAPEX. Table 5.1 shows that the responses did not point to a marked pattern. 27% claimed a gearing of 45–65% to be appropriate, and only slightly fewer respondents (24%) claimed that 65–85% would be an appropriate level for gearing. It is interesting to note that 18% of respondents thought that gearing above 85% would be appropriate. Some of the responses suggested that, given that the regulator cleared highly geared structures, the inference is that these structures are adequate.

Table 5.1: Respondents' views on appropriate capital structure for a water company

	%
Above 85% of gearing	18
Between 65 and 84% of gearing	24
Between 45 and 64% of gearing	27
Other	9
No opinion	21

Section 3 above examined the question of which factors affect firms' capital structure decisions. Table 5.2 provides the responses to the survey of investors. The survey appears to be broadly in line with the predictions of some of the academic literature described in section 3. In particular:

- almost 80% of the respondents suggested that taxes are an important factor leading to higher levels of gearing;
- there is some agreement with the free-cash-flow theory—almost 50% of the respondents claimed that higher debt reduces the risk of value-destroying diversifications.

Nevertheless, there is no agreement among respondents in relation to the managerial incentives provided by debt financing. This was described in section 3 as the agency costs theory. In addition, few respondents thought that higher debt financing reduces regulatory risk (only 27% of the respondents considered this to be an important factor).

Finally, the survey provides some evidence that the water sector may have limited access to the equity markets. 40% of the respondents suggested that debt is the relevant source of financing because equity markets will not finance additional CAPEX. Only 18% of the respondents claimed this to be an irrelevant justification for debt financing. The identification of the reasons why equity financing may not be available to the water sector is beyond the scope of this report. Nevertheless, this appears to be consistent with the pecking-order theory of capital structure described in section 3. Recent financial restructurings in the water sector are also consistent with this finding, since these involved mostly LRs or LBOs (see Table 2.4) rather than takeovers (as is the case in the energy distribution sector).

Table 5.2: Respondents' views on factors affecting gearing (%)

	Very important	Important	Of some relevance	Irrelevant	No opinion
Higher debt provides strong incentives to managers	3	3	18	67	9
Debt has tax benefits	30	49	12	3	6
Aside from the tax benefits, debt reduces the WACC	37	33	12	12	6
Debt decreases regulatory risk	12	15	19	45	9
Higher debt reduces risk of value-destroying diversifications	15	34	21	21	9
Debt is important since equity market will not fund incremental investment in the water sector	9	31	30	18	12

The next step of the analysis was to investigate the limits of debt financing. As predicted, respondents suggest that the possibility of default and credit downgrades leads to an increase in water companies' WACC (see Table 5.3). This is to some extent consistent with the trade-off framework, whereby, beyond a certain point, the possibility of financial distress outweighs the benefits of debt financing.

Table 5.3: Respondents' views on the limits of debt financing in water companies (%)

	Very important	Important	Of some relevance	Irrelevant	No opinion
Tax benefits from debt become exhausted	15	31	24	15	15
Credit-rating downgrades will increase the overall cost of capital	58	27	3	0	9
The risk of default outweighs the benefits	52	21	12	0	15

5.2.2 Survey views on high levels of gearing

One of the critical aspects of the survey is to identify whether there are advantages associated with highly geared structures in the water sector. The survey aimed to gather evidence on this particular issue from two angles. First, respondents were asked to comment on whether structured debt financing reduced water companies' costs of capital. Structured debt financing means funding on the basis of identifiable assets instead of the credit standing of the entity concerned. Some recent debt restructurings in the water sector have these characteristics. Table 5.4 shows that a majority of the respondents believe that such debt restructurings reduce the overall cost of capital, and not just the cost of debt financing. Therefore, according to these respondents, and contrary to what the MM framework may suggest, the reduction in the cost of debt associated with the refinancing of debt more than outweighs the higher risks to equity holders. Section 6 revisits this issue, and provides empirical evidence for a number of recent water restructurings.

Table 5.4: Do you think structured debt reduces the overall cost of capital?

Yes	No	Uncertain	No opinion
55%	30%	9%	6%

Respondents were also asked to provide reasons for why structured debt may reduce the cost of capital. From the questionnaire results, the following factors have been mentioned as potential causes of a reduction of the cost of capital:

- the role of debt covenants;
- tighter monitoring by investors;
- enhanced transparency of the corporate governance framework.

In general, structured debt is seen as having a positive effect on the cost of capital exactly because it imposes tighter monitoring and greater transparency, both of the firm's real capacities and its intentions. In other words, the survey confirms the theoretical argumentation set out in section 3 in relation to the advantages of securitisation. In that section, it is argued that securitisation, a particular form of secured debt financing, may be seen as a solution to the asymmetric information problem highlighted by Myers and Majluf, by giving investors additional potential for discriminating between healthy firms and firms in difficulties.

The second angle explored with regard to the advantages of highly geared structures is to seek views on the maximum sustainable level of debt financing in the water industry. Table 5.5 shows that one-third of the respondents believe that gearing above 85% is sustainable for a water company. A majority of respondents believe that a gearing of at least 65% is sustainable. Caution needs to be attached to this result, however. A possible justification for it might be the fact that, because the regulatory framework has been able to accommodate such structures, investors think that these structures are sustainable in the long run.

Table 5.5: Respondents' views on the maximum sustainable gearing

	%
Above 85% of gearing	33
Between 65 and 84% of gearing	21
Between 45 and 64% of gearing	12
Other	19
No opinion	15

5.2.3 Survey views on role of regulation in mitigating risks

Given the results presented above, one interesting question is to ask investors what role regulators would play if one highly geared water company encountered financial distress. Table 5.6 suggests the following.

- A majority of the respondents believe that any cost shocks that may affect a highly geared structure would be accommodated by regulators through, for example, the

shipwreck clause. Nevertheless, investors do not believe that bondholders would be fully protected. This therefore suggests a risk sharing between customers and bondholders.

- A great majority of the respondents believe that the default of one water company could lead to an industry-wide increase in the cost of debt. This may suggest that the financing decisions of one company could affect the rest of the industry.

Table 5.6: Respondents' views on the relationship between gearing and regulation

	Yes (%)	No (%)	No opinion (%)
Any cost shocks will be accommodated by regulatory intervention through, for example, the shipwreck clause	52	39	9
In case of default, with bondholders suffering losses, this would increase the overall cost of debt across firms in water	87	7	6
In case of default, the regulator would fully protect bondholders	9	82	9

5.3 Summary of survey results

To summarise, the survey suggests the following.

- Investors' views of the optimal capital structure of a water company point to a wide range of estimates. This is consistent with the conclusions of the academic literature described in section 3.
- Taxes are the most important advantage of debt financing.
- There is some limited evidence that equity markets are not willing to fund additional investment in the water sector.
- Highly geared structures are thought by respondents to reduce the cost of capital of water companies. This issue is further examined in section 6.
- There is *prima facie* evidence of risk sharing between customers (through potential regulatory intervention) and bondholders in the event of financial distress of a highly geared water company.

6. Case Studies

Three case studies were undertaken of recent financial restructuring deals: the acquisition by Glas Cymru Cyfyngedig of Welsh Water, and the leveraged recapitalisations (LRs) by Sutton & East Surrey Water and Anglian Water.[15] The motivation for these was the need to examine the characteristics of individual cases that may have contributed to the claimed cost of capital outperformance that resulted.

However, any analysis of the overall effect of these restructurings encounters a fundamental constraint: while there is evidence on the resultant cost of debt, it is far more difficult to estimate the impact on the cost of *equity*, and hence the *overall cost of capital*. Indeed, in one of the cases (Glas Cymru), the restructurings eliminated any listed equity. Even in the remaining two cases, while listed equity remains, it is difficult to infer with any degree of precision the impact of the increase in gearing on the cost of equity. The two options available are to observe the impact both on equity betas (which should, according to theory, increase as gearing increases) and on firm value.

Considering first the impact on equity betas, the main problem is the lack of sufficient evidence post-restructuring to obtain a reliable estimate of any change in the underlying equity beta. While these were estimated, no significant changes in equity betas were discernible. However, this does not imply that increases in leverage have not had an impact on underlying equity risk (indeed, it would be hard to explain such a result), but rather that the paucity of data currently precludes a reliable analysis.

Turning to the impact on firm value, while observing firm value does not lead to a direct estimate of the cost of equity, it does provide a way of addressing the question of whether, considered from the viewpoint of shareholders, the transaction was value-enhancing. If the overall cost of capital has fallen, the remaining equity valuation should be enhanced.

This section is organised as follows: section 6.1 outlines the methods and assumptions used; section 6.2 presents the three case studies; and section 6.3 draws some implications from these case studies.

6.1 Methods and assumptions

6.1.1 Cost of debt calculations

For each transaction, both publicly available data and data provided by companies have been used to calculate a weighted average cost of debt resulting from the transaction, based on the capitalisation of each bond in issue, as a proportion of the total. Wherever possible, issue fees and credit insurance premia are included in the analysis, and a comparison is made between the cost of debt now and that at the time of issue.

[15] The case of Mid Kent Water was also considered; however, as the resultant debt is not traded, this case study was considered not suitable for analysis for the purposes of this study.

The first stage in the process was the collection of data from annual reports and offering circulars, and from the companies themselves on the capitalisation of each bond issued, coupons and issue fees. Similar data were collected for existing debt.

For each analysis, the following assumptions have been made:

- preference shares have been classed as debt;
- a range for UK inflation of 1.5–2.5%, for converting nominal rates into real rates;
- issue fees have been annualised over the life of the bond in question, while credit-wrap fees are assumed to be paid each year and are therefore treated as an addition to the debt coupon.

Further assumptions have been made on a case-by-case basis and are detailed below.

6.1.2 Relative share-price reactions

This assessment uses techniques from event study methodology[16] to analyse the effect of the restructuring announcements relative to the market as a whole. The steps are as follows.

- Establish when the announcement took place, and define an 'event window' around it that takes account of the market becoming aware of a likely event before it actually occurs, and any post-announcement effects. For this study, the window was assumed to cover 20 trading days before and after the day of the announcement. This assumption was used to allow for multiple announcements.

- Estimate normal and abnormal returns (ARs). In order to compare the relative share-price performance of the company during the announcement period to what otherwise would have taken place, a model is required that provides evidence on 'normal' returns for the company. The recommended model is a market model that relates the individual company's return to that of a broad-based stock-market index (in this case, the FTSE All-share index) via the formula $R_i = \alpha_i + \beta_i R_m + \varepsilon_i$, where R_i is the company return; α_i is a constant; R_m is the return on the market; and ε_i is a normally distributed error term. The coefficients are estimated over a trading period *before* the event window, which for this study was assumed to be one year. This gives over 250 degrees of freedom for the regression analysis, which should be sufficient. Then the ARs earned by shareholders for each day of the announcement period are $AR_{it} = R_{it} - \alpha_i - \beta_i R_{mt}$.

This procedure is repeated for each company where a share-price reaction can be observed.

[16] See Campbell, J.Y., Lo, A.W. and MacKinlay, A.C. (1997), *The Econometrics of Financial Markets*, Princeton University Press, chapter four, for a detailed description of this methodology.

6.2 The case studies

6.2.1 Sutton & East Surrey Water

On February 28th 2001, East Surrey Holdings (ESH) announced a proposed issue of £100m long-dated sterling index-linked debt by its subsidiary, Sutton & East Surrey Water (S&ESW). It also announced that the issue was expected to be wrapped by Financial Security Assurance and thus be rated AAA/Aaa. The debt's coupon was 2.874%, and led to a gearing ratio of 75% for the WOC.

Calculation of the fees associated with the issue was carried out as follows. ESH's 2001 final accounts show that, although £100m in bonds was issued, the company received only £86.5m up front in loaned principal. As such, around £13.5m of the bond issue was accounted for in up-front fees, including issuing fees and the credit-wrapping costs associated with the bond. Using this information, and information provided in the debt Offering Circular, it is possible to arrive at the basis point (bp) equivalent of the £13.5m (viz. 76bp). This is then added to the weighted average redemption yield of the company's debt to give the cost of debt inclusive of fees. It should, however, be noted that this method provides an overestimate of the cost of debt, since the fees calculated[17] include both credit-wrap fees (payable annually, and therefore attributable to the coupon) and issue fees (which must be annualised over the life of the bond). As OXERA has no information on the relative proportions of issue fees and credit-wrap fees, an assumption has been made that the total (76bp) should be added in full to the cost of debt.

In estimating the cost of debt, it has been assumed that ESH's £12m of 7.8% irredeemable preference shares is attributable to the regulated business. Two calculations are carried out: the cost of debt at the time of issue, and at present, using Datastream redemption yields and the issue fees calculated above. Results are provided in Table 6.1.

Table 6.1: S&ESW cost of debt

	Parameter assumptions (%)	
Parameter	**At issue**	**As at July 22nd 2002**
Pre-tax cost of debt	4.01–4.12	4.14–4.25

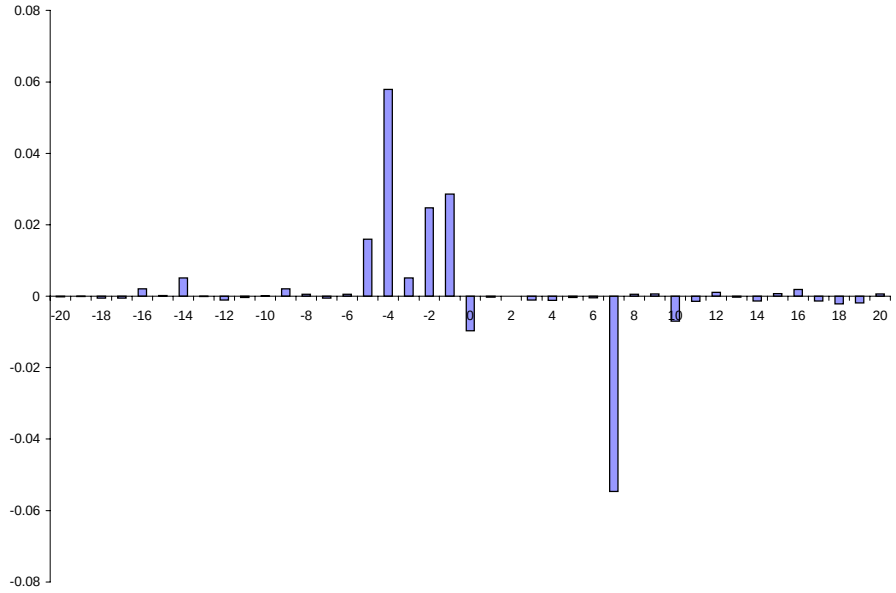
Source: Datastream and OXERA calculations.

Relative share-price reaction

The event window was set 20 trading days either side of February 28th, thus encompassing a second release by ESH on March 13th 2001, which confirmed the debt issue. The ARs are shown in Figure 6.1.

[17] See Appendix 2 for details of the calculation method.

Figure 6.1: ARs over the event window, ESH



Source: Datastream and OXERA calculations.

The figure shows positive ARs in the days leading up to the first announcement, and a slight negative AR on the actual announcement day. The second announcement day is accompanied by a clear negative AR. The cumulative abnormal return (CAR) from ten days before the first announcement to day zero is over 12.5%. However, the CAR from ten days before the first announcement to ten days after is much less, at just over 6.1%. There is therefore some evidence that investors viewed the restructuring as shareholder value-enhancing, at least in the short term.

6.2.2 Anglian Water Services

awg, owner of Anglian Water Services (AWS), made its first stock-exchange announcement about its restructuring plans on September 21st 2001. However, it was not until July 16th 2002 that AWS's debt issue was priced. The details of the issue are set out in Table 6.2.

Table 6.2: Anglian Water bond issue

	Details				Maturity		Other information
Tranche	**Size (m)**	**Rating**	**Coupon (%)**	**Type**	**Expected**	**Final**	**Spread (bp)**
A1	£250	AAA	5.837	Fixed, nominal	–	2022	85
A2	$400	AAA	LIBOR + 40bp	Floating, nominal	2007	n/a	n/a
A3	£200	AAA	3.070	RPI-linked	–	2032	85
A4	£60	AAA	3.070	Limited price index-linked	–	2032	85
A5	£246	A–	6.293	Fixed, nominal	–	2030	140
A6	£50	A–	LIBOR + 140bp, steps up after 5 years	Floating, nominal	2007	n/a	n/a
A7	£180	A–	LIBOR + 125bp, steps up after 7 years	Floating, nominal	2009	n/a	n/a
A8	£75	A–	3.666	RPI-linked	–	2024	140
B1	£275	BBB	7.882	Fixed, nominal	–	2012	280
B2	£105	BBB	LIBOR + 280bp, steps up after 8 years	Floating, nominal	2010	n/a	n/a
B3	• 115	BBB	Euribor + 250bp, steps up after 8 years	Floating, nominal	2010	n/a	n/a

Source: *Financial Times*, July 17th 2002, p. 31.

According to Standard & Poor's pre-sale report,[18] the gearing of the water company has risen to 85%. Its net debt also comprises existing debt, which will be retained.[19] To calculate AWS's cost of debt, the following assumptions have been made:

- issue and insurance fees were the same as in the Glas Cymru case (see below);
- debt *coupons* for fixed-rate debt and LIBOR plus spread for floating-rate debt have been used to estimate the cost of debt;[20]
- Eurozone inflation is 1.8% (correct as of June 2002), and Euribor is 3.41% (correct as of July 17th 2002);
- £3m LIBOR is 4.02% (correct as of July 17th 2002), and US inflation is 1.1% (correct as of June 2002). Again, the cost of debt is presented using a range of 1.5–2.5% for UK inflation.

Under these assumptions, Table 6.3 shows the cost of debt resulting from the refinancing of the regulated business.

[18] Standard & Poor's (2002), 'Presale: Anglian Water Services plc—• 10bn Global Secured Medium-Term Note Program', April 11th.

[19] Existing debt includes two issues that will be credit-wrapped under the refinancing.

[20] It should be noted that the Offering Circular for the debt issue states that foreign currency debt will be swapped into sterling. However, since no swap rates are available, it has been assumed that the debt remains in foreign currency terms.

Table 6.3: Anglian Water cost of debt

	At refinancing (%)
Pre-tax cost of debt:	4.20–4.81

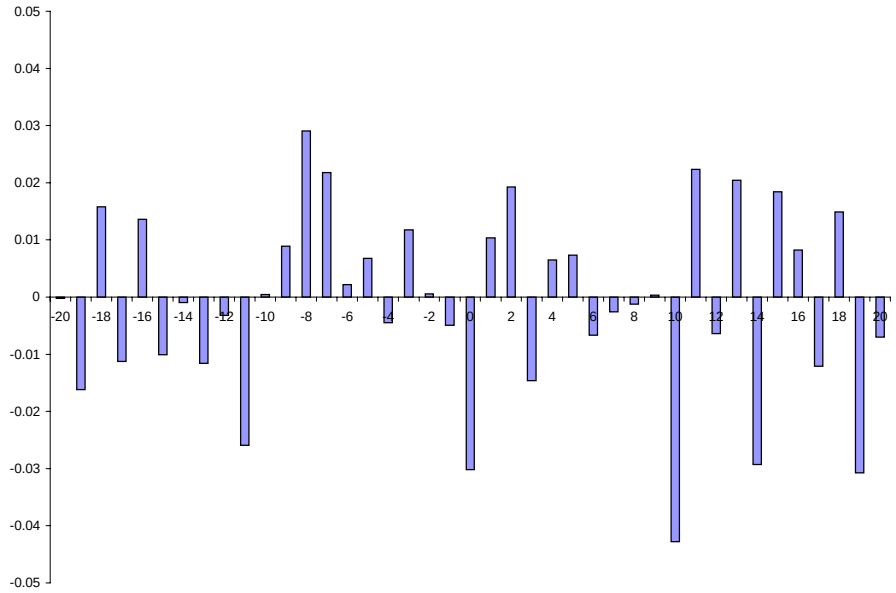
Source: OXERA calculations.

Relative share-price reaction

Following the stock-exchange release of September 21st 2001, further details of the refinancing were released by awg in its interim results document, published on November 28th 2001. In April 2002, press reports suggested that there were doubts as to the willingness of some bondholders to back (at least some elements of) the restructuring plans.[21] At the end of that month, it was announced that higher levels of compensation were to be paid to some bondholders. On May 29th, awg's annual results provided further information on the amount to be returned to shareholders as a result of the restructuring, while, on May 31st, holders of bonds due to mature in 2008 and 2014 voted in favour of the proposals. The bondholder meeting of June 17th also resulted in a favourable outcome for awg. As noted above, the debt issue was finally priced on July 16th.

The event window was set 20 trading days either side of September 21st 2001. The ARs are shown in Figure 6.2.

Figure 6.2: ARs over the event window—awg



Source: Datastream and OXERA calculations.

[21] See 'AWG urges bondholders to back changes', April 5th 2002, *Financial Times*.

There is a less well-defined pattern here relative to the previous case, although the large negative AR on the announcement day is notable. However, the CAR from ten days before the first announcement to day zero is positive, at 4.2%. The CAR from ten days before the first announcement to ten days after is lower, at 1.8%.

Consistent with this evidence is the finding from analysis of April–June 2002, which is also inconclusive. However, of note is the negative AR of 5.6% observable on the day of the announcement that more compensation would have to be paid to some existing debtholders (calculated using the same estimation period as was used for Figure 6.3). Overall, the awg restructuring seems to have had limited short-term impact on the value of the company. However, this restructuring was announced so far in advance of the actual transaction that the application of event study methodology is somewhat problematic.

6.2.4 Glas Cymru

This was a unique restructuring, resulting in the creation of a debt and reserves-financed company. In addition, Welsh Water was not separately listed prior to the bid by Glas; hence there is no equity information available either before or after the transaction. However, evidence is available on the various tranches of debt finance, which are detailed in Table 6.5.

Table 6.5: Glas Cymru bond issue

	Details				Maturity		Other information	
Tranche	**Size**	**Rating**	**Coupon (%)**	**Type**	**Expected**	**Final**	**Spread (bp)**	**Fees (%)**
A1	£350	AAA	6.015	Fixed, nominal	–	2028	105	0.625
A2	£100	AAA	LIBOR + 37.5bp, steps up to LIBOR + 93.75bp after 5 years	Floating, nominal	2006	2011	n/a	0.25
A3	$286	AAA	LIBOR + 42bp, steps up to LIBOR + 105bp after 7 years	Floating, nominal	2008	2013	n/a	0.3
A4	£265	AAA	3.514	Index-linked	–	2030	110	0.75
A5	£85	AAA	3.512	Index-linked	–	2031	110	0.75
B1	£325	A–	6.907	Fixed, nominal	–	2021	180	0.75
B2	£100	A–	LIBOR + 130bp, steps up to LIBOR + 325bp after 7 years	Floating, nominal	2008	2016	n/a	0.45
B3	£100	A–	4.377	Index-linked	–	2026	190	1.0
B4	£35	A–	4.375	Index-linked	–	2027	n/a	n/a
C1	£125	BBB	8.174, converts to LIBOR + 575bp in 2011	Fixed nominal until 2011, then floating	2011	2036	n/a	n/a
C2	£125	BBB	LIBOR + 250bp, steps up to LIBOR + 625bp after 7 years	Floating, nominal	2008	2036	n/a	n/a
D1	£100	n/a	LIBOR + 550bp, steps up to LIBOR + 1375bp after 7 years	Floating, nominal	2008	2036	n/a	n/a

Source: Glas Cymru (2001), 'Offering Circular', Appendix A, May. Spread and fee information is from the *Financial Times*, May 3rd 2001.

To calculate a cost of debt figure for Glas Cymru, the following assumptions have been made:

- using information provided by Glas Cymru, the $286m debt is assumed to have been swapped into sterling;

- all floating-rate debt has been swapped into fixed-rate debt (the rates used have also been provided by Glas Cymru);
- the 'at issue' cost of debt has been calculated using coupon rates and swap rates, not market redemption yields, while the July 2002 cost of debt uses market redemption yields and the provided swap rates;[22]
- issue fees have been annualised and averaged over the whole issue, and the credit insurance premium provided by Glas Cymru has been used.

Table 6.6 presents the results of this calculation.

Table 6.6: Glas Cymru cost of debt

	PR 99 *post-tax* WACC allowance	Post-acquisition *pre-tax* cost of debt
At issue	4.75	4.66–5.41
As of July 19th 2002		4.14–4.89

Source: Glas Cymru (2001), 'Offering Circular', May; *Financial Times*, May 5th 2001; Datastream; and OXERA calculations.

Drawing a conclusion on whether the structure of the Glas Cymru debt issue led to an outperformance on Ofwat's PR 99 allowance relies on both the inflation assumption and the assumed rate of taxation used to move from the PR 99 post-tax allowance to the outturn pre-tax cost of debt. However, even using a 1.5% inflation assumption and the 'at issue' cost of debt, analysis suggests that a saving has been made against the PR 99 cost of capital allowance, unless the tax rate used for the adjustment is less than 12.2%.

6.3 Implications

The case studies considered in this section are all rather different, and, as noted, there are problems in inferring clear conclusions for the impact of the financial restructurings on the overall cost of capital. What perhaps is clearest is that the cost of debt finance in these cases varies considerably, no doubt reflecting movements in the underlying level of interest rates, although corporate debt spreads also vary significantly. While windows of opportunity to exploit movements in financing costs doubtless exist, it is equally the case that companies considering such financial restructurings could execute such deals at rates that are (ultimately) disadvantageous (to shareholders). The case studies also demonstrate that transactions costs can be significant in such transactions, although the cost of credit wrapping observed in some of the issues seems to suggest that the insurers of these bonds judge the risks involved to be somewhat lower than the market as a whole. It is unlikely that such differences in the pricing of risks will remain in the longer term.

[22] This date was chosen purely to allow comparison between the cost of debt for Glas Cymru and that achieved in the AWS refinancing. It should be noted that, first, this is only a snapshot in time, and, second, market yields do not include the issue premium that would be expected to be paid by a company issuing on that date. Hence, the actual cost of *new* debt is higher than the figures in the second row of Table 6.6.

7. Social Versus Private Costs

Thus far, the analysis has considered optimal capital structures from the viewpoint of water companies. It has been noted that the risks of a water company encountering financial distress may be lower than in other industries because of the greater degree of stability of its income streams and the price-resetting regulatory framework. Furthermore, it has been noted that some investors believe that, in the event of financial distress, the terms of regulatory contracts could be relaxed to preserve companies' viability.

This last point raises a general issue about a possible divergence of interest between investors and customers—ie, between private and social considerations. Risks that are mitigated by relaxation of regulatory rules would come at the expense of customers. Rather than a reduction of risk, they involve a transfer of risk from investors to customers (described in section 3 as risk redistribution).

Naturally, the view of the regulator is to assert that such regulatory relaxations would not occur. While the regulator has a duty to ensure that companies are able to finance their functions, this does not extend to ensuring that they remain financially viable under all circumstances. Investors have to bear the consequences of financial structures that involve increased risks, and should not be able to turn to the regulator or customers for support in the face of adverse outcomes.

It is perfectly credible for the regulator to maintain such a position in the face of a water company failure. In the event of a failure, a licence would be transferred through Special Administration procedures.

7.1 Provisions under the Water Industry Act 1991

Under Sections 23–26 and Schedule 3 of the Water Industry Act 1991 (the Act), there are four circumstances under which the Secretary of State or the Director General, with the Secretary of State's permission, may apply to the High Court for the appointment of a Special Administrator. These are:

- where it is deemed inappropriate for the licensee to continue its Appointment as it has breached, in a manner sufficiently serious, either a principal duty to supply water or a final or confirmed provisional Enforcement Order;
- where the company is unable, or is unlikely to be able, to pay its debts;
- where, if it were not that the company held an Appointment, it would be appropriate to petition for the winding up of the company under Section 440 of the Companies Act 1985;
- if the regulated company is unable or unwilling to participate in arrangements regarding the Appointment of a new Appointee at the termination of the existing company's Appointment.

In addition, if another body (ie, directors, creditors) seeks to bring a winding-up petition on the company, and if the court is satisfied that, if it were not an Appointee, it would be appropriate to issue a winding-up order, the court would instead issue a Special Administration order.

The purpose of such an order is very specific:

- to transfer to one or more new companies as much of the undertaking of the existing licensee as is necessary to ensure that the new company can carry out its functions in accordance with the existing company's licence;
- until this is achieved, to carry out those same functions.

In meeting these objectives, the Special Administrator is required to act in a manner that protects the respective interests of the members and creditors of the company. In this regard, the role of Special Administrator differs from that of an Administrator appointed under the Companies Act 1985, as, in the latter case, the role of the Administrator is to serve the interests of all creditors. This difference would, for example, prevent a Special Administrator in the water industry from accepting an offer to purchase the assets on a break-up basis, insofar as this would prevent a new Appointee from carrying out its duties within its licence, even if such a sale would be in the best interest of creditors.

During the period in Administration, Section 153 of the Act grants the Secretary of State, with the approval of the Treasury, two important powers:

- to make grants or loans so that the aims of the Special Administration order can be met, or to indemnify the Special Administrator against losses or damage sustained while carrying out its functions;
- to guarantee the payment of principal or interest of any borrowing of a regulated company that is subject to a Special Administration order.

The period of Special Administration is ended through a transfer scheme arranged by the Special Administrator on behalf of the existing licensee, as set out in Schedule 2 of the Act. The transfer scheme may provide for the transfer of properties, rights and liabilities to the new licensee(s), and may provide for the transfer of the licence, which the Special Administrator has powers to modify. The transfer scheme must be approved by the Secretary of State or the Director General of Water Services, and either may subsequently modify a transfer scheme with the consent of the Special Administrator, the existing Appointee and the new Appointee.

7.2 Possible social costs of financial distress and bankruptcy

Provisions therefore exist for transferring control of a water company in the event of financial failure of the existing operator and avoiding disruption of services to customers. It is therefore credible for the regulator to assert that there is little incentive to adjust the terms of a regulatory contract in the face of worsening financial conditions and the impending financial failure of a water company. Investors should therefore set the terms on which they provide finance on the basis that risk transfers from companies to customers will not occur in the event of bankruptcy. However, it is less clear that this is a credible stance for the regulator when there is a risk of multiple failures of several water companies.

The successful implementation of Special Administration procedures relies on the emergence of alternative operators willing to acquire the licence of a failing firm. While at least one purchaser could be expected to emerge at a particular point in time, it is questionable whether there would be a sufficiently large number of substitute firms to acquire several licences. At the very least, it is doubtful that there would be enough purchasers to establish a real market in licences that would ensure the negotiation of

appropriate prices and terms. Furthermore, the process of negotiating the transfer of licences would impose a considerable administrative burden on the regulator and the Special Administrator.

The ability of a small regulatory department to handle a major industry restructuring, as compared with an individual firm restructuring, must be in question. Faced with such a 'systemic' failure, the regulator may well be under pressure to relax the regulatory contract. Furthermore, the industry might argue that the simultaneous failure of several firms was indicative of the fact that the regulatory contract was unduly onerous and did not satisfy the regulator's obligation to ensure that water companies were able to finance their functions. The terms of the regulatory contract could then be subject to judicial review.

In addition, even if the licence transfer process operated smoothly, this would not negate the adverse effects of financial distress on the performance of a water company. Even in the absence of formal insolvency or administration, financial distress leads to deterioration in performance. There is an under-investment problem associated with high levels of leverage, and financial distress results in reduced investment, sale of assets at depressed prices and costly attempts at avoiding restructuring. The review of the literature in section 3.4.2 provided evidence on the potential under-investment issue in relation to non-regulated firms. It could, however, be claimed that the issue for regulated water companies is of more importance than for non-regulated businesses because of the health and safety issues involved. Of course, at present the regulator monitors maintenance CAPEX on an annual basis, and this could be seen as a potential tool for identifying any problems that may arise. Nevertheless, even if regulation is able to identify this under-investment problem, it could be claimed that this is only after a lag.

NATS provides an illustration of the potential under-investment problem associated with financial distress instead of bankruptcy.[23] Much detail regarding the strengths and weaknesses of the NATS private–public partnership (PPP) has come out in two recent reports, one from the National Audit Office (NAO) [24] and the other from a House of

[23] NATS was privatised via a public–private partnership (PPP) on July 27th 2001, at a price of £758m. The group chosen as the government's strategic partner was The Airline Group, which is a consortium of seven UK-based airlines. Finance for the acquisition and related transaction costs of 46% of NATS by The Airline Group was provided by: £733m in bank loans; £50m in cash from The Airline Group shareholders; and £15m in a loan from British Airways. NATS' RAB was £632m in 2000/01 and was therefore exceeded by its debt levels (and still is). The debt:RAB ratio is expected to rise in the medium term in order to finance NATS' investment. However, September 11th had a major impact upon the company's business, with NATS estimating that the revenue loss from 2001 to 2005 is around £190m in present-value terms. (*Source*: House of Commons Transport, Local Government and the Regions Committee (2002), 'National Air Traffic Services Finances', July, para 3.) This revenue shortfall has resulted in a financing shortfall at the firm, and NATS has requested that the CAA reopen the price cap on the firm in order to grant it extra revenues over the rest of the control period. Rather than a price pattern of RPI – 2.2, RPI – 3, RPI – 4, RPI – 5, RPI – 5 for CP1, NATS has requested a move to a flat profile of RPI + 2 for the remainder of the first regulatory control period, together with a range of other incentive mechanisms.

[24] NAO (2002), 'The Public Private Partnership for National Air Traffic Services Limited', July.

Commons Select Committee.[25] In particular, the Select Committee points to a range of failings in the way in which the PPP was set up, and in the financing of the newly privatised firm.

The Select Committee argues that the air transport industry is subject to major downside demand shocks, and that NATS' high gearing ratio did not provide the flexibility required to withstand these 'relatively frequent' shocks. It also points towards serious consequences arising from NATS losing access to its capital facility, which may lead to capacity constraints towards the end of this decade.[26] This is because, without some increase in the price cap or relaxation of loan terms, all CAPEX will have to be drawn from operating cash flow.[27] The Select Committee refers to the possible 'dire' effects on the UK aviation industry of this lack of capacity.

According to the two reports, the funding problems that NATS is facing are already beginning to have an effect on efficiency and investment. As part of its reassessment of its capital investment plan, the Select Committee points to the delay of the new Scottish air traffic control centre at Prestwick by, at the moment, 18 months to two years. The Committee also considers it unlikely that the revised completion date in 2009 will be met.[28] As regards efficiency, the NAO notes that some redundancies in non-operational posts have been delayed while NATS has been seeking ways to afford the redundancy payments, given its current financial position.[29]

In summary, financial distress could lead to an under-investment problem, which may require more active regulation in order to minimise any future CAPEX issues. It has also been suggested that it is reasonable for the regulator to assert that risk redistribution in the event of the failure of a single water company would not occur through a relaxation of the regulatory contract. There should then be no divergence between private and social interests in the setting of optimal levels of leverage. However, faced with a systemic failure of several water companies, this stance is less credible, and investors could reasonably anticipate that the regulator would be forced to adjust the regulatory contract. Anticipation of this occurring leads investors to underestimate the cost of debt from a social perspective, and results in firms selecting levels of leverage that are excessive. In the parlance of the economics literature, there is an externality reflecting firms' failure to take account of the costs of financial failure that they are imposing on customers, leading them to choose capital structures that are at variance with socially optimal levels.

[25] House of Commons Transport, Local Government and the Regions Select Committee, op. cit.

[26] The financing arrangements for NATS provided for a capital loan facility of £690m, which, along with generated revenues, was expected to be the main basis for funding NATS' future investment programme. (CAA (2002), 'NATS Application to Re-open the Eurocontrol Charge Control', May, paragraph 4.8.)

[27] NAO, op. cit., para 3.30.

[28] House of Commons Transport, Local Government and the Regions Committee, op. cit., para 48.

[29] NAO, op. cit., para 3.34.

The scale of this private/social divergence cannot be reasonably demonstrated in the water sector at this stage. Nevertheless, it can be expected to increase over time, as more water companies increase their scale of leverage. The risk of industry-wide failures is greater, the larger the number of highly levered firms. When Glas proposed this structure, there were no other highly levered firms and risks of industry failure were minimal. However, this is no longer the case now that several water companies have opted for high levels of leverage. Section 2.4 states that there are seven cases of highly leveraged companies that are either in the process of completing an HLT or have already completed a refinancing. There may be a case for Ofwat to investigate this issue further.

Appendix 1: Questionnaire—Capital Structures of Water Companies

OXERA has been commissioned by Ofwat, the water regulator, to undertake research into the appropriate capital structure for water companies in England and Wales.

As part of its research, OXERA is undertaking a survey of market practitioners regarding what the market believes is the optimal capital structure for water and sewerage companies (WASCs).

We would very much appreciate it if you could take a few minutes to complete this survey.

Please send your response **by July 12th 2002** to:

Emma Gower
OXERA
Fax: 01865 204606
Email: emma_gower@oxera.co.uk

If you wish to obtain more information about the research analysis and questionnaire, please contact Andrew Meaney of OXERA's research team on tel: 01865 253000.

Thank you very much for your cooperation.

FAX REPLY FORM

TO	**EMMA GOWER, OXERA**
FAX NO	**(0)1865 204606**
FROM	
COMPANY	
DATE	

Notes: WASCs are subject to price-cap regulation, with price reviews taking place every five years. An important component of the allowed revenues set by Ofwat is the allowed rate of return, or cost of capital. The appropriate capital structure of a water company is, in turn, a key component of the cost of capital calculation. Capital structure, in this context, is taken to mean the water company's ratio of debt/(debt + equity).

Background Information

1) Name of firm ----------

2) Your name and contact details ----------

---

3) Your position ----------

Question 1

In a steady-state situation, in which the forward-looking investment of a WASC is broadly in line with the depreciation, what do you consider to be an appropriate capital structure for a WASC?

Please quote a range if necessary.

----------**. . . %**

Question 2

Some water companies have adopted, or are considering a move towards, capital structures with a high proportion of debt. Please mark, in order of importance, what you consider the benefits of debt financing to be
(1 = very important, 2 = important, 3 = of some relevance, 4 = irrelevant)

Higher debt-financing provides strong incentives for managers ☐

Debt-financing has tax benefits	☐
Aside from tax benefits, debt-financing reduces the weighted average cost of capital (equity and debt)	☐
	☐
Higher debt-financing decreases regulatory risk	☐
Higher debt-financing reduces the risk of value destroying diversification by companies	☐
Debt-financing is important because equity markets will not fund incremental investment in the water industry	☐
Others (please state) . . .	☐

Question 3

What would you consider to be the limits to debt-financing for water companies?

Please mark, in order of importance, what you consider these to be
(1 = very important, 2 = important, 3 = of some relevance, 4 = irrelevant)

Tax benefits of debt become exhausted	☐
Credit-rating downgrades will increase the overall cost of capital	☐
The risk of default outweighs the benefits of debt-financing	☐
Other (please state) . . .	☐

Question 4

If a water company were to adopt a highly leveraged structure, say 90% capital structure, would you expect:

	Yes	No
Any cost shocks to be accommodated by regulatory intervention through, for example, the shipwreck clause [30]	☐	☐
In the event of default, the regulator would fully protect bondholders	☐	☐
If, in the event of default, bondholders suffered losses, would this increase the cost of debt financing for all other companies in the water sector (whether highly leveraged or not)	☐	☐

Question 5

Do you think that structured debt financing (ie, funding on the basis of identifiable assets instead of the credit standing in the entity concerned) reduces the overall cost of debt-financing?

☐ Yes

☐ No

Why?

Question 6

What would you consider to be the maximum sustainable proportion of debt in the overall capital structure of the debt/(debt + equity) of a water company?

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[30] This clause allows for price limits to be reset between periodic reviews if the regulated business suffers a substantial adverse effect or enjoys a substantial favourable effect, which is not attributable to prudent management action. In this context, 'substantial' is quantified as an effect equivalent to at least 20% of the previous year's turnover.

---. . . **%**

If this differs from the answer to Question 1, please explain the reason.

Appendix 2: Calculation of Sutton & East Surrey Water Issue Fees

Information on the level of fees paid by S&ESW may be garnered from the Offering Circular for the debt issue and ESH's 2001 final report. The results show that, although £100m in bonds was issued, the company received only £86.5m up front in loaned principal. As such, around £13.5m of the bond issue was accounted for in up-front fees, including issuing fees and the credit-wrapping costs associated with the bond.

Using this information, and data from the Offering Circular, it is possible to estimate the additional amount that should be included in the cost of debt to account for these fees. The first four rows of Table A2.1 show the payments that are likely to be made to bondholders, in real terms, over the period of the bond. The table shows that, given that £100m was issued and a coupon rate of 2.874%, the interest payments to bondholders for the majority of the bond period are expected to be £2.874m real per annum. The Offering Circular also reveals that the maturity of the bonds issued is staged over the 2027–31 period, with increments of £20m in principal gradually repaid over this period. As such, the amount of interest (in £m) which is payable on the outstanding principal, declines towards the end of the bond period.

Table A2.1: S&ESW fees estimation

		Payments to bondholders (£m)									
Basis for bond payments (£m)		**2001**	**2002**	**2003**	**…**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
100	Principal outstanding	100	100	100	…	100	100	80	60	40	20
Coupon	Interest	2.874	2.874	2.874	…	2.874	2.874	2.299	1.724	1.150	0.575
2.874%	Principal repayment	0	0	0	…	0	20	20	20	20	20
	Sum	**2001**	**2002**	**2003**	**…**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Discounted cash flows (r = 2.874%)	100.00	2.794	2.716	2.640	…	1.376	10.64	10.09	9.552	9.039	8.548
Discounted cash flows (r = 3.634%)	86.53	2.773	2.676	2.582	…	1.136	8.726	8.209	7.717	7.249	6.805

Source: OXERA analysis of Sutton & East Surrey press releases, end-year accounts and Offering Circular.

The penultimate row in Table A2.1 calculates the sum of discounted cash flows (including interest and repaid principal) expected to be paid to investors over the period of the bond, assuming a discount rate of 2.874%. Mathematically, this sum is identical to the *basis* for the bond payments (the issuing price) in the first instance—£100m. In order to examine how the fees charged affect the cost of capital, it is necessary to ascertain the discount rate (or redemption yield) that is required in order to reduce the NPV of future expected payments to investors to £86.53m. The last row of Table A2.1 shows that the redemption yield required to do this is 3.634%. Hence the increase in redemption yield required is around 75 basis points. This suggests that credit-wrapping and issuing fees would appear to account for an additional 75 basis points on the cost of debt for S&ESW.

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