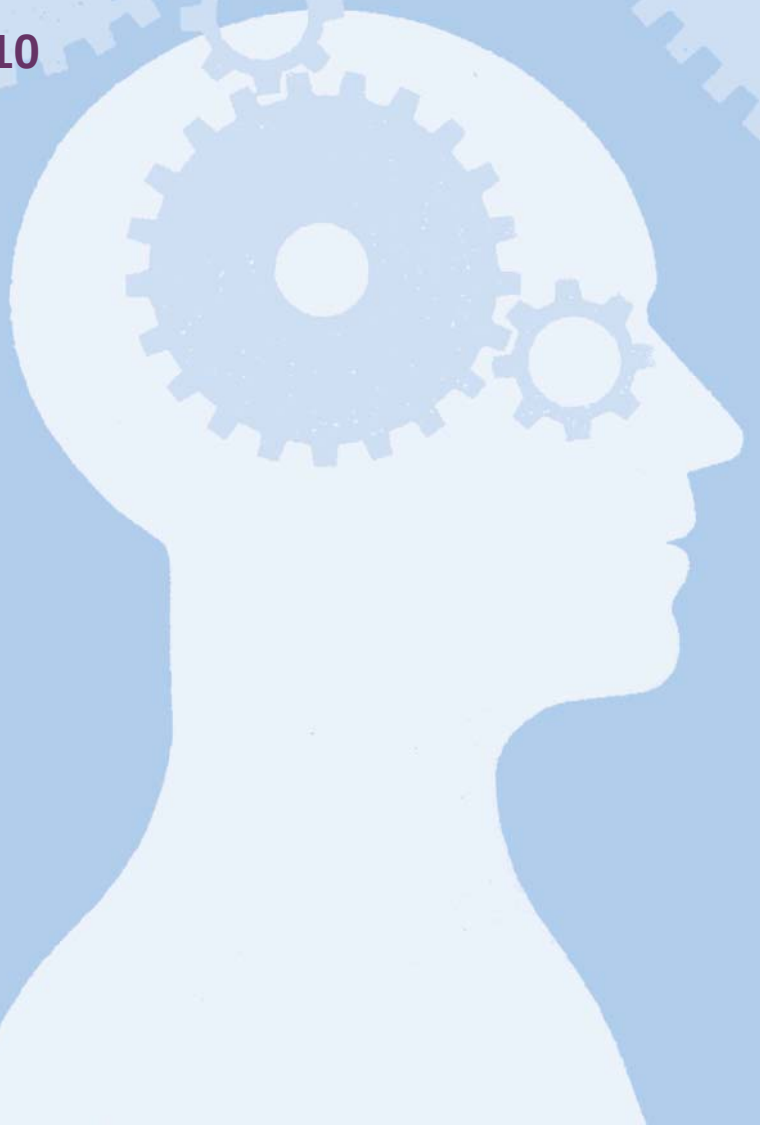
Oxera

What is the impact of financeability on the cost of capital and gearing capacity?

Prepared for
Energy Networks Association

June 9th 2010



Executive summary

The pressures on UK regulated energy networks and the expectation that capital expenditure (CAPEX) will have to increase in response to these pressures mean that the probability and severity of financeability difficulties are likely to increase. In this context, it is appropriate to consider whether reforms could deliver improvements over the current financeability framework. The 'strawman' advanced by Ofgem is a useful device for considering reforms to the financeability framework as it could be viewed as representing one end of the spectrum of possible reforms. Understanding the implications of the strawman can therefore indicate the maximum impact that any reforms could have.

The proposals in Ofgem's strawman contain a key assumption: provided that the cost of capital is estimated correctly, there is not a financeability problem. Any mismatch in the timing of cash flows from customers and cash flows to providers of capital can therefore be addressed by the company through raising additional equity in the short term and increasing equity distributions when cash flows increase in the long term. Under this scenario, which is consistent with a pure 'Modigliani–Miller' model of corporate finance, there is no need to re-profile revenue to reduce the cash-flow mismatch. The implication of the strawman is that companies will face a cash-flow profile with longer duration—the weighted average time to receipt of each cash flow—as short-term cash flows are reduced and long-term cash flows are increased.

In principle, it is correct for companies to use a mix of debt and equity funding in their long-term capital structures, and to adjust these proportions dependent on CAPEX requirements. The fundamental issue in the regulatory context is then to determine the weighted average cost of capital (WACC). Critically, the strawman assumes that there is no *a priori* reason to believe that the cost of capital would change significantly were the strawman to be implemented, but states that this is an empirical issue. This report reviews the empirical evidence to provide a background against which to understand the relationship between duration of cash flow and the cost of capital.

However, the challenge of using capital market evidence for UK regulated utilities to make this inference is that the evidence is drawn from a period when the existing financeability framework was in place. Therefore, it is important to consider in greater detail the mechanisms by which the strawman proposals could affect the cost of capital, and to use this framework to understand what theory and evidence can indirectly say about the core proposition: that there is unlikely to be a material change in the cost of capital under the strawman. Therefore, the question of what the impact on the cost of capital is requires a more complex framework of analysis. The approach followed in this report is to consider the mechanisms by which the strawman could affect the cost of capital.

The mechanisms are developed around a number of assumptions implicit in Ofgem's strawman:

– the increase in the duration of cash flows does not lead to a higher cost of capital;

– there is no increased risk from transferring cash flows from one regulatory cycle to another—ie, there is no 'time-inconsistency problem';

– Ofgem has measured the WACC correctly and there is no need for financeability as a cross-check;

– the definition of an efficiently financed company does not change under the strawman (ie, there is no change to the efficient level of gearing in the notional capital structure);

– there is a class of investors who are willing to provide an external source of finance at no incremental cost due to the increased duration of the cash flows.

There are strong theoretical and empirical grounds for why these assumptions do not hold in practice. Extending the duration of cash flow is likely to increase the risk exposure of the regulated company. However, the mechanisms by which duration translates into increased risk exposure are complex, and hence there is a requirement to go beyond standard models of the cost of capital. More advanced models that take into account time-varying components of risk suggest that duration will have three effects on the cost of capital:

– a **term premium effect**, resulting from the increased sensitivity of the value of the stream of cash flows to interest rates;

– a **beta effect**, resulting from the increased sensitivity to the market price of risk, as measured by the Sharpe ratio;

– a **time-inconsistency effect**, resulting from the increased probability of events not covered by the 'regulatory contract'.

The term premium effect is analogous to the higher returns generally observed on average over the long term for long-maturity relative to short-maturity bonds. This effect means that the cost of capital will increase with the duration of cash flows.

Existing theoretical models, such as in Brennan and Xia (2006), suggest that duration is positively correlated with beta due to increased sensitivity to the market price of risk, as measured by the Sharpe ratio. However, the impact on required returns for a particular security is dependent on the sensitivity of short-term cash flows to market returns. In this framework, the relatively low covariance of a regulated utility's cash flows suggests that, based on the long-run average term premium for the UK of 1% and assuming for consistency an equivalent decrease in the equity risk premium, the term premium effect could increase the cost of capital by an order of magnitude of 60 basis points (bp).

Relaxing the assumptions of the Brennan and Xia framework—that shocks to cash flows are persistent and hence revert to a long-run average, and that new information reveals more about short-term than long-term cash flows—and replacing them with more plausible assumptions for regulated companies subject to periodic price reviews, the increase in the cost of capital from extending duration is likely to be exacerbated.

Furthermore, due to the inability of the 'regulatory contract' to cover all possible circumstances, and hence to provide complete certainty over future cash flows, there is a time-inconsistency problem. Regulators are unable to give a binding commitment that future regulators will honour in full pledges made today about the recovery of investment costs. Investors would be expected to require a premium as compensation for this risk, although the size of the premium is difficult to quantify.

In addition to impacts on the cost of capital, the strawman has a number of further implications.

– Given that getting the cost of capital correct is critical to mitigating financeability problems and the challenges of achieving correct estimation through the capital asset pricing model (CAPM) alone, there is a role for financeability tests and subsequent adjustments to allowed rates of return if problems are detected.

– The higher business risk under the strawman suggests that the efficient level of gearing assumed in the notional efficient capital structure may have to be reduced. This would have implications for transitional costs and the lower value of the tax shield of debt. Illustrative analysis based on DPCR5 parameters suggests that a decrease in the

notional level of gearing could, at least in the short run, increase the post-tax cost of capital by an order of magnitude of 40bp.

– An extended-duration cash-flow profile—particularly one where, in the short term, cash flows could be substantially negative—is likely to entail a change in the investor base. This is likely to generate transaction costs as a result of having to access external sources of funds. The change in the investor base would, however, be unlikely to mitigate the market price of an increase in required returns as a result of extending the duration of cash flows. Furthermore, while, in theory, there should be sufficiently large demand for utility equity, equity analysts and investors interviewed as part of this project suggested that the pool of equity available to support the market in utility equity may be limited given the changes to the cash-flow profile implied by the strawman.

A number of recommendations follow from this report.

– The drivers of the cost of capital for a regulated utility are complex, particularly as returns on investments in long-lived assets are major factors determining risks and returns. Standard approaches to estimating the cost of capital appear to lack the flexibility to model companies that are significantly different from the average, such as regulated utilities. In particular, where the source of risk is more from cash flows in the long term rather than cash flows in the short term, there is a role for insights from intertemporal models to refine estimates of the cost of capital. This report sets out some of the ideas that could underpin a new approach to understanding the cost of capital for regulated utilities.

– Insights from alternative approaches could also assist regulators to estimate the cost of capital where there is a lack of data on listed equity for regulated utilities. This could help ensure that the cost of capital is set appropriately given both current market conditions and the size of a regulated company's CAPEX programme. Progress on this issue could have benefits in terms of placing less emphasis on financeability tests as a cross-check on the cost of capital.

– Financeability checks still have a role to play in ensuring that the overall allowed return is set at an appropriate level. However, these checks could be refined by considering what is the optimal set of financial metrics, and over what time horizon these metrics should be assessed.

– Mechanisms to improve commitment can be tailored according to the three aspects of the time-inconsistency problem referred to in this report. Rules to limit the discretion of future regulators and measures to give greater security around the value of the regulatory asset value (RAV) would be expected to have some impact on reducing the premium that investors require as compensation for the time-inconsistency problem. These mechanisms could help to mitigate the impact on the cost of capital of extending the duration of cash flows.

Notwithstanding these recommendations, this report shows that there are strong theoretical and practical reasons why the assumption implicit in Ofgem's financeability proposals—that the strawman will not have a significant impact on the cost of capital—is likely to be breached in practice. The potential for mechanisms to improve commitment is limited to some mitigation of the time-inconsistency problem and does nothing to address the link between duration and the cost of capital that exists independently of the regulatory regime. Asset pricing models that capture the relationship between duration and the cost of capital suggest that Ofgem's proposals are likely to materially increase the cost of capital for regulated energy networks.

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1 Introduction

The UK regulated energy networks face significant challenges in the delivery of policy objectives in the areas of energy security and climate change. The substantial future investment requirements combined with the constraint of sharing the burden fairly between current and future generations of consumers, suggest an increase in the likelihood and severity of financeability problems. In this context, it is appropriate to consider whether alternative approaches are likely to deliver improvements over the current financeability framework in the following areas:

– greater transparency and certainty around the regulatory approach to resolving financeability problems;
– sharper incentives for companies to organise their operations and finances efficiently;
– mitigation of unnecessary increases in the probability and cost of financial distress.

Alternatives to the current framework that might be considered for resolving financeability issues lie along a spectrum. Ofgem published its strawman proposals on reforming the financeability framework for the regulation of energy networks on January 20th.[1] The strawman represents what could be seen as one end of this spectrum—where there is no regulatory intervention to alleviate financeability issues. Therefore, the strawman is a useful device for analysing the maximum potential impact on the cost of capital and gearing capacity from reforming the current financeability framework. Understanding the risk and size of any potential changes to the cost of capital under the strawman is therefore a necessary pre-condition for evaluating the whole range of alternative approaches that could be taken towards financeability.

In principle, it is correct for companies to utilise a mixture of debt and equity funding in their long-term capital structures, and to adjust these proportions dependent on CAPEX requirements. The fundamental issue in the regulatory context is then to determine the WACC. In setting out the strawman, Ofgem states that the impact of its propositions on the cost of capital is an empirical issue.[2] The implication is that there is no *a priori* reason to expect a significant probability of a material change in the cost of capital. The Energy Networks Association (ENA) has commissioned Oxera to assess this proposition and to investigate the potential impact of the Ofgem strawman proposals on the cost of capital and gearing capacity of regulated energy networks.

This report sets out the Ofgem strawman proposals and the explicit assumptions Ofgem makes about the cost of capital for a regulated company. First, the empirical evidence is reviewed to understand whether there is any evidence on the extent to which cash-flow profiles matter for a regulated energy network. Next, the series of implicit assumptions required for there not to be a material probability of a significant change in the cost of capital under the strawman proposals, and the likelihood that these assumptions hold in practice, is investigated. Finally, additional implications of the strawman are explained, including the robustness with which the allowed rate of return is estimated, the impact on the level of gearing assumed in the notional capital structure, and the impact on the nature of the investor base.

As part of this assignment, Oxera conducted a series of interviews on a non-attributable basis with credit rating agencies and debt analysts, equity investors and analysts, with a view

[1] Distribution and transmission networks for both gas and electricity.

[2] Ofgem (2010), 'Regulating Energy Networks for the Future: RPI-X@20: Emerging Thinking – Embedding financeability in a new regulatory framework', January 20th, para 4.19.

to testing hypotheses on the likely reaction of a wide range of financial market participants if Ofgem's proposals on financeability were to be implemented.

The approach in this report is designed to address the questions of how and why the cost of capital might change, rather than to provide an estimate of the expected magnitude of the change. This is because the multi-fold and inter-related potential impacts of reform do not readily lend themselves to an alternative approach whereby impacts in the counterfactual scenario (where little or no weight is placed on financeability metrics) are modelled in a stylised framework. Therefore, the approach in this report is to ground the analysis in theory and evidence, rather than modelling and assumptions, thus recognising the imperfections and the reality of capital markets.

1.1 What drives the financeability problem?

When a company is forecast to have problems in generating sufficient cash flow to cover its CAPEX and payments to debt holders, it can be described as having a financeability problem. One of the drivers of financeability problems for utility companies is the way in which the majority of the UK regulatory regimes provide companies with deferred compensation for inflation.

Price-regulated utilities receive a level of revenue that is equivalent to a given real rate of return in any given year, and receive compensation in arrears for inflation through indexation of the RAV over time. When CAPEX is high, the difference between the forecast cash inflows from the allowed real rate of return, depreciation of the RAV and OPEX, compared with cash required to cover obligations to providers of capital, can decrease such that thresholds for credit rating metrics are breached.[3] Traditionally, when such circumstances have appeared likely, Ofgem has re-profiled revenues on an NPV-neutral basis to advance cash flows from future periods to ameliorate the expected financeability problem.[4]

The key implication of the strawman is that in the absence of revenue re-profiling, the company will be able to mitigate financeability problems through NPV-neutral transactions in the capital markets. In practice, this is likely to entail injecting equity to cover shortfalls and then returning the additional equity to investors when cash flows improve in the future. Such an approach would be valid if a pure Modigliani–Miller (MM) view of the effects of dividend policy and capital structure is correct.[5] Specifically, in a pure MM framework, investors are indifferent between receiving dividends or capital gains that represent the change in the net present value of dividends in the future. The value of the company is also invariant to the capital structure if a pure MM framework holds.

While this is a theoretically appealing proposition, as the analysts and investors interviewed as part of this study agreed, if a pure MM framework does not hold (ie, in a world with capital market frictions), the timing of cash flows and dividends could have a material impact on the company's cost of capital. Different cash-flow profiles that have the same net present value if discounted at the same cost of capital, may, nevertheless, have different NPVs to the investors if changing the cash-flow profile has consequences for the cost of capital and the gearing capacity of the company. The critical implication is, therefore, that financeability problems will not arise **provided the cost of capital is appropriate for the cash-flow profile**.

[3] For more detail see Oxera (2006), 'Testing for financeability: an assessment: Report prepared for Water UK', March.

[4] Ofgem has achieved this by 'tilting' depreciation—essentially shortening regulatory asset lives.

[5] Modigliani, F. and Miller, M.H. (1958), 'The Cost of Capital, Corporation Finance and the Theory of Investment', *American Economic Review*, **48**:3, June, pp. 261–97 and Modigliani, F. and Miller, M.H. (1963), 'Corporate Income Taxes and the Cost of Capital: A Correction', *American Economic Review*, **53**:3, June, pp. 433–43.

1.2 Ofgem's strawman

An important assumption in Ofgem's strawman financeability proposals is that:

> If both the allowed return and the depreciation allowance are set appropriately, the notional company should be financeable.[6]

The elements of this assumption that relate to setting the depreciation profile and actually measuring the allowed return, raise a number of complex issues. However, this report focuses instead on the implication of the strawman that there is no *a priori* reason to expect the proposals to have an impact on the cost of capital.

At present Ofgem models the cash flows expected for each regulated company over the next price control period. These cash flows are based on the price cap determined by the regulator and forecasts for volumes and expenses (operating, capital and financing). Ofgem models a notional company rather than an actual company, based on its assessment of how an efficient company would structure its finances. Specifically, this entails Ofgem making assumptions about the appropriate levels of the following parameters for an efficiently operated and financed company:

– the cost of equity and the cost of debt;
– the level of gearing at the start of the price control period;
– the proportion of debt that is index-linked at the start of the price control period;
– the proportion of debt raised during the control period that is index-linked.

Traditionally, Ofgem has used this approach to assess whether, for a given credit rating, a company would meet the rating agencies' thresholds in terms of standard metrics such as funds from operations (FFO) to debt, interest coverage and gearing. Ofgem applies judgement in this assessment, and does not require that the notional company meets 'pre-specified target values for defined ratios in all years.'[7] Nevertheless, these thresholds are significant because, if breached, they could lead to a credit rating downgrade and an increase in the borrowing costs for the notional company. This increase in borrowing costs could be interpreted as infringing Ofgem's statutory duty to enable companies to access finance on 'reasonable terms'.[8]

Ofgem's strawman proposals imply that there would no longer be any compensatory adjustment to revenues if the actual company faced financing difficulties associated with:

1) a financial structure significantly different to the notional structure;

2) inefficiency;

3) a mismatch in the timing of its cash flows.[9]

The first two conditions for not providing revenue adjustments are relatively uncontroversial, although there may be doubt over whether it is possible to determine unambiguously what constitutes an efficient financial structure for any given company, or even for a particular regulated sector.

The third condition effectively removes the financeability problem by assuming that, provided that the allowed return and depreciation allowance are set 'appropriately', any cash-flow deficit may be postponed to the end of the regulatory cycle or carried over to the next. Ofgem

[6] Ofgem (2010), op. cit., para 5.8.
[7] Ofgem (2010), op. cit., para 3.3.
[8] Ofgem (2010), op. cit., para 3.1.
[9] Ofgem (2010), op. cit., paras 5.9 and 5.12.

recognises that this proposal is likely to result in companies being cash-flow negative for a number of years, given both the size of CAPEX programmes expected for energy networks and Ofgem's proposals to move from the current system of accelerated depreciation towards economic life depreciation.

This has two consequences. First, in effect it increases the duration of a company's cash flows, and therefore the risk to investors, by making its value more sensitive to shocks to the discount rate. As a result, one would expect the company's cost of equity to increase, leading to a higher cost of capital. Second, in a world where regulatory commitment is explicitly for one regulatory cycle only, the third condition of the strawman exposes investors to increased regulatory risk. For example, in the case of Terminal 5, BAA and many financial analysts believed that there was a ten-year commitment to add a premium to the company's cost of capital. At the end of the five-year cycle, the Competition Commission made it clear that no such commitment either existed or could exist.[10]

A further benefit of a financeability test is that it can provide a cross-check on the cost of capital. Cost of capital estimation is imprecise, and checking that the allowed cash flows can support an assumed notional capital structure can be a useful complement to standard cost of capital estimation. This cross-check is particularly important given that since some regulators attribute a higher cost to underinvestment than to overinvestment, large errors in the cost of capital can be particularly costly.

1.3 Assumptions supporting the strawman

The implicit assumptions supporting the key assertion in the strawman—that there is not a financeability problem that requires the regulator to take action when there is a short-term deterioration in financial ratios—are as follows.

– The increase in the duration of cash flows—the weighted average time until the realisation of cash flows—does not lead to a higher cost of capital.

– There is no increased risk from transferring cash flows from one regulatory cycle to another—ie, there is no problem of time inconsistency.

– Ofgem has measured the WACC correctly and there is no need, as described earlier, for financeability as a cross-check.

– The definition of an efficiently financed company does not change under the strawman (ie, there is no change to the efficient level of gearing in the notional capital structure).

– There is a class of investors who are willing to provide an external source of finance at no incremental cost due to the increased duration of the cash flows.

This report assesses whether these assumptions are likely to hold in practice.

1.4 Structure of this report

The remainder of this report is structured as follows:

– section 2 presents a review of the evidence available to draw direct inferences about the link between changes to the financeability framework and the cost of capital;
– section 3 sets out the relationship between duration of cash flows and the cost of capital;
– section 4 outlines further implications of the strawman;
– section 5 concludes and provides recommendations.

[10] Competition Commission (2007), 'A report on the economic regulation of the London airports companies (Heathrow Airport Ltd and Gatwick Airport Ltd: Presented to the Civil Aviation Authority', September 28th.

2 Background evidence on cash-flow profile and the cost of capital

Ofgem states that the impact of its propositions on the cost of capital is an empirical issue, which will be investigated.[11] This section first considers the evidence available on the relationship between cash-flow profile, the cost of capital and investment incentives for an unregulated company in general, and finds that there is a wide body of empirical evidence that suggests that cash-flow profile matters. The section then focuses on the evidence available for UK regulated energy networks, and finds that there is weak evidence that cash-flow profiles matter for these companies specifically.

In terms of the cost of debt, the published methodologies of credit rating agencies suggest that short-run levels of cash-flow metrics are critical determinants of credit ratings. Moreover, the ability of the regulatory regime to ensure financeability of CAPEX programmes without recourse to external sources of finance is also identified as a key rating factor. Cross-sectional differences in credit spreads suggest that there is variation in company-specific risk across regulated utilities, which is consistent with variations in CAPEX intensity and cash-flow metrics across companies.

Capital market evidence for UK regulated utilities suggests that utility bonds are to some extent exposed to systematic risk, as indicated by the volatility of credit spreads around the time of economic crises. Therefore, any implications that extending the duration of cash flows has for equity betas and the cost of equity will also, to some extent, be applicable to debt betas and the cost of debt.

On the equity side, the exposure to total risk of regulated energy networks appears to be similar to low-risk unregulated companies. However, the total risk of energy companies appears to vary over time, potentially indicating that the arrival of new information about future cash flows is clustered around the periodic price reviews.

In terms of systematic risk, while regulated energy networks appear to have lower equity betas than the overall equity market, evidence from the 1990s suggests that equity investors in energy networks were still exposed to a significant amount of systematic risk over this period. In recent years, a lack of listed equity for energy networks means that there is less information about current levels of systematic risk exposure.

However, there is a fundamental consideration when using empirical evidence to answer the direct question of what might happen to the cost of capital were the strawman proposals to be implemented—all the available evidence from UK regulated energy networks is generated from time periods when regulatory frameworks that were supportive of advancing cash flows to address financeability concerns were in place. Therefore, the evidence can only offer limited direct insight into the counterfactual, where the onus on resolving financeability problems is placed on the regulated companies.

2.1 Impact of cash-flow profile for an unregulated company

The cash-flow profile for an unregulated company would be expected to have an impact on the cost of debt; however, standard theory is less clear about the impacts on the cost of equity or investment incentives. This section outlines some of the empirical evidence on these relationships.

[11] Ofgem (2010), op. cit., para 4.19.

2.1.1 Cash flows and cost of debt

Spreads on corporate bonds are influenced both directly and indirectly by cash-flow metrics. The indirect effect occurs through the impact of cash-flow metrics on credit ratings. The link between stronger cash-flow metrics and higher credit ratings is confirmed by a number of studies. Blume et al. (2009) present descriptive statistics based on 7,324 observations between 1987 and 1995; these statistics indicate that average interest coverage ratio increases as the rating of the bond improves from BBB to AAA.[12]

While the majority of the impact of cash-flow metrics on the cost of debt is captured by the credit rating, a number of studies suggest that credit ratings and financial metrics provide different sets of information. Campbell and Taksler (2003) show that in a regression of cross-sectional variation in bond spreads on credit ratings and idiosyncratic firm-level volatility, both types of data have explanatory power.[13] Pogue and Soldofsky (1969) find a direct relationship between earnings coverage and bonds ratings. They refine the analysis to include only utility companies and find a positive, although less distinct, relationship between the two variables as well.[14]

More recent studies on the probability of default present evidence that cash flow is a significant predictor of default:

> … even though the market value of assets is the most significant predictor of the probability of default, **the firm's cash holdings have incremental predictive power over and above the effect of value**. Moreover, liquidity shortages increase the probability of default primarily for firms with restricted access to outside financing, whereas for unrestricted firms cash shortages are typically irrelevant.[15]

Significantly, the impact of cash shortages on the probability of default is heightened for companies with limited access to external sources of funds, highlighting the importance of utilities being able to access capital markets to manage their cash position.

2.1.2 Cash flows and cost of equity

In models of the cost of equity based on the standard CAPM, there is no role for cash flows in explaining the cost of equity. Nevertheless, there is a significant body of evidence that highlights the empirical shortcomings of the CAPM for explaining equity returns. As part of this literature, multi-factor models have identified a range of variables that are correlated with equity returns, including book-to-market ratios and size.

A wide range of explanations have been advanced to justify the role of these variables in driving equity returns. One category of explanations considers whether there is a relationship between default risk and systematic risk. For example, Fama and French (1995) find that firms with high book-to-market ratios have persistently poor earnings and are more financially distressed than other firms. This is posited as a theoretical explanation for the performance of the high-minus-low (HML) factor in multi-factor asset pricing models.[16] Alternatively, it has been suggested that default risk could operate on the cost of equity through the size factor.[17]

Regardless of the precise link between default risk and the cost of equity, the literature suggests that there is a reasonable probability that default risk is priced by equity investors. A short-term reduction in cash flow would therefore suggest either an increase in default risk

[12] See table III of Blume, Marshall E., Lim, Felix B. and Mackinlay, A.C. (1996),'The Declining Credit Quality of US Corporate Debt: Myth or Reality?', September, Rodney L. White Center for Financial Research Working Paper #3-98.

[13] Campbell, J.Y. and Taksler, G.B. (2003),'Equity Volatility and Corporate Bond Yields', December, Journal of Finance.

[14] Pogue, T.F and Soldofsky, R.M. (1969), 'What's in a Bond Rating', *Journal of Financial and Quantitative Analysis*, June, pp. 201–28.

[15] Davydenko, S. (2007), 'When do firms default? A study of the default boundary', working paper University of Toronto, August 1st, pp. 21–22.

[16] Fama, E. F. and French, K. R. (1995), 'Size and Book-to-Market Factors in Earnings and Returns', *Journal of Finance*, **50**:1, March, pp. 131–55.

[17] Vassalou, M. and Xing, Y. (2004), 'Default risk in equity returns', *The Journal of Finance*, **59:**2, April.

at the current level of gearing, and hence a higher cost of equity, or a decrease in gearing to mitigate the increased default risk.

2.1.3 Cash flows and investment

Standard theories of investment suggest that the only driver of investment is net present value—positive-NPV projects will be undertaken while negative-NPV projects will be rejected. However, empirical evidence suggests that cash flows are also an important driver of investment activity.

> Regression estimates … indicate that firms' investment decisions are sensitive to investment opportunities as proxied by market-to-book, but are even more sensitive to liquidity variables … Coefficients for liquidity variables are all positive and significant, which suggests firm investment decisions are sensitive to the availability of internal funds.[18]

Lamont (1997) also finds that large decreases in cash flow decrease investment, based on a study of oil firms and the negative oil price shock in 1986.[19]

Cash flows could vary because of changes in financial structure as well as changes in the operational environment—lower levels of cash flow could reflect higher gearing rather than weaker generation of cash from operations. However, this effect has been tested in the literature:

> Despite the relevance of firm leverage, the cash flow coefficients remain virtually identical for all of the groups, which is the primary concern of the present study. This evidence suggests that the observed pattern of investment liquidity-sensitivities is not attributable to a *leverage effect*.[20]

A relationship between lower cash flows and lower levels of investment is therefore supported by empirical evidence, after controlling for the impact of gearing on cash flows.

2.2 Impact of cash-flow profile for a regulated company

While the relationships between cash-flow profile and the cost of capital outlined in section 2.1 may hold for an unregulated company in general, different circumstances mean that such relationships would not necessarily be present for a price-regulated company. This section considers the approach adopted by credit rating agencies and the significance placed on cash-flow ratios for utilities. The section also considers capital market evidence on the cost of debt and equity to examine the level and nature of risk faced by investors in regulated utilities.

2.2.1 Cost of debt

The methodology applied by credit rating agencies is to assess the creditworthiness of an issuer based on both financial and business risk. A variety of quantitative and qualitative evidence is used in this assessment. In the case of regulated utilities, the nature of the regulatory regime is a critical rating factor. Furthermore, credit rating agencies take into consideration the degree to which the regulator is required to ensure the financeability of regulated companies.

> … regulators in jurisdictions with high institutional strength are usually required to ensure that efficient companies remain financeable.[21]

[18] Cleary, S. (1999), 'The relationship between firm investment and financial status', *The Journal of Finance*, **54:**2, p. 685.
[19] Lamont, O. (1997), 'Cash flow and investment: evidence from internal capital markets', *The Journal of Finance*, **52:**1, p. 105.
[20] Cleary, S. (1999), 'The relationship between firm investment and financial status', *The Journal of Finance*, **54:**2, p. 687.
[21] Moody's Global Infrastructure Finance (2009), 'Global Regulated Water Utilities', December, p. 41.

While an assessment of the impact of the regulatory regime on creditworthiness is a significant driver of credit ratings, a variety of financial ratios are also important for utility credit ratings. These ratios are awarded significant weight in the analysis.

> As credit metrics are already adjusted to reflect a generally high degree of debt capacity of a regulated water utility, they are assigned a relatively high weighting [in determining the credit rating], accounting for 40% of the final score.[22]

The particular set of ratios that ratings agencies focus on is different for utilities compared with corporate issuers more generally. Specifically, significant emphasis is based on cash-flow ratios that describe an issuer's capacity to meet its financial and CAPEX obligations, with S&P identifying 'support for a reasonable cash return on investment' as a key driver of a regulatory regime that is supportive of credit ratings.[23]

> The final set of factors in our assessment of regulatory environments is arguably the most important. The phrase "cash is king" can be overused, but it does highlight an essential part of the credit analysis. A regulatory jurisdiction that recognizes the significance of cash flow in its decision making is one that will appeal to bondholders. Generating cash is a function of the actions of utility management, but the regulator can supply (or withhold) the tools that can affect the company's essential ability to actually realize the intended level of cash flow.[24]

The importance of cash-flow-based metrics for evaluating regulated utilities is common across ratings agencies.

> In Fitch's view, cash flow-based analysis provides the most accurate assessment of an issuer's ability to fund its business operations and meet debt service. Fitch ascribes greater importance to cash flow measures than to other more traditional earnings and capital structure indicators that play a secondary role in the rating analysis.[25]

This is supported by evidence on the relationship between credit ratings and interest coverage ratios for UK utilities, as provided in Figure 2.1, which depicts a generally positive relationship between the FFO to interest ratio and credit ratings for UK regulated utilities.

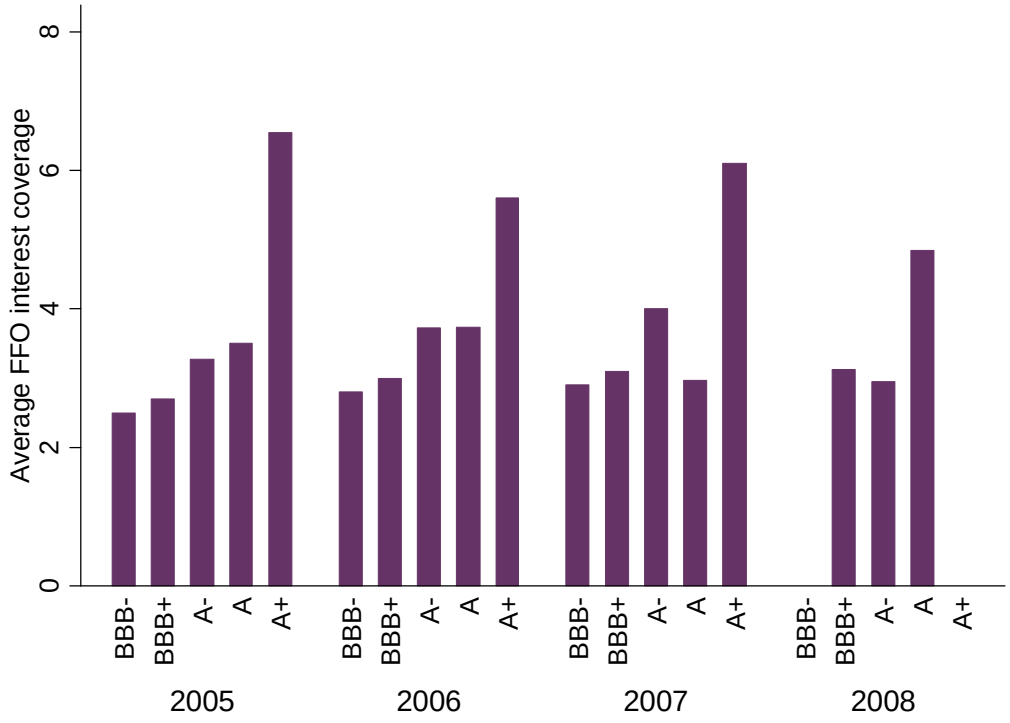
[22] Moody's Global Infrastructure Finance (2009), 'Global Regulated Water Utilities', December, p. 6.

[23] Standard & Poor's (2008), 'Key Credit Factors: Business and Financial Risks In the Investor-Owned Utilities Industry', November 26th, p. 8.

[24] Standard & Poor's (2007), 'Assessing U.S. Utility Regulatory Environments', November 7th, p. 6.

[25] FitchRatings (2007), 'Credit Rating Guidelines for Regulated Utility Companies', July 31st, p. 10.

Figure 2.1 FFO/ICR by rating



Source: S&P reports and Oxera analysis.

Under the Ofgem strawman proposals, the cash-flow ratios of companies with large CAPEX programmes would be expected to weaken in the short run, threatening credit ratings.

> … companies facing a very large investment programme compared to their asset base and/or projects of high technical complexity would score at the lower end of the spectrum.[26]

The degree to which the regulatory regime is viewed as providing the conditions to support cash-flow metrics throughout periods of intensive CAPEX, is taken into consideration by credit rating agencies.

> Especially during upswings in the capital expenditure cycle, such as we are experiencing now, a jurisdiction's willingness to support large capital projects with cash during the construction phase is an important aspect of our analysis.[27]

Importantly, it appears that credit rating agencies draw a distinction between issuers that are able to finance their CAPEX programmes with internally generated cash flows, and issuers that are likely to require access to external sources of funds.

> … we view positively the financial flexibility enjoyed by a utility with limited capex requirements easily funded by internally generated cash flows. Such a company would not need to access the markets to raise additional finance and may have a wider range of options to react to changing economic circumstances.[28]

Due to the requirement to maintain an investment-grade credit rating, and the similarities in the business and regulatory environment within which regulated utilities operate, the debt

[26] Moody's Global Infrastructure Finance (2009), 'Global Regulated Water Utilities', December, p. 15.
[27] Standard & Poor's (2007), 'Assessing U.S. Utility Regulatory Environments', November 7th, p. 6.
[28] Moody's Global Infrastructure Finance (2009), 'Global Regulated Water Utilities', December, p. 21.

spreads of bonds issued by regulated utilities would be expected to be clustered. Inspection of spreads on utilities' bonds measured over the period 1995–2010 (Figures A1.1—A1.3) indicates two features.

– Since 1997, there has been a spread of approximately 50bp between the highest and lowest bond yields. This suggests that bond investors' perception of the risk of utility debt varies across companies. Although there could be multiple explanations for this variation, including differing proportions of regulated and unregulated activities, the spread is consistent with the finding of Figure 2.1, that differing cash-flow metrics have an impact on credit ratings for utilities.

– The volatility in spreads around times of economy- and market-wide crises (emerging markets crisis in 1998; technology and telecoms boom in late 2000; financial crisis of 2008 and 2009) is notable in that it indicates that the cost of debt for utilities is sensitive to economy-wide changes in the perception of risk. While it is likely that utility debt supported by regulated cash flows is currently viewed as low risk relative to other corporate issuers, it is not viewed as risk-free. Indeed, as well as requiring a risk premium in 'normal' market conditions, in times of crisis, utility bond investors demand an increased risk premium, suggesting that there is a systematic component to the cost of utility debt.

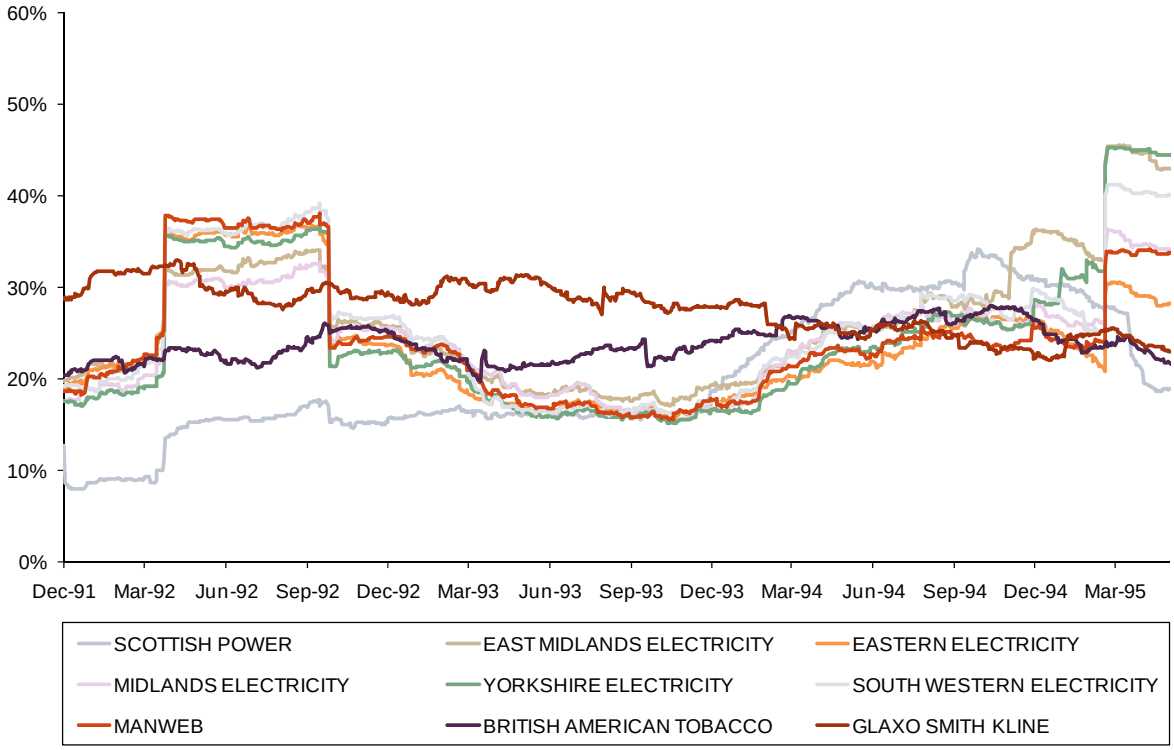
In summary, the methodologies published by credit rating agencies for assessing regulated utilities suggest that short-run levels of cash-flow metrics are significant factors when determining credit ratings. This is supported by descriptive statistics on the relationship between interest coverage and credit rating for UK utilities. The evidence on bond spreads for utilities is consistent with cross-sectional differences in the cost of debt being driven by differences in CAPEX programmes and cash-flow metrics. Furthermore, while utility bonds may be low risk relative to the average corporate bond, the volatility observed during crises over the past 15 years is indicative of a systematic component to the cost of debt for utilities. Therefore, any implications that extending the duration of cash flows has for equity betas and the cost of equity will also, to some extent, be applicable to debt betas and the cost of debt.

2.2.2 Cost of equity

Analysis of the share price patterns exhibited by UK regulated energy networks is restricted by the paucity of listed companies in recent years. However, Figure A1.4 presents share price evidence for a sample of companies with regulated and unregulated activities in the energy sector compared with a couple of relatively low-risk non-utility companies over the period 1991–95. The figure suggests that at certain points the share prices of energy utilities have experienced peaks in volatility that were not experienced by either of the non-utility companies.

Share price volatility indicates the level of total risk to which equity investors are exposed. Figure 2.2 examines volatility of share prices directly for seven listed energy networks compared with two relatively low-risk non-utility companies, and indicates that while the difference in volatility between listed energy networks and low-risk non-utility companies is, on average, low over the period, the patterns of volatility are different. In particular, volatility is relatively constant over time for British American Tobacco and GlaxoSmithKline, whereas for energy networks, volatility appears to follow a cycle. This suggests that the nature of risk faced by regulated utilities is different to that faced by unregulated companies more generally, potentially reflecting the impact of periodic price reviews.

Figure 2.2 Annualised volatility of share prices—six-month rolling data

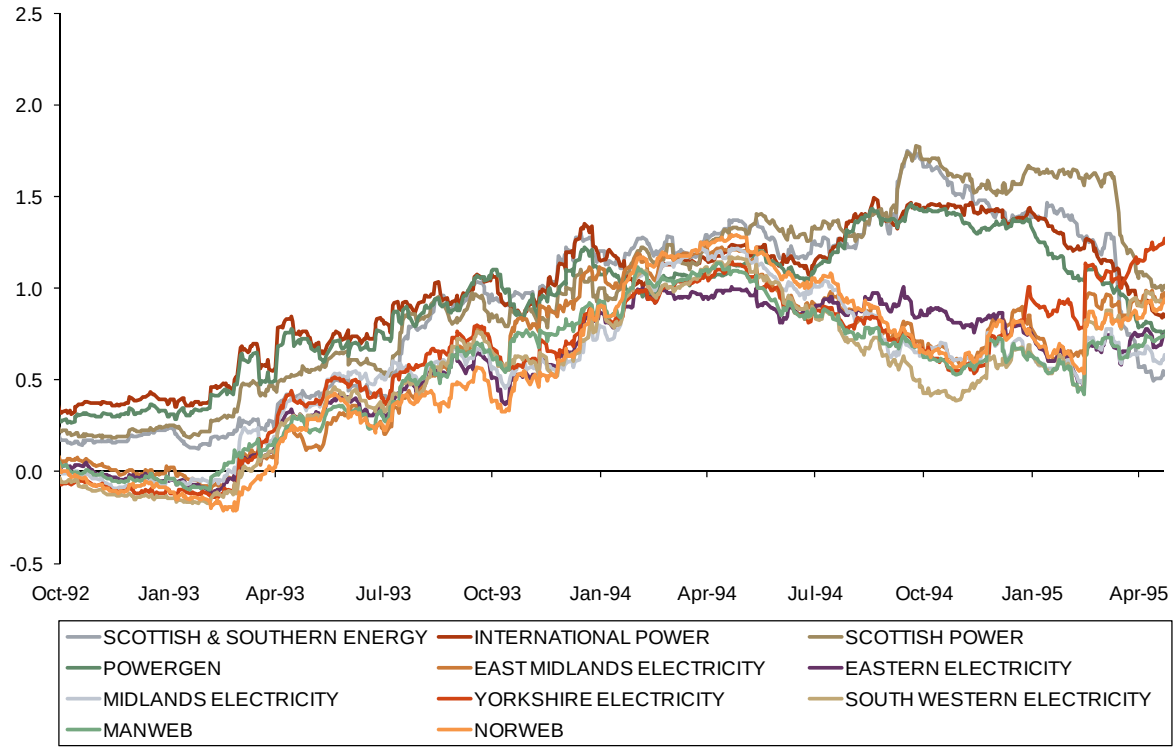


Source: Datastream and Oxera analysis.

The total risk of equities can be separated into systematic and company-specific components. Figures A1.1–A1.3 suggest that for UK regulated utilities, both components are significant for the cost of debt, due to the volatility of spreads around the time of economic crises and the cross-sectional dispersion of spreads.

Figure 2.3 provides a simple and high-level calculation of rolling equity betas for a sample of energy companies. The figure is intended to illustrate stylised facts rather than provide a thorough analysis of betas either at the level of individual securities or for the industry as a whole. Figure 2.3 indicates an increase in equity betas between 1992 and 1994. After 1994, the dispersion of equity betas increases, with some betas—mostly for companies with a significant proportion of generation activities—increasing to approximately 1.5, and others—mostly for network companies—decreasing to approximately 0.5.

Figure 2.3 Six-month rolling equity betas



Source: Datastream and Oxera analysis.

Although Figure 2.3 does not control for differences in levels of gearing, it does suggest that network companies have significant systematic risk exposure, albeit below the average for the equity market. Therefore, an equity investment in an energy network still has a significant amount of sensitivity to overall equity market returns, and consequently investors would require a risk premium as compensation.

Overall, the evidence on equity market data for listed energy companies suggests that their risk characteristics differ from non-utility equities. Specifically, energy companies appear to have greater company-specific risk than other low-risk non-utility equities. This risk appears to coincide with the periodic price reviews. While equity betas for listed energy utilities are below the market average, nevertheless, they suggest that energy networks have a significant amount of sensitivity to overall equity market returns.

3 Impact of longer duration of cash flows on cost of capital

The strawman proposal to avoid accelerating cash flows when financeability metrics are weak will increase the duration of cash flows. The time between cash outflows for investment and recovery of the cash through allowed revenues will be extended, and companies are likely to experience negative cash flows in the short run. Although the 'short run' is not defined in the strawman, for companies with large CAPEX programmes, cash-flow negativity could persist for a number of years.

Extending the duration of cash flows has three impacts on the cost of capital:

– a **term premium effect**, resulting from the increased sensitivity of the value of the stream of cash flows to interest rates;

– a **beta effect**, resulting from the increased sensitivity to the market price of risk as measured by the Sharpe ratio. For a regulated utility, on balance it is likely that the beta effect increases the cost of capital;

– a **time-inconsistency effect**, resulting from the increased probability of events not covered by the 'regulatory contract'—the impact on the cost of capital is likely to be positive, but is difficult to quantify.

Overall, the net effect of the extended duration of cash flows implied by the strawman is likely to be a material increase in the cost of capital for a regulated energy network.

3.1 Relationship between duration and cost of capital

A longer duration stream of cash flows will be exposed to a greater number of shocks, including shocks to the real economy, shocks to financial markets, and company-specific events (eg, the impact of volcanic ash on aircraft movements and hence revenues for BAA). The company will also be more exposed to regulatory and political changes (discussed separately in the next section). Therefore, it would be expected that a long duration stream of cash flows would be more risky than a short duration stream. This expectation was shared by the parties interviewed as part of this study, particularly the equity investors.

A more risky stream of cash flows suggests that an appropriate mixture of debt and equity funding is required. There is clearly a role for equity as a cushion for risks and a mechanism for incentivising companies. The fundamental issue is then to determine the impact of a longer duration stream of cash flows on the WACC.

The investors expressed the view that while a 'back-end loaded' cash-flow profile would be assessed by applying a higher rate of return to more distant cash flows than to nearer cash flows, the premium on the more distant cash flows is hard to quantify. However, the premium was felt to increase with the size of the negative cash flows in the short run and for the length of time before the cash flows reverse.[29]

As an example of the existence of a premium for back-end loading of cash flows, the comparison of 'greenfield' and 'brownfield' toll roads was made in the interviews. Equity investors highlighted that approximately a 5% premium is required for investing in the former rather than the latter. However, the investors suggested that a 5% premium would

[29] Practical issues such as the ease of co-ordinating a consortium of investors were also highlighted as potential influences on the premium.

substantially exceed the range of likely premiums on more distant cash flows for a regulated energy network.

3.1.1 Theoretical framework

While the expectation of the analysts and investors interviewed as part of this study was that increased exposure to risk is likely to change the rate of return required by investors, the usual model used to estimate the required return to equity—the CAPM—is unable to explain how the cost of capital might vary with duration. This is because the CAPM is a one-period model, and therefore by application to cash flows over multiple periods, any impact of the duration of cash flows on the equity beta will be inseparable from the impact of short-term systematic cash flow risk.

Research into the effects of duration on the cost of capital has therefore focused on alternative methods to the CAPM. Da (2009) uses a two-factor version of the consumption CAPM, estimated using the covariance of cash flows with the market return to replace the covariance of returns with the market return.[30] The model takes into account the impact of duration on the relationship between cash flows for the asset and returns for the market. The two-factor model, including duration, is found to explain up to 82% of the cross-sectional variation in average returns for portfolios sorted according to size and book-to-market ratios. However, the impact of duration on expected returns is dependent on the degree to which the cash flows to the security co-vary with the market returns in the short term.

Dechow et al. (2004) use a measure of implied equity duration to examine the interaction between duration, and beta and stock price volatility, and find that duration is positively correlated with both of these measures of risk.[31] An equity 'yield curve' is constructed based on plotting average realised annual returns against the measure of implied equity duration. The curve is downward-sloping as duration increases, suggesting that the expected return for the average equity decreases with duration. The authors note that this finding is consistent with the analysis in Brennan and Xia (2006), where expected returns may be either an increasing, decreasing or non-monotone function of duration.[32] As discussed later in this section, in Brennan and Xia (2006) it is highlighted that the critical factor that determines how expected returns for a particular security vary with duration is the sensitivity of short-term cash flows to the market returns.

The practical implications of the research into duration and the cost of capital are provided by Cornell (1999), who undertook a case study of a US biotechnology company, Amgem, finding that despite operational performance having low correlation with the market, Amgen had a high beta.[33] This is consistent with the duration of cash flow being an important determinant of beta. Cornell notes that not only does this imply that longer-term projects will have a higher cost of capital, but that where it is not possible to measure beta directly and accurately, it will be important to allow for the impact of duration when using indirect methods such as cash flow and accounting betas.

The overall message from the research to date is that the impact of duration is significant and may be responsible in part for the empirical success of multifactor models due to correlations between duration, book-to-market ratios and/or size. However, this is an evolving area of research and the effects of duration on risk and required returns are complex. The findings from models of the impact of duration are sensitive to assumptions about the short-term sensitivity of cash flows to market returns. However, at this stage, the

[30] Da, Z. (2009), 'Cash Flow, Consumption Risk, and the Cross-section of Stock Returns', *Journal of Finance*, **64:**2, April.

[31] Dechow, P., Sloan, R. and Soliman, M. (2004), 'Implied Equity Duration: A New Measure of Equity Risk', *Review of Accounting Studies*, **9:**2–3, June.

[32] Brennan, M. and Xia, Y. (2006), 'Risk and Valuation under an Intertemporal Capital Asset Pricing Model', *Journal of Business*, **79:**1.

[33] Cornell (1999), 'Risk, Duration, and Capital Budgeting: New Evidence on Some Old Questions', *Journal of Business*, **72:**2.

overall effect on the cost of equity of extending duration can be simplified by separating it into term premium and beta effects.

3.1.2 Term premium

The term premium effect derives from the result that the NPV of a longer-duration stream of cash flows is more sensitive to changes in interest rates. This is because the compounding of the annual interest rate for more distant cash flows will also compound any changes in the interest rate. This sensitivity constitutes a non-diversifiable risk for investors in long-duration assets, as it is related to changes in the real economy.

Risk-averse investors will require a premium to compensate for non-diversifiable changes in interest rates. Such a premium will apply even for a stream of cash flows with low exposure to systematic risk. Indeed, in the limiting case of a risk-free bond, the premium for interest rate risk would still apply. This is the term premium that leads to an upward-sloping yield curve in theories of the term structure of interest rates.

However, at any point in time there may be either an upward- or a downward-sloping yield curve. Theories of the term structure of interest rates suggest that other factors, such as the expected path of future interest rates, are also significant for determining the shape of the yield curve. The impact of factors other than the term premium on the shape of the yield curve would be expected to reduce as the slope of the yield curve is averaged over a longer time period. For the UK, using a proxy for the slope of the yield curve based on the difference between realised returns on long-maturity government bonds compared with short-maturity bonds over the period 1900–2009, gives an estimate of 1.0% for the term premium.[34]

The additional premium over a shorter-maturity cost of capital represents compensation for interest rate risk, not equity market risk. Therefore, extending the duration of cash flows suggests that it is appropriate to use a higher risk-free rate in the estimation of the cost of equity. However, to maintain consistency between the parameters used to estimate the cost of equity, the increase in the term premium on the risk-free rate would have to be matched by an equal decrease in the market equity risk premium. The net effect on the cost of equity of an increase in the maturity of cash flows therefore depends on the equity beta.

Securities with a beta of less than one would be expected to have a cost of equity that increases with the duration of cash flows as the increase in the term premium exceeds the decrease in the equity risk premium for that security. As regulated energy networks would be expected to have equity betas lower than the average for the overall equity market, the net effect of an increase in the duration of cash flows and the associated increase in the term premium is likely to be an increase in the cost of equity.

As both the cost of equity and the cost of debt would be expected to be affected by the term premium, an approximation of the net impact on the cost of capital could be given by considering the impact for a 100% equity financed company. On this basis the impact on the cost of capital would be to increase the risk-free rate by the term premium and decrease the risk premium by the product of the term premium and the asset beta. Assuming an asset beta of 0.4, an effect of the term premium on the cost of capital of the order of 60bp would be expected.

3.1.3 Beta

The second effect on the cost of equity of extending duration is the impact on beta. In an intertemporal CAPM, the market price of risk (ie, the Sharpe ratio—the ratio of excess equity market returns to the standard deviation of returns) and the interest rate can vary over time. Brennan and Xia (2006) provide a theoretical framework which suggests that in addition to increasing the sensitivity of the asset value to the interest rate, extending duration also

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

increases the sensitivity of the asset to the market price of risk.[35] The market price of risk can be simply interpreted as the expected risk premium on the market normalised (ie, divided by) the variance of the market.[36]

Although the size of discount in the value of the asset, measured in units of currency, increases with duration, when the value discount is converted to a cost of capital and normalised by duration, the premium measured per year actually falls. The reason can be seen from the form of the coefficient on the Sharpe ratio—$D(\tau)/\tau$. The function $D(\tau)$ increases with maturity but, once normalised by the number of years, (τ), the annualised cost of capital actually decreases with maturity. It is as though that while investors require an absolute increase in risk premium for greater duration, this is not sufficient to offset the increase in duration so that when the absolute increase in risk premium is normalised by the number of years the cost of capital actually goes down for an averagely risky company.

Exactly the same effect is observed in the term structure of credit spreads where, for low quality, risky bonds (ie, non investment-grade or junk bonds), the term structure is typically downward sloping. The reason is that, when the price discount to par is large enough, then, even though the price discount does increase with maturity, it will not increase sufficiently fast with the change in maturity and, as a result, the credit spread on these risky bonds decreases with maturity.

Therefore, within the existing theoretical frameworks, the impact of extending duration can increase or decrease beta depending on the riskiness of the security and the short-term sensitivity of the cash flows for the security to the market returns.

3.1.4 Implications of the existing theoretical models for regulated utilities

The net effect of the term premium and the beta effects on the cost of equity depends on the relative sizes of the risk-free and equity premium components. Brennan and Xia (2006) show that the critical parameter that resolves this question is the degree of sensitivity of the asset's cash flows to the market return. Cash flows for a regulated utility might be expected to have a relatively low sensitivity to the market return.

The separate impacts of the term premium, the sensitivity to the Sharpe ratio, and the sensitivity of cash flows to the market return can also be estimated through disaggregation of the one-period CAPM beta. Campbell and Mei (1993) use an accounting identity describing equity holding period returns to estimate the three separate components of the CAPM beta.[37] The authors undertake the exercise for equities covering a variety of industries.

Specifically, Campbell and Mei (1993) disaggregate the CAPM beta into: cash-flow beta, excess return beta, and real interest rate beta. The cash-flow beta measures the short-run sensitivity of a company's cash flows to the overall equity market returns. The excess return beta reflects the sensitivity of long-run expected returns for the equity to the market return, and the real interest rate beta captures the relationship between the real interest rate and the market return.

The three betas all contribute positively to the overall CAPM beta. The Campbell and Mei estimates of the relative contributions of each beta vary according to the industry. For utilities, the majority of the overall CAPM beta is determined by the excess return beta—comparable to the Sharpe ratio sensitivity in the Brennan and Xia (2006) framework—and the cash-flow beta is not statistically significantly different from zero. The real interest rate beta provides a small positive contribution to the overall CAPM beta. These results are

[35] Brennan, M. and Xia, Y. (2006), 'Risk and Valuation under an Intertemporal Capital Asset Pricing Model', *Journal of Business*, **79:**1, p. 18, equation 33.

[36] Here ϕ represents the discount rate applied to a cash flow with maturity τ. As the equation shows, the discount depends linearly on both the real interest rate (r) and the Sharpe ratio (η).

[37] Campbell, J. and Mei, J. (1993, 'Where do betas come from? Asset price dynamics and the sources of systematic risk', *Review of Financial Studies*, **6:**3.

consistent with the higher term premium associated with longer duration offsetting any reduction in the exposure to equity market risk.

The overall impact of increasing the duration of cash flows for a regulated utility is therefore likely to be an increase in the cost of equity equal to the impact of the term premium, plus a positive contribution from the increased weight that increased duration places on the excess return beta relative to the cash-flow beta. It is uncertain from the existing theoretical frameworks how large the latter effect could be.

3.1.5 Implications for the cost of capital in a less restrictive theoretical framework

The result that for certain companies the annualised premium for sensitivity to the Sharpe ratio may decrease with duration is dependent on two key assumptions.

First, is the assumption that all shocks (to cash flows, the Sharpe ratio and the interest rate) are not persistent and revert to their long-run average levels over time. Mean reversion has the effect of diminishing the impact of a current shock on the current value of an asset. While this may be a reasonably accurate description of an unregulated company, it is less likely to apply to a price-regulated company where the path of future expected cash flows may be subject to step changes at each price review, with more limited prospects for mean reversion.

Second, is that the relationship between beta and the duration of cash flows is also sensitive to the rate at which new information about future cash flows arrives. For example, when the price of an asset such as a commodity is mean-reverting, new information reveals more about current than future cash flows. In contrast, when an asset currently has zero or negative cash flow but there is a positive probability of generating positive cash flow at some point in the future, new information reveals more about future than current cash flows.

For the latter type of asset, the longer the duration of the cash flow, the greater the proportion of any new piece of information that relates to future rather than current cash flows. This latter information structure may more accurately represent the situation of a regulated utility undertaking a substantial CAPEX programme, which would suggest that the cost of capital will increase with duration. For example, information about the likely outcome of a price review will have no impact on short-term assets that terminate before the review, but will have an impact on assets that straddle multiple review periods.

Therefore, in the models that predict that the cost of equity could decrease with duration for high levels of short-term cash flow covariance with market returns, the assumptions about mean-reversion and the rate of information arrival about future cash flows may not accurately describe the situation of UK regulated energy networks. Under more plausible assumptions that reflect the regulatory context of periodic price reviews, the result that for low levels of short-term cash flow covariance the beta is likely to increase with duration could be exacerbated.

3.2 The time-inconsistency problem

Regulators cannot comprehensively bind the actions of their successors or offer commitment that cash flows expected at the time of investment will, on average, materialise in the future. In particular, there is a problem of time-inconsistency whereby, at the time when investment is required, the priority is for the regulator to set a rate of return and forecast a depreciation profile adequate to remunerate the investment. Once the capital is sunk, the objective of reducing prices may assume a higher priority than allowing the company to recover the full value of the investment. This presents a critical downside risk faced by those investing in regulated utilities, as expressed by Colin Mayer in his recent Beesley Lecture:

> During periods of high capital expenditure requirements, regulators seek to promote investment by offering high rates of return. However, once the capital is sunk then there are strong political forces encouraging regulators to claw back as much as possible by

> offering lower rates of return. Even if they feel compelled to follow rules that prevent that from happening, they cannot bind their successors and there is therefore no way in which the regulatory system can provide long-term commitments to firms about allowed rates of return. In the absence of long-term contracts (implicit or explicit), firms are discouraged from undertaking long-term investments.[38]

The nature of the time-inconsistency problem may vary according to the uncertainty generated by an inability to commit. Specifically, the time-inconsistency problem may vary according to:

– uncertainty about how the regulator will act in the future, given the current regulatory framework;
– uncertainty about how the regulatory framework may resist political pressure;
– uncertainty about how to address events not covered by the current regulatory framework.

Separating the time-inconsistency problem into these categories can help to understand to what extent mechanisms may be designed to reduce the impact of the problem.

3.2.1 Future regulatory actions

The first aspect of the time-inconsistency problem is the evolution of the interpretation of the regulator's statutory duties within the existing regulatory framework. The example of BAA has already been cited, where an uplift to its Terminal 5 cost of capital was promised over two regulatory cycles, which was subsequently discontinued after the first regulatory cycle.

> BAA told us that although the CC cannot bind its successors, the two uplifts should also be applied to Q5, on the basis that:
>
> (a) There was an understanding that the Q4 uplifts were to remain in place for two quinquennia (Q4 and Q5). BAA told us that, as documented in board papers and minutes, there was an expectation by BAA management at the time of the Q4 determination that the uplifts were for ten years. We acknowledge that there is a tension between setting the cost of capital for five years at a time and the long economic life of some of BAA's assets (eg 40 years or more); however, no commitment was given by the CC in Q4 for the continuation of the uplifts in Q5 and nor could there have been ...
>
> ... (c) A change in regulatory approach would undermine the basis on which investment has taken place.[39]

An example of the time-inconsistency problem with respect to the 'finance functions' duty is available from the water sector. In the 2004 price control review, Ofwat allowed additional revenue to improve the financeability of those companies with large CAPEX programmes. To the extent that the water companies expected the uplift to remain in place for AMP5, Ofwat's PR09 Final Determination—which showed greater inclination towards market-based solutions such as equity issuances to address water companies' financeability problems—would also represent an example of the time-inconsistency problem.

As a further example of the time-inconsistency problem, the analysts and investors interviewed as part of this study mentioned the change in approach by a number of regulators towards the estimation of the cost of debt when determining the allowed rate of return. Specifically, changing from an approach based on the market cost of debt to an approach that takes into account the cost of existing debt at a time when the market cost exceeded the cost of existing debt, implies that investors would receive a rate of return lower than expectations.

[38] Mayer, C. (2009),'Financial Markets and Financeability: The Implications of Recent Developments for Utility Regulation', September 25th.
[39] Competition Commission (2007), 'BAA Ltd.: A report on the economic regulation of the London airports companies (Heathrow Airport Ltd and Gatwick Airport Ltd)', presented to the Civil Aviation Authority, September 28th.

The interviewees were encouraged that the strawman proposals had the potential to bring greater transparency and predictability to the regulation of energy networks. The role of rules as a mechanism for reducing regulatory discretion, and hence the exposure of equity holders in the regulated company to downside risks from the potential actions of future regulators, was highlighted in Colin Mayer's 2003 Beesley lecture.[40] There are options that could be considered to increase transparency and reduce this aspect of the time-inconsistency problem, including ex ante rules to limit the discretion of the regulator, and contractual or statutory commitments.

3.2.2 Robustness of the regulatory framework to future political pressure

A second aspect to the time-inconsistency problem relates to the robustness of the regulatory framework to external political pressure. The evolution of the statutory duties of Ofgem demonstrates that the statutory basis of the regulatory framework is not static. For example, the Electricity Act 1989 and the Gas Act 1986 placed a primary duty on Offer and Ofgas to ensure that the regulated companies could finance their functions, and were mainly put in place to incentivise investment in the regulated companies. However, these Acts were superseded by the Utilities Act 2000, which included a new primary duty for Ofgem to protect consumer interests. Such a regime shift reflects a possible change in the risk of under-compensation and asset-stranding faced by investors in the energy companies.

Of particular relevance to the strawman proposals is the ability of the regulator to guarantee that the substantial positive cash flows required in the future will indeed be treated as compensation for past investment and not interpreted by future politicians, consumers and commentators as excessive returns. There is a risk that once the investment has been made, future regulators will come under pressure to limit distributions to equity holders and pass through the benefits to consumers as lower prices. Mechanisms to address this aspect of the time-inconsistency problem are likely to require, at minimum, greater security about the value of the RAV across several control periods.

3.2.3 Events outside the current regulatory framework

A third aspect to the time-inconsistency problem is whether the regulator can commit to insuring the company against unforeseen and uncontrollable events. Such events include natural disasters, terrorism, industrial action, and changes to the tax regime. In the case of energy networks, the impacts of weather-related events and, in the longer term, climate change, are to a large extent unpredictable.

Standard approaches to dealing with such effects include the 'logging-up' of additional CAPEX into the RAV and providing allowances for additional OPEX during the next price review. Regulatory frameworks also generally include a variety of mechanisms that can trigger a re-opening of the price control should sufficiently material and unforeseen events arise.

While in principle existing mechanisms could be adequate ways of addressing this aspect of the time-inconsistency problem, in practice this is an area where the 'regulatory contract' is incomplete. This is because it is impossible to specify how prices will be set in all states of the world. Therefore, it is likely that at least a proportion of this aspect of the time-inconsistency problem will persist, although it may be possible to achieve a more efficient allocation of this risk between the company and consumers.

3.2.4 Duration and the time-inconsistency problem

The extent to which regulatory mechanisms and structures can address the three aspects of the time-inconsistency problem varies. Even if it is possible to give increased certainty around the future actions of regulators within the current regulatory framework and the robustness of the framework to political intervention, the inherently incomplete regulatory contract implies that there will be residual uncertainty about future regulatory actions. Indeed,

[40] Mayer, C. (2003), 'The Future of Water Regulation', November 25th.

from the perspective of society, leaving the regulator with a degree of discretion to respond to unpredictable outcomes may be preferable to a situation where an inefficient supply–demand imbalance becomes ossified.

However, residual uncertainty arising from the time-inconsistency problem has implications for the returns required by investors. Moreover, the impact of the problem on required returns would be expected to increase with the duration of the cash-flow profile, as there is an increased probability of unpredictable negative changes that prevent the required level of return being earned on investments.

The increasing dependence on the regulator's commitment entailed by the strawman was confirmed as a risk driver by the equity and debt investors interviewed by Oxera. The analysts and investors interviewed as part of this study noted that many investors focus on a three- to five-year time horizon, extending up to the time of the next regulatory review. Even cash-flow profiles where negative cash flows are expected to reverse within a single regulatory period were viewed as less than ideal, and could have significant implications for the cost of, and access to, finance at times of market uncertainty.

Since the strawman sets out a scenario in which investors recover their investments from cash flows that are generated further in the future than under the current regime, it increases the reliance on future regulators allowing the company to earn these cash flows. Longer duration cash-flow profiles, where financial ratios deteriorate over the next regulatory period and the situation does not improve until future regulatory periods, were considered by the interviewees to require the regulated company to place increased faith in the 'regulatory covenant'.

It was also suggested by several interviewees that pushing cash flows further into the future could lead to a loss of credibility for the regulator and may erode investor confidence in the regulatory regime, potentially in a non-linear and discontinuous way. This would be expected to affect the risk premium that investors demand for bearing these risks, over and above the worsening of the time-inconsistency problem that derives from extending the duration of cash flows.

4 Further implications of the strawman

In addition to a likely impact on the cost of capital, there are three further types of implications were the strawman proposals to be implemented.

– **Increased probability that the allowed rate of return is estimated with error**—the financeability test provides a cross-check on the overall rate of return generated as an output from theoretical modelling. This cross-check is particularly valuable for UK regulated energy networks, where there is only limited evidence on the cost of equity. The consequences for investment incentives of incorrectly setting an allowed rate of return below the cost of capital suggest that the outcome of a financeability test is an important piece of information for setting the allowed rate of return.

– **Impact on the efficient level of gearing in the notional capital structure**—increasing the duration of cash flows would be expected to expose the company to greater business risk and be reflected in a higher cost of capital. The efficient level of gearing consistent with increased business risk would be expected to be lower under the strawman proposals than under the current financeability framework. The impact of this factor on the post-tax WACC could be of the order of 40bp, at least in the short term.

– **Change in the composition of the investor base**—the different cash-flow profile under the strawman would be expected to attract a different class of investors. There would likely be costs associated with the transition and the need to access external forms of finance. New investors would expect to receive the same level of returns as required by the market for exposure to a given level of risk. Furthermore, there is a risk that the pool of equity capital with a preference for the cash flow profile under the strawman is insufficiently large to support the market in regulated energy network equity.

4.1 Financeability tests as a cross-check on the rate of return

Ofgem interprets its duty to enable companies to finance their functions as having two strands:

– to allow an efficient, well-run company to earn a rate of return that is at least equal to the cost of capital for that class of network;

– to check that an efficient, well-run company would be able to raise finance from the capital markets readily and on reasonable terms.[41]

Regulators have tended to interpret the second strand as requiring a notional efficient company to maintain financial ratios consistent with a solid investment-grade credit rating, implemented through a financeability test. One of the roles of the financeability test is therefore to cross-check that the allowed rate of return is sufficient for the notional company to finance its functions, taking into account the size of its CAPEX programme.[42]

There is always uncertainty when estimating the WACC, and at any price control review the regulator has to determine its best estimate of the true underlying WACC based on the data available. As there will be a distribution of estimates around the true underlying WACC, there

[41] Ofgem (2010), op. cit., para 3.1.

[42] Notwithstanding that, even if the WACC is correct, financeability problems can still arise due to the mismatch between the allowed real rate of return and actual nominal financing costs.

will also be a probability that the regulator underestimates the WACC and therefore fails to deliver against the first strand of its finance functions duty.

Regulators often consider that the costs of setting too low or too high a WACC are asymmetric. In other words, the cost of delaying investment exceeds the cost of setting prices higher than necessary to cover efficient costs.[43] In such cases, it may be prudent to allow a limited amount of headroom in excess of the uncertain point estimate for the WACC.[44] For example, the Competition Commission and Ofcom recently gave some weight to historical averages over recent time periods and allowed 'headroom' in the risk-free rate.[45]

As the risk of investing in constructing new assets is greater than the risk of investing in existing assets,[46] the uncertainty around WACC estimation is exacerbated when the company is forecast to have a significant CAPEX programme. Therefore, the asymmetric costs of misestimating the true WACC are likely to be greater when CAPEX programmes are larger. One interpretation of the financeability uplift provided to selected companies by Ofwat in PR04 is that the financeability test indicated that the pre-uplift average WACC for the industry was too low for those companies with particularly large CAPEX programmes.[47]

The uncertainty around WACC estimation is exacerbated for UK regulated utilities due to a lack of observable market data on equity returns. In the UK, the problem of limited market data has increased over time as more regulated utilities have passed into private hands—currently, only two companies among all the electricity and water companies (Northumbrian Water and Dee Valley Water) are publically traded on a stand-alone basis.[48] Listed equity provides regulators with useful data (for example, for DGM and Q-ratio analysis) during times of regulatory reviews on the appropriateness of the allowed rate of return.

Furthermore, the increasing transfer of companies into private hands has made accurate estimation of equity beta for regulated energy networks—and hence the application of the CAPM framework—more challenging, and requires comparisons to be made with the small number of listed water companies. Therefore, the first strand of the financing functions duty—to determine an appropriate rate of return from 'first principles'—is difficult for regulated energy networks. This means that the second strand is critical, and has become more important over time. The value of having a financeability test as a 'common sense' check on the outputs from theoretical modelling was highlighted by the analysts and investors interviewed as part of this study.

Therefore, the financeability test based on cash-flow ratios is a critical check on the overall level of allowed returns when the WACC is derived from a limited information set on listed equity returns.[49]

[43] See Brealey, R. and Franks, J. (2009), 'Indexation, investment, and utility prices', *Oxford Review of Economic Policy*, **25**:3, pp. 435–50.

[44] For example, Brealey and Franks (2009) suggested that, in the last five-year price control for Stansted Airport, given the risk of underinvestment, headroom of 90 basis points in the cost of capital would have been appropriate if the cost of underinvestment was significant.

[45] For example, Competition Commission (2008), 'Stansted Airport Ltd Q5 price control review', October 23rd; Ofcom (2009), 'A new pricing framework for Openreach', May 22nd.

[46] Bernado, A.E, Chowdhry, B. and Goyal, A. (2006),' Growth Options, Beta, and the Cost of Capital', *Financial Management,* **36:**2, October.

[47] Ofwat (2005), 'Financial performance and expenditure of the water companies in England and Wales: 2004-05 report', September.

[48] A stand-alone basis implies companies with more than 90% revenue generation from the regulated business.

[49] The approach adopted by the Water Industry Commission for Scotland to set a WACC for Scottish Water essentially generates the WACC as an output from the financeability test. This emphasises the importance of the financeability test where there is no observable market data for the regulated company.

4.2 Efficient capital structure under the strawman

Ofgem states that where the actual company 'has chosen a significantly different financial structure' to that which Ofgem assumes for the notional company, no adjustment will be made to revenues to compensate for financing difficulties.[50] This assumes that the notional efficient financial structure does not change under the strawman.

Such an assumption can only hold under a strict interpretation of the MM capital structure irrelevance propositions, including the proposition that the value of a company is independent of its capital structure.[51] However, as stressed by MM themselves, the purpose of their research was, by indicating the strict assumptions on which a capital structure irrelevance proposition must rest, to highlight the factors that could influence a company's choice of capital structure.[52] In particular, one variant of the MM propositions presents optimal capital structure as a trade-off between the tax advantages of debt and the increased probability of financial distress resulting from increasing gearing.

4.2.1 Relationship between capital structure and credit rating

A company's probability of financial distress is related to both the level and volatility of its cash flows. Lower cash flows provide a smaller margin over fixed obligations to debt holders, and more volatile cash flows increase the probability that, at any point in time, the company will be unable to discharge its obligations to debt holders. The strawman proposal not to adjust revenues to compensate for financing difficulties will lead, in the short term, to lower cash flows, a smaller margin over obligations to debt holders (proxied by credit rating metrics such as PMICR), and hence an increased probability of financial distress. The trade-off theory of capital structure implies that, under the strawman, the efficient level of gearing will fall. Furthermore, Ofgem's parallel consultation on the regulatory ring-fence also implies that the gearing of the notional company will have to decrease if the company is to maintain a solid investment-grade credit rating, based on the current set of credit rating metrics.

One option proposed by Ofgem is to continue to assess financeability but to look at financial metrics over the long term.[53] If this option were implemented, a notional company that would fail the financeability test in the short term may pass the test, and lead to a conclusion that no adjustment to revenues is required.

There are two aspects to consider when evaluating the impact of using different metrics to test for financeability. First, credit rating agencies already adapt their normal corporate bond rating methodologies to account for the different economic circumstances of regulated utilities. The adjustments include looking at a modified set of financial ratios—such as interest coverage adjusted for maintenance investment—and reducing the levels of these ratios that correspond to a particular credit rating.[54] As described in section 2, credit rating agencies place significant weight on financial ratio analysis of regulated utilities.

Second, as credit ratings matter for a large proportion of investors in utility debt, and indeed many investors have a fiduciary duty to invest only in investment grade-rated debt, it is important that Ofgem does not open up a gap between itself and the credit rating agencies in approaches to assessing the credit rating expected for a notional company. This was a key area of risk identified by the debt analysts interviewed as part of this project. Discussions with the credit rating agencies revealed that, although ratios over the longer term could be taken into consideration, the short-term levels would still be awarded greater weight. In

[50] Ofgem (2010), op. cit., para 5.12.

[51] Modigliani, F. and Miller, M.H. (1958), 'The Cost of Capital, Corporation Finance and the Theory of Investment', *American Economic Review*, **48**:3 (June), pp. 261–97.

[52] Modigliani, F. and Miller, M.H. (1963), 'Corporate Income Taxes and the Cost of Capital: A Correction', *American Economic Review*, **53**:3 (June), pp. 433–43.

[53] Ofgem (2010), op. cit., para 4.18.

[54] Moody's Global Infrastructure Finance (2009), 'Global Regulated Water Utilities', December, pp. 19–22.

particular, due to the decreased certainty of cash flows, credit ratios beyond the current regulatory period would be awarded relatively low weight.

The expected impact of the strawman on the level of cash flows suggests that, under the current framework of testing financeability, the notional company would be less likely to attain the thresholds consistent with a solid investment-grade rating. As there appears to be limited scope for adopting a financeability test that diverges materially from the methodologies followed by credit rating agencies, this suggests that the notional gearing level consistent with a solid investment-grade rating will be lower under the strawman. The notional company will therefore have to raise new equity over and above the volume required to maintain stable gearing with a growing asset base, and target a lower level of gearing.

4.2.2 Relationship between capital structure and the cost of capital

While the strawman does not provide detail on the relationship assumed between capital structure and the WACC, Ofgem has previously commissioned analyses of the cost of capital of utilities. One of these studies, which analysed the equity betas for a sample of eight UK utility companies, reached the following conclusion.

> The evidence points to a declining relationship between gearing and equity betas: a rise in gearing is associated with a decrease in equity betas for the eight companies we examine over the period 1996-2005. This is contrary to the pure Modigliani-Miller theorem, which predicts that equity betas should be linearly increasing in gearing…One hypothesis is that the combination of stated concern about gearing, and the inability of the regulator to commit against bailing-out a bankrupt firm, has lead the market to lower its perception of the asset risk of the electricity distribution companies[55]

This highlights that while, based on the experience of UK regulated utilities, there may be little empirical evidence to support the theoretical prediction that equity risk and required returns are an increasing function of gearing, it is important to control for other factors that could influence how estimated equity betas evolve over time. Such factors include changes in the underlying asset risk of the regulated parts of listed utility companies and changes in the proportion of regulated activities in the total enterprise value of these companies.

It does not follow from the Smithers & Co (2006) analysis that UK regulated utilities constitute a special case where the cost of equity is independent of gearing and the insights from extensive theoretical and empirical research into the relationship between equity beta and capital structure fail to apply. Were such a situation to prevail, illustrative analysis based on the DPCR5 Final Proposals, assuming the real post-tax costs of equity and debt are unchanged at 6.7% and 2.6% respectively, suggests that the implication of a lower efficient level of gearing (assumed to be 55% rather than 65%) for the notional company would be a 40bp increase in the post-tax cost of capital from 4.0% to 4.4%. The analysts and investors interviewed as part of this study suggested that in the short run, a qualitatively similar result would prevail as investors would be unlikely to recalculate the cost of equity in response to a lower level of gearing.

The likely long-run equilibrium result is that the cost of capital for UK utilities is affected by gearing in a similar way to companies more generally—as gearing decreases, equity risk and the cost of equity decrease, offsetting the impact of the changing proportions of relatively more or less expensive sources of capital. Under a strict interpretation of the MM propositions, the two effects would exactly offset and the cost of capital would not change with lower gearing.

However, as outlined earlier in this section, the MM propositions are a starting point for understanding the factors driving capital structure. Two important considerations—tax and the probability of financial distress—suggest that the cost of capital may not be independent

[55] Wright, S., Mason, R., Satchell, S., Hori, K. and Baskaya, M. (2006), 'Report on the cost of capital', for Ofgem on behalf of Smithers & Co., September 1st, p. 63.

of capital structure. In the context of a notional company that reduces gearing to accommodate the lower cash flows—and hence mitigate the increase in probability of financial distress expected as a result of the strawman—there will be an unambiguous increase in the pre-tax cost of capital due to the decrease in the value of the tax shield of debt.

In the case of regulated utilities, the time-inconsistency problem (as outlined in section 3) is a further important consideration that has an impact on equity risk and required returns. As described in Colin Mayer's 2003 Beesley lecture, and recognised by the analysts and investors interviewed, the time-inconsistency problem is likely to have a disproportionate effect on equity relative to debt as equity holders are residual claimants on cash flows, and hence more exposed to the risk that future regulators will deliver lower than expected cash flows.[56]

The increased duration of cash flows under the strawman further increases the proportion of the time-inconsistency risk that falls on equity holders. In this context, a decrease in gearing for the notional company would be expected to place upward pressure on the overall (vanilla) WACC.

4.3 Investor base and implications for the cost of capital

Ofgem recognises that the strawman proposals are likely to have implications for the composition of the investor base.

> Some investors—such as pension funds—who have long-term liabilities and generate cash in the short run may be attracted to cash negative businesses with growing RAVs. But income investors may not.[57]

Assuming that risk and expected return are held constant, extending the duration of a company's cash-flow profile would be expected to attract a class of investors with a preference for receiving higher cash flows in the long run in exchange for lower (or negative) cash flows in the short run. Furthermore, as explained in section 4.2, the strawman is also likely to lead to a lower level of efficient gearing for the notional company and a greater role for equity investors.

There are likely to be costs associated with the transition to a lower level of gearing and with the change in the composition of the investor base. Ofgem recognises that 'any transition would need to be managed appropriately.'[58] Such transitional costs will include the direct and indirect costs of marketing and underwriting new equity and debt issuances. The magnitude of transitional costs is likely to be influenced by the extent to which reforms to the financeability framework are introduced and the length of time over which the reforms are phased in.

The class of investors with a preference for the cash-flow profile that is likely to result from the strawman can be considered from the perspective of the characteristics that such investors would have. These characteristics could be shared by a variety of investors, including fund managers that focus on listed equity on behalf of pension funds and retail investors, private equity investors, infrastructure funds, and sovereign wealth funds. The following characteristics are relevant:

– the **ability** to tolerate a prolonged period of low or negative cash flows;
– the **willingness** to tolerate a prolonged period of low or negative cash flows in exchange for increased positive cash flows in the future;

[56] Mayer, C. (2003), 'The Future of Water Regulation', November 25th.
[57] Ofgem (2010), op. cit., para 1.8.
[58] Ofgem (2010), op. cit., para 1.8.

– the willingness to invest given the perception of inter-period **time-inconsistency risk**.

First, it is self-evident that investors must be able to tolerate a prolonged period of low or negative cash flows from their investments. This excludes investors who require their investments to generate substantial cash flow in the short term to achieve their strategy. For example, investment funds with a style oriented towards income or yield will be unable to hold investments with long-duration cash-flow profiles. Pension funds that are currently distributing a high proportion of the value of assets on an annual basis to scheme members may be similarly constrained.

Second, investors must also be willing to accept a longer-duration cash-flow profile. A critical feature that distinguishes the cash-flow profiles likely to arise under the strawman from the cash-flow profiles that attract investors with styles oriented towards growth is that there is a distinct possibility that a sequence of equity injections will be required under the former.

Even if investors have the ability to make multiple equity injections, they may be reluctant to commit funds against the expectation that future injections will be required if they value the option to re-evaluate periodically the attractiveness of investing in regulated energy networks relative to other sectors. For example, although investors may be willing to make further equity injections when markets are relatively stable, a view expressed by the analysts and investors interviewed as part of this study was that investors would be far less relaxed about having to reinvest when financial markets are highly volatile.

The third characteristic is that the investors must still be willing to invest given the inter-period risk. Under the proposed changes to the financeability framework, not only is there likely to be a change in the composition of the investor base, but, as outlined in section 3, both extending the duration of the cash flows and increasing the impact of the time-inconsistency problem are likely to lead to a material change in risk. Investors would be expected to require higher returns as compensation for this increase in risk. Indeed, the analysts and investors interviewed were cognisant of the impact of both factors, identifying them as critical drivers of risk that would affect investment decisions.[59]

Therefore, given the extended-duration cash-flow profile that would emerge from the strawman, these investors would still expect higher equity returns. If higher returns were not available then, given the likely increase in the risk of the sector relative to other investment opportunities, investors would be expected to transfer funds to investments with more favourable risk–return trade-offs.

As well as the likelihood that investors will require higher returns, there is also potential that—contrary to what would be expected in a well-functioning capital market—the pool of capital with the ability and willingness to tolerate a prolonged period of low or negative cash flows is constrained even if the allowed rate of return equals the required rate of return. Furthermore, the equity investors that participated in this study suggested that the additional complexity of understanding how the regulatory framework would change under the RPI – X@20 proposals could act as a barrier to encouraging investors that have not traditionally invested in the sector.

The strawman therefore raises the risk that even if the allowed rate of return is increased to compensate for a potential increase in the cost of capital and decrease in gearing capacity, there may not be a sufficiently large pool of equity capital available to support the market for the equity of regulated energy networks.

[59] The investors and analysts interviewed as part of this study also highlighted that as much as encouraging a shift in the investors base, the strawman could lead to increased financial engineering and use of structuring arrangements including equity bridges and subordinated debt.

5 Conclusions

The implication of Ofgem's strawman for reform of the financeability framework—that there is no *a priori* reason to expect a significant probability of a material change in the cost of capital—rests on a series of implicit assumptions about the relationship between the reforms proposed in the strawman and the mechanisms that drive the cost of capital. The key findings of this report regarding these assumptions are as follows.

1) Empirical evidence confirms that cash-flow metrics are significant drivers of both the cost of debt and the cost of equity. However, the ability of empirical evidence to directly answer the question of what might happen to the cost of capital for a regulated energy network under an alternative financeability framework is constrained because the data is conditioned on the existing financeability arrangements. A more complex framework of analysis is therefore required to address this question.

2) The consequences for the cost of capital of the implied extension of the duration of cash flows under the strawman cannot be modelled in a one-period CAPM framework. However, intertemporal CAPM frameworks suggest that for a regulated utility, the cost of capital is likely to be increased by both a term premium and a beta effect. The overall impact is likely to be at least of an order of magnitude of 60bp. The impact on the cost of capital is likely to be exacerbated in the context of a set of assumptions that more accurately describe the circumstances of regulated utilities in the intertemporal CAPM frameworks.

3) A fundamental driver of the correlation between duration and increased required returns for a regulated utility is the time-inconsistency problem. While various mechanisms might be considered to increase regulatory commitment and mitigate the costs of this problem, due to the incomplete nature of the regulatory contract, a residual element of the time-inconsistency problem will remain.

4) Removal of the financeability check on the overall allowed rate of return would increase the probability that the cost of capital is estimated with error. This increases the risk of creating an underinvestment problem.

5) The efficient level of gearing assumed under the notional capital structure may decrease as a result of higher business risk. This would have cost implications from the transition to a lower level of gearing, and tax implications from the lower value of the tax shield of debt.

6) A different class of investors may be attracted to the extended duration cash-flow profile. These investors would be expected to require the market cost of capital commensurate with the risk of the cash-flow profile. While in theory, new investors could be attracted in sufficient quantity to support the market in utility equity, in practice there could be constraints on the size of the pool of available investment funds.

Overall, there is a material possibility that some or all of the assumptions required to support the implication in the strawman do not hold, and that the strawman would be expected to materially increase the cost of capital. Therefore, a number of recommendations follow from this report.

– The drivers of the cost of capital for a regulated utility are complex, particularly as returns on investments in long-lived assets are major factors determining risks and returns. Standard approaches to estimating the cost of capital appear to lack the

flexibility to model companies that are significantly different from the average, such as regulated utilities. In particular, where the source of risk is more from cash flows in the long term rather than cash flows in the short term, there may be a role for insights from intertemporal models to refine estimates of the cost of capital. This report sets out some of the ideas that could underpin a new approach to understanding the cost of capital for regulated utilities.

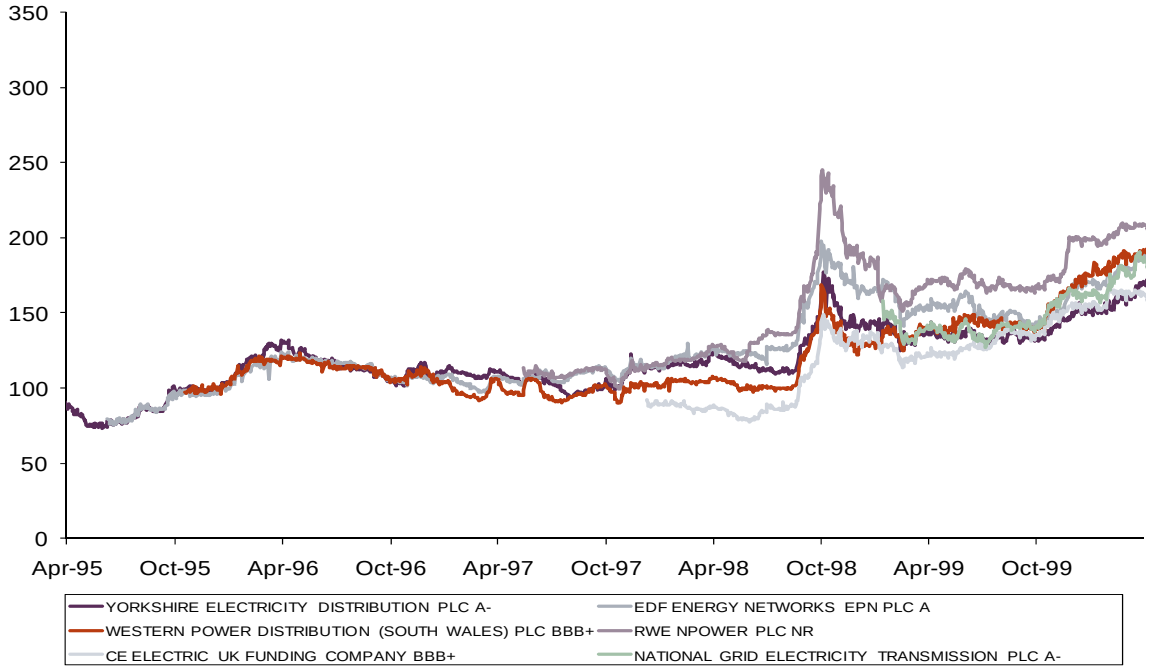
– Insights from alternative approaches could also assist regulators to estimate the cost of capital where there is a lack of data on listed equity for regulated utilities. This could help ensure that the cost of capital is set appropriately given both current market conditions and the size of a regulated company's CAPEX programme. Progress on this issue could have benefits in terms of placing less emphasis on financeability tests as a cross-check on the cost of capital.

– Financeability checks still have a role to play in ensuring the overall allowed return is set at an appropriate level. However, these checks could be refined by considering what is the optimal set of financial metrics, and over what time horizon these metrics should be assessed.

– Mechanisms to improve commitment can be tailored according to the three aspects of the time-inconsistency problem. Rules to limit the discretion of future regulators and measures to give greater security around the value of the RAV, would be expected to have some impact on reducing the premium that investors require as compensation for the time-inconsistency problem. These mechanisms could, to some extent, mitigate the impact on the cost of capital of extending the duration of cash flows.

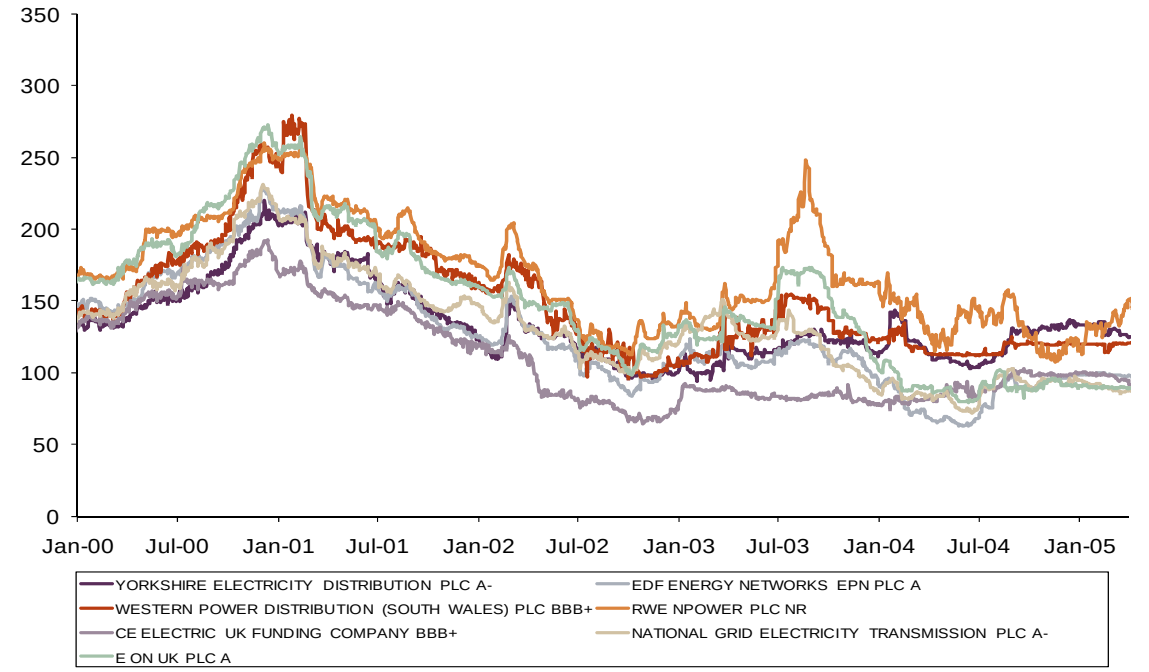
A1 Capital market evidence

Figure A1.1 Debt spreads on utility bonds, 1995–2000



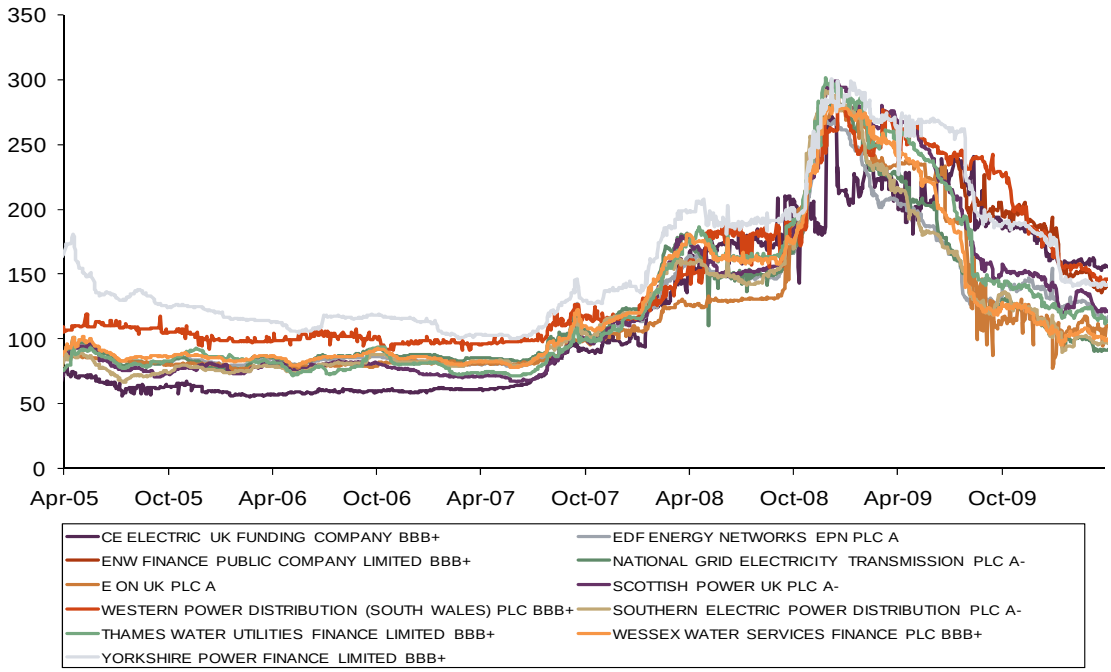
Source: Datastream and Oxera analysis.

Figure A1.2 Debt spreads on utility bonds, 2000–05



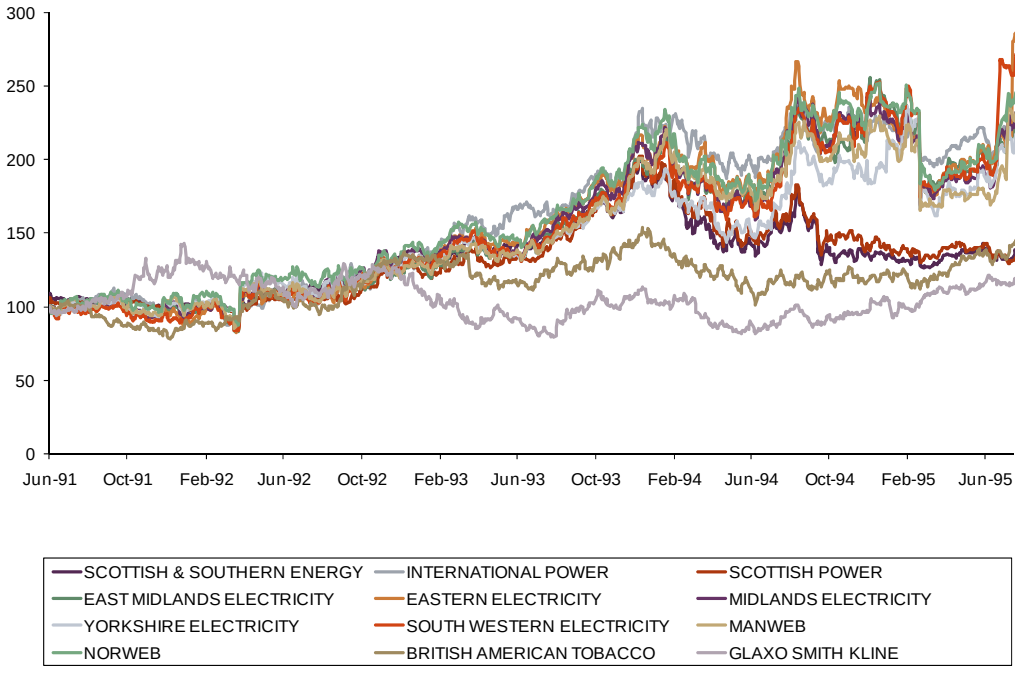
Source: Datastream and Oxera analysis.

Figure A1.3 Debt spreads on utility bonds, 2005–10



Source: Datastream and Oxera analysis.

Figure A1.4 Share price for utilities and defensive stocks, re-based to 1991



Source: Datastream and Oxera analysis.

A2 Key messages from interviews

Oxera interviewed a mix of equity and debt analysts, credit rating agencies, and pension funds to obtain their views on the impact of Ofgem's financeability proposals. The key points from these interviews are summarised below.

Debt analysts characterised the ratios provided by the credit rating agencies as a function of the price control parameters—indicating that any discrepancy between investors' required compensation and the parameters of the price control would be reflected in the credit rating agencies' ratios. In addition, certain credit rating agencies emphasised that it was important for regulators to demonstrate that the long-run compensation for investors was adequate irrespective of the types of ratio used by the regulator.

Rating agencies stated that cash flows in future regulatory periods were considered less reliable than those in the current regulatory period; therefore, the former were given lesser weight. Furthermore, certain rating agencies highlighted that the horizon for rating assessment was three to five years, giving more weight to short-run metrics. This view was supported by debt analysts, who suggested that three to five years was the investment horizon for most investors.

It was indicated that a disconnect between credit ratings agencies' approach to financeability tests for utilities and that of the regulator might be exacerbated if Ofgem decided to implement its proposals. Also, any increase in complexity of the methodology adopted by Ofgem might discourage investors from investing in utility assets.

It was noted that the strawman could significantly worsen cash-flow metrics, especially in times of greater uncertainty in the economic climate. Although high investor confidence in the regulatory regime might mitigate this problem to some extent, the proposed changes would, themselves, be likely to erode investor confidence in the regime.

Equity and debt analysts also highlighted the costs of transition to the strawman. Companies may have adopted certain capital structures that are efficient under the current regulatory regime and any change may mean that these would no longer be efficient. The transition might also lead to costly financial structures such as those involving equity bridges and subordinated debt.

Equity injection was recognised as a potential solution to the financeability problems. However, it was highlighted not only that equity investors valued the flexibility on the timing of reinvestment, but also that expectations of repeated equity injections being needed were likely to make equity investors more reluctant to invest in the first place.

Most interviewees suggested that there would be increased reliance on the regulator's commitment under the strawman financeability proposals. The CAA's removal of the uplift on the WACC for T5 in the first review after the investment was made was cited as an example of this risk, as was the change in approach by a number of regulators to the treatment of embedded debt.

The change in equity investor base as a result of the implementation of the financeability proposals was commented on by most interviewees. A series of factors, including the cash obligations of the investors, risk appetite and investment horizons, were identified as potential limiting factors on the size of the resulting investor base.

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