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EVALUATING THE CASE FOR A GEARING INCENTIVE MECHANISM

A report for Southern Water

Economic Insight Ltd

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INTRODUCTION AND EXECUTIVE SUMMARY

INTRODUCTION

At PR24, Ofwat is proposing options for a 'gearing incentive mechanism', which may financially penalise companies with gearing above 70%. There are reasons for caution, however, as such a mechanism has the potential to increase costs to customers (should it inadvertently promote less efficient capital structures) and deter investment.

Drawing on theoretical and empirical analysis, we find that the case for the mechanism's role in promoting efficient choices over capital structure has not been made, and that the proposed 70% threshold is plausibly within a range for efficient gearing in the sector.

This is because: (i) there is a contradiction between the mechanism's rationale and regulatory practice in setting the WACC (as previously highlighted by the CMA); (ii) we observe material differences in gearing across industries, and gearing of over 70% is not unusual in non-regulated sectors; (iii) the characteristics of the water industry (high capital intensity, large sized companies, long asset lives etc) are consistent with a high optimal gearing level (based on results from existing peer reviewed empirical studies); and (iv) our own econometric analysis indicates optimal gearing for an average water company of around 66%, with the potential for this to be as high as 75% for some companies.

OUR FINDINGS

Based on theoretical and empirical analysis, we conclude that the proposed options for a gearing incentive mechanism lack empirical support and risk harming customers, by inhibiting companies' ability to optimise their capital structures.

02

BACKGROUND AND CONTEXT

In its PR24 Draft Determinations (DDs), Ofwat set out concerns regarding the capital structure of certain (more highly geared) companies, and emphasised a need for equity to contribute to asset growth over AMP8. Relatedly, Ofwat's DDs included both a proposal to reduce notional gearing; and three options for a mechanism to disincentivise water companies from having 'too high' a level of gearing ('gearing incentive mechanisms').

02.01 Lower notional gearing at PR24

Ofwat has confirmed its intention to lower notional gearing to 55% at PR24. The regulator has made various statements that suggest it sees notional gearing as both a 'signalling mechanism' to encourage more equity into the industry; and that it is now viewing (at least to some degree) notional gearing as being an indication of efficient capital structure.

> *"The notional gearing level is an important signal to companies and investors about the prudent level of risk within capital structures, reflecting that companies need to raise significant amounts of finance to meet their obligations and deliver their investment programmes"*[1] *[emphasis added].*

> *"It [notional gearing] sets out a view about the prudent level of risk within the capital structure, reflecting that companies need to… deliver their investment programmes, and these investments should be financed efficiently"*[2] *[emphasis added].*

Related to the above, when undertaking its financeability assessment, Ofwat's approach has been to assume 'equity solutions', once gearing reaches 57.5%, through reduced dividend yields and new equity injections.

02.02 Introduction of a gearing incentive mechanism

In addition to its position on notional gearing, Ofwat has set out its view that 'high' gearing levels, which it identifies as being above 70%, are not sustainable.

> *"Companies have freedom to deviate from the notional capital structure, within the constraints of the price control determination, the licence and their wider obligations. However, they do so at their own risk, and… we set out that gearing levels that exceed c.70% may not be sustainable in the long term. Therefore we signal more firmly than before our view that gearing levels that exceed 70% are above the level that is consistent with the need for a water company to meet the requirement of maintaining long-term financial resilience."*[3]

[1] *'PR24 draft determinations: Aligning risk and return appendix.' Ofwat (July 2024); page 23.*

[2] *'PR24 draft determinations: Aligning risk and return.' Ofwat (July 2024); page 14.*

[3] *'PR24 draft determinations: Aligning risk and return.' Ofwat (July 2024); page 14.*

Ofwat's concern appears to be that high gearing leaves companies poorly placed to withstand shocks (presenting analysis showing how the ability to absorb RoRE penalties reduces, as gearing increases). Ofwat further explains that it is concerned that companies' decisions regarding capital structure may be short-term in nature, and may not be taking longer-term consequences, particularly for customers, into account. However, Ofwat's analysis does not seem to indicate a break point in risk at 70% gearing.

The regulator has ruled out a modified version of the previous gearing outperformance sharing mechanism (GOSM), stating: "*the GOSM has not operated as intended. We have considered amending the GOSM for the 2020-25 period to operate as intended, but we note the decision of the CMA to disapply the mechanism for those companies that appealed the PR19 determinations*."[4] Instead, the DDs contain three alternative options (for consultation) on incentive mechanisms to encourage companies to reduce / maintain gearing below 70%:

- **Option 1:** to signal more clearly in its guidance that 70% gearing is an upper limit, beyond which Ofwat would expect dividend yields to be restricted.
- **Option 2:** a requirement that restricts companies' ability to make distributions, where gearing is above 70%.
- **Option 3:** a mechanism whereby, in the event that dividends are paid where gearing is above 70%, there would be a downwards RCV adjustment, equivalent to the amount paid out.

Ofwat is seeking views from companies on the above options, within the consultation on its DDs.

02.03 Risks to customers and investors

The proposal to introduce a gearing incentive mechanism of some form requires careful consideration, as it has the potential to cause harm to customers in two main ways:

- Firstly, it may inadvertently disincentivise legitimate and efficient capital structures, and conversely may therefore encourage (or force) companies to adopt less efficient capital structures. Were this to occur, customers will pay for this inefficiency in the form of higher bills (relative to the counterfactual of no gearing incentive mechanism).
- Secondly, it may discourage sustainable long-term investment into the sector, both because efficient capital structures may be disincentivised, and because it provides a further signal that the regulatory regime has become less predictable and more interventionist. This increases risk to investors and impedes managements' ability to run companies as they deem appropriate to the interests of shareholders and customers. The discouragement of investment itself could cause additional harm to customers, over time; for example, by lowering service quality.

This potential for harm means it is important to be clear as to why, in principle, incentivising certain capital structures might be appropriate. Economic theory indicates two main reasons why this could be the case.

[4] *'PR24 draft determinations: Aligning risk and return appendix.' Ofwat (July 2024); page 64.*

- **Discouraging inefficient capital structures**. A case could be made for applying a gearing incentive mechanism if there was good evidence that the actual capital structures of water companies were (at least in some cases) materially deviating from efficient capital structures, as this could imply that customers are overpaying (to the extent that customers bear the cost of that inefficiency).

- **Addressing a possible risk transfer to customers (a form of moral hazard).** Ofwat's observation that there is a smaller equity buffer to withstand shocks at higher levels of gearing is correct. However, as Ofwat also notes elsewhere, as financial risks are borne by shareholders, capital structures have typically been viewed as a matter for companies. In principle, however, one could nonetheless make a case for intervention, if it could be shown that, at high levels of gearing, some of the associated risks were, in fact, transferred to customers. In other words, if there is a moral hazard, because those who take the risks of high gearing – shareholders – do not fully bear those risks.

In this report, we consider theoretical and empirical evidence as to whether actual water company capital structures have materially deviated from efficient levels (i.e. the first potential rationale above). We consider, in turn:

- relevant theory as to whether / why efficient capital structures exist and what determines them; and

- evidence on the existence efficient capital structures, based on a review of empirical literature and our own analysis of companies' gearing choices in England and Wales.

We then go on to identify a range for the efficient level of gearing in the water industry, by developing an econometric model, consistent with the existing theory and evidence.

03

THEORY AND EVIDENCE

There are several alternative theories of capital structures in the corporate finance literature, which it is helpful to consider when assessing the rationale for, and specification of, any gearing incentive mechanism at PR24 (including whether there is any evidence of water companies making demonstrably inefficient choices regarding their capital structures).

03.01 Overview of relevant theory

Modigliani-Miller theorem

The seminal Modigliani-Miller theorem (1958)[5] sets out the conditions under which the value and weighted average cost of capital (WACC) of a firm are unaffected by its capital structure. These conditions, which do not hold in the real world, are that:

(i) capital markets are perfectly efficient;
(ii) there are zero taxes;
(iii) there are zero bankruptcy costs; and
(iv) there are zero agency costs.

The intuition for the theorem is that equity and debt investors are able to buy and sell bonds and stocks freely, such that any difference in value between two firms (identical in all respects save for capital structure) would be arbitraged away, leaving overall firm value unaffected by capital structure. The above conditions are required for arbitrage to eliminate differences in firm value in full.

Because the above conditions do not apply in the real world, finance theory tells us that *strict* capital structure / value neutrality does not hold. A range of alternative theories have thus developed to provide a basis for companies' actual choices over capital structures, which we summarise in the following sections.

Trade-off theory

Trade-off theory proposes that firms have a single optimal capital structure, where the WACC is minimised (Fama & French, 2002)[6]. Debt is an allowable deduction from taxable income. Companies therefore enjoy lower taxes from raising finance via debt; while increasing levels of debt make equity riskier for equity holders (as debt is paid before equity), increasing the cost of equity. The WACC is therefore minimised where:

- the benefits of increasing gearing levels (the 'tax shield effect') are offset by
- the costs associated with increasing gearing levels (the 'financing cost effect').

Signalling theory

Signalling theory is based on the notion that firms use gearing as a positive signal to the market (Ross, 1977)[7]. Debt contracts can be seen as a 'commitment' from companies to future interest payments and are therefore a signal of confidence that the firm will have sufficient cashflows to make those payments. As such, larger firms (and firms with greater profitability) may be expected to hold higher levels of debt.

[5] *'The cost of capital, corporation finance and the theory of investment'. Miller, M., & Modigliani, F. The American Economic Review (1958); pages 261-297.*
[6] *'Testing trade-off and pecking order predictions about dividends and debt.' Fama, E., & French, K. (2002). The Review of Financial Studies, 15(1), (2002); pages 1-33.*
[7] *'The Determination of Financial Structure: The Incentive-Signalling Approach.' Ross, S. A. The Bell Journal of Economics, 8(1), (1970); pages 23-40.*

Pecking order theory

Pecking order theory can be seen as an extension of signalling theory. Under this theory firms follow an established hierarchy when raising finance, reflecting the relative costs associated with debt and equity (Myers, 1984)[8]. External financing requires a higher return than internal financing, to compensate external parties for the risk associated with information asymmetries over firm performance. As a result, firms prefer to finance internally through retained earnings. If internal financing is unavailable, firms may finance externally through debt as a signal of confidence, with equity issuance a last resort. This gives rise to a 'pecking order' of preferred financing sources.

Market timing theory

Market timing theory indicates that managers' decisions over whether to issue debt or equity are determined by a motivation to exploit fluctuations in market prices over time (Baker and Wurgler, 2002)[9]. Baker and Wurgler cite evidence that firms tend to issue equity (over debt) when their market value is high (relative to the book value); and tend to buy equity when their market value is low.

The authors explain that this may (at the least) provide a rationale for capital structure choices in the short-run. However, they note that, over time, these decisions may 'balance out', such that fluctuations in market prices may not have a persistent impact on firm capital structure. While Baker and Wurgler *do* find a persistent effect on gearing due to market timing decisions, other empirical studies such as Lui (2009)[10] find more limited support for this strand of the capital structure literature.

03.02 Evidence on the existence of efficient capital structures

There is extensive empirical evidence both that efficient capital structures exist and that they differ across industries. This is consistent with the position in finance theory that strict capital structure / value neutrality does not hold, because the Modigliani-Miller conditions are not satisfied in practice. We first outline the empirical evidence from academic literature, before setting out our own analysis of gearing levels across UK industries.

Academic literature

Kayo and Kimura (2011) summarise the relevant academic literature as *"suggest[ing] the existence of an optimal level of leverage."*[11] At a high level, the literature indicates differential efficient gearing across industries, with studies identifying systematic variation in gearing across industries alongside robust explanatory variables for that variation.

- Schwartz and Aronson (1967)[12] found statistically significant differences in gearing across industries, based on an analysis of US data for railroads, electric and gas utilities, mining and industrials covering the period 1923 to 1961.

[8] *'The capital structure puzzle.' Myers, S. The Journal of Finance, 39(3), (1984); pages 574-592.*

[9] *'Market Timing and Capital Structure.' Malcolm Baker and Jeffrey Wurgler. Journal of Finance (2002).*

[10] *'Historical Market-to-Book in a Partial Adjustment Model of Leverage.' 'Liu, L. X. Journal of Corporate Finance, 15, (2009); pages 602-612.*

[11] *'Hierarchical determinants of capital structure.' Kayo and Kimura. Journal of Banking & Finance (2011).*

[12] *'Some Surrogate Evidence in Support of the Concept of Optimal Financial Structure.' Schwartz, E., & Aronson, J. (1967). Journal of Finance, 22(1), 10-18.*

- Flath and Knobber (1980)[13] test for variation in the tax benefit of debt and bankruptcy costs across industries. As those two factors are, under the trade-off theory, the determinants of efficient gearing, the authors identify whether, and to what extent, they vary across industries . The authors undertake a panel analysis across 38 industries and then test an optimal capital structure equation. They find *"empirical support to theoretical assertions that taxes and failure costs do imply optimal capital structure."*

- Based on a sample of 852 firms across 25 industries, Bradley et al. (1984)[14] show that over half of cross-sectional variance in gearing can be explained by industrial classification.

- Shyam-Sunder and Myers (1999)[15] tested time-series predictions on a panel of 157 firms in the USA from 1971 to 1989. They found empirical support for both the pecking order and trade-off theories for efficient capital structures.

- Margaritis and Psillaki (2007)[16] analyse data from a sample of 12,240 firms in New Zealand . They find empirical evidence for the (positive) impact of tangible assets and profitability on gearing and the (negative) impact of intangible assets. They also find evidence for the impact of firm size and efficiency on capital structure choices.

- Lemmon et al (2008)[17] find evidence that differences in gearing are generally stable over time, with highly geared firms tended to remain so for decades. They suggest that this indicates that variation in capital structures is mainly determined by factors that are stable over long periods of time (such as industry characteristics).

In Chapter 04 of this report, we additionally review the literature that focuses on the drivers of differences in gearing across industries / firms. This is to inform our own modelling approach, for the purpose of estimating efficient capital structures for the water industry. Those papers are, of course, also highly relevant to establishing the existence of efficient capital structures in the first place.

03.03 Comparative analysis of gearing levels across industries in the UK

If the Modigliani-Miller conditions held, and there were no particular capital structure that was more efficient than any other, one would not expect to observe systematic differences in gearing across firms or industries in the UK. Put simply, if there is no relationship between firm value and gearing, variation in gearing across firms and industries would likely be random. On the other hand, if one observes clear and systematic differences in capital structure across firms and industries, this would be more consistent with the existence of efficient capital structures (i.e. if Industry A consistently has higher average gearing than Industry B, it would suggest that there were commercial advantages to a more highly geared structure in Industry A).

[13] *'Taxes, Failure Costs, and Optimal Industry Capital Structure: An Empirical Test.' David Flath and Charles R. Knoeber. Journal of Finance.*

[14] *'On the Existence of an Optimal Capital Structure: Theory and Evidence.' Bradley, M., Jarrell, G., & Kim, E. (1984, July). The Journal of Finance, 39(3), 857-878.*

[15] *'Testing static tradeoff against pecking order models of capital structure.' Shyam-Sunder and Myers. Journal of Financial Economics (1999).*

[16] *'Capital Structure and Firm Efficiency.' Dimitris Margaritis, Maria Psillaki. Journal of Business Finance and Accounting (2007).*

[17] *'Back to the beginning: persistence and the cross-section of corporate capital structures.' Lemmon, M., Roberts, M., & Zender, J. (2008, August). The Journal of Finance, 63(4), 1575-608.*

We have therefore undertaken a comparative analysis of gearing across industries in the UK. Our analysis is based on data sourced from the Fame database, which collects both public and private company financial data across the UK and Ireland. It covers the time period 2013-23, with a total of 104,119 observations.

Figure 1 shows a box and whisker diagram of gearing across industries, with the thick dark blue line indicating the industry median and the limits of the box indicating upper and lower quartile gearing levels.[18] Gearing is calculated as net debt / capital employed (which aligns with the calculation of gearing for regulatory purposes in the water sector). We have four main observations:

- **Consistent with the existence of efficient capital structures, there are material and systematic differences in gearing across industries**. For example, (on the net debt measure of gearing), electricity and gas supply has an upper quartile gearing of 74%, whereas agriculture, forestry and fishing has an upper quartile gearing of 57%, a difference of 17 percentage points.

- **Also consistent with there being efficient capital structures, this variation generally accords with economic intuition.** Industries in which companies are likely to be more asset and capital intensive (e.g. electricity, gas, steam and air conditioning supply) tend to have higher gearing than industries that are less asset and capital intensive (e.g. arts, entertainment and recreation).

- **A number of industries have gearing above the levels / thresholds Ofwat is proposing at PR24.** Specifically:

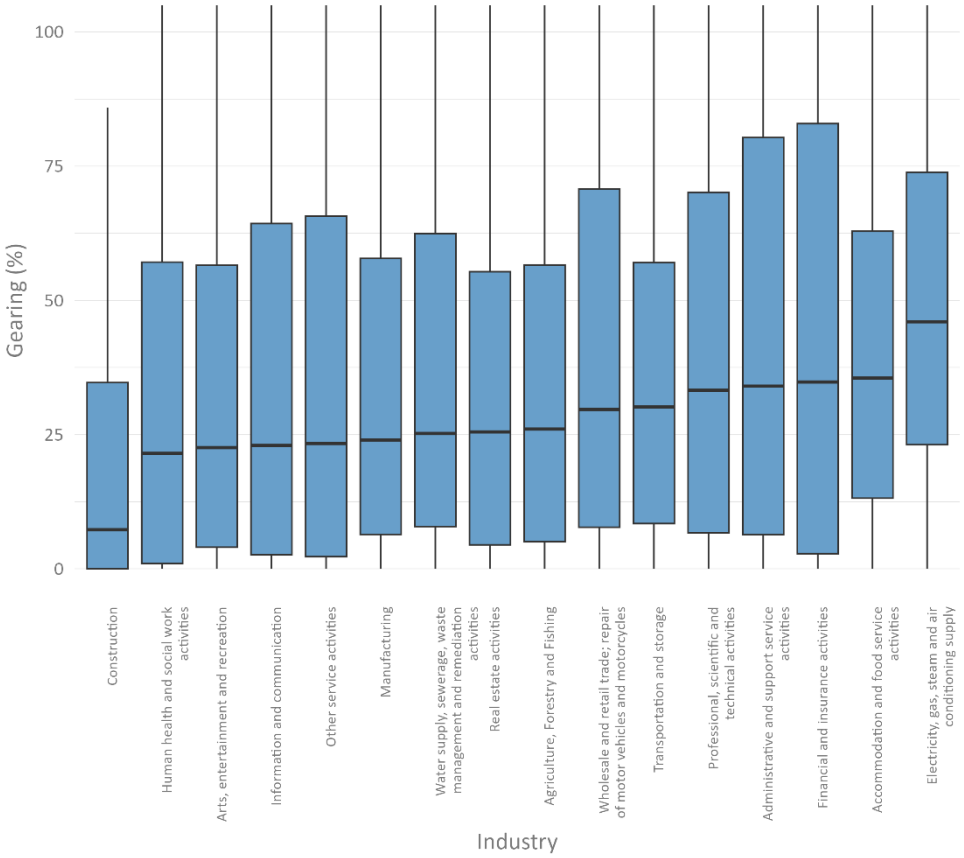
  - 15 industries out of 17 have upper quartile gearing above 55% (Ofwat's proposed notional gearing); and

  - 5 industries out of 17 have upper quartile gearing above 70% (Ofwat's proposed threshold for any gearing incentive mechanism).

Many firms operating in non-regulated industries therefore have gearing above the level Ofwat has identified as not being sustainable (or efficient, in the case of notional gearing). As such, there does not appear to be anything particularly unusual about companies having gearing above Ofwat's proposed thresholds. Indeed, the fact that several industries have gearing above 70% does not suggest that gearing of that level is *intrinsically unsustainable.* Rather, it depends on industry (and firm) level features.

[18] *We remove industries with less than 300 observations and remove micro-entities (turnover less than £0.632 million).*

Figure 1: Net debt / capital employed across industries in the UK.

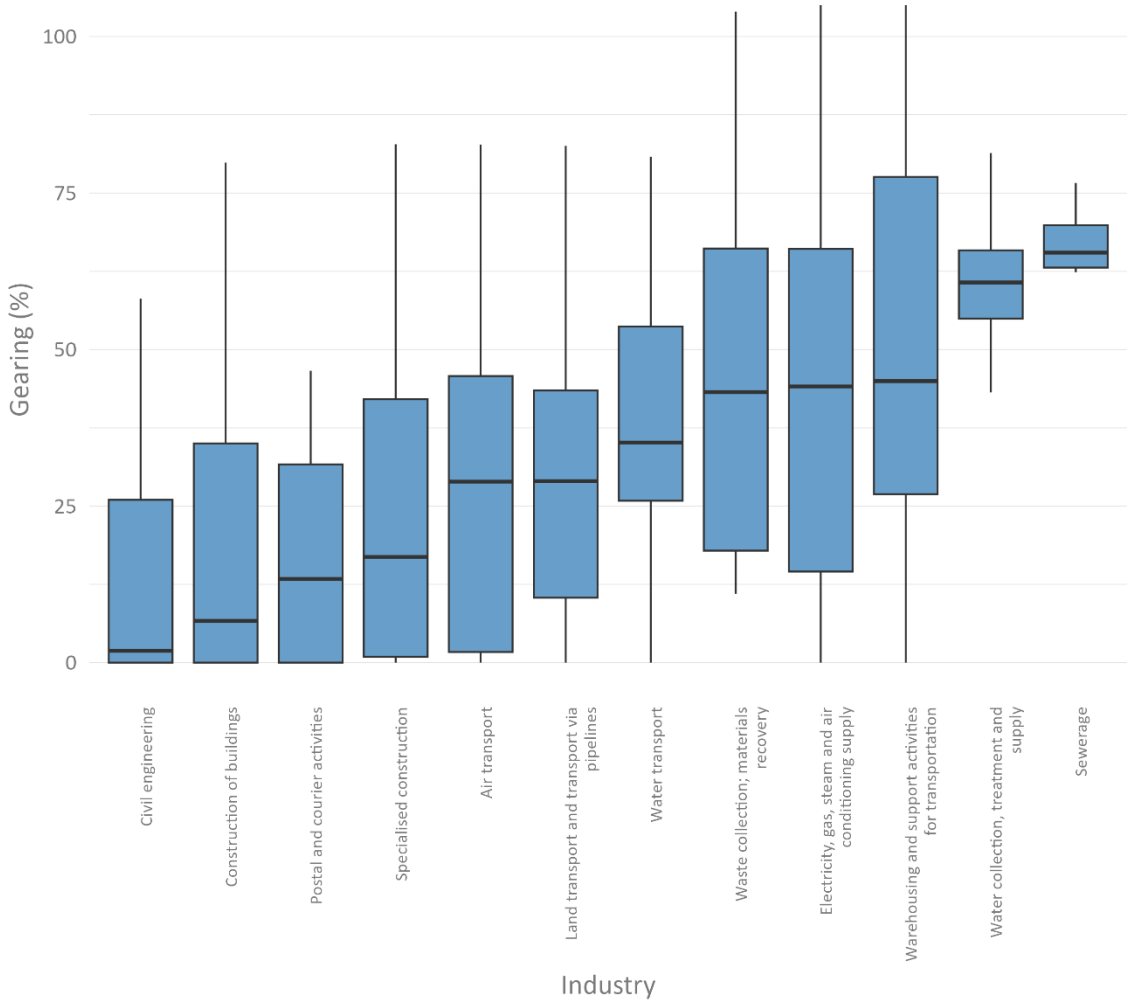


Source: Economic Insight analysis of Fame data.

We note that there remains significant variation in capital structures *within* the industry groupings presented here. To some extent this is inevitable when grouping 104,119 observations across 16 broad industry types. Importantly, this is also likely to reflect the fact that some drivers of optimal capital structures are different for firms within the same industry (i.e. are driven by firm level characteristics). For example, signalling theory points to the importance of profitability in decisions over capital structure. This clearly varies both across different industries (for example, due to market structure) and across different firms in the same industry (for example, due to managerial performance). Furthermore, and as we discuss subsequently, various studies show that firm level features (including firm size) are pertinent to optimal capital structure.

To explore these points in greater detail, we examine differences in gearing at a more granular level. **Figure 2** shows a similar box and whisker diagram for firms with revenue in excess of £100m for sub-divisions of the following industries: construction; electricity, gas, steam and air conditioning supply; transportation and storage; and water supply, sewerage, waste management and remediation activities. Clearly, looking at gearing at a more granular level reduces the extent of variation within the industry sub-divisions, though material differences remains across some groups. This illustrates the importance of accounting for the many factors that could affect firms' gearing choices when making an assessment of efficient capital structures.

Figure 2: Net debt / capital employed across selected industry sub-divisions in the UK.



Source: Economic Insight analysis of Fame data.

04

APPLICATION TO THE WATER INDUSTRY

Having set out theoretical and empirical evidence as to the existence of efficient capital structures, we turn to the question of the optimal level of gearing for water companies in England and Wales. To answer this question, we develop an econometric model of firm capital structures in the UK, which we apply to water company data to establish a plausible range for the optimal level of gearing in the sector.

04.01 Overview of our approach

Both the academic literature and our empirical analysis of gearing across UK industries, is consistent with the existence of efficient capital structures. There could, therefore, be an 'in principle' rationale for introducing a gearing incentive mechanism in the water industry on this basis.

In practice, however, this depends on:

- whether it is possible to identify efficient capital structures in the water industry, with a reasonable level of robustness and certainty; and
- whether the actual capital structures of water companies deviate from the above and, if so to what degree (in the context of any uncertainty regarding the efficient capital structure).

To address these questions, we have developed a method for estimating efficient gearing in the UK water industry. Our approach has three main components:

- A review of the existing empirical (econometric) literature on efficient capital structures, which we use to identify potential drivers of gearing.
- An econometric analysis, whereby (informed by our literature review) we regress firm gearing in the UK against identified drivers, in order to identify a preferred model for efficient gearing.
- Application of the estimated model coefficients to the water industry in the UK, to establish a plausible range for the efficient capital structure and determine whether it differs from companies' actual choices.

04.02 Existing empirical studies

To inform our modelling approach, we reviewed existing empirical studies to identify the determinants of companies' gearing choices. In summary, existing empirical studies find support for the following potential drivers of firm capital structure choice:

- capital intensity;
- tangible asset intensity;
- asset lives;
- firm size;
- firm age;
- firm growth rate;
- liquidity;
- profitability;
- revenue volatility;

- tax shields;
- wider economic performance and shocks; and
- other unobserved factors that vary by industry / firm (i.e. other firm or industry characteristics and / or policy and regulation that vary across industries / firms).

We set out further detail of these drivers of gearing choices in turn.

- The literature finds that **capital intensity** has a positive relationship with gearing and varies across industries (see Brierly & Bunn, 2005)[19]. The rationale posited for this is that substantial capital investment is likely to be financed through loans, rather than shareholder funds, to ensure that the return on equity is sufficiently high, such that (for a given level of risk) shareholders' investments are profitable. Funding substantial upfront investment in assets primarily through equity, however, is likely to dilute returns. Capital-intensive firms therefore have a tendency to use debt financing, rather than equity funds.

- Studies find that levels of **fixed tangible assets** are related to gearing (see Graham & Leary, 2011)[20]. Due to their tangible nature and finite value, these assets provide scope for securitised loans, as it is easier to repackage them into asset-based securities. Such securities can provide a new source of funding, by moving assets off balance sheets into liquidation (Jobst, 2008)[21] In default, therefore, tangible assets are more recoverable than intangible assets. High investment in tangible assets may also allow firms to borrow at lower interest rates, if their debt is secured with assets (see Nunkoo & Boateng, 2010)[22]. With this reassurance in times of distress, firms with more tangible assets may be more able to choose to have higher gearing.

- Related to the above, **longer lived assets** may be positively associated with gearing. Longer assets may be easier to securitise against and / or raise long-term financing against. Myers (1977)[23] shows that companies with longer lived assets may have an incentive to issue more longer-term debt.

- **Firm size** is discussed in the literature as a potential driver of gearing choices. Poutziouris et al (2002)[24] undertake an empirical analysis of gearing choices across SMEs in the UK, highlighting several factors that impact both access to and the cost of forms of debt finance, which vary by firm size. Similarly, some empirical studies have shown a positive relationship between firm or industry growth rates and gearing (Krishnan and Moyer, 1996)[25]. Mugoša (2015)[26] also found a positive association was found between gearing and firm size.

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[19] *'The Determination of UK corporate capital gearing.' Brierly, P., & Bunn, P. Bank of England Quarterly Bulletin, (2005) Q3, 363.*

[20] *'A Review of Empirical Capital Structure Research and Directions for the Future.' Graham, J., & Leary, M. Annual Review of Financial Economics (2011), 3, 309-345.*

[21] *'What is securitization?' Jobst, A. Finance and Development; (2008, September). 45(3), 48-49.*

[22] *'The empirical determinants of target capital structure and adjustment to long-run target: evidence from Canadian firms.' Nunkoo, P. K., & Boateng, A. Applied Economics Letters (2010), 17, 983-990.*

[23] *'Determinants of Corporate Borrowing.' Myers, S. C. Journal of Financial Economics 5 (1977), 147-175.*

[24] *'Capital structure of UK SMEs: an integrated understanding.' Poutziouris, Markou, Glyptis and Hadjielias. Entrepreneurship and Small Business. (2022).*

[25] *'Determinants of Capital Structure: An Empirical Analysis of Firms In Industrialized Countries.' Krishnan and Moyer. Managerial Finance (1996).*

[26] *'The determinants of capital structure choice: Evidence from Western Europe.' Ana Mugoša. Business and Economic Horizons (2015).*

- **Firm age** is found to have an effect on gearing in some empirical studies. Bhaird and Lucey, (2010)[27] point out that firm age is both linked with firm size, and also affects whether the firm has a trading and credit history that can alleviate problems of moral hazard for lenders. In addition, newer firms will, on average, have a greater need to access start-up / growth capital.

- **Firm growth**, while related both to age and size, is found to have a distinct effect in some studies. Hall et al (2000)[28] found that short-term debt was related positively to growth (and negatively to profitability, asset structure, size and age), whereas long-term debt was found to be positively related to company size and negatively to age.

- Capital structure may further be influenced by **liquidity**. Following Myers' pecking order, a firm with higher liquidity may prefer to use funds generated internally to finance capital investments, rather than external loans. We would therefore expect a negative relationship between leverage and a firm's liquidity ratio. In an analysis of evidence from 11 countries during the period 2000-2013, Koralun-Bereźnicka (2018)[29] finds a significant negative relationship between the two.

- Pecking order theory additionally suggests that **firm profitability** is negatively associated with gearing. Empirical analysis is consistent with this (see, for example, Hall et al, 2000)[30]. This relationship may also be indirectly observed when assessing the impact of privatisation on leverage. Privatised firms may become more efficient, while producing higher quality outputs, thus becoming more profitable. This, in turn, provides signals to lenders that allow firms to increase reliance on debt-financing, (Barbosa, Costa, & Funchal, 2012).[31]

- Some studies also indicate high **revenue volatility** may be negatively associated with gearing, although this variable is considered less frequently in the empirical literature than many other potential drivers of gearing choices. In principle, material variation in revenue may increase both the risk faced by lenders and the cost of bankruptcy to the firm. In turn, management may decrease reliance on external debt financing, and creditors may be relatively more reluctant to provide debt loans (Sheikh & Wang, 2011)[32]. Conversely, firms with stable revenue may have the financial confidence needed in order to take out higher levels of debt.

- As set out above, **tax shields** play an important role in determining gearing choices under trade-off theory. Flath and Knobber (1980)[33] find empirical support for the impact of tax shields on optimal capital structure choices.

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[27] 'Determinants of capital structure in Irish SMEs.' mac an Bhaird, Ciarán ; Lucey, Brian. Small business economics, (2010-10), Vol.35 (3), p.357-375.

[28] 'Industry Effects on the Determinants of Unquoted SMEs' Capital Structure.' Hall, Hutchinson and Michaelas. International Journal of the Economics of Business (2000).

[29] 'Firm size and debt maturity as indirect determinants of capital structure: evidence from European panel data.' Koralun-Bereźnicka, J. Applied Economics Letters (2018), 25(18), 1319-1322.

[30] 'Industry Effects on the Determinants of Unquoted SMEs' Capital Structure.' Hall, Hutchinson and Michaelas. International Journal of the Economics of Business (2000).

[31] 'The effects of privatization on the capital structure of Brazilian firms.' Barbosa, C., Costa, C. M., & Funchal, B. Applied Economics Letters, (2012) 19, 1189-1192.

[32] 'Determinants of capital structure: An empirical study of firms in manufacturing industry of Pakistan.' 'Sheikh, N. A., & Wang, Z. Managerial Finance (2011), 37(2), 117-133.

[33] 'Taxes, Failure Costs, and Optimal Industry Capital Structure: An Empirical Test.' David Flath and Charles R. Knoeber. Journal of Finance.

- **Wider economic performance** (e.g. economic growth in general and / or economic shocks) may affect companies' capital structure choices (see Drobetz et al., 2015)[34].

- **Other factors that vary by industry / firm** identified in the literature include regulation and ownership models.

  – Ovtchinnikov (2010) finds that the deregulation of firms in the USA was associated with a reduction in gearing.[35] Here by deregulation the author is referring to *"deregulation of entry, exit, price, and quantity."* The author's proposed intuition for his result is that deregulation materially affects the operating environment of firms. Firms then respond to the associated lower profitability, higher growth opportunities and increased bankruptcy costs by reducing leverage.

  – Watson and Wilson (2002)[36] note that closely-held firms (such as family businesses) have greater opportunities and incentives to retain profits in the business and therefore rely more on internal equity as a source of finance.

04.03 Our econometric analysis

Overview of our approach

Our approach to deriving econometric models for identifying efficient gearing is based on our literature review, as outlined above. We start with a generalised model specification, incorporating the range of factors identified in our literature review, before focusing on a more parsimonious model. It is important for a regression model to be parsimonious (and ideally should neither overfit, nor underfit, the dataset). As such, the model should only include explanatory variables that contribute sufficient explanatory power to the specification. Having established a generalised model founded on *all* the potential drivers identified in capital structure literature, we therefore derive a specialised regression model. This removes variables that are not statistically significant in our generalised model, and thus are unlikely to have any strong explanatory power, in addition to those that lack intuitive justification.

Our generalised and specific models

Our analysis uses data from the Fame database, which provides financial data on companies within the UK. We used data from the 10-year period 2013-2023 and removed all observations with missing values for any of the variables. We truncated relevant variables,[37] and removed outliers by excluding the 2% extremes of financial ratios.[38] The resulting dataset has 104,119 observations across 20,130 companies. We measure gearing as the ratio of net debt to capital employed.

[34] 'Heterogeneity in the speed of capital structure adjustment across countries and over the business cycle.' 'Drobetz, Schilling, and Schröder. (2015) European Financial Management (2015), Vol. 21, pages 936–973.

[35] 'Capital structure decisions: Evidence from deregulated industries.' Alexei V. Ovtchinnikov. Journal of Financial Economics (2010).

[36] 'Small and medium size enterprise financing: a note on some of the empirical implications of a pecking order.' Watson, R., & Wilson, N. (2002). Journal of Business Finance & Accounting, 29(3–4), 557–579.

[37] We remove any observations with capital intensity or deprecation rate below 0%, or asset tangibility above 100%, on the basis that these may be data entry errors. Where gearing is below 0%, we set gearing to 0%.

[38] Asset tangibility; capital intensity; profitability; liquidity; and gearing. For variables without an upper or lower bound, we remove 1% in each tail. For truncated variables, we remove 2% on each tail.

Our generalised model examines the relationship between gearing and all of the key explanatory variables identified by the literature for which data was available. As such, the generalised model includes variables measuring the following:

- capital intensity – measured as the ratio of capital employed to revenue;
- asset tangibility – measured as the ratio of tangible assets to capital employed;
- profitability – measured as the ratio of operating profit to capital employed;
- liquidity – measured by the ratio of current assets to current liabilities;
- revenue variability – measured by the ratio of the standard deviation of revenue to the mean of revenue;
- firm age – defined as the number of years since the incorporation of the firm;
- asset life – measured by the ratio of total assets to depreciation;
- tax shields – measured by the prevailing main level of corporation tax in the UK;
- revenue growth of firms;
- firm size – measured by dummies testing whether a firm is in the upper or lower quartile of total assets (as the literature indicates the relationship between firm size and gearing is non-continuous);
- wider economic performance and shocks – measured by a GDP growth variable and a Covid-19 pandemic dummy;
- other unobserved factors that vary by industry / firm – measured by industry dummies.

In our specific model, we remove both the revenue growth and GDP growth variables. These are not statistically significant at the 1% significance level. In addition, we remove the revenue variability variable. This is because revenue variability was not as strongly supported by literature as other variables. Furthermore, results from our generalised model indicate that it has a counterintuitive relationship with gearing (positive, where we would expect a negative relationship).

Our results for the generalised and specific models are shown overleaf, as model (1) and (2) respectively, in **Table 1**.

Table 1: Regression results for generalised and specific models.

Explanatory variable	Generalised model	Specific model
Capital intensity (%)	0.01*** (0.001)	0.01*** (0.001)
Asset tangibility (%)	0.13*** (0.01)	0.13*** (0.01)
Profitability (%)	-0.20*** (0.01)	-0.20*** (0.01)
Liquidity (%)	-0.13*** (0.002)	-0.13*** (0.002)
Revenue variability	0.05*** (0.01)	-
Firm age (years)	-0.21*** (0.01)	-0.21*** (0.01)
Asset life (log) (%)	8.68*** (0.20)	8.73*** (0.20)
Corporation tax (%)	0.43*** (0.13)	0.44*** (0.13)
Revenue growth (%)	-0.0001 (0.0001)	-
GDP growth (%)	-0.08** (0.04)	-
Dummy: UQ assets	6.33*** (0.48)	6.24*** (0.48)
Dummy: LQ assets	-6.78*** (0.44)	-6.69*** (0.44)
Dummy: Covid year (2020, 2021)	-2.86*** (0.45)	-2.60*** (0.43)
SIC: Accommodation and food service activities	24.00*** (3.09)	25.27*** (3.06)
SIC: Activities of extraterritorial organisations and bodies	30.39** (12.89)	30.98** (12.89)
SIC: Activities of households as employers	30.39** (12.89)	19.38 (12.06)
SIC: Administrative and support service activities	34.29*** (2.90)	35.36*** (2.87)
SIC: Agriculture, forestry and fishing	26.44*** (3.29)	27.39*** (3.26)
SIC: Arts, entertainment and recreation	10.45*** (3.41)	11.77*** (3.37)
SIC: Construction	9.40*** (2.93)	10.56*** (2.89)
SIC: Education	-10.17*** (3.15)	-9.14*** (3.12)
SIC: Electricity, gas, steam and air conditioning supply	29.63*** (3.42)	30.85*** (3.39)
SIC: Financial and insurance activities	25.56*** (2.88)	26.59*** (2.85)
SIC: Human health and social work activities	18.22*** (3.16)	19.16*** (3.13)

Explanatory variable	Generalised model	Specific model
SIC: Information and communication	22.22*** (2.94)	23.30*** (2.91)
SIC: Manufacturing	27.97*** (2.88)	28.88*** (2.85)
SIC: Mining and quarrying	20.17*** (3.27)	21.51*** (3.24)
SIC: Other service activities	22.32*** (3.17)	23.41*** (3.14)
SIC: Professional, scientific and technical activities	29.10*** (2.88)	30.09*** (2.85)
SIC: Public administration and defence; compulsory social security	22.82*** (5.51)	23.91*** (5.50)
SIC: Real estate activities	14.93*** (3.18)	15.91*** (3.15)
SIC: Transportation and storage	24.02*** (2.98)	25.03*** (2.95)
SIC: Water supply, sewerage, waste management and remediation activities	24.23*** (3.22)	25.10*** (3.19)
SIC: Wholesale and retail trade; repair of motor vehicles and motorcycles	31.75*** (2.90)	32.67*** (2.87)
Observations	104,119	104,119
R2	0.41	0.41
Adjusted R2	0.41	0.41
Residual Std. Error	56.21 (df = 104085)	56.22 (df = 104088)
F Statistic	2,150.01*** (df = 34; 104085)	2,356.37*** (df = 31; 104088)

Source: Economic Insight analysis of Fame data.

*Note: *p<0.1; **p<0.05; ***p<0.01*

These models perform well overall:

- The variables analysed generally have a statistically significant relationship with the level of gearing. In our specific model, all variables (other than two industry dummies) are statistically significant at the 1% significance level.
- The explanatory variables generally have the expected signs. Capital intensity; asset tangibility; asset life; corporation tax; and the dummy for large firms are all found to be *positively* correlated with gearing, as expected under theory. Profitability; liquidity; firm age; the dummy for small firms and the pandemic years, are all found to be *negatively* correlated with gearing. These are all in line with expectations, based on our literature review.
- The model's R^2 is 0.41, meaning that the variables explain 41% of the variation in gearing. This indicates that the model has a high level of explanatory power.

04.04 Predicting efficient capital structures in the UK water industry

Our regression model can be used to predict the efficient level of gearing for the water sector in the UK. Because the model takes into account the relationship between gearing and the underlying drivers of companies' capital structure choices across the economy, it can provide an estimate of the efficient level of gearing in the water sector (that does not solely rely on observing water companies' actual gearing choices).

It is important, however, to recognise that there are two sources of uncertainty that are inherent in any attempt to predict (identify) the efficient level of gearing for water companies in England and Wales.

- Firstly, **modelling uncertainty.** While regression models aim to capture the *true* relationships between dependent and independent variables, this is inevitably limited by underlying uncertainty or measurement error in the data.

- Secondly, and as identified in section 03.03, **some of the determinants of efficient capital structures vary between firms within the same industry.** The current approach to notional capital structures in water regulation means that company allowances are calculated (and financeability is assessed) based on a *common* notional gearing level. Interestingly, theory and evidence (including that presented here) may indicate that there is a case for reconsidering this, to some degree, in future.

Recognising the above sources of uncertainty is thus crucial in making a balanced assessment the efficient gearing level using our (or any other) model. This is especially the case, given the risk of inadvertently discouraging beneficial capital structures, as highlighted in section 02.03.

To account for this uncertainty, we assess the appropriate *range* for efficient gearing in the water sector, accounting for both modelling uncertainty and differences between firms in the industry.

To account for modelling uncertainty, we examine the 95% confidence interval around the point estimate of optimal gearing for an average water company. This involves the following steps.

- We calculate the average value for each explanatory variable in the model specification for water companies in the UK. We consider a time-period covering the past 5 years (i.e. 2019-23) as this aligns with the price control length used in England and Wales; and therefore with the frequency of decisions around notional company capital structure.

- We calculate a range for gearing by applying the average value of the explanatory variables calculated in the preceding step to the upper and lower 95% confidence interval values for each coefficient in the model.

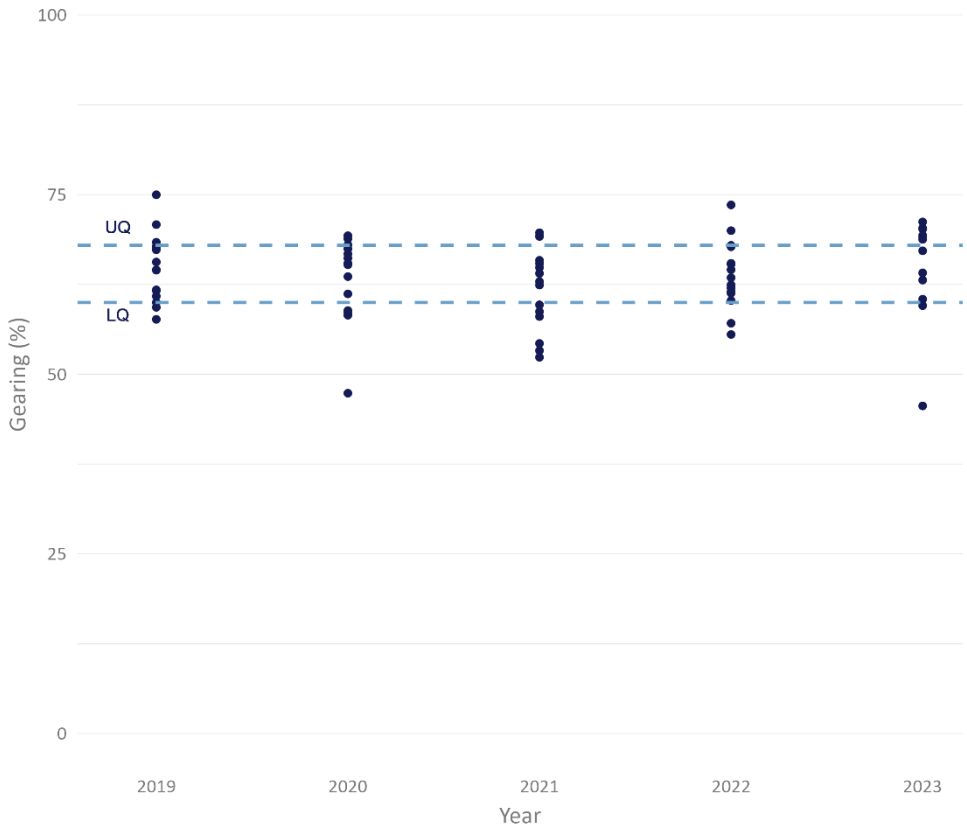
This analysis indicates a range for an average UK water company's efficient level of gearing being between 58% and 70%, with a point estimate of 66%. For so long as the regulatory method is based on applying a 'single' gearing level for all water companies, this range may be considered a good indication for the notional (efficient) gearing for use in the WACC and under financeability assessment.

Separate from the issue of identifying the efficient level of gearing for the above purpose, however, is the question of what the 'best estimate' might be for an upper limit on gearing. That is to say: at what point does gearing become unsustainable, or demonstrably inefficient, as this would seem to be the appropriate threshold for any gearing incentive mechanism, as proposed by Ofwat.

On the above issue, we consider the theoretical and empirical evidence on 'within industry' variation in optimal capital structure is important to consider. For example, on the evidence, a smaller water company may have a different optimal capital structure to a large one. Therefore, to account for differences *within* the water sector in England and Wales, we analyse the range of the model's predicted efficient gearing levels for individual companies over the five years from 2019 to 2023. We summarise the model's predicted values for individual companies in **Figure 3** below.

- There are material differences in predicted efficient gearing levels across individual companies**, with an upper end estimate of 75%** (and a lower end estimate of 46%).
- Overall, **the interquartile range of the model's predictions for efficient individual water company gearing levels is 60% to 68%**, broadly consistent with the point estimate for an average water company of 66%.

Figure 3: Predicted gearing values for the water industry.



Source: Economic Insight analysis of Fame data.

Drawing the above evidence together, we summarise that our modelling supports:

- An efficient (notional) gearing for an 'average' water company as being between 58% and 70% (point estimate of 66%).
- Efficient capital structures being as high as 75%, once individual water company characteristics are taken into consideration.

Our modelling results are consistent with our analysis of cross-sector variation in actual gearing in the UK. As outlined in section 03.03, there are several highly geared industries across the UK, including industries with gearing ranges reaching above the 70% threshold identified by Ofwat. Given that the water industry's characteristics align with the drivers of high gearing identified in our model (e.g. the water industry has relatively high capital intensity and asset intensity), the water industry's relatively high level of predicted efficient gearing aligns with our expectations and existing empirical studies, and so is unremarkable.

05

CONCLUSIONS AND RECOMMENDATIONS

Based on the theoretical and empirical analysis set out in this report, our overall conclusion is that the proposed options for a gearing incentive mechanism lack empirical support and risk harming customers, by inhibiting companies' ability to optimise their capital structures. This chapter sets out more detailed conclusions and recommendations, based on our analysis.

Conclusion 1: if Modigliani–Miller holds, there is no basis (under a capital structure efficiency rationale) for introducing a gearing incentive mechanism

In relation to the potential capital structure efficiency rationale for incentivising certain capital structures, we firstly highlight that, should one take the view that capital structures are value-neutral (i.e. Modigliani–Miller holds, or largely holds) then this provides no sound basis for introducing a gearing incentive mechanism of any kind.

Conclusion 2: in practice, existing studies, and data, are consistent with efficient capital structures existing – thus, this may provide an principle rationale for incentivising certain levels of gearing

Both existing theoretical and empirical studies provide good grounds to suppose that, in practice, there are likely to be efficient capital structures. In addition to the there being tax advantages to debt finance, capital markets are unlikely to be perfectly efficient. The main strands of capital structure theory supporting efficient capital structures existing are: trade-off; signalling; pecking order; and market timing.

Further to the above, a preliminary analysis of gearing across firms / industries in the UK reveals material and systematic differences. This seems more consistent with the existence of there being efficient capital structures than capital structure neutrality.

Conclusion 3: However, even if Modigliani–Miller theorem does not 'strictly' hold (i.e. efficient capital structures exist, as we suggest above) one should consider the consistency of using this to justify a gearing incentive mechanism, whilst relying on the theorem when estimating the cost of capital

This conceptual inconsistency was the key reason the CMA chose to disapply the GOSM at the PR19 redeterminations, whereby it found:

"To be clear, our approach and our assessment of the GOSM does not require that the Modigliani-Miller propositions are a perfect representation of all the real-life impacts on the cost of capital. There may well be 'real life' influences on an optimal level of gearing based on factors such as relative costs of debt and the benefits of particular financing structures, which can change the balance of risk between equity and debt investors independently of changes in the level of gearing.

Rather, our approach reflects that:

(a) The Modigliani-Miller propositions are used throughout the cost of capital calculations; and
(b) That the gearing's impact on the cost of equity is to increase to reflect a differing exposure of equity investors to systematic risks at each 'notch' of gearing.

As a result, we consider it [the GOSM] to be inconsistent to base the bulk of the calculation of the allowed return on equity on the standard assumption that the cost of equity strictly increases with gearing."[39]

Conclusion 4: if the regulatory approach is to be predicated on the basis of there being efficient (or inefficient) levels of gearing, it is imperative to take an evidence based (data driven) approach, in order to avoid causing inadvertent harm to customers

If a gearing incentive mechanism is to be introduced to prevent / discourage inefficient (or unsustainable) capital structures, clearly it necessary that the 'efficient' level can be identified with a relative degree of certainty.

In our view, that means the approach must be rooted in a careful and balanced appraisal of the relevant evidence. More specifically, it would also seem to imply placing weight on data on actual industry gearing levels, at least to some degree. For example, when determining cost / outcomes efficiency, Ofwat undertakes forms of benchmarking analysis, which inherently draw on industry data on actual costs / outcomes delivered. Thus, if efficiency is the lens through which one is considering whether there is a requirement to set incentives on gearing, then actual industry gearing data must logically be informative of that.

Conclusion 5: Drawing on existing research and evidence, it is possible to identify / estimate ranges for efficient gearing in the water industry

From our review of the literature, in our view there is a sufficient base of empirical research identifying the drivers of gearing across firms and industries, such that it possible to estimate ranges for the water industry. In particular, there is sufficient commonality in the main drivers of gearing identified in the literature be reasonably confident that said key drivers likely determine gearing choices (e.g. capital intensity; tangible asset intensity in particular).

Conclusion 6: Our modelling suggests efficient (notional) capital structures in the water industry in the region of 66% for an average company, with efficient levels for some companies being as high as 75% (high once firm level characteristics are controlled for)

We have been able to estimate an econometric model for gearing that is statistically robust, accords with intuition, and consistent with existing empirical studies. Whilst no model is perfect, we think this provides a reasonable basis for reaching a view on potential efficient gearing levels in the water industry.

[39] *'Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations: Final report- Appendices and Glossary.' CMA (2021); D3-D4.*

Conclusion 7: At this time, Ofwat has not (from a capital efficiency perspective) made the case for the need for any mechanism and, furthermore, its proposed thresholds risk disincentivising appropriate capital structures, which will increase costs to customers and risk deterring investment

Following from the above, the existing evidence and our own analysis indicates that Ofwat's proposals (which impose financial penalties on companies with gearing above 70%) may actually overlap with appropriate and efficient capital structures. If Ofwat were to introduce a mechanism, therefore, this points to a need to reconsider the threshold. We note that in its recent Sector Specific Methodology Decision, Ofgem is applying a threshold of 75% gearing at which a dividend lock-up applies.[40]

In our view, however, Ofwat has not adequately made the case for the mechanism by demonstrating the inefficiency of companies' actual capital structures. It appears that broader, related, issues such as complex ownership structures, intragroup financing, and UK taxation payments, etc. may, quite legitimately, be of more concern to the regulator. To the extent that this is the case, it would be seem appropriate for Ofwat to consider tools for addressing those concerns more directly, noting that blanket incentives triggered by gearing alone may penalise entirely proper commercial decisions.

Finally, we again highlight the analyses and evidence in this report are also relevant to the question of notional gearing. It is important to keep in mind that harm to customers may arise from inadvertently setting the notional gearing level 'too low', as well as 'too high'. Firstly, under Ofwat's calculations of the WACC, all else equal a reduction in notional gearing lowers the allowed return. Thus, if the notional gearing level is below the appropriate level, there is a risk that efficient companies are under-funded. Secondly, when Ofwat undertakes its financeability assessment, notional gearing is a determinant of the assumed equity buffer. Therefore, if the notional gearing is 'too low', key credit metrics (financial ratios) will appear to be stronger than would actually be the case for a efficient firm (i.e. because 'too low' notional gearing implies an unrealistic equity buffer). In turn, this can lead to a regulator incorrectly concluding an efficient firm is financeable.

[40] *Specifically, Ofgem's decision is to apply a lock-up at "the earlier of reaching BBB- with a negative watch/outlook and 75% net debt to regulatory asset value." 'RIIO-3 Sector Specific Methodology Decision – Finance Annex.' Ofgem (July 2024); page 152.*

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