Europe Economics

Further Advice on the Allowed Return on Capital for the Water Sector at PR19 – Betas and Gearing

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Contents

Summary

In this note, commissioned from Europe Economics by Ofwat in the context of the CMA appeals regarding the PR19 price control, we set out views on issues relating to how to estimate betas and how to treat differences between notional and actual gearing levels.

First we consider whether the CMA's provisional findings in its review of the Civil Aviation Authority's NERL (En Route) Plc appeal have relevance for the beta calculations that Ofwat has used.

We consider the methods the CMA uses, in those findings, to calculate betas and what the implications would be for water sector betas were those methods to be applied. As Europe Economics did in its advice to Ofwat, the CMA estimated betas based on both 2-year and 5-year daily and weekly data. However, unlike the Europe Economics approach, which focused upon spot-beta estimates and the application of judgement, the CMA NERL/CAA approach places formal weight on averaging beta values over a 1-year, 2-year and 5-year period.

In our view, given that 2-year and 5-year betas already average data over their periods, to average these averages again goes too far. We would suggest that instead of formal averaging it is better to assess the data visually over a period and apply judgement to consider whether the most recent data is erratic or is fairly typical of much of the recent past.

That objection notwithstanding, we here replicate the CMA NERL/CAA approach on beta using both an end-September 2019 cut-off date (as per the data window used in our advice for Ofwat's Final Determination (FD)) and an end-February 2020 cut-off date. For the end-September data cut-off, using the CMA's core approach produces an unlevered beta of 0.26, in line with Europe Economics' recommendation. Excluding extreme values produces an unlevered beta of 0.29, in line with Ofwat's determination. Application to an end-February data cut-off makes no material difference to the results. We conclude that the CMA's approach on this question would not materially affect the PR19 FD unlevered betas.

The CMA proposes a new method for unlevering and relevering betas, based upon maintaining the overall WACC constant rather than the asset beta constant. We argue that this issue is more relevant in the NATS case, where the difference between the actual gearing of comparator firms and the notional gearing is much larger (30 per cent versus 60 per cent) than in the case of Ofwat (56.4 per cent versus 60 per cent). For Ofwat the effect, even if applied, would be only 1.6 basis points reduction in the overall WACC.

The main reason the WACC currently rises with gearing for Ofwat-regulated entities is Ofwat's use of an embedded debt allowance, to which the Modigiliani-Miller Theorem would not, in an event apply. And that would not be true over multiple price control periods. When the embedded debt allowance is below the cost of new debt, Ofwat's method will produce a WACC that declines as gearing rises. Over multiple price control periods the embedded debt and new debt costs should be expected to converge.

We also demonstrate that the CMA's preferred method is mathematically equivalent to treating, for calculation purposes, the entire debt premium as accounted for by the debt beta.

We consider objections raised by various firm submissions (most notably that of Yorkshire Water) to Ofwat's gearing outperformance mechanism, whereby the benefits of gearing up above a dead-band threshold beyond the notional gearing are to be shared with consumers. We argue that, since high gearing imposes costs upon consumers and upon Ofwat, it is reasonable for Ofwat to either restrict the ability of firms to gear very highly or to give them incentives to limit the extent to which they over-gear, through a benefits-sharing mechanism.

1 Introduction

Europe Economics has advised Ofwat on the cost of capital for the its PR19 determination.[1] In this note, we set out further our views on issues relating to how to estimate betas and how to treat differences between notional and actual gearing levels.

We first consider whether the CMA's provisional findings[2] in its review of the Civil Aviation Authority's NERL (En Route) Plc appeal have relevance for the beta calculations that Ofwat has used. Specifically, we consider the implications of different methodological approaches in (a) the way that evidence is used to form a view on the range and point estimates for beta and (b) un-levering and re-levering beta at the notional gearing level to obtain a notional equity beta. In both cases, we find that the differences are unlikely in practice to affect conclusions materially.

Second, we consider arguments that Ofwat's gearing outperformance mechanism is inconsistent with the Modigliani-Miller theorem. We conclude that such arguments neglect Ofwat's remit, which is to make a determination that protects the interests of consumers. There are reasons for a regulator to consider how different gearing arrangements may affect the interests of consumers, over and above of the question of how finance theory suggests changes in gearing may affect the cost of capital.

[1] See Europe Economics (2019) "The Allowed Return on Capital for the Water Sector at PR19 – Final Advice" https://www.ofwat.gov.uk/publication/europe-economics-the-allowed-return-on-capital-for-the-water-sector-at-pr19-final-advice-december-2019/

[2] https://www.gov.uk/cma-cases/nats-en-route-limited-nerl-price-determination#provisional-findings

2 CMA Approach to Estimating Beta

In this section we cover two methodological aspects raised by the CMA in the recently published provisional findings report regarding the NERL/CAA regulatory appeal.[3]

- The first aspect is related to the way evidence is used to form a view on the beta range and point estimate.
- The second aspect is more fundamental and is related to an alternative approach to the regulatory practice of de-levering and re-levering beta at the notional gearing level so as to obtain a notional equity beta.

2.1 Beta evidence

In its provisional findings report regarding the NERL/CAA case, the CMA estimated betas based on both 2-year and 5-year daily and weekly data. However, unlike the approach we took in our December 2019 Report, which relied entirely on spot-beta estimates, the CMA NERL/CAA approach places formal weight on averaging beta values over a 1-year, 2-year and 5-year period.

In our view, given that 2-year and 5-year betas already average data over their periods, to average these averages again goes too far. We would suggest that instead of formal averaging it is better to assess the data visually over a period and apply judgement to consider whether the most recent data is erratic or is fairly typical of much of the recent past.

That objection notwithstanding, in this section we have replicated the CMA NERL/CAA approach on beta using both an end-September 2019 cut-off date (as per the data window used in our advice for Ofwat's Final Determination (FD)) and an end-February 2020 cut-off date (reflecting the final complete month before the current COVID-19 pandemic significantly disrupted the data). The betas obtained under this approach for Severn Trent, United Utilities, and the SVT/UU portfolio, are presented in the tables below.

Table 2.1: Unlevered beta evidence under the CMA's approach (end of September 2019)

		Spot end Sept 2019	1-yr average	2-yrs average	5-yrs average
Severn Trent	2-yr daily	0.26	0.28	0.30	0.34
	2-yr weekly	0.18	0.24	0.32	0.35
	5-yr daily	0.32	0.34	0.34	0.32
	5-yr weekly	0.31	0.33	0.35	0.33
United Utilities	2-yr daily	0.25	0.26	0.28	0.33
	2-yr weekly	0.19	0.23	0.28	0.32
	5-yr daily	0.31	0.33	0.33	0.30
	5-yr weekly	0.29	0.31	0.33	0.30
SVT/UU	2-yr daily	0.25	0.27	0.28	0.33
	2-yr weekly	0.18	0.24	0.30	0.34
	5-yr daily	0.32	0.33	0.33	0.31
	5-yr weekly	0.30	0.32	0.34	0.31

Source: Thomson Reuters, Europe Economics' calculations.

The CMA approach consists of using all the beta evidence provided above in order to firm a view on the plausible range. To this end, based on the evidence provided in Table 2.1 a plausible unlevered beta rage for

[3] See https://assets.publishing.service.gov.uk/media/5e7a2644d3bf7f52f7c871f3/Provisional_Findings_Report_-_NATS_-_CAA.pdf

SVT/UU is between 0.18 (spot value of the 2-year weekly beta) and 0.34 (2-year average of the 5-year weekly beta and/or 5-year average of the 2-year weekly beta). The mid-point of this range is 0.26. We note that the value we would thus obtain by employing the CMA approach is identical to the value we recommended in our December 2019 Report.

The CMA NATS provisional analysis includes some discussion of the exclusion of outliers. If, from the above range, we exclude the highest and lowest values, the range becomes 0.24 to 0.33, with a mid-point of 0.285, in line with Ofwat's FD value of 0.29.

Table 2.2: Unlevered beta evidence under the CMA's approach (end of February 2020)

		Spot end Feb 2020	1-yr average	2-yrs average	5-yrs average
Severn Trent	2-yr daily	0.28	0.27	0.29	0.33
	2-yr weekly	0.27	0.21	0.28	0.34
	5-yr daily	0.33	0.33	0.34	0.32
	5-yr weekly	0.34	0.32	0.34	0.33
United Utilities	2-yr daily	0.28	0.27	0.28	0.33
	2-yr weekly	0.27	0.21	0.25	0.31
	5-yr daily	0.32	0.32	0.33	0.31
	5-yr weekly	0.33	0.31	0.32	0.30
SVT/UU	2-yr daily	0.28	0.27	0.28	0.33
	2-yr weekly	0.27	0.21	0.26	0.32
	5-yr daily	0.32	0.32	0.33	0.31
	5-yr weekly	0.33	0.31	0.33	0.32

Source: Thomson Reuters, Europe Economics' calculations.

Based on the evidence provided in Table 2.2, a plausible unlevered beta rage for SVT/UU is between 0.21 (1-year average of the 2-year weekly beta) and 0.33. The mid-point of this range is 0.27. Excluding extremes, the range would be 0.26 to 0.32, with a mid-point of 0.29, again in line with Ofwat's FD value.

We thus conclude that the CMA's approach on this question would not materially affect the PR19 FD unlevered betas.

2.2 Betas and gearing

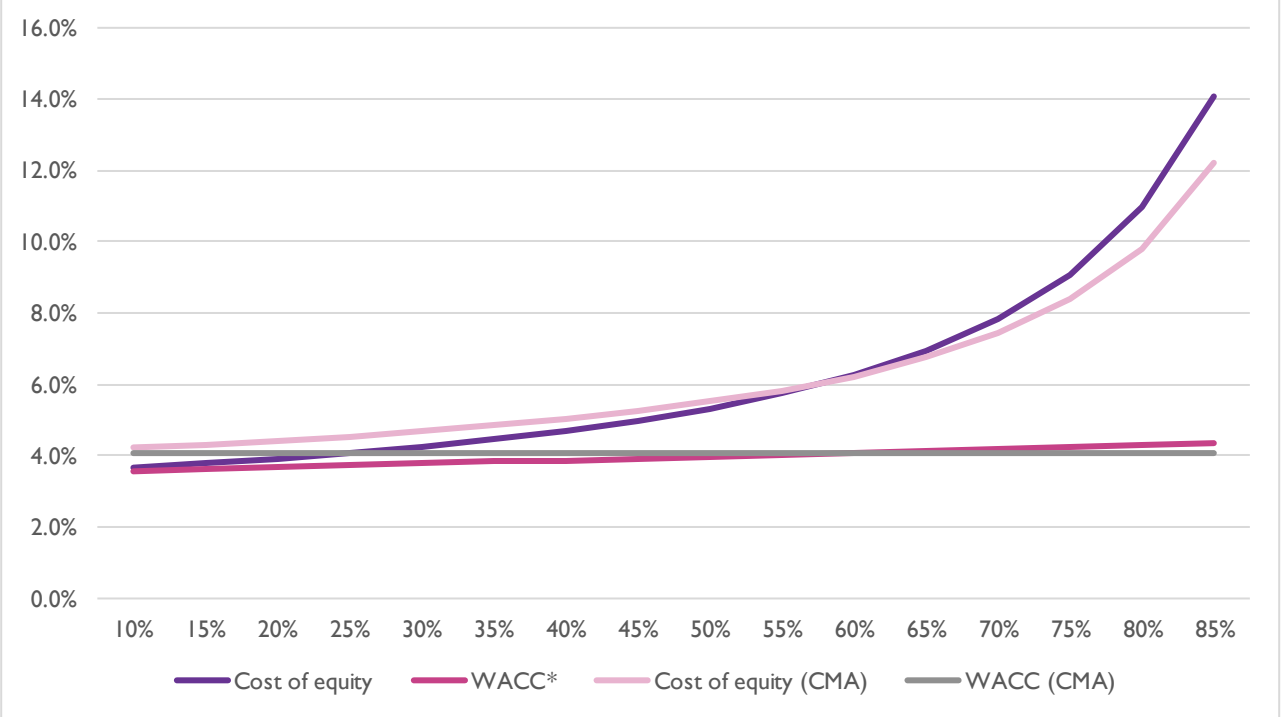
The standard regulatory approach when estimating the cost of equity is to de-lever (or "un-lever") raw equity betas using market gearing figures and to then re-lever the beta at a notional gearing level. The notional gearing of NERL's gearing (60 per cent) is materially higher than the market gearing of the relevant comparators (the market gearing of relevant comparators airports is around 30 per cent). The CMA's provisional findings note that applying the standard de-levering/re-levering approach results in a WACC figure that increases with gearing. This they regard as being inconsistent with finance theory and the irrelevance of capital structure principle of the Modigliani-Miller Theorem.

One approach to reconcile the standard de-levering/re-levering approach with the Modigliani-Miller Theorem would be to treat the entire debt premium as reflecting debt beta, which would result in a debt beta that meant the WACC remained constant as gearing changed.[4] However, the CMA states that the debt beta required to ensure that the WACC does not vary with gearing would be implausibly high, and therefore favours an alternative approach which consists of estimating the cost of equity based directly on the raw equity beta (and thus based on market gearing). The mathematical implication of this approach is that for the WACC to remain constant at the notional gearing level the asset beta must change.

[4] Indeed, in the Appendix we demonstrate that an approach of treating the entirety of the debt premium as the result of debt beta is mathematically equivalent to the CMA NERL/CAA provisional findings approach.

In practice, the issue is not especially significant when setting the cost of equity for water companies, since the actual gearing of the comparator companies and the notional gearing are not so far apart. The chart below replicates the CMA's Figure D1 showing the implied cost of equity for different levels of gearing when the WACC is constant across gearings, [5] but with a starting point based on a comparator with 56.4 per cent gearing (56.4 per cent is the point at which the WACC lines below cross). Given Ofwat's notional gearing level is 60 per cent, there is relatively little difference in the cost of equity between that produced by the standard regulatory approach and that produced by the approach proposed by the CMA in its provisional findings for NERL. The difference in what we refer to as the "Vanilla WACC"[6] is even less, and the difference in the Ofwat WACC would be proportionately less still, because of the impacts of embedded debt, as we explain below.

Figure 2.1: Cost of equity and "Vanilla WACC" at different gearing levels using standard regulatory approach to re-levering and CMA's proposed approach, excluding embedded debt



Source: Europe Economics calculations

The graph is constructed using Ofwat's cost of equity (which is referred to as "Cost of equity") and Ofwat's cost of new debt (including issuance costs).[7] To create this graph, we use two steps.

- Step 1 – first, we have estimated the cost of equity based on the raw equity beta and the WACC based on market gearing, which in this case is 56.4 per cent. As noted, we treat the cost of debt, for the purposes of this calculation, as determined entirely by the cost of new debt.
- Step 2 — we have then calculated what the cost of equity would need to be at the notional gearing in order for the WACC to remain constant and from this we have then inferred what the asset beta would be.

[5] Page D5, Appendix D, CMA (2020) "NATS (En Route) Plc /CAA Regulatory Appeal Provisional findings report" https://assets.publishing.service.gov.uk/media/5e7a266cd3bf7f52f03c8a06/Appendices_and_glossary_PFs.pdf

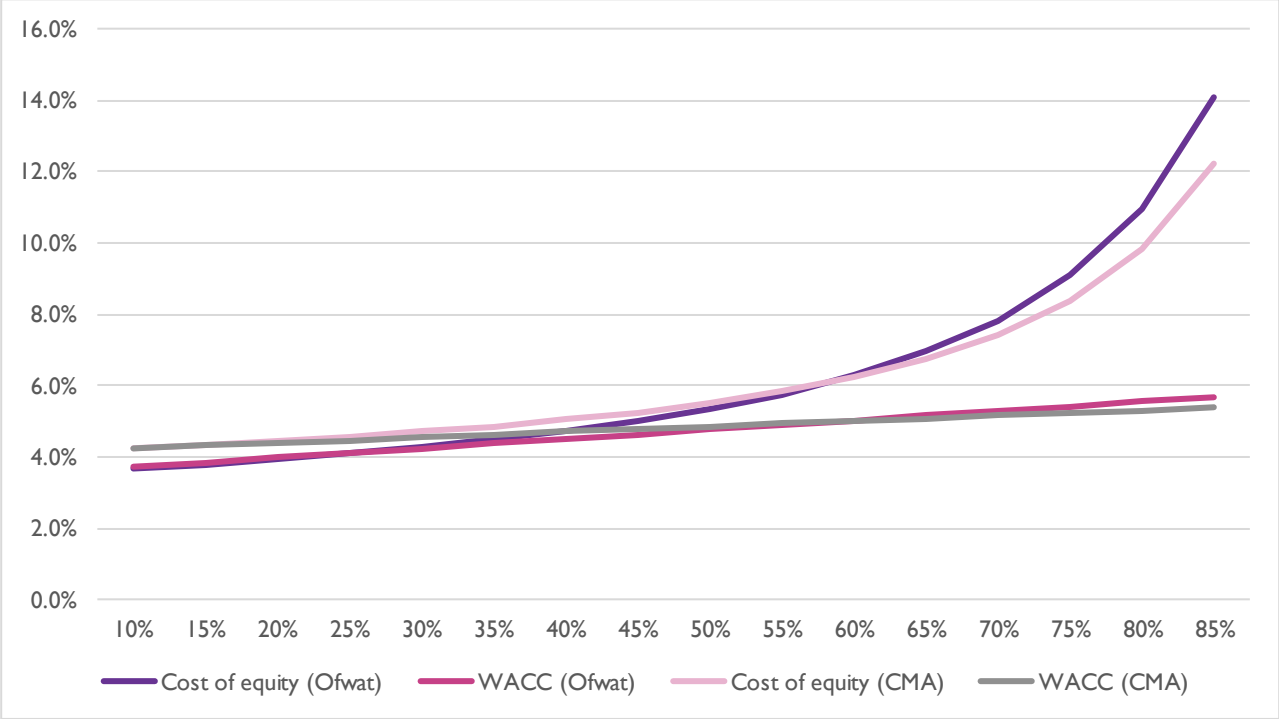
[6] The "Vanilla WACC" in what follows is purely a calculation device. It is derived by using the name notional gearing that Ofwat has determined but using the cost of new debt instead of the cost of all debt as the "cost of debt" for the purposes of calculating this "Vanilla WACC".

[7] This is 2.55 per cent, versus Ofwat's overall cost of debt allowance including embedded debt of 4.18 per cent.

As the graph illustrates, because the market gearing of 56.4 per cent is so close to the notional gearing of 60 per cent, the impact of the CMA method on the WACC would be very small – only around 1.6 basis points, in this case changing the "WACC" result from 4.09 per cent to 4.08 per cent.

What impact, then, would this have in a setting that included embedded debt? An embedded debt allowance is outwith the Modigliani-Miller and CAPM frameworks altogether, since it is an additional allowance on top of (or, in principle, deduction from) the allowance for the costs of raising new finance (to which Modigliani-Miller and CAPM frameworks apply). So we should not expect or require the WACC to remain invariant to gearing once an embedded debt allowance is included. Since in this case the amount of embedded debt is greater than zero and the cost of embedded debt is higher than the cost of new debt, that means that under both the Ofwat or CMA methods the WACC should be expected to increase with gearing (since in either case a higher gearing means a higher share of non-CAPM, non-Modigliani-Miller debt financing cost). In that case the Ofwat and CMA approach graphs look as follows.[8]

Figure 2.1: Cost of equity and Ofwat Vanilla WACC at different gearing levels using standard regulatory approach to re-levering and CMA's proposed approach, and including embedded debt



In this case we see that *both* lines slope up and cross at a gearing of 56.4 per cent, but as before the difference at a gearing of 60 per cent is very small – as before just 1.6 basis points but in this case that is an even smaller share of the total WACC of 5.02 per cent (under the Ofwat definition) or 5.00 per cent (under the CMA definition).

We thus conclude that the CMA's approach on this question would affect the PR19 FD WACC only very marginally, by less than 2 basis points.

[8] It is worth noting that in Ofwat's case embedded debt is the main reason the overall WACC rises with gearing. And it is also worth noting that this will not be always be true. Over multiple price controls the return on embedded debt will trend on average towards the cost of new debt. And in some price control periods the cost of embedded debt will be lower than that of the cost of new debt, so in those price control periods the WACC will fall as gearing rises.

2.2.1 Relationship between gearing, the debt premium and debt beta

In the Appendix we prove that the CMA's treatment of gearing is mathematically equivalent to the use of a notional "debt beta", i.e. that there is no liquidity risk premium in the debt market. Here we explain the intuition behind that.

In recent regulatory determinations it has been common to adopt the approach to debt beta and re-gearing that Ofwat used in its Final Determinations. In that approach the debt premium is regarded as explained partly by the debt beta and partly by other factors – in particular a liquidity risk premium.[9] In the Capital Asset Pricing Model there is no role for a liquidity risk premium. That means that in the cost of debt there is an additional factor, not accounted for in the CAPM.[10]

When regulators apply the Modiglini-Miller Theorem to the CAPM, to re-gear (re-lever) an equity beta via an asset beta (including the debt beta), that holds the CAPM element of the WACC constant with gearing. But because there is a non-CAPM element in the cost of debt – the liquidity risk premium – at a higher level of gearing the liquidity risk premium is applied to a higher proportion of the total capital structure. Since the CAPM element is held constant and the non-CAPM element rises, the allowed WACC rises with gearing.

The CMA's answer to this is to allow the CAPM element of the WACC to decline with gearing – via a falling asset beta – so as to offset the effect of the share of the liquidity risk premium rising. But an alternative route to achieving exactly the same effect would be to exclude the liquidity risk premium from the beginning. Since it is the liquidity risk premium that creates the wedge between the CAPM WACC and the overall WACC, and hence forces a choice between applying the Modigliani-Miller Theorem to the CAPM portion of the overall WACC or to the overall WACC itself, if the liquidity risk premium is set to zero the wedge will disappear and there is no longer any choice to be made.[11]

To say we will set the liquidity risk premium to zero is simply another way to say that the entirety of the debt premium on new debt is to be explained by the debt beta.[12] If the debt beta is set high enough to account for the whole debt premium, then the CAPM WACC and overall WACC are the same thing, and applying the Modigliani-Miller Theorem to the CAPM asset beta is the same thing as applying the Modigliani-Miller Theorem to the WACC overall. In our view this would be a more direct, simpler and more consistent way to achieve the CMA's objective.[13]

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[9] There is also often, as in the case of Ofwat's PR19 analysis, an adjustment for the difference between the promised and expected cost of debt, but this adjustment is much smaller than the liquidity risk premium and would in any event be consistent with the CAPM. We set this aside as a tangential issue for the rest of our discussion here.

[10] This was precisely the objection Europe Economics raised to the use of a liquidity risk premium in its advice to the CAA and its evidence to the Competition Commission's Review of 2007 - https://webarchive.nationalarchives.gov.uk/20140402235745/http:/www.competition-commission.org.uk/assets/competitioncommission/docs/pdf/non-inquiry/rep_pub/reports/2007/fulltext/532af.pdf

[11] This is proved formally in the Appendix.

[12] Strictly, this is not quite true in that a small portion of the debt premium is the difference between the expected and the promised cost of debt. But as stated earlier, we abstract from that, much less material, issue, so as to avoid over-complicating the discussion.

[13] We note that the discussion here relates entirely to the treatment of the debt premium on new debt. As set out in previous subsections, our interpretation of the CMA approach is that when there is a positive embedded debt allowance there would still (correctly) be an upwards-sloping WACC. We should not expect the Modigliani-Miller theorem or CAPM to apply to embedded debt.

3 Gearing Outperformance Mechanism

Ofwat has set a benefit sharing mechanism for companies with a high gearing level. This effectively reduces the allowed cost of capital for firms with reported gearing in excess of 74 per cent, with this threshold falling to 70 per cent over the AMP. The notional gearing used to estimate the cost of capital is 60 per cent, so this mechanism only applies for companies significantly above the Ofwat's notional gearing level. Yorkshire Water disagrees with this approach, which it considers 'unduly simplistic' and to involve thinking that "no economist or financial expert would recognise".[14]

In this section, we set out why Ofwat's approach is defensible. This conclusion does not hinge on adopting a different interpretation of finance or economic theory. Rather it follows from thinking about what Ofwat's ultimate objective is when making a determination, and how that should guide its approach to setting allowances for the cost of capital. There are reasons why Ofwat may have concerns that a firm's interest in having a very high level of gearing may not align with the interests of the firm's customers, customers who do not have the opportunity to change supplier. A mechanism to deter firms from becoming highly geared may be a prudent regulatory approach consistent with the underlying rationale for most economic regulation, that of protecting customers in situations where the regulated firm has market power.

According to the Modigliani-Miller theorem, abstracting from tax (which is not relevant in the way that Ofwat determines the WACC) the cost of capital is invariant with gearing, unless changes in the level of gearing are themselves associated with changes in the management of the firm's assets. For given management of assets there are given net cash flows with given risks, and all that gearing does is to allocate those net cash-flows between different claimants (debt holders and equity holders).

Even if a firm's investors are, in aggregate, indifferent to the level of gearing in their evaluation of the value and risk of a company overall (taking into account both equity risk and debt risk) that does not mean that a firm's customers are indifferent. If there are no benefits to the firm from gearing being higher that are in due course passed on to customers in the form of lower prices or higher quality of service, a firm's customers lose out when gearing rises, because those customers face an increased risk that the firm goes bankrupt and

[14] See page 76, Yorkshire Water (2020) 'PR19 Redetermination Yorkshire Water Services: Statement of Case' https://assets.publishing.service.gov.uk/media/5e8dc82686650c18cc99f228/_Yorkshire_Water_-_PR19_redetermination_Statement_of_Case__02.04.2020__--.pdf
Other company submissions argued that the gearing outperformance mechanism is:

- an unprecedented intervention into company capital structures;
- inconsistent with financial and economic theory (Modigliani Miller's Financial Structure Irrelevance Proposition).
- applied to an arbitrary level of gearing that is not grounded in evidence
- an affront to the principle of maintaining a stable regulatory regime; and
- the glidepath does not account for the scale of the regulatory change.

The companies argue that highly geared structures benefit customers as they result in lower bills as a result of a lower payments for tax. Additional points raised are that:

- Anglian Water argues highly geared structures have generated customer benefits as a result of licence conditions such as the dividend lock up licence conditions.
- Northumbrian Water argues there is no one-size fits-all-gearing that is optimal for all companies, and costs to customers would rise over time as additional risk is priced in.
- Yorkshire Water argues that the fact that water companies have different levels of gearing in the range 60-80 per cent is evidence that the cost of capital is not particularly sensitive to changes of gearing in this range.
- Yorkshire Water cite statements in previously published material by the CMA and Ofwat's cost of capital advisors at PR04 and PR09 as evidence that the WACC is insensitive to gearing changes.
- Bristol Water argues the trigger level of gearing for the gearing sharing mechanism is too low.
- Bristol Water suggests Ofwat's mechanism should treat preference shares as equity in the gearing calculation.

hence has its service provision interrupted. That is particularly true in the case of a regulated water sector firm that has no direct competitors and for which there is limited if any scope for new entry.

Furthermore, Ofwat's framework includes an embedded debt allowance, which has the consequence of partially-shielding firms from financing risks on debt. That means that, relative to whatever their economically-optimal level or range of gearing is, regulated water sector firms have an incentive to gear up beyond it, so as to take advantage of the partial shielding of debt risk – thereby passing additional risk on to customers. Furthermore, in periods when the cost of debt is falling and expected to fall further in the future, so the cost of embedded debt is expected to be higher than that of the cost of new debt in the next price control period, firms may have a collective interest in raising their gearing so as to increase the notional gearing, since with a positive embedded debt allowance the WACC allowance rises as notional gearing rises.

The extent to which customers lose out may be limited at relatively modest rises of gearing above the notional level. As with many regulators, Ofwat allows a degree of tolerance above its notional level. One regulatory approach is to impose a hard barrier, after a tolerance band - forbidding regulatory licenses to firms that adopt gearing levels above the notional level plus the tolerance band. Ofwat's approach is more nuanced, granting flexibility to firms to set gearing above the notional level plus the tolerance band provided that they share the benefits of their doing so with consumers, to compensate consumers for the additional risks of service interruption and to compensate the regulator for the risk of bearing additional potential costs in managing a situation of default.

Such benefits (over-and-above those associated with embedded debt) may exist. The conclusion of the Modigliani-Miller theorem is not that there is no such thing as an optimal level or range of gearing. Rather, it points us to factors that are or are not relevant in determining such an optimal level or range. There are a variety of corporate finance theories that attempt to account for differences in gearing choices by different firms in different sectors.

We do not need to choose which of those theories, if any, is correct for us to conclude that there may well be benefits to certain firms in choosing a particular level or range of gearing. However, we note that some potential benefits to firms (albeit not all) might accrue from the ways high gearing creates pressure upon regulators to agree to allow higher prices in revenue controls. That could be because higher gearing undermines the general financeability of firms. It could be because higher gearing leaves firms more exposed to certain large cost shocks that could create pressure on regulators to re-open price controls. So in addition to compensating consumers for the additional risks of service interruption and to compensate the regulator for the risk of bearing additional potential costs in managing a situation of default, benefits sharing in the case of high gearing could also be an important mechanism to deter firms from artificially over-gearing in order to game the regulator.

If a water-sector firm considers that its optimal gearing lies markedly above the notional level of gearing - indeed more above the notional level than Ofwat's tolerance band allows for - then it must consider that there are benefits (either genuine or of a gaming nature) for it in doing so. Ofwat does not seek to prevent firms from setting gearing higher than the notional level. It accepts that for some firms it may be optimal for them to do so. But setting gearing high imposes costs on water customers and on the regulator, and creates the potential for the regulator to be gamed. Ofwat therefore considers that, to offset or compensate for these losses, firms should share their benefits with consumers. Whilst this is not the only approach regulators could take (eg some adopt a hard threshold and forbid gearing to exceed it), Ofwat's approach in this area is, in our view, justifiable on the basis we have set out above.

4 Appendix

In this Appendix we demonstrate that the CMA NERL/CAA provisional findings approach is mathematically equivalent to assuming that the entire debt premium is explained by the debt beta – i.e. that there is no "liquidity risk premium" in the debt beta nor any non-nugatory wedge between the promised market cost of debt and the expected return on debt (i.e. virtually no probability of default).

Suppose

- MM holds
- CAPM holds and applies to the cost of debt as well as the cost of equity
- The asset beta is constant

Then

$$rd = Bd \times MRP + rf$$

$$re = MRP \times (Ba - Bdg)/(1-g) + rf$$

$$WACC = Ba \times MRP + rf$$

Next suppose CAPM did not apply to the cost of debt, and that there were a wedge W>0 above the CAPM cost of debt number:

$$rd = Bd \times MRP + rf + W$$

In that case

$$WACC = Ba \times MRP + rf + gW$$

$$=> dWACC/dg = W > 0$$

So WACC rises with gearing and we should write WACC(g) to give the WACC at a given level of gearing.

Next suppose that we knew the WACC at some level of gearing, g. Then suppose we wanted to consider the WACC at a different level of gearing, g*. If we apply the CMA method, we have rd unchanged and

$$WACC(g*) = WACC(g)$$

So

$$(1-g*)re = WACC(g) - g* \times rd = Ba \times MRP + rf + gW - g* \times (BdMRP + rf + W)$$

$$=>$$

$$re = MRP \times (Ba - Bdg*)/(1-g*) + rf - (g* - g)W/(1-g*)$$

Now, let us consider an "asset beta" Ba', such that

$$\frac{MRP(Ba - Bdg*)}{1-g*} + rf - \frac{(g* - g)W}{1-g*} = MRP(Ba' - Bdg*)/(1-g*) + rf$$

That gives

$$(Ba' - Bdg*) = (Ba - Bdg*) - (g* - g)W/MRP$$

$$Ba' = Ba - (g* - g)W/MRP$$

So the CMA method gives an asset beta that falls by the amount above as the gearing rises.

Suppose that all the above were true. But then suppose we falsely assumed the following.

$$Bd' = (rd - rf)/MRP$$

In other words, we incorrectly assumed W = 0. And suppose we observed rd directly and correctly.

So at gearing g, relative to the truth (with the non-zero W) we would have

$$rd = BdMRP + rf + W = Bd'MRP + rf$$

$$=> Bd' = Bd + W/MRP$$

Assume also that in both the true cases and our erroneous W = 0 case we estimated the equity beta directly at gearing g. Then the overall WACC estimation would be the same at g, but the asset beta would be erroneously overstated at Ba' > Ba, because of the overstatement of Bd, by an amount precisely sufficient to leave the WACC unchanged.

$$WACC(g) = BaMRP + rf + gW = Ba'MRP + rf$$

$$=> Ba' = Ba + gW/MRP$$

Then suppose that when gearing rose to g*, it were erroneously assumed the asset beta was unchanged, at the erroneously-calculated value Ba'. Then we would have

$$WACC(g*) = Ba' \times MRP + rf = (Ba + gW/MRP) \times MRP + rf = Ba \times MRP + rf + gW = WACC(g)$$

So by erroneously assuming there is no wedge and also erroneously assuming the asset beta is invariant with gearing, the same mathematical result is produced: the WACC stays invariant with gearing.

We conclude that assuming no wedge, estimating the debt beta on that basis, then applying that inferred debt beta (whether it corresponds to the true beta of debt or not) and then assuming asset beta is invariant as gearing changes is mathematically equivalent to assuming there is a non-zero wedge and having the asset beta decline with gearing such that the WACC does not rise. In other words, the key material implication of the CMA NERL/CAA provisional findings approach is a rejection of the liquidity risk premium adjustment to the debt beta used for calculation purposes, even though the CMA regards that liquidity risk premium adjustment as correct if one were attempting to estimate the debt beta in its own right.