Europe Economics

Responses to the CMA's Provisional Findings regarding WACC in the Water Appeals

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Summary

- This document responds to various issues concerning the WACC arising from the CMA's Provisional Findings in the Water Appeals.
- We argue that the CMA's general approach to aiming up is flawed, both in terms of not setting out an adequate rationale for aiming up at all and more specifically for aiming up at what appears to us to be approximately the 95th percentile of the CMA's distribution, rather than (as we assume it intends) something close to the 75th percentile.
- We argue that the CMA's approach to its choice of ranges for each of the individual cost of equity parameters is conservative, amounting to a form of implicit aiming up. Hence its overall aiming up is double aiming up.
- We argue that for a number of specific parameters it is incorrect for the CMA to treat its ranges as being centred around the midpoint as the most likely value. In a number of cases the most likely value is much lower or higher than the mid-point of the range.
- We argue that the CMA has mis-characterised the technical requirements of the CAPM in respect of the ability of the relevant agents to borrow and lend at a risk-free or zero beta asset yield. It is not required that low-risk corporates be able to issue bonds at the risk-free rate. Rather, it is required that any agent be able to go short in risk-free asset. Furthermore, the CMA mis-characterises the requirement for a water sector equity holder. Such an agent, being typically a net lender, has the option to reduce its holdings of risk-free asset (go shorter, even if not short) rather than issue its own new risk-free debt.
- We argue that the CMA appears to have misunderstood the nature and purpose of Ofwat's "outperformance wedge".
- We include an appendix exploring the implications of MAR analysis based on September 2020 share prices, which suggests that, even after adjusting for outperformance, market prices for listed water companies imply that the Ofwat cost of capital allowance is above the market WACC.

1 Responses to the CMA's Provisional Findings regarding WACC in the Water Appeals

This document responds to various issues concerning the WACC arising from the CMA's Provisional Findings in the Water Appeals.[1]

1.1 General remarks on the CMA's approach to aiming up

Whilst aiming up has been used in a number of past regulatory determinations around the world, its use depends on regulatory judgements about a range of issues. These include the degree of uncertainty in financial markets, the relevance of disruption if firms fail, the relative policy importance of consumer prices being lower in a given macroeconomic climate, the current scope for investment or innovation, other mechanisms in a regulatory framework that provide scope for outperformance, the presence or absence of regulatory mechanisms insuring against extreme downside outcomes, and a host of other related questions.

When aiming up it is usually considered good practice for a regulator to have some specific sense of how far up a probability distribution its aiming up takes it. There is, of course, a danger of false precision and one should not exaggerate how exact a process aiming up can be. But it is usually considered relevant to have some understanding of whether one is aiming up only very marginally, or aiming up perhaps one standard deviation above one's best-estimate of the mean, or aiming up by say two standard deviations.

It is common for the above process to make some use of ranges. But ranges should be treated with care. The fact that the range for some parameter runs from X to Y does not mean that all points within the range X to Y are equally likely. Suppose that for some WACC parameter – let us say the TMR, for concreteness – most of the evidence points to a value within a range X to X + 0.5, but there is one evidence source suggesting that X + 1.5 cannot be altogether ruled out. Under such circumstances one might say that the range for the TMR runs from X to X + 1.5. But that does not mean all points in the range X to X + 1.5 should be considered equally likely. Most of the evidence points to a value closer to X. X + 0.75 is unlikely to be the best-estimate, and X + 1 is materially less supported by the evidence than X + 0.5.

Now suppose we have some additional parameter – let us say the equity beta, for concreteness. Suppose that every point in the equity beta range K to L is equally likely. If we say we are intending to aim up to the 75th percentile of the probability distribution, that is not equivalent to choosing a value of K + 0.75 x (L –K) for the equity beta and X + 0.75 x 1.5 for the TMR, because the 75th percentile of the TMR probability distribution is not, in this case, three quarters of the way between the lower bound and upper bound of the TMR range.

Furthermore, if the range for one parameter runs from X to Y and for another parameter runs from A to B, that does not imply that the overall range runs from a lower bound using A and X to an upper bound using B and Y. It might be very unlikely (or even impossible) that all lower bounds or all upper bounds occur together. One obvious case for that is the TMR and risk-free rate of return, since these are linked variables

[1] https://assets.publishing.service.gov.uk/media/5f72f3d2e90e0740cf4eb0a9/Water_provisional_determinations_report_all_-_September_2020_---_web_-.pdf

(ie there is strong evidence that the TMR varies specifically with the risk-free rate). But more generally there may be some connection between the "possible worlds" within which parameters lie.

The CMA provisional findings derived its point estimate for the cost of equity by taking the mid-point between the mid-point of its ranges for the various cost of equity parameters and their high-end. It might be easy to imagine that this procedure will produce something close to the 75th percentile of the probability distribution for the cost of equity. That is, however, incorrect. We suggest that if the intention is to aim up to the 75th percentile of a probability distribution for the WACC, the correct approach is to develop some view as to the weighting of different points within a probability range and then conduct Monte Carlo analysis to identify the 75th percentile.

When a range is evenly distributed (noting that we argue at various points in this paper that the distribution of the CMA's ranges should be assumed not to be even), one interpretation of a "range" in a regulatory determination is that it is the 95 per cent of most likely values or two standard deviations around a mean of the mid-point of the range.

Using that interpretation, one approach some regulators take to aiming up is to use a Monte Carlo model to derive an overall distribution, in this case for the cost of equity, from the assumption that the individual cost of equity parameters are normally distributed with a standard deviation equal to one quarter of the width of the range. One can then choose the extent to which one aims up in terms of the number of standard deviations above the central estimate or the target percentile of the distribution.

We have used the CMA's ranges to produce such a Monte Carlo model and report the results in the tables below.[2] First we set out the standard deviations and mid-points we have obtained.

Table 1-1: Monte Carlo inputs

Cost of equity parameter	CMA range (CPIH-Real)		Range width	Standard deviation [Range width / 4]	Mid-point
TMR	6.20%	7.21%	1.01%	0.253%	6.71%
RFR	-1.40%	-0.81%	0.59%	0.148%	-1.11%
Equity Risk Premium	7.59%	8.00%	0.41%	0.103%	7.80%
Unlevered Beta	0.27	0.32	5.00%	1.250%	29.50%
Debt Beta	0	0.15	15.00%	3.750%	7.50%
Equity Beta	0.65	0.8	15.00%	3.750%	72.50%
Cost of Equity	3.56%	5.60%	2.04%	0.510%	4.58%

Next we set out the results derived from our model.

Table 1-2: Monte Carlo results

Mid-point of CMA cost of equity range	4.58%
Monte Carlo standard deviation for cost of equity	0.31%
75th percentile of distribution	4.78%
CMA point estimate for cost of equity	5.08%
Percentile of CMA point estimate	95th

[2] Specifically, we have assumed that each of the cost of equity parameters is drawn from a normal distribution with a mean equal to the mid-point of the CMA's range and a standard deviation equal to one half the distance from the mean to the extremes of the range. For this purpose we also treat each of the cost of equity parameters as independent.

We see here that the Monte Carlo model produces a cost of equity standard deviation of 0.31 percentage points. The 75th percentile of a normal distribution with a 0.31 percentage points standard deviation and a 4.58 per cent mean is at 4.78 per cent. The CMA value of 5.08 per cent is much higher than the 75th percentile – in fact lying at the 95th percentile. We are not proposing a value of 4.78 per cent here – that would be incorrect for various reasons spelt out in more details below; the value of 4.78 per cent merely takes at face value the CMA's own ranges. But this exercise does illustrate that the CMA's method for aiming up results in an estimate very high in the probability distribution – higher, we suspect, than the CMA would have intended had it chosen a percentile explicitly.

Furthermore, the above should not be taken as implying that we recommend aiming up to the 75th percentile. If aiming up is to be done the extent of it (eg the percentile) would need to be justified as part of an overall judgement taking account of the intent of the aiming up given the features of the industry, the risk environment, and features of the regulatory framework such as the scope for outperformance or risk-sharing mechanisms that shield firms from idiosyncratic shocks, and a view as to why aiming up achieves the desired effect more efficiently and effectively than would some other change to the regulatory framework (eg providing additional scope for outperformance).

In sectors where aiming up is used more commonly, such as communications, there are rationales such as rapid technological evolution (with the possibility that within-price-control-period innovations end up delayed). One key reason given for aiming-up in those sectors is that the costs to consumers of delays in new products when prices are slightly too low (because the WACC has been under-estimated) are greater than the costs to consumers of prices being slightly too high (because the WACC has been over-estimated). That "asymmetry of consequences" argument depends crucially upon the relative value of innovations and lower prices. Water is intrinsically a much simpler product, and many of the most relevant innovations are those that reduce water prices or make services more reliable rather than providing profoundly new water products. That means that, other things being equal, we should expect the optimal degree of aiming up to be materially less, for water, than is the case for communications.

In Ireland, the communications regulator Comreg has in the past used aiming up. When it did so, it aimed up by one standard deviation, to the 84th percentile of the distribution. If aiming up is to occur in the water sector at all, it should be expected to be to a materially lower percentile than that – rather than, as per the CMA's provisional findings, to the 95th percentile.

In fact, though, other things are not equal. A secondary argument for aiming up is that if a regulated monopoly goes bankrupt there is intrinsically more disruption for consumers and the regulatory authorities than is the case with a competitive firm (where by definition the customers of one firm can be rapidly served by other firms or new entrants to the market). Regulators, such as those in the communications sector, that impose relatively limited restrictions upon the activities of regulated entities may therefore choose to aim upon on their best estimate of the price (and hence the return) that would prevail in a competitive market. But in the water sector there are a range of additional mechanisms, including regulatory ringfencing and a special resolution regime, that reduce both the risk of bankruptcy and the disruption it would cause, without the need for aiming up.

It is sometimes suggested that an additional argument for aiming up is that if returns are too low, firms will under-invest in infrastructure resulting in service disruptions. Then, because these services are network utilities, the social cost of such service interruptions may be high – indeed, inducing systemic effects spilling out beyond the interruption itself. We do not recognise this as providing a genuine rationale for aiming up, because it is unclear what asymmetry is supposed to be at play here. If prices are slightly too low, there will be under-investment and hence more service disruptions; if prices are slightly too higher there will be over-investment and hence fewer service disruptions. It is unclear why the risks here are not balanced, such that the regulator's best estimate of the WACC is the correct value to use.

1.1.1 Inconsistencies and disconnects in the process of aiming up

An additional point about the CMA's approach to aiming up for the cost of equity in its provisional findings is that there appears to be a disconnect between the CMA's choice of individual parameter ranges and its overall decision to aim up. In particular, for some ranges the CMA chooses to include highly speculative points in its range (eg it includes a zero debt beta in its range even though it states there is "a compelling case that the regulatory model should include a positive debt beta"1) whilst for others it excludes what it terms "outliers" (eg in its analysis of unlevered beta). Had the CMA used appropriate judgement in its choice of point estimates within these ranges, such a disconnect might have been irrelevant. But the fact that the CMA then uses a mechanical aiming-up procedure that uses a point halfway between the mid-point of its range and the upper bound means that these inconsistencies have an impact on the result (specifically, making it materially higher).

A further point regarding the CMA's approach at this preliminary stage not having used all relevant evidence to determine a point estimate is that in the case of some parameters the CMA's provisional findings report says that evidence has value as a cross-check but it does not use that evidence in determining its point estimate – an example of this is the TMR, where the CMA indicates that forwards-looking evidence can have some value as a cross-check yet the CMA does not use it to inform any point estimate (presumably because the evidence would lie within the CMA's range).

We suggest that in its final determinations the CMA might consider a more consistent basis to its choice of ranges – either excluding outliers from all ranges or including outliers in all ranges – and a more thorough used of the evidence in determining its point estimates.

One last point on the use of ranges is that in one case the CMA appears to anticipate the degree of precision of its point estimate in a way that results in an increased value. The evidence the CMA quotes for its TMR range (which we shall discuss further below) appears to have been interpreted by the CMA as indicating a range of 5.2-6.2 per cent on an RPI-deflated basis. The CMA appears to believe that TMR estimates should only be attempted to the nearest one quarter of a percent. It therefore rounds that 5.2 to 6.2 range up to a 5.25 to 6.25 per cent range. But, even if rounding is appropriately applied, it is surely relevant only in respect of the ultimate point estimate, not of the range. By rounding up to create a coarse-grained range and then aiming-up within that range, the CMA's method effectively aims up twice – further exaggerating the ultimate result.

1.2 On the CMA's treatment of the relative weights of the CED/CPI series, the CED/RPI series and the MMW series

In the NATS case under the "ex-post historical approach", the CMA took account of the following ranges.

- CED/CPI range 5.1% to 5.9% (RPI)
- CED/RPI range (unadjusted): 5.9% to 6.6% (RPI)
- CED/RPI range (adjusted): 5.6% to 6.2% (RPI)

It noted that there was a significant overlap between CED/CPI range and CED/RPI (adjusted) range, but took the view that the CED/CPI range is more reliable due to CPI's greater accuracy and consistency as a measure of inflation. Accordingly, it chose a range of 5 to 6 per cent.

In its Provisional Findings in the current case, under its "ex-post historical approach" the CMA notes the following evidence.

- CED/CPI range 5.2% to 5.9% (RPI)
- CED/RPI range (unadjusted): 5.9% to 6.6% (RPI)
- PwC, following the MMW approach, range: 5.5% to 6.2% (RPI)

In its summing up of how it interprets this evidence, the CMA indicates that it considers that evidence in the current case has led it to revise its view as to the strengths of past data. We interpret that as meaning that the CMA is no longer sufficiently confident in the CED/CPI range that it feels it can use that as its main source for determining its range. Instead, its range is derived from the CED/CPI range or, as it puts it, by considering a full range that includes the CED/RPI range but then discounting the upper end of that CED/RPI range where it exceeds the MMW range, because of the formula effect.

We suggest that in formulating its final view, the CMA might consider whether the approach above understates the relative strengths of the CED/CPI range evidence and the MMW range (or CED/RPI range with the upper end discounted). Specifically, the CMA might consider whether, even if it chooses to include 6.2 (or 6.25) per cent as an upper end of its range, it is right to consider that upper end range as carrying the same weight as the lower end (5.2 to 5.9 per cent) drawn from the more reliable CED/CPI source. Just because one ceases to believe a source is so much more reliable that one can rely upon it alone, it does not follow that therefore it is now only on a par with other evidence sources.

A further issue is that in picking the upper end of the MMW range, the CMA uses the top of the PwC range as the uplift for calculating the arithmetic mean.3 That means that the top end of its range has already embodied an element of aiming up. So, again, when the CMA aims up its overall cost of equity it is aiming up on values that had already been aimed up themselves.4

1.3 Unexplained departures from the CMA Provisional Findings in the NERL Preliminary Decision with respect to the TMR

In a number of areas, the approach the CMA has taken with regard to the TMR represents a significant departure from the approach recently taken in the NATS Preliminary Decision. More specifically, we note that that:

- In its assessment of the historical evidence the CMA has not applied any adjustment to the TMR range to take into account for the 'formula effect'.
- The CMA does not place the same weight on the evidence from historical *ex-ante* approaches.
- The CMA has changed its characterisation of the overall TMR range based on *ex-ante* historical evidence.

We discuss these points in turn below.

No formula effect adjustment

In the NATS Preliminary decision the CMA relies on two main approaches to the calculation of *ex-post* historical estimates: one is based on the CED/CPI inflation series which provides a TMR range of 5.1 per cent to 5.9 per cent in RPI terms (depending on the holding period and on whether the arithmetic or geometric mean is used), the other is based on the CED/RPI inflation series which provides a range of 5.9 per cent to 6.6 per cent (RPI).

At paragraph 13.209 of the NATS Preliminary Decision the CMA states that

[3] See para 9.184

[4] We observe that the CMA did not use the PwC evidence in this way in the NERL case.

> *"The estimates of real returns using the CED/RPI inflation series ranged from 5.9 to 6.6%. However, we considered that the methodological changes in the RPI series over time, demonstrated by the 2010 increase in the 'formula effect' in response to change in the collection of clothing data, meant that these historic estimates could not be taken, unadjusted, as the expected RPI-real equity market return on a forward-looking basis".*

As a result the CMA applies a 'formula effect' adjustment which results in an (adjusted) TMR range based on the CED/RPI inflation series of 5.6 per cent to 6.2 per cent (RPI). Therefore the overall TMR range based on *ex-post* historical evidence after taking into account for the formula effect is 5.1 per cent to 6.2 per cent.

In contrast, in the Water Preliminary Decision, the CMA does not apply any formula effect adjustment to the estimates obtained from the CED/RPI inflation series, instead the CMA prefers to discount the upper end of the overall range. More specifically, at paragraph 9.218 Water Preliminary Decision, the CMA states:

> *"[…] we consider that the TMR range derived from the CED/RPI inflation series is likely to over-estimate the real TMR on a forward-looking basis due to the increases in the formula effect over time. On this basis, we consider that less weight should be placed on the upper end of the overall range (of 5.2% to 6.6%)".*

Change in the characterisation of the *ex-ante* historical TMR rage

We note that the lower bound of the TMR range based on ex-ante historical evidence quoted in the CMA's overall assessment is much higher than the lower bound it uses in the NERL case despite being based on essentially the same evidence. More specifically, at paragraph 9.219 the CMA states:

> *"The historic 'ex-ante' evidence provides a range of RPI-real TMR estimates of 5.6% to 6.65%, including volatility adjustments".*

However at paragraph 9.202 and 9.203, when presenting overall evidence the *ex-ante* historical approaches, the CMA states:

> *"In the case of the Fama & French model estimated with data from the Barclays Equity Gilt Study, the adjusted RPI-real TMR estimate would be around 5.35% (geometric) and 6.65% (arithmetic)"*

The CMA notes at footnote 1421 that the above figures include both an inflation and volatility adjustment. Then at paragraph 9.203 the CMA states that:

> *"Adjusting the DMS estimate similarly, gives a CPI-real average of 5.05% (geometric) and 6.55% (arithmetic). Applying the forward-looking wedge of 90 basis points between RPI and CPI converts these figures to 4.1% and 5.6% RPI-real, respectively".*

Therefore, it appears that if the CMA had applied the same approach it did in the NERL preliminary findings, the overall TMR range based on ex-ante historical evidence appears would be 4.1 per cent to 6.65 per cent (very close to the NERL case's 4.1 to 6.5 per cent range) and not the 5.6 per cent to 6.65 per cent range the CMA uses in the Water provisional findings.[5]

We observe that if the CMA is choosing to exclude the 4.1 per cent value, that is another case of its aiming up in its characterisation of evidence to create ranges, excluding lower-end outliers, such that when aiming up is applied to that overall range there is aiming up on an already implicitly aimed-up value.

1.4 On the interpretation of the technical requirements for a zero-beta asset under CAPM

A central aspect of the CMA's approach to the risk-free rate in its provisional findings is the claim that, "the CAPM model assumes that investors can borrow and lend at the risk-free rate", but that "even with the best available credit rating, non-government investors cannot access debt at the rate of ILGs."[2] This

[5] See paragraph 13.240 of the NATS Preliminary Decision.

claim (assessed by the CMA especially in paragraphs 9.73-9.78) motivates the CMA's subsequent choice to use AAA-rated corporate bond yields as the upper bound of its risk-free rate range.

We have four remarks here.

a. In our view, the CMA's text here mis-characterises the technical requirement of the CAPM model.
b. Although we agree in principle that AAA-rated corporates might be a relevant evidence point for risk-free rate assessment, the specific AAA-rated corporate bonds available (including for the specific index used by the CMA) have some technical weaknesses that make them at worst unsuitable as an evidence point and at best mean that if they are to be used they should carry lower weight than evidence from government bonds.
c. Both points (a) and (b) imply that it is a mistake to treat evidence from corporate bonds as equal to that from government bonds.
d. The CMA's provisional findings do not engage with the key arguments made for our "observed asset" approach in our PR19 "Initial View".

Let us take these points in turn.

1.4.1 The technical requirement of the CAPM model

Under the CAPM model, investors need to be able to borrow and lend at the risk-free rate. It was noted that in a well-known paper by Black (1972) it is proved that if investors can lend at a risk-free rate but not borrow at that risk-free rate, then the return on a zero-beta portfolio is higher than the risk-free rate. But it does not follow from this that any investor needs to be able to create new risk-free asset in their own account. It would be enough for them simply to be able to go short or long in a pre-existing risk-free asset (eg government bonds) to whatever extent they choose. Indeed, Black defines the case of "no riskless borrowing" as follows:[6] "Let us turn now to the case in which there is a riskless asset available, such as a short-term government security, but in which investors are not allowed to take short positions in the riskless asset". Thus, the standard interpretation of the issue is: can investors go short in government bonds as well as long, not: can highly rated corporates issue their own new bonds at near to risk-free yields?[7]

Indeed, if the issue were whether near-risk-free agents (eg AAA-rated corporates) are able to issue their own new bonds at the risk-free rate it would not be required that risky agents (eg junk-rated corporates) be able to borrow at the risk-free rate. But in fact the CAPM requirement is that *any* investor must be able to borrow as well as lend at the risk-free rate. As Black states it:[3] "An investor may take a long or short position of any size in any asset, including the riskless asset. Any investor may borrow or lend any amount he wants at the riskless rate of interest."

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6 Black (1972), op cit, p452.

7 This interpretation appears in a number of other key academic papers as well – eg Perold, A.F. (2004), "The capital asset pricing model", *Journal of economic perspectives*, 18(**3**), p3-24 states (p16): " Second, capital markets are perfect in several senses: all assets are infinitely divisible; there are no transactions costs, short selling restrictions or taxes; information is costless and available to everyone; and all investors can borrow and lend at the risk-free rate." Again, Blume, M. E., & Friend, I. (1973), "A new look at the capital asset pricing model", *The Journal of Finance*, 28(1), pp19-33 states (pp30ff): "If, for example, the return on stocks implies a much higher zero-beta return than the return on high-grade corporate bonds, so that the market for corporate securities is out of equilibrium, then there is no action on the demand side which would correct for this disequilibrium if sufficient short-sales of bonds (associated with purchases of stocks) are not possible. With unlimited short-sales the disequilibrium should disappear since investors could obtain a higher return for given beta by selling bonds short and using the proceeds to lever lower beta stocks to the level of beta they desire. Without short-sales, the disequilibrium could still be corrected by corporations issuing more bonds and in the process raising bond yields sinc this would tend to lower their cost of capital. However, for U.S. Government securities, including Treasury bills, there would be no similar adjustment process, though short-sales should be easier to effectuate than in corporate bonds."

There is a range of ways investors can short government debt, including shorting a bond exchange-traded fund (ETF), purchasing ETF put options or government bond put options, or trading in bond futures. The CMA does not explain in its provisional findings why these mechanisms are not available or, if they are available, why they are not sufficient for the technical requirements of the CAPM model.

Closely related to this point, even were it the case that investors in general could not go *short* in the risk-free asset or create their own new risk-free asset, marginal water sector equity investors (i.e. those investors for whom the risk-free rate is relevant here) might have a further option when seeking to go *shorter* in risk-free or zero beta asset: they could reduce an existing long position. The owners of water companies (i.e. their equity-holders) are typically institutional investors and as such likely to be (or be the agents of) net lenders. So if a water company wanted to make its holdings of risk-free asset more negative / less positive, its owners could achieve that change in exposure by reducing their own long positions in risk-free asset. The firm does not need to be able to issue new zero beta asset bonds itself to achieve that effect. Since the CMA is assuming the rate for lending risk-free is lower than the rate to borrow at zero beta, water sector equity investors (and hence water sector firms) would have an incentive to adjust their net lending positions in this way (reducing pre-existing long risk-free positions) rather than by issuing new zero beta asset.[8]

Eventually this route might in principle become exhausted. But the fact that water sector equity investors are institutional investors that can be assumed to still be net lenders suggests that that has not occurred. By itself, this latter point might not demonstrate that the zero beta return relevant to the cost of water equity is precisely equal to the risk-free return (eg one could imagine a theoretical scenario in which market equilibrium included a threat from a new investor – eg to take over a water company - where that new investor was a net borrower[9]). But it might suggest that the relevant benchmark lay materially closer to the risk-free return than to the low risk corporate bond rate.

So if we think of water capital specifically and the details of who the investors are, the implication would appear to be that for the relevant investors the relevant benchmark would be (or be close to) the risk-free asset return not the required yield on low-risk borrowing. But even if one thought about "capital" as a single aggregate across the economy, it is by no means obvious that the state is not the marginal investor in "capital" as a whole, for the economy as a whole, under the macroeconomic conditions that have prevailed in recent years. At various points in recent years the Federal Reserve policy has been explicit in seeking to shift capital market yields across a range of capital assets (not simply government bonds) – ie acting as the marginal agent. Policy in the UK has not, in the main, had that goal as explicitly, but both the Bank of England (in respect of quantitative easing) and the UK government (in respect of borrowing) appear to respond to market signals, in terms of bond yields, in determining their financial policies. The aspiration to act as the marginal investor can be seen as one characterisation of macroeconomic demand management via fiscal policy. Government spending affects capital prices – both directly when the government itself invests in capital assets and indirectly when government consumption spending affects demand for capital assets from suppliers of the relevant consumption goods. If the government and central bank were the marginal lender in capital markets (ie increaser in its net lending position – which might arise from a reduction in its stock of debt) as well as the marginal borrower, differences in inframarginal borrowing and lending rates for zero-beta assets might be irrelevant.

It is perhaps worth remarking that the relevance of this argument is by no means temporary. There is no general rule that low-risk corporates are always unable to issue bonds at yields below those of governments. Famously, in the past, firms such as McDonalds have been regarded by financial markets as less risky than the

8 In more technical terms, and in the terms the CMA has expressed its own position, this means that a water equity investor has a capital allocation line running from r_S to T_S in the CMA's Figure 4 of Appendix C, pC4 of https://assets.publishing.service.gov.uk/media/5f72f3e9e90e0740cd69dfb3/Appendices_and_Glossary_Water_PD_-_September_2020_---.pdf

9 The implication of this would be that not all marginal investors were net lenders.

US government.[10] Insofar as there were any non-trivial wedge at present between the borrowing rate on the lowest risk corporate bonds and the yield on government bonds, it would arise precisely because of the combination of macroeconomic conditions and macroeconomic policies that made the government the marginal investor.

1.4.2 The role or otherwise of AAA corporate bonds under the observed asset approach

As we have noted previously, we do not in principle object to the concept of using highly rated corporate bonds to provide indications about the risk-free rate. That might not only take the form of a basis for estimating yield levels, but might also be helpful in other ways such as indicating how much the risk-free rate has changed over time (highly rated corporate bonds might in principle provide a better indication of changes than of levels).

In our view such an approach is more relevant when the task is to assess the equilibrium risk-free rate, and in that context AAA corporate bonds might be one amongst several alternative sources of evidence. Under our observed asset approach we are simply taking government bonds as an empirical approximation to a real-world risk-free asset. That asset just is the risk-free asset proxy, hence the yields on that asset just are the risk-free yields. As noted in our 2017 paper there are a number of pros and cons for this approach versus the "equilibrium concept" approach. We feel that there are three particularly important such points that the CMA's provisional findings did not engage with and that the CMA might usefully reflect upon in forming its ultimate view.

- First, we note that the observed asset approach means the risk-free return is concrete and relatively easy to measure. It is by no means clear that a "zero beta asset" approach shares this feature.
- Second, the observed asset approach "lets the data speak" transparently, without requiring extensive manipulation or the application of extensive judgement.
- Third, any alternative to the observed asset approach of necessity involves correcting for some purported distortion in the observed data. But there is no guarantee that the correction for a distortion does not create a larger distortion of its own. If we respond to a barely-perceptible dent by hammering heavily from the other side of the fender, we can easily replace a small issue with a much larger one.[11] It is widely believed (and the CMA would appear to acknowledge) that the widespread practice of regulatory correction for "distortions" over the decade or so leading up to 2015 resulted in systematic and material over-statement of regulatory WACCs.

1.4.3 Weaknesses in the AAA-rated corporate bonds in the CMA's preferred index

In order to determine the upper bound of its provisional risk-free rate range, the CMA relies on the observed yields of two AAA-rated corporate bond indices, namely:

- The iBoxx £ Non-Gilts AAA 10+ index; and
- The iBoxx £ Non-Gilts AAA 10-15 index

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10 See, for example, https://seekingalpha.com/article/98843-is-ronald-mcdonald-a-safer-bet-than-uncle-sam

11 For example, suppose the CMA is correct to believe that there are sufficient restrictions upon risk-free borrowing (eg by going short in government bonds) that the relevant "risk-free rate" measure (which the CMA believes would then be the yield on a zero beta asset) will lie above the risk-free rate. It does not follow from that that therefore the correct answer lies halfway between the yield on government bonds and that on AAA-rated corporates. It could be that the use of government bonds would result in a 10 bps under-statement of the risk-free rate whilst the average of government bonds and AAA-rated corporates results in a 20 bps over-statement – making the error bigger, not smaller.

Some of the key issues arising with these bonds are as follows.

- Around 87 per cent (by number) of the bonds composing the iBoxx £ Non-Gilts AAA 10+ index have been issued by banking/financial sector firms[12], and all the bonds composing the iBoxx £ Non-Gilts AAA 10-15 are from the banking/financial sector. So not only are they exposed to financial sector-specific risk plus any debt beta for the financial sector (which might potentially be relatively high, given that scenarios in which banks default are often associated with large macroeconomic shocks) but also the scope for diversifying within AAA bonds to hedge against financial sector risk is limited. We note in particular that in the recent past many financial sector bonds rated AAA have subsequently been downgraded very markedly (in some case to junk status). The percentage of AAA-rated bonds that default whilst AAA is less relevant than the share of AAA-rated corporate bonds that have at some point ceased to be AAA-rated (implying large capital losses for those that do not want to hold such bonds to maturity, even setting aside the possibility of further downgrades or defaults at a later date).
- The bonds do not satisfy standard liquidity tests. For example the bonds' bid-ask spreads are typically much higher than those of the comparable gilt benchmark – in most cases at least in the tens of basis points higher and in some in the hundreds of basis points higher. A much higher bid-ask spread creates transactions costs and liquidity risks that will clearly upwards-distort yields.

Our conclusion remains that, although in principle we do not object to the principle of attempting to use AAA-rated corporate bonds as a cross-check to gilt yields for the purposes of determining risk-free rates, the AAA-rated corporate bonds available in the UK are of only limited value for the purpose. There is a wide range of yields on those that do exist; they reflect sector-specific risks; and they do not satisfy the required liquidity metrics.

1.4.4 Implications of the above for the weight given to AAA corporate bonds versus government bonds

Given the incomplete nature of the theoretical case upon which the use of AAA corporate bonds lies and the weaknesses in the specific AAA corporate bonds available, we suggest that even if AAA corporate yields feature in the risk-free rate range they should not be considered as having equal weight with government bonds - as the CMA's provisional findings aiming up methodology gives them even before aiming up (and after aiming up these bonds de facto carry much more than equal weight). Government bonds are clearly a superior evidence point (even if they are imperfect) and as such should carry materially greater weight.

1.5 Ranges used for assessing beta

The CMA's beta evidence comes in two parts: evidence on unlevered beta; and evidence on debt beta. However, the CMA does not produce its ranges for these two variables on the same basis. For unlevered beta it excludes outliers; for debt beta it does not. The exclusion of outliers raises the lower end of the range by more than it lowers the upper end. By contrast, the inclusion of outliers materially lowers the low end of the debt beta range (with the consequence of raising the final equity beta).

Thus, at paragraph 9.279 the CMA's provisional findings state: "The different frequency/sampling approaches give a wide range of beta estimates, ranging from 0.21 to 0.35. We consider that some of the monthly estimates are outliers and therefore should be removed. Excluding this data gives a minimum of 0.25 and maximum of 0.35." Again, at paragraph 9.283 the CMA's provisional findings state: "The different frequency/sampling approaches with a February cut-off gave a wider range of unlevered beta estimates,

[12] The only exception are two bonds issued from the University of Cambridge and one bond issued by the University of Oxford.

ranging from 0.20 to 0.39. We again note that monthly estimates, which suffer from higher standard errors, provide the lowest and highest numbers. We consider that some of the 5-year and 10-year monthly estimates are outliers and therefore should be removed. Excluding these estimates gives a minimum of 0.25 and maximum of 0.35."

By contrast, when it came to debt beta, even though at 9.314 the CMA provisional findings stated: "we have reviewed the decomposition approaches presented by Ofwat, and conclude that while they also have a wide range of uncertainty, they provide a compelling case that the regulatory model should include a positive debt beta" a value of 0 was still used as the bottom end of the debt beta range on the grounds that (para 9.313, in the context of econometric estimates of beta that are not statistically different from zero) "Rather than discarding this or any other methods, our preferred approach would be to consider all the evidence available when setting an appropriate range for the debt beta." And this was even though the CMA states: "we agree with Oxera's analysis that a finding that the debt beta is not statistically indifferent *[sic.]* from zero is as a result of high standard errors around what is likely to be a low debt beta" - ie even though the CMA believes the lowest likely value for debt beta is above zero.

If we were to use a consistent treatment of ranges for the beta, either excluding outliers for both ranges or including outliers for both ranges, the results would change as follows.

- If outliers are excluded for both, so we use the CMA range for unlevered beta but a range with 0.05 (the lowest proposed by submissions from Anglian or Third Parties) as the lower bound instead of 0, the final equity beta range becomes 0.65 to 0.79.
- If outliers are included for both, so we use the CMA range of 0 to 0.15 for debt beta but do not exclude outliers in the estimation of unlevered beta, the unlevered beta range becomes 0.27 to 0.31 and the final equity beta range becomes 0.65 to 0.78. (Applying the CMA's aiming up methodology this would imply a final point estimate for the equity beta of 0.75 versus the CMA's value of 0.76.)

1.6 The role of the outperformance adjustment in creating a synthetic index

Ofwat's cost of new debt and cost of embedded debt methodologies are based on newly-created synthetic indices. These synthetic indices are intended to approximate yields for water companies. The synthetic indices are created using relatively simple procedures. They begin with iBoxx non-financial corporates indices for the market-wide average yields on BBB and above and A and above rated debt. To make these overall indices more indicative of specifically water sector bonds, Ofwat then applies what it calls an "outperformance wedge" but which might instead be referred to as simply a wedge or adjustment (since no "outperformance", per se, is implied in the sense of issuing at a lower yield for a given tenor and rating). The outperformance wedge is calculated from the average difference, over time, between the yields at issuance of water companies at the iBoxx non-financial corporates index yield at the point of issuance. In practice, the outperformance adjustment takes a very simple form, dropping all yields, at all times, by a given number of basis points (the wedges differ for the cost of new debt and for embedded debt).

There might be two kinds of basis upon which an index of water company bonds yields might differ from an index of the average yields across all non-financial corporates:

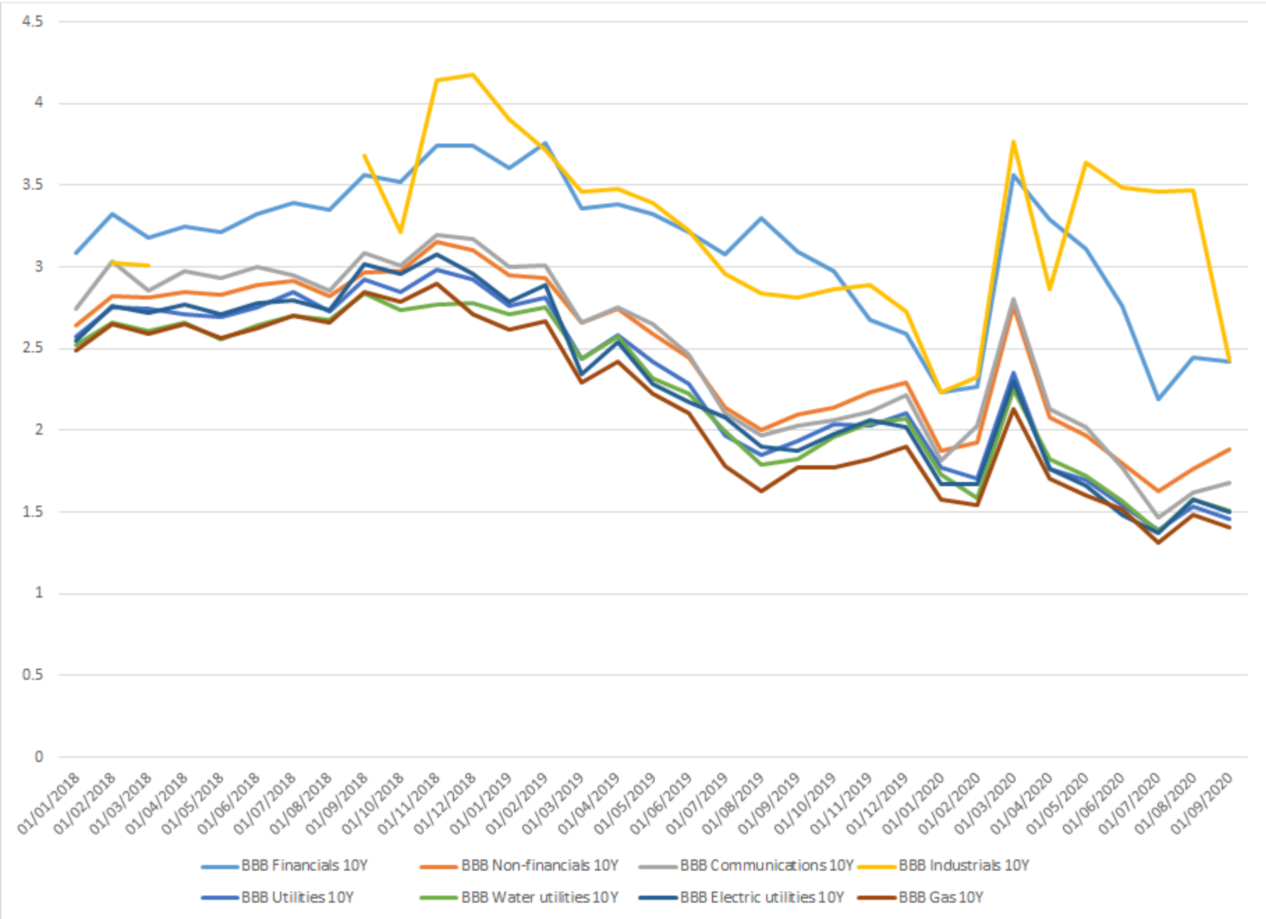
- Water company bonds might have different yields even at the same rating and tenor.
- The mix of tenors might be different even at the same rating.

Let us take these concepts in turn. There should be nothing especially controversial about the idea that bond yields for a specific sector might differ from those of the average of the market as a whole. It is well-established that bonds of a given credit rating may have different yields. There are a number of reasons for this, but perhaps the most obvious is that the credit rating is simply an indicator of credit risk whilst the yield includes not only credit risk but also the likely correlation of that credit risk with the wider asset returns cycle (ie the debt beta). In some sectors credit risk is more correlated with the general returns cycle so the debt beta is higher and yields are higher; in others the reverse is true.

Secondly, the mix of tenors might be different even at the same rating. Suppose, for example, that water companies tended to issue shorter-term bonds than the average issuance term of non-financial corporate bonds. With a positively-sloped yield curve, even if water company bonds of a given tenor had identical yields to those of the average non-financial corporate, an index of water company bonds would have a lower average yield than would an index of non-financial corporate bonds in general.

That indices of bonds of a given credit rating differ, between sectors, in their yields – for whatever reason - can be illustrated in the following figure.

Figure 1.1: Yields of 10 year bonds from different sectors



Source: Thomson Reuters Eikon. The indices are Thomson Reuters indices.

It should also be noted that water company debt might be over-stated by corporate bond indices, since water companies also hold debt from sources such as bank/LIBOR debt, private placement, or EIB debt.

For our purposes it is irrelevant *why* the yields on an index of water company bonds would differ from those of non-financial corporates in general. All that matters is whether they would be lower, higher or the same. If we know the direction and the amount, then we can create a synthetic index by applying a wedge. That synthetic index can then be used for our cost of debt purposes.

The next question we investigate here is what difference there might be to the cost of new debt answer if the cost of debt index were the utilities index instead of non-financial corporates. In its provisional determination the CMA determines the lower bound and the upper bound of the cost of new debt based on the 6-months average yield (up to July 2020) of the iBoxx A-rated 10+ and iBoxx BBB-rated 10+ respectively. This gives a nominal range of 2.22 per cent to 2.53 per cent, and the CMA chooses the mid-point of the range (2.38 per cent) as its provisional point-estimate. If the iBoxx £ Utilities index 10+ were used instead, the cost of new debt (i.e. the 6-months average of the iBoxx Utilities index up to July 2020) would be 2.28 per cent, i.e. 10bps lower than the CMA's provisional value.

One way to conceive of the CMA's position is as follows. It placed particular weight upon analysis from KPMG on behalf of the water companies. That analysis suggested that, once adjustments had been made for tenor, yields at issuance of water company bonds were very close to those of the iBoxx. One view of the correct way to respond to that is by imposing a wedge to the iBoxx index – which on the KPMG analysis would be equivalent to adjusting the average tenor of the iBoxx so that it matched the average tenor at which water companies issue bonds. The CMA approach is the opposite – it implicitly chooses a notional tenor equal to that of the iBoxx index instead of being equal to that of actual water companies. We are unclear why the CMA considers it preferable to choose a notional tenor different from the actual tenor used by water companies (especially for embedded debt), but note that the consequence of this choice is a straightforward increase in the allowed cost of debt.

2 Appendix – MAR model

In this appendix we will set out how we built the MAR model for Severn Trent and United Utilities. Our analysis is composed of three different sets of assumptions that lead to different values of the MAR model. We have developed three different sets of assumptions:

- Approach A - Europe Economics 2017 Approach
- Approach B - Barclays approach using Europe Economics values. And
- Approach C - Barclays approach with Barclays values

The main idea behind the use of three different approaches is to obtain a range of plausible Market-to-Asset Ratios, taking into consideration different elements. Indeed, the MAR analysis is strongly influenced by the market values, and different approaches could lead to different values, depending on to which extent the calculations rely on market values, as opposed to values coming from annual reports/based on companies' submissions to Ofwat.

We will then explain two extensions to the model that have been carried out in order to analyse how the results differ changing some assumptions (i.e. limiting the totex outperformances up to 2025 and up to 2030), and a "flip exercise", in which we carried out a reverse analysis that gives the 2020-2050 totex outperformance value required to get a MAR value of 1. For both extensions we will provide the tables with the results obtained for both companies and for each approach.

2.1 General assumptions on outperformances

Before presenting the approaches, we will set out the general assumptions on which the model is based. The standard assumptions for the totex outperformances are based on the historical averages provided by Ofwat. These averages are based on past performances for each company, and they consider the period 2000-2020. For Severn Trent, we have an average totex performance of 0.80 per cent, while for United Utilities we have a totex average of -1.20 per cent (ie historically UU has underperformed not outperformed). In this context, percentages are considered with respect to the return on regulated equity.

An alternative assumption is to use the totex provided by Barclays analyst. In this case, the totex values are 1.5 per cent for Severn Trent, and 0.7 per cent for United Utilities. For the ODI, SIM and Financing & other we used the value provided by Barclays analysts.

2.2 Approach A - Europe Economics 2017 Approach

This approach has been built upon the initial analysis Europe Economics carried out in 2017. The model compares the RCV values provided by Ofwat, with the adjusted firm value. Given that the RCV are not published for September 2020, we did a linear interpolation between March 2020 and March 2021 values to obtain the values for each week between the two dates. This is the only adjustment we carried out for the RCV value.

The Adjusted firm value, on the other hand, is composed by three "building blocks", that gives as the final result the firm value adjusted for performance and unregulated activities. The first building block is the sum between the market capitalisation and the net debt of the companies. The Market capitalisation is retrieved from Thomson Reuters Eikon database and then averaging the daily values of the last month. In the last iteration of the model, we used the September 2020 average. The net debt is composed by three elements: the net debt as presented by the company in their annual reports, an adjustment element that comes from the App19 submission to Ofwat and another adjustment element that comes from a Barclays analysis and that adds to the previous two elements the provisions.[13]

The second building block is the net present value of the future performances on a set of elements, such as the totex, ODI, SIM, financial & other and Fast track award.[14] The net present value is calculated using as its discounting factor the lower Cost of Equity (CoE). The lower CoE is computed as the percentage value that makes the difference between the PV of base equity returns calculated using the FD CoE and the lower CoE equal to the difference between the firm enterprise value and the RCV. As such, it is the moving element that changes when iterating the model, given that the analysis defines the MAR on the basis of the lower CoE's value that solves the abovementioned function.

The third element and last element that constitutes the firm value adjusted for performance and unregulated activities is the sum of the market capitalisation and net debt (as explained above) multiplied by the difference between the share of unregulated activities[15] and the market premium.

Having defined the adjusted firm value as above, we take the ratio between it and the RCV value, obtaining the adjusted Market-to-Asset Ratio for the company.

2.3 Approach B - Barclays approach using Europe Economics values

The Barclays approach using Europe Economics values is based on a different set of steps for the determination of the adjusted enterprise value, while the RCV does not change (i.e. it is defined in the same way as explained in approach A). Therefore, we will focus our attention on how the adjusted firm value has been defined. The main difference between approach A and B is how the firm value has been adjusted, while keeping the same "core" values.

The adjusted firm value for approach B could be considered as a simplified version of the method used in the previous approach. Indeed, the value has been determined as the sum of the market capitalisation, defined as the average of the daily values for the last month, plus the net debt value (which has been defined as in the previous approach). From this sum we subtracted the PV of the outperformances (calculated using as discount value the lower CoE) and the adjustment as proposed by the Barclays method.[16] As we can see, the adjusted firm value does not consider any adjustment for the unregulated activities and the market premium.

2.4 Approach C - Barclays approach with Barclays values

The last approach differs from the previous methods for both the source of the values and how the firm value has been adjusted. Indeed, we used the values provided by Barclays to Ofwat to carry out a further MAR analysis that does not rely on market value as much as the previous two approaches. Indeed, both the adjusted enterprise value and the RCV are sourced from the model shared by Barclays with Ofwat. Therefore, the values are not influenced by shares prices, and have been adjusted only to create a fictitious value for September using the linear interpolation as explained above.

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[13] Among others, this value include also pensions deficit or surplus

[14] Given that the fast track award is assigned at the start of each price control period, we added the value only for the period 2021-2025 and only for Severn Trent, since United Utilities was not awarded with the fast track outperformance increase.

[15] The unregulated activities have been set to 3%. This is based on the PwC "Updated analysis on cost of equity for PR19" (link). However, the model allows the user to set the unregulated activities share to a different value.

[16] The adjustment, in this case, is the subtraction of the non-core valuation. Given that these core evaluations (and their forecasts) have been defined at the end of each fiscal year, we used the linear interpolation to obtain a plausible forecast for the September values.

In particular, the adjusted enterprise value is defined as the sum of market capitalisation[17], net debt and provisions. The sum then is reduced by the amount of non-core evaluation. The RCV, on the other hand, is defined as headline capital value and is slightly different from the RCV provided by Ofwat.

2.5 Results

In this section we will present the MAR obtained for each model, providing also a brief explanation of the main differences. Overall, the ratios obtained from the analysis range between 1.02 and 1.18. Table 2.1 presents the values obtained for each company and each approach in details.

Table 2.1: MAR values, September 2020

	Severn Trent	United Utilities
Approach A - Europe Economics 2017 Approach	1.18	1.02
Approach B - Barclays approach using Europe Economics values	1.12	1.12
Approach C - Barclays approach with Barclays values	1.09	1.17

Source: Europe Economics MAR analysis

As we can see, the MAR for Severn Trent ranges between 1.09 and 1.18, while the MAR for United Utilities ranges between 1.02 and 1.17. As explained above, the models have differing sensitivity to market values and oscillations therein.

However, the limit of this model is in its assumptions, as we will see in the next paragraph. Indeed, we are considering that the totex outperformances are constant for the period 2020-2050, which could be argued that do not reflect the reality, assuming that both companies perform constantly, from a totex point of view, each year. However, there are few alternatives that can be followed, given the difficulties in forecasting companies' performances

2.6 First extension – limiting outperformances/underperformance to end of AMP7 and end of AMP8

One of the main assumptions that is common to the three approaches is that the values for the outperformances do not change for the period 2020-2050. It can be argued that this assumption may be too strong, since it assumes companies will have constant outperformance (or underperformance for UU in one scenario) for over 30 years. Even if this were plausible in itself, it seems implausible that such an assumption is fully embodied into equity prices, with probability 1. Accordingly, we consider two alternative scenarios for what outperformance assumptions are embodied in current prices: i) that outperformance will persist until the end of the current period, AMP7 (i.e. 2025), and thereafter there will be no systematic outperformance, on average, over time; ii) that outperformance will persist until the end of AMP8 (i.e. 2030) with no systematic outperformance thereafter.

This modified assumption has an impact on the NPV of the outperformance, changing the Market-to-Asset Ratios and modifying the lower CoE. In Table 2.2 we present the results obtained when we limit the outperformance up to the end of AMP7.

[17] In this case it is not variable, since the source is not an online database such as Thomson Reuters Eikon

Table 2.2: MARs with outperformance up to end of AMP7

	Severn Trent	United Utilities
Approach A - Europe Economics 2017 Approach	1.40	1.03
Approach B - Barclays approach using Europe Economics values	1.30	1.13
Approach C - Barclays approach with Barclays values	1.26	1.18

Source: Europe Economics MAR analysis

As we can see, the ratios are now higher compared to those produced by the original model, with Severn Trent ranging between 1.26 and 1.40 United Utilities between 1.03 and 1.18. This is because, compared to the previous assumptions, the stream of outperformances is limited up to 2025, therefore affecting market values by less. This implies that the adjusted enterprise values for each model are higher, driving up the MARs.

In Table 2.3 we present the results obtained when we limit the outperformance up to the end of AMP8.

Table 2.3: MARs with outperformance up to end of AMP8

	Severn Trent	United Utilities
Approach A - Europe Economics 2017 Approach	1.35	1.03
Approach B - Barclays approach using Europe Economics values	1.25	1.12
Approach C - Barclays approach with Barclays values	1.22	1.17

Source: Europe Economics MAR analysis

As expected, the ratios, under the assumptions of having outperformances up to the end of AMP8, are slightly lower when compared with the results from Table 2.2. In particular, Severn Trent's MARs are now between 1.22 and 1.35, while United Utilities values range between 1.03 and 1.17. We expect ratios to be lower in this case because, with a longer period of assumed outperformance, the impact of outperformance on the firm's value is greater.

2.7 Second extension - Sensitivity Analysis

Finally, we developed a sensitivity analysis that let us understand how the totex and the ODIs performances should change for the period 2020-2050 to get a MAR of 1.00 for each company. It should be noted that, when running the model, the results for this sensitivity analysis can vary depending on the starting point (i.e. what original model was lunched before). However, after running both analysis several times for each approach, the results eventually converge, meaning that the sensitivity analysis reached a value of the totex (or ODIs) performance for which the MAR is 1.00 and the conditions for the original model are respected.

In the first case, totex performances are the only elements that change, leaving the ODIs, SIM, Financing & other and the Fast track award performances as they are. Overall, Severn Trent's totex performances ranges between 2.86 per cent and 4.78 per cent, while United Utilities' totex performances vary between -0.88 per cent and 1.22 per cent. For reference, the current levels of totex performances are 0.85 per cent for Severn Trent and -0.51 per cent for United Utilities.

In the table below, we present the values of the Totex for the period 2020-2050 that produce a MAR of 1. As we have done for the previous sections, we present values for each approach and both companies. These values should be also compared to the Barclays assumption on totex outperformances for Severn Trent and United Utilities, which were estimated to be 1.5 per cent and 0.7 per cent, respectively.

Table 2.4: Sensitivity analysis – 2020-2050 Totex performances as percentage of RORE

	Severn Trent	United Utilities
Approach A - Europe Economics 2017 Approach	4.78%	-0.88%
Approach B - Barclays approach using Europe Economics values	3.40%	0.53%
Approach C - Barclays approach with Barclays values	2.86%	1.22%

Source: Europe Economics MAR analysis

We carried out also the same exercise letting the ODI outperformances change, while the other performances are fixed. In this case, the ODIs performances for Severn Trent ranges between 3.13 per cent and 5.09 per cent, while the values for United Utilities are between 0.32 per cent and 2.43 per cent. This means that, in order to get a MAR of 1.00 with other assumptions (i.e. outperformances) unchanged, Severn Trent and United Utilities should have a yearly outperformance on the ODIs of at least 3.13 per cent and 0.32 per cent, expressed as a return on regulatory equity, respectively. Both values are higher if compared to the FD outperformances for 2019/20. Severn Trent had ODIs outperformances of 0.99 per cent, while United Utilities had a value of 0.15 per cent. We provide the full list of results in the table below. For reference, Barclays estimates for ODIs outperformances are 1.1 per cent for Severn Trent and null for United Utilities.

Table 2.5: Sensitivity analysis – 2020-2050 ODIs performances as percentage of RORE

	Severn Trent	United Utilities
Approach A - Europe Economics 2017 Approach	5.09%	0.32%
Approach B - Barclays approach using Europe Economics values	3.64%	1.73%
Approach C - Barclays approach with Barclays values	3.13%	2.43%

Source: Europe Economics MAR analysis