COST OF CAPITAL FOR PR24

A report prepared for United Utilities

02 September 2022

CONTENTS

EXECUTIVE SUMMARY

United Utilities (UU) has asked Frontier Economics to provide a report on the Weighted Average Cost of Capital (WACC) to be allowed at PR24 – covering the April 2025 to March 2030 period. This is to support UU's response to Ofwat's PR24 Draft Methodology Consultation which was published on 7 July 2022.

The PR24 timetable still has some way to run, so the WACC estimates set out in this report will require revision over time. Nevertheless, these estimates:

- provide context to the consultation responses made regarding methodology;
- capture the impact of some of the significant market movements that have occurred since the PR19 determinations were made; and
- may help inform Ofwat's own assessment of the WACC that should be used in company business plans – which Ofwat has highlighted it will publish alongside its PR24 Final Methodology in December 2022.

UU has also asked us to consider issues regarding equity financeability and the funding of RCV growth in the context of listed companies for PR24, which we also cover as part of this report.

Approach to the PR24 WACC

In order to estimate the cost of equity for PR24, in line with regulatory convention, we continue to apply the Capital Asset Pricing Model (CAPM) methodology. We also discuss the role of cross-checks to CAPM outputs. Given the proposed switch towards full CPIH RCV (Regulatory Capital Value) indexation for PR24 we also express all WACC outputs in CPIH-deflated terms.

Overall, we find that Ofwat's proposed methodology, which builds on the December 2021 risk and return discussion paper, would likely drive down the allowed return on equity, with the risk that equity investors will find the water sector less attractive than before. At the same time, Ofwat is proposing that equity investors finance a greater share of assets in the sector.

We also find that Ofwat, on the one hand, stresses that it wants to shift focus to long-term investment needs of the sector while, on the other hand, suggests making prominent use of short-term equity market data in setting the WACC.

In this report we assess the evidence carefully when appraising each part of Ofwat's proposed methodology, and where we do not feel the evidence supports the proposals we adopt appropriate alternatives. Where an alternative is adopted we explain why we have not followed the Draft Methodology.

Throughout this report we have used a cut-off date of 30 June 2022 for market data, with data from companies' Annual Performance Reports (APRs) reflecting the latest 2022 submissions.

Market developments since PR19

The PR19 WACC was set in an environment where interest rates were close to historical lows. This environment had a bearing on both the cost of debt and on the risk-free rate that was selected for estimating the cost of equity. Since PR19 there has been a significant shift in monetary policy as central banks globally have raised rates. This means that current market projections for interest rates differ materially from those in 2019.

The impact of the COVID-19 pandemic also creates challenges in setting a WACC for PR24. The pandemic has created a high degree of economic and financial market volatility in the first half of AMP7. As many of the methods used to estimate the WACC, including CAPM, rely on historical data for their estimation, there are important questions about how data points from this period of volatility are used. As we are interested in the WACC for the 2025 to 2030 period it is important to recognise that by this time COVID-related risks may have changed. We consider that these questions need to be reviewed on a parameter-by-parameter basis, and for each parameter throughout this report we outline our approach.

In addition, the water sector faces a number of long-term challenges that require substantial investment to help solve. To address these long-term challenges, timely investment in the 2025 to 2030 period will be required. While there is uncertainty as to the exact scale of proposed investment for the 2025 to 2030 period at this stage, the long-term capital expenditure requirements of the sector emphasise the importance of setting a WACC that is supportive of raising large amounts of financing.

WACC estimate for PR24

Our WACC estimate for PR24 is summarised in Figure 1 below, followed by a summary of our key findings for each parameter in deriving estimates.

Overall, we estimate a vanilla wholesale WACC for the water sector in the range of **3.01% to 3.58%**, which we note is higher than the final point estimate from the PR19 Final Determinations. This is mainly due to higher interest rates, and updating estimates for the latest available data.

Figure 1 PR24 cost of capital estimate (CPIH, real)

Parameter	PR24 estimate		PR19 allowance
	Lower bound	Upper bound	
Gearing	60%	60%	60%
Risk-free rate	-0.28%	0.49%	-1.39%
Total Market Return (TMR)	6.70%	7.30%	6.50%
Equity Risk Premium (ERP)	6.98%	6.81%	7.89%
Unlevered beta	0.28	0.30	0.29
Debt beta	0.05	0.05	0.125
Asset beta	0.31	0.33	0.36
Notional equity beta	0.69	0.74	0.71
Allowed return on equity	4.54%	5.54%	4.19%
Ratio of new to embedded debt	20%	20%	20:80
Cost of new debt	2.19%	2.19%	0.53%
Cost of embedded debt	1.80%	2.20%	2.42%
Additional borrowing costs	0.22%	0.22%	0.10%
Allowed return on debt	2.10%	2.42%	2.14%
Appointee WACC (vanilla)	**3.08%**	**3.67%**	**2.96%**
Retail net margin deduction	0.07%	0.09%	0.04%*
Wholesale WACC (vanilla)	**3.01%**	**3.58%**	**2.92%**

Source: Frontier Economics, Ofwat PR19 Final Determinations

*Note: * We note that Ofwat corrected this value as part of its submission to the CMA, to a range of 0.07%-0.09%*

We consider that there are merits to selecting a point estimate from the upper half of this range given the large scale financing that the sector requires to deliver on the priorities of customers and government.

Below we summarise our key findings for each parameter.

- **Inflation** – Inflation is currently above the Bank of England's target, but the latest projections are that inflation will have returned to levels closer to 2% by 2025. Given that long-term inflation projections are consistent with the long-term financing that Ofwat assumes the notional company has in place, we adopt a 2% CPIH assumption.
- **Gearing** – We note that Ofwat has published discussion papers on the issue of notional gearing and has hinted that a lower notional gearing would be perhaps more desirable for PR24. However, our analysis does not find any meaningful evidence to suggest the current 60% gearing is either too high (i.e. risky) or too costly for the sector. We have therefore chosen to retain a notional gearing assumption of 60%, consistent with credit rating agency guidance and evidence from actual company structures.
- **Cost of equity** –
  - Risk-free rate – Gilt yields have increased significantly over 2022, lifting up the estimates of the risk-free rate. In addition, academic research that has become available since PR19 further supports the case that convenience yields should be taken into account. Combined, these lead to a higher value for the risk-free rate for PR24.

- Total Market Return – there are regulatory consistency benefits from continuing to follow the approach of assuming a constant real-terms TMR that is derived from ex-post historical approaches. Given the transition to full CPIH indexation for PR24, we update real return estimates for the latest CPIH evidence, finding they are higher than under previous measures.
- Beta de-gearing and re-gearing – Ofwat has suggested alternative ways to de-gear and re-gear equity betas instead of the traditional Harris-Pringle formula used in GB regulatory settings. We have assessed both of the proposed alternatives, and find that although they are not in principle wrong, they are either not suited to the GB regulatory context or they introduce undesirable additional uncertainties and potential measurement errors, all for solving a problem that may not even exist (we explain in detail why we think the problem may not exist). We therefore retain the traditional formula for the purpose of this report.
- Beta estimation – as betas are derived from equity market data, observations from short-term windows of data are going to be influenced by equity market volatility associated with COVID. For this reason we review a range of windows and averaging options to derive betas estimates, placing more weight on longer-term averages.
- Cross checks – Ofwat has suggested to put weight on Market-to-Asset Ratio analysis to cross check its CAPM derived cost of equity estimate. We are concerned with the way GB regulators (including Ofwat) interpret the MAR evidence, where a prior belief of MAR should be equal to 1 is the starting premise of the analysis. We note that even if regulatory allowances exactly equal actual costs, including the cost of capital, there is no guarantee that the MAR would be 1 because the capital market does not always price stocks by their fundamental intrinsic value. We propose Ofwat to look at relative valuation instead (if indeed valuation of water companies is a concern for Ofwat) by comparing standard valuation metrics across sectors to benchmarks and the wider market. Furthermore, we propose two additional cross checks, with one also based on a market valuation implied cost of equity (Dividend Growth Model) and the other entirely away from short-term capital market conditions that focusses on long-term historic profitability achieved by comparable benchmark companies and the wider market. We conclude that no cross check is perfect or robust enough to single-handedly challenge the CAPM estimates, but together, they can provide a real-life perspective on the theory-based CAPM estimates. The result of our cross checks show that Ofwat's allowed COE at PR19 is at the very bottom end of the range supported by the cross checks. We therefore recommend Ofwat not to rely on the MAR evidence alone at PR24 to justify any further decrease in the allowed equity return.

- **Cost of debt** –
  - Cost of embedded debt – we estimate a wide range of estimates for the cost of embedded debt in line with Ofwat's proposed balance sheet approaches. However, at this stage we note two issues with relying on these estimates in our WACC estimation. First, given the analysis excludes swaps, outputs from the balance sheet approach are likely to misrepresent the cost of embedded debt. Second, our estimate using the 'actual-notional

cost' approach is uncertain due to assumptions on the notional structure weights that will be used, and whether floating debt is considered. Given this, at this stage we select a lower bound estimate that we believe is reflective of the sector's current embedded debt costs (excluding swaps), and an upper bound based on benchmark index using the 20-year collapsing average.

- Cost of new debt – Our methodology does not include the reduction from expected outperformance on the cost of new issuance, as we do not see sufficient evidence of its existence.
- Weighting – In the absence of business plan data for PR24, at this stage we retain an assumption of 20% new debt, in line with Ofwat's estimate at PR19 at Final Determination (and slightly higher than the CMA's of 17%). However we expect that this will likely be higher given the investment requirements for the sector at PR24.
- Additional borrowing costs – In addition to the 10 bps of issuance and liquidity costs that Ofwat has proposed be included, we further consider that allowances for cost of carry and CPIH basis risk should be made.

- **Setting the wholesale WACC** – We agree with Ofwat that a single WACC continues to be applied across the sector. In making a retail margin adjustment to the appointee WACC, we consider the approach adopted by Ofwat at PR19 to be appropriate, although note that our estimate will be subject to further updates based on Ofwat's assessment of the retail margin and for updated information used in the calculations of the adjustment for PR24.

Equity financeability

Overall, we consider there are risks to an approach to equity financeability that isn't sufficiently flexible, and that Ofwat should consider there are factors that can make a difference to how a range of ownership models in the sector can be supported. Two key steps Ofwat can take to support equity financeability are to recognise the role of dividend stability and to provide an appropriate allowance for equity issuance costs of at least 5%.

1. INTRODUCTION

United Utilities (UU) has asked Frontier Economics to provide a report on the Weighted Average Cost of Capital (WACC) to be allowed at PR24 – covering the April 2025 to March 2030 period. This is to support its response to Ofwat's PR24 Draft Methodology Consultation which was published on 7 July 2022.

Alongside this, UU has also asked us to consider issues regarding equity financeability and the funding of RCV growth in the context of listed companies for PR24.

The PR24 timetable still has some way to run, so the WACC estimates set out in this report will require revision over time. Nevertheless, these estimates:

- provide context to the consultation responses made regarding methodology;
- capture the impact of some of the significant market movements that have occurred since the PR19 determinations; and
- may help inform Ofwat's own assessment of the WACC that should be used in company business plans – which Ofwat has highlighted it will publish alongside its PR24 Final Methodology in December 2022.

Overview of WACC methodology

In this report we estimate a vanilla WACC, which can be expressed as:

$$WACC = g.k_d + (1 - g).k_e$$

Where g is gearing, k_d is the cost of debt, and k_e is the cost of equity.

In order to estimate the cost of equity for PR24, in line with regulatory convention, we continue to apply the Capital Asset Pricing Model (CAPM) methodology. This can be expressed as follows:

$$k_e = RFR + \beta_e.ERP$$

Where RFR is the risk-free rate, β_e is the equity beta, and ERP is the equity risk premium.

In estimating the WACC and CAPM in this report we focus on long-term figures, consistent with the long investment horizons in utilities – which extend beyond a given five-year price control. We consider that stability and consistency help to support the perception that the water sector is low risk, so we only make changes in this report where there they can be well evidenced.

Given the proposed switch towards full CPIH RCV (Regulatory Capital Value) indexation for PR24 we also express all WACC outputs in CPIH-deflated terms.

Overall, we find that Ofwat's proposed methodology, which builds on the December 2021 risk and return discussion paper, would likely drive down the allowed return on equity, with the risk that equity investors will find the water sector less attractive than before. At the same time, Ofwat is proposing that equity investors finance a greater share of assets in the sector.

We also note that Ofwat, on the one hand, stresses that it wants to shift focus to long-term investment needs of the sector while suggesting to make prominent use of short-term equity market data in setting the WACC.

In this report we assess the evidence carefully when appraising each part of Ofwat's proposed methodology, and where we do not feel the evidence supports the proposals we adopt appropriate alternatives. Where an alternative is adopted we explain why we have not followed the Draft Methodology.

Throughout this report we have used cut-off date of 30 June 2022 for market data, with data from companies' Annual Performance Reports (APRs) reflecting the latest 2022 submissions.

Structure of this report

The structure of this report is as follows:

- Section 2 provides market context for setting the WACC for PR24, include recent sector specific and macroeconomic developments;
- Section 3 discusses the treatment of inflation in the WACC in light of the proposed full transition of RCV indexation to CPIH;
- Section 4 estimates notional gearing and responds to proposals regarding setting a lower gearing assumption in the sector;
- Section 5 estimates the cost of debt and responds to proposals regarding both the cost of embedded debt and cost of new debt;
- Section 6 estimates the market parameters in the cost of equity and responds to proposals regarding the risk-free rate and total market returns;
- Section 7 reviews Ofwat's proposed approach to de-gearing and re-gearing and sets out our preferred approach for estimating beta;
- Section 8 estimates the unlevered beta and debt beta using market data;
- Section 9 estimates the cost of equity range and considers issues regarding cross-checks and selecting a point in the range;
- Section 10 estimates the retail net margin deduction and responds to proposals regarding use of a single wholesale WACC;
- Section 11 concludes with an estimate of the preliminary WACC for PR24 that would be appropriate for business planning purposes; and
- Section 12 reviews equity financeability risks, considerations in relation to the debt financeability assessment, and estimates a cost of equity issuance allowance.

The annexes to this report provide further detail on the following topics:

- Annex A – provides supporting information on the cost of equity issuance.
- Annex B – provides supporting information on equity financeability.
- Annex C – contains analysis on a range of cross-checks to the cost of equity.
- Annex D – reviews the reliability SONIA swaps as a proxy for the risk-free rate.

2. MARKET CONTEXT FOR PR24

Three years have passed since Ofwat set the PR19 draft and final determinations. The next Asset Management Period (AMP8) for the water sector is scheduled to run from April 2025 to March 2030.

It is important that allowed returns are set with consideration of the wider financial market and macroeconomic environment as well as the sector-specific context. While the PR24 process still has just over two years remaining there have been a number of key developments since PR19 that will have a significant bearing on the WACC. In this section we set out those key developments covering:

- Financial market and macroeconomic context – including the interest rate environment, inflation expectations and pandemic impacts; and
- Sector specific context – including information from long-term company plans and the latest strategic priorities of government.

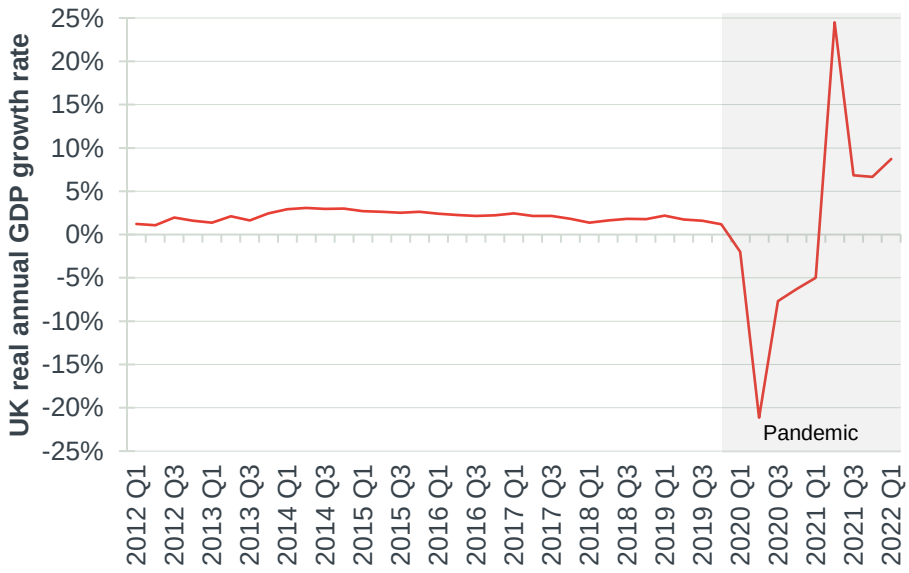
Overall, we find that these developments need to be carefully considered when setting the WACC, and we consider this broader market context when assessing each of the parameters in this report.

Financial markets and the macroeconomy

Pandemic impacts

COVID has created significant volatility for the UK economy and financial markets in the early part of AMP7. The lockdowns that were put in place in the UK and other countries created large dislocations in GDP. This is shown in Figure 2, where the annual growth rate for the UK, which had previously been in the range 1% to 3%, was below -20% in 2020 Q2.

Figure 2 UK real GDP growth

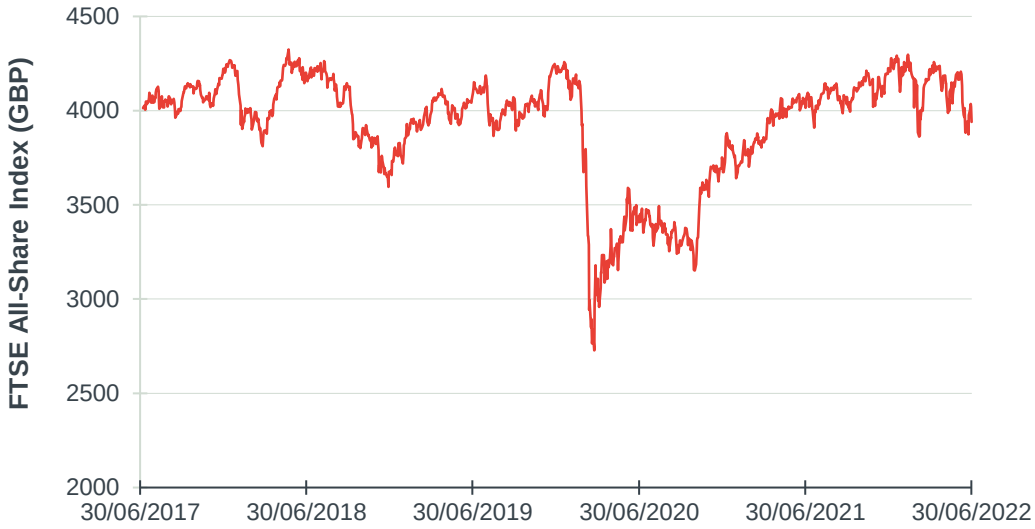


Source: ONS

For an extensive period of time consumption and investment decisions have been made in an environment of heightened uncertainty regarding the evolution of the pandemic and potential restrictions on activity.

These shocks, and ongoing uncertainty, in the real economy have also been associated with high levels of financial market volatility. Equity markets globally declined rapidly over March 2020. This was also the case in the UK, where the FTSE-All share, an index regulators use in financial analysis, declined by over 30% in the space of one month from 21 February 2020 to 20 March 2020 before subsequently recovering. This is shown in Figure 3 below.

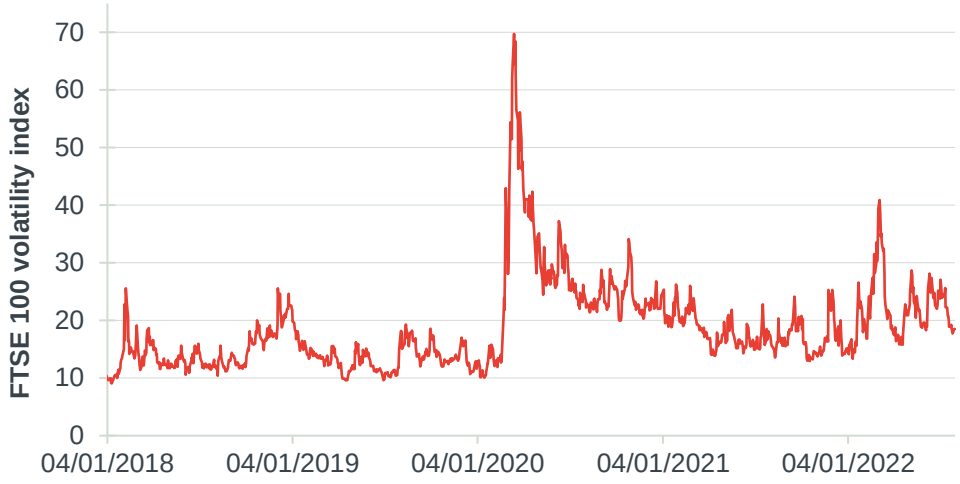
Figure 3 FTSE All-share Index



Source: Bloomberg

Since this initial shock in Spring 2020 equity market volatility has continued to be higher than pre-pandemic trends. This can be shown by reviewing option implied volatilities on the FTSE-100 index over time. In Figure 4 we show that equity market volatility has still not subsided back to the range seen prior to March 2020. Figure 4 also shows that volatility in 2022 has increased relative to average levels over 2021. The spike in volatility in March 2022 is associated with the Russian invasion of Ukraine.

Figure 4 FTSE 100 Option Implied volatility index



Source: Bloomberg

High levels of volatility such as this create challenges for setting a forward-looking cost of capital for the 2025 to 2030 period. A key question is how representative historical data such as this is going to be for that period of time. Given the extreme nature of the shocks to the real economy that occurred in the past two and a half years, we are cautious about how representative spot market observations are for a time period that is still another two and a half years away from beginning. As such, we treat observations from this period of volatility with caution when considering how the WACC should be set at PR24.

Interest rates

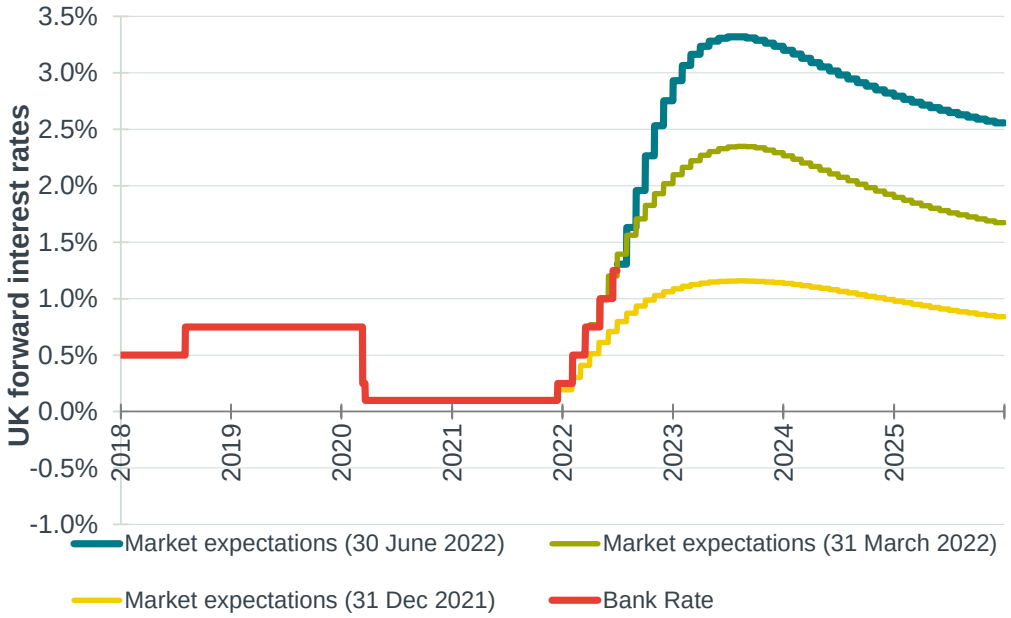
Interest rates underpin both the cost of equity and the cost of debt, they therefore play a key role in determining the WACC. Since PR19 there has been a marked change in the interest rate environment, with the Bank of England's base rate climbing to its highest level since the global financial crisis. This has been in response to the highest levels of inflation experienced in decades. This trend is not unique to the UK, with other major global interest rates rising in response to global price pressures.

There is currently uncertainty regarding how quickly inflation can be brought back towards the central bank target, and hence uncertainty over how high interest rates will go, and for how long they will remain elevated.

However, interest rate expectations from market data can provide some indication of current sentiment. As captured in Figure 5 below, market expectations for the end of June 2022 are that the short-term UK interest rates will rise from around 1.2% to a peak of 3.3% in nominal terms in mid-2023. Short-term rates are then expected to remain at over 2.5% by the start of AMP8.[1]

[1] The Bank of England raised the bank rate by 0.5% to 1.75% on 04 August 2022. This is broadly in line with market expectations from 30 June 2022.

Figure 5 Base rate expectations

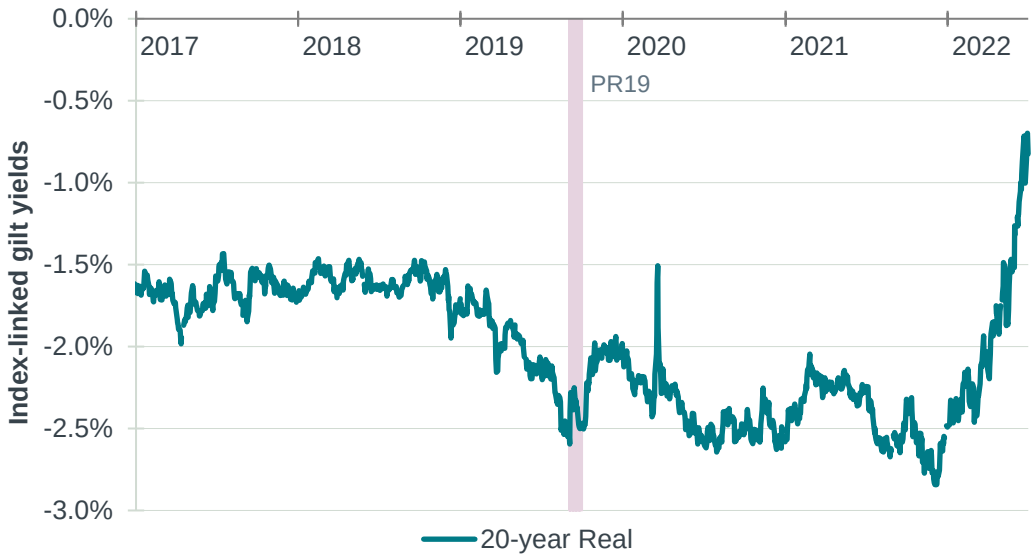


Source: Bank of England

For comparison, equivalent market expectations for short-term interest rates from November 2019 (the time the PR19 final decisions were being made) were that the base rate would stay close to 0.5% for entirety of AMP7.

Shifts in interest rate expectations are also evident from longer-term interest rates in the gilt market. Figure 6 below sets out the increase in the 20-year index-linked gilt yield that has occurred in recent months compared to the much lower rates that were prevailing around PR19. The yields at the end of June has climbed to -0.82%, this compares to an equivalent figure of -2.84% in December 2021, an increase of around 2 percentage points. Current figures are also significant higher than those at the time of the PR19 FD data cut-off, where average yields for September 2019 were -2.61%.

Figure 6 Index-linked gilt yields



Source: Bank of England

Interest rates and government yields have increased significantly over the past year, and in a way that was not anticipated at the PR19 determination. The evidence also shows the elevated uncertainty of the path of interest rates over the next 3 years.

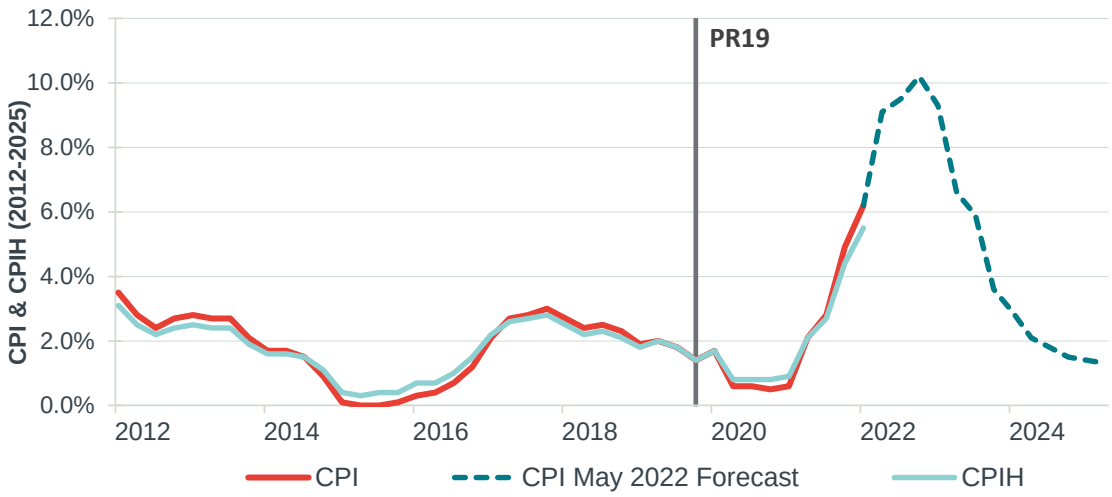
Inflation

In the water price control methodology inflation is addressed through the indexation of the Regulatory Capital Value (RCV). The WACC to be applied to the RCV is therefore estimated in real terms. As described above, Ofwat has proposed that from PR24 the RCV will be indexed by CPIH inflation (as opposed to a mix of RPI and CPIH).

Nevertheless, an understanding of inflation trends is vital in the assessment of WACC. Some of the input parameters are observed in nominal terms and the WACC is estimated in nominal terms and then deflated to real terms using a projection of CPIH inflation.

Over the course of the past year inflation has increased significantly, driven by increases in wholesale energy prices, as well as increases in the cost of food and other commodities. This is shown in Figure 7 which also shows the Bank of England projection (from May 2022) that inflation will spike at the end of this year before subsiding closer to target by the start of the 2025-2030 period.

Figure 7 CPI and CPIH inflation



Source: Bank of England, May 2022 Monetary Policy Report

The data on inflation and the potential uncertainty around projections are discussed further in section 3 below.

Sector-specific market context

The water sector faces a number of long-term challenges that require substantial investment to help solve. The scale of these challenges is evident from the Water Resource Management Plans (WRMPs) and Drainage and Wastewater Management Plans (DWMPs) that companies produce – both of which set out what is required over the long-term.

For example, UU's Draft Drainage and Wastewater Management Plan – which is currently out for consultation – has set out the potential for £21bn of investment over the 2025 to 2050 period. The draft plan for Thames Water, another large WaSC, sets out £24bn of investment over the next 25 years as a starting point for proposed investment. Together these indicate the potential scale of the challenge that lies ahead.

The latest strategic priorities of government to Ofwat (as set out in the Strategic Policy Statement published on 28 March 2022) also highlights the challenges facing the industry over the next 20-30 years. The priorities include:

- Delivering net zero operational carbon emissions by 2030;
- Delivering against government targets in the 25 year Environment Plan, including returning 75% of river bodies to their natural state;
- Resilience to a one in 500-year drought by 2040;
- Reducing leakage by half by 2050 relative to current levels;
- Reducing per capita consumption (PCC) to 110 litres per day by 2050; and
- Achieving greater flood resilience.

In addition, the industry will need to invest to work towards to the government's target of reducing combined sewer overflows (CSOs) by 80% by 2050.

In those strategic priorities there was also an emphasis on the government being committed to taking a long-term approach to investment, highlighting that a system that works in the enduring interest of consumers does not, *'simply mean lower prices in the short-term at the expense of future generations'.*[2]

To address these long-term challenges timely investment in the 2025 to 2030 will be required. While companies have not yet finalised their business plan for PR24, meaning there is uncertainty on the exact scale of proposed investment, the long-term capital expenditure plans the sector has in place emphasise the importance of setting a WACC that is supportive of raising large amounts of financing.

[2] https://www.gov.uk/government/publications/strategic-policy-statement-to-ofwat-incorporating-social-and-environmental-guidance/february-2022-the-governments-strategic-priorities-for-ofwat#governments-strategic-priorities-for-ofwat

3. INFLATION

In this section we discuss the two main inflation assumptions that are required when estimating the WACC for PR24:

- First, what an appropriate assumption is for the long-run CPIH rate; and
- Second, what an appropriate assumption is for the long-run RPI-CPIH wedge.

CPIH assumption

As we are estimating a WACC expressed in CPIH-deflated terms, in order to convert nominal figures into CPIH-deflated equivalent, an assumption for CPIH is required. As the nominal figures being deflated are often associated with long-term financing, the assumption required for CPIH is also long-term in nature.

Draft methodology proposals

In its PR24 draft methodology, Ofwat has proposed to maintain *"the Bank of England's 2.0% CPI target as our long-run CPIH assumption where we need a long term forecast for our cost of capital calculations, noting that CPI and CPIH have been very close in value since the CPIH was introduced."* [3]

In other words, Ofwat is proposing to anchor a long-run assumption of CPI to the Bank of England's target. But as it is CPIH that is the index being applied in PR24, they are also assuming that the two inflation rates are equivalent. This leads to a 2.0% CPIH assumption.

Our approach

As shown in the market context chapter, while CPI rates are currently high, forecasts from the OBR (which we discuss in more detail later) suggest that inflation will be closer to Bank of England target by the start of the 2025-30 period. We are therefore also minded to assume a long-run CPI assumption of 2% for PR24.

To assess whether it is appropriate to assume that the CPIH inflation rate is equivalent to the CPI inflation rate (as Ofwat are proposing), we review long-run evidence on the spread between the two. Market evidence on the difference between the two inflation rates for 2022 shows that there can, at times, be a non-trivial spread between the two. However, as we are interested in setting a long-run assumption, we consider that long-run historical evidence is the best guide for testing whether it is appropriate to assume the two rates are equal.

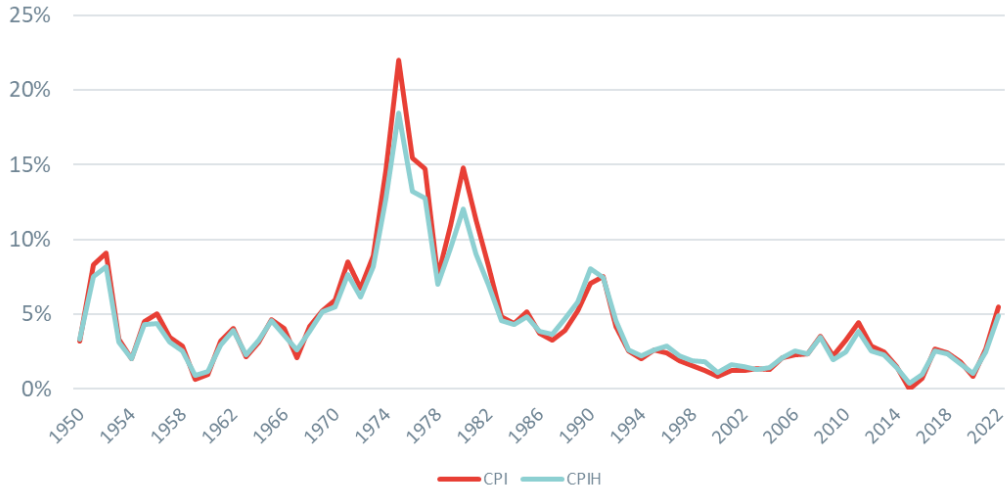
Specifically, to review the long run CPI-CPIH wedge, we have compared the estimated inflation rates from each index over time since 1950. We select 1950 as this is the furthest back in time that estimates of the two indices are available. This is shown in Figure 8. [4]

[3] Ofwat PR24 Draft Methodology, p94

[4] This uses data released by the ONS in May 2022 which estimates the historical rate of CPIH from 1950-1988 as well as reported data from the ONS

Our analysis shows there can be some differences between the two measures over time. However, the only significant deviations appear to be during periods of high inflation. To illustrate this, the average CPI-CPIH wedge is 1.11% during years where CPIH was over 5%, whereas the wedge was -0.01% during the years where CPIH was lower than 5%. Therefore, given that we expect inflation to have returned to lower levels during the 2025 to 2030 period, we consider it reasonable to assume that there is no long run CPI-CPIH wedge for the same period.

Figure 8 CPI and CPIH inflation



Source: ONS

Long-term RPI-CPIH wedge

As some data sources are expressed in RPI-deflated terms, an assumption on the difference between RPI and CPIH is required in order to convert them into a CPIH-deflated equivalent. This is sometimes referred to as the RPI-CPIH wedge.

Draft methodology proposals

In the PR24 Draft determination Ofwat outlines three options for converting RPI-linked data to a CPIH basis:

- The 'Do minimum' approach. This involves adjusting RPI-linked gilt yields by the OBR's long-term RPI-CPI 'wedge' of around 1.0%.
- 'Official forecasts' approach. This would base the RPI-CPIH wedge on the OBR's RPI and CPI forecasts before 2030, and then assume that the RPI will be fully aligned with the OBR's long-term CPI forecast after 2030.
- 'Inflation swaps' approach. This would infer the market-implied long-term expectation of the RPI-CPIH wedge based on rates from RPI and CPI swaps.

Out of these options, Ofwat has said that their provisional view is that the first of these approaches is not appropriate as *"it unrealistically assumes that the market is currently pricing gilts that mature after 2030 with no regard to the drop in*

indexation rates due to come in as a result of the UKSA's 2030 reforms." [5] Further, it says that the 'Official forecasts' approach may be preferable to using inflation swaps, as it *"avoids distortions due to inflation risk premia and/or low liquidity in swap markets."* [6]

Our approach

We also consider that the 'Do minimum' approach, given the proposed reforms, would likely not be appropriate given that it does not price in the expected fall in the wedge between RPI and CPIH to zero once RPI has transitioned after 2030; thereby potentially overstating inflation beyond 2030.

We note that there is still some residual uncertainty over the methodology reform to RPI that could affect the proposed 2030 transition.[7] Nonetheless, for the purposes of this report we have assumed that the wedge will fall to zero once the proposed transition has occurred. Furthermore, in this report we have not reviewed the extent to which the reform to RPI could have different implications for the sovereign bond market compared to the corporate bond market.[8] Where such treatment differs, then it may be appropriate to consider whether different RPI-CPIH wedges are required when adjusting data from sovereign index-linked debt and corporate index-linked debt. We suggest this is something Ofwat considers in its methodology and determinations going forward; for this report we apply the same RPI-CPIH wedge to both data sources.

We also find evidence that supports the view that the 'Inflation Swap' approach may have some bias due to the presence of risk premia and issues with liquidity.

To illustrate concerns with a swap approach, we compare the OBR's estimate of the long-run RPI-CPI wedge with data from long-run swaps. In order to do this we draw on the OBR's forecast, from 2015, that the long run wedge between RPI and CPI is 1.0%. The OBR's view was based on historical data and a review of the structural differences between the two indices.[9] As shown in Figure 9, the long-run wedge implied from the difference between 10 year and 20 year RPI and CPI swaps predicts a consistently smaller wedge than the 1.0% OBR estimate of the wedge. We consider that these differences are unlikely to be explained by differences in inflation expectations between the market and the OBR, and instead may be reflecting swap market specific frictions and risk premia.

[5] Ofwat PR24 Draft Methodology, Appendix 11, p9

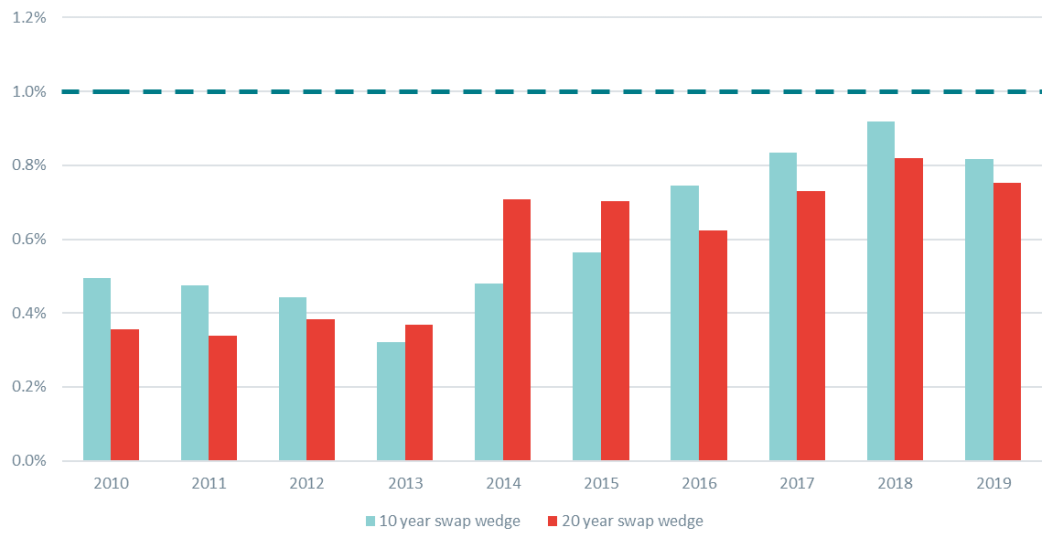
[6] Ofwat PR24 Draft Methodology, Appendix 11, p10

[7] The High Court of Justice is currently hearing a challenge against the proposed change.

[8] A possibility that has previously been discussed when previous RPI reforms have been proposed is that index linked corporate bonds may have adjusted terms or be subject to early redemption in connection with RPI reforms, and that this may depend on the contractual terms of a given bond. For example, see Moody's 2012 report: "UK Regulated Utilities: Possible Change in the Calculation of RPI Would Be Credit Negative".

[9] Revised assumption for the long-run wedge between RPI and CPI inflation, OBR (2015), available at https://obr.uk/box/revised-assumption-for-the-long-run-wedge-between-rpi-and-cpi-inflation/

Figure 9 10 and 20 year Swap Wedge



Source: *Swap price data extracted from Bloomberg*

Note: *We have presented data up to 2019 since it was announced in 2020 that RPI would converge to CPI after 2030 in the consultation on the Reform to Retail Prices Index (RPI) Methodology by HM Treasury*

Given these concerns with the other two options set out, we use an approach similar to the 'Official Forecast' approach that Ofwat described when generating a RPI-CPI wedge for PR24.

Estimate of the RPI-CPIH wedge

Given that we do not know what the forecasts for inflation will be at the time of the final determinations, we cannot accurately forecast what the average wedge will be for upcoming pricing period. However, using the data currently available, we are able to generate an indicative figure for the current period – this figure will change as new forecasts are released closer in the time to the determination.

The latest OBR forecast provides an estimate of inflation up to 2026, however there is no forecast data beyond then. We therefore make assumptions about the wedge for the years between the end of the OBR's forecasts and the RPI transition year of 2030 to estimate a wedge. We assume that from the year 2030-31, the wedge is zero. Based on this approach we currently estimate a long-term RPI-CPIH wedge of around 0.25% to 0.35%, and adopt an assumption of 0.3% in our analysis (unless otherwise stated).

We note that this figure is subject to significant uncertainty and emphasise that is only indicative.

4. GEARING

Draft methodology proposals on gearing

In its December 2021 discussion paper Ofwat introduced its proposed framework for setting the appropriate notional capital structure. This framework is intended to:

- Incentivise efficient financing choices given the balance of risk faced by water companies;
- Reflect the scale and nature of investment needs;
- Take account of a range of appropriate benchmarks and evidence; and
- Allows the regulator to set a price control that is in the best interest of current and future customers.

In the context of this framework, Ofwat suggested that the current notional gearing level of 60% may not be fit for purpose for PR24 and that a lower gearing rate would be more appropriate. It justified this thinking on the basis that the water sector faces greater uncertainty in the future leading to a 'greater role for equity in order to provide a buffer against supply-side or demand-side shocks'.

Ofwat has since published its draft methodology. It recognised that there was 'limited support for our proposed framework for determining the notional structure and companies were universally opposed to a reduction in notional gearing from 60%'. However it is proposing to continue with its notional capital framework and remains minded to adopt a lower notional gearing level for PR24 (relative to the 60% assumption taken at PR19). Ofwat continues to reference a more uncertain future, for example associated with less predictable weather and the effects of climate change, as a reason for a greater role for equity.

Response to draft methodology proposals

Ofwat uses the concept of notional gearing rate for three purposes:

- as an input into the weighted average cost of capital (WACC);
- for the notional financeability assessment; and
- for monitoring and enforcing financial resilience.

In this report we focus on setting a notional gearing rate for the calculation of the WACC. We note though, in passing, that there is a compelling case for the notional gearing assumption for the financeability assessment to be the same as that used for the estimation of the WACC. The role of notional gearing in the monitoring of financial resilience is not considered in this report.

Regulatory practice dictates that the notional gearing level should be assessed on an independent and objective basis. Adjusting the notional gearing level away from this objective level in order to address financeability issues would not be consistent with Ofwat's financing duty.

We therefore assess Ofwat's proposals against the following set of questions:

- What is the market evidence on gearing? Is there a case to set notional gearing at a different level?
- Is notional gearing the best tool to provide additional headroom for risk?
- Is the treatment of notional gearing in line with regulatory best practice?

Evidence on notional gearing for PR24

When reviewing the empirical evidence the relevant metric is regulatory gearing, typically measured as the ratio of net debt for the appointed business to its regulatory capital value (RCV). This the metric used by credit rating agencies in their financeability criteria. Gearing levels based on enterprise value (EV) are inappropriate in the context of notional gearing.

EV based gearing metrics are useful to understand the amount of risk borne by equity. However, it is debt rather than equity that is the focus of the financeability assessment regarding the notional gearing, specifically the ability of a company to service its debt and its associated credit default risk. For example, Moody's methodology for regulated water companies specifies that 'leverage ratios aim to capture different measures of how easily an issuer can repay its debt, coverage ratios focus more on the ability to service the debt prior to repayment'. As water company cashflows are defined by their RCV, the EV is of limited consequence to debt investors. Therefore it is gearing in relation to the RCV that matters.

The market evidence across credit rating agency criteria, actual gearing rates, and regulatory precedent supports a range of 60%-75%. The current notional gearing level of 60% is therefore already at the bottom of this range:

- **Credit rating guidance.** Moody's ratio guidance for UK water utilities has threshold regulatory gearing range of 65%-72% for a Baa1 rating.[10] A regulatory gearing level of 60% is actually at the midpoint of the Moody's 55-65% range for an A3 rating which is higher than Ofwat's target for the notional company of BBB+/Baa1. The current level of 60% therefore already provides headroom for the notional company.
- **Actual sector gearing.** In the water industry, the current sector wide RCV weighted average gearing level is 68.5%[11] which is well above the 60% notional gearing level. Furthermore, the interquartile range of actual company gearing in 2021/22 was 63% - 72% and the lower quartile has remained at or above 64% over the past seven years. Currently only three companies have a gearing level below 60% and all three have non-standard capital structures that limit their value as comparators for the notional company or industry as a whole.[12] Excluding these three companies results in actual 2021/22 gearing levels ranging from 62% to 81%. Again this suggests that 60% already lies at the lower bound of efficient gearing levels. Furthermore, whilst there has been a

[10] Moody's (2018), 'Regulator's proposals undermine the stability and predictability of the regime'.

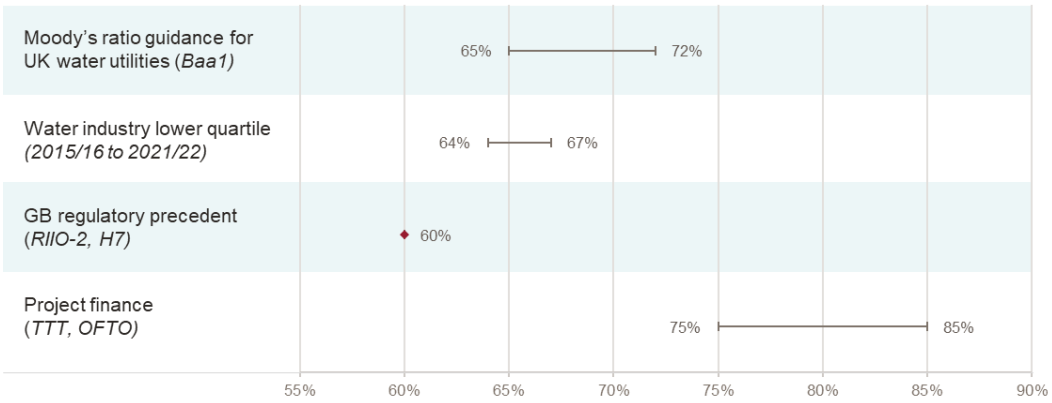
[11] This is the total sector gearing level i.e. total net debt / total RCV

[12] The three companies are Hafren Dyfrdwy, Dŵr Cymru, and South Staffordshire Water. Haffren Dyfrdwy has a reported gearing level of 40% which reflects its ownership by Severn Trent and intragroup adjustments. Dŵr Cymru's limited by liability ownership structure renders its gearing level incomparable to the rest of the industry. South Staffordshire Water's parent company, South Staffordshire plc, recently implemented a new group structure including the creation of a new intermediate holding company SSW Finance Limited (MidCo).

modest reduction in actual sector gearing levels in 2021/22, much of this is likely due to company specific factors that should not affect the assessment of notional gearing. More generally, even with the small reduction in total sector gearing in 2020/21, the majority of companies remain well above the 60% notional level, reinforcing its position as the bottom end of the market range.

- **Competitive infrastructure project finance.** Comparators from competitive infrastructure finance have also been consistently higher than 60%. For example, the Thames Tideway Tunnel currently has a gearing of 83% and Offshore Transmission Operators have typically been financed at gearing levels of 75%-85%.
- **Regulatory precedent**. Recent GB regulatory precedent for energy (RIIO-2) and aviation (H7) have all used 60% as their notional gearing assumption.

Figure 10 Summary of market evidence



Source: Frontier Economics

Furthermore, there is no evidence to indicate that the social optimal level of gearing would be below the level determined by the market evidence. Also to the extent that Ofwat has identified increases in the risk profile, we have not seen any rating agencies update their criteria to suggest lower gearing levels are required to address risk in the sector.

Is lowering the notional gearing is the best option for financial headroom

As Ofwat recognises in its draft methodology, credit ratings are based on multiple factors. Regulatory gearing only has a weighting of 10% in Moody's rating methodology and Ofwat has not provided evidence that it has considered other options for providing necessary headroom which may be more effective. Other regulators have considered alternative solutions to address uncertainty from factors such as increased risk of extreme weather. For example, Ofgem's draft determination for RIIO-ED2 includes a severe weather funding mechanism, as well as severe weather allowances and re-openers. We recommend that Ofwat works with companies to understand the root cause, scale, and balance of any additional uncertainty and use this to assess solutions in the round.

Without clear market evidence and supporting assessment, changing the notional gearing level goes against regulatory best practice

The government's recent review of economic regulation has highlighted the importance of stability in the regulatory regime to support long-term investment. This is key given that the water industry is likely to require significant investment in PR24 and beyond. Lowering the notional gearing rate without supporting evidence is likely to reduce investor confidence due to higher perceived regulatory risk. This in turn will undermine Ofwat's original intentions to support investment in the sector and may be perceived as counter-intuitive given the role of debt investment over the life of new assets.

While Ofwat argues that a change of up to 5% would not be unprecedented based on historical gearing levels, these should be considered in the context of the wider financial and regulatory environment and, in particular, the growth of RCV relative to annual costs over the past 30 years. This means that relying on historical gearing rates alone is not sufficient to argue that a change today is precedented, particularly as Ofwat has provided no empirical data or evidence to justify moving away from 60%.

Conclusion on gearing

In summary, we have seen no significant evidence to support a move away from the current 60% gearing level. Nor have Ofwat provided an impact assessment to demonstrate that a reduction in notional gearing levels is beneficial for customers, particularly as any change in gearing levels will have associated costs including equity issuance cost and tax liability impacts.

Without this evidence, there is a real risk that a reduction in the notional gearing level will mean companies are incentivised to move to inefficient actual gearing levels. This would lead to several adverse impacts including undermining investor confidence, over-reliance on a single source of financing, and equity issuance costs which ultimately need to be borne by customers.

5. COST OF DEBT

In this section, we set out our approach and estimate of the overall cost of debt and its components for PR24.

Cost of embedded debt

Draft methodology proposals

In its PR24 Draft Methodology, Ofwat has proposed to set the cost of embedded debt based on an assessment of the actual debt held on the balance sheets of each company. The proposal is as follows:

- It will consider two estimation approaches – an 'all-in costs' approach that reflects the 'pure debt' costs presented on each company's balance sheet, and an 'actual-notional cost' approach that takes a weighted average of each company's actual 'pure debt', weighted using the notional share of index-linked debt.
- It will set a single allowance for the sector, based on the cost of embedded debt faced by large companies.[13]
- It will exclude from consideration any swaps or certain other debt instruments from its estimation.

In addition, Ofwat has proposed using a benchmark index as a cross-check of this estimate as the upper limit using a calibration of its market benchmark, the iBoxx GBP 10+ A/BBB non-financials indices. Ofwat however has not specified the specific calibration it might use for PR24 at this stage (e.g. on the use of collapsing or trailing average, or the time period considered).

This approach represents a departure from that which Ofwat employed at PR19, where it instead set the embedded debt based on the benchmark index, and used the analysis of companies' balance sheets as a cross-check. The benchmarked estimate was calculated as the 15-year trailing average of the iBoxx A/BBB non-financials 10 years+ index, uplifted using market-implied interest rate rises for 15-year nominal gilts. It further applied an outperformance wedge of 25 basis points as a downward adjustment.

Ofwat considers that focussing its estimation on the balance sheet debt for PR24 will better reflect observed debt issuance, while maintaining strong incentives to issue debt efficiently.

In the following sections:

- we first set out our estimation of the cost of embedded debt using the balance sheet approach. This includes a discussion and some illustrative analysis of the key merits and drawbacks from excluding the assessment of swaps and other debt instruments from the estimation;

[13] This includes all large WaSCs and large WoCs (Affinity and South East Water). Ofwat notes that companies can request a company-specific adjustment should they fall outside this definition.

- we then present our estimates of the cross-checks based on the benchmark iBoxx index; and
- last, we summarise our current estimate of the cost of embedded debt for PR24.

Balance sheet approach

High-level approach

In principle, we see merits in the use of a balance sheet approach to estimate the cost of embedded debt for the sector as a whole, as to a degree this would still preserve incentives for efficient financing. While we raise some concerns with the details of Ofwat's approach in the following sub-sections, we have applied its high-level approach to assessing companies' balance sheets as set out in Ofwat's PR24 Draft Methodology, as follows:

- We have relied on debt analysis data contained in Table 4B of each company's Annual Performance Report (APR) in line with Ofwat's proposals. In doing so, we have included fixed, floating, RPI-linked and CPI-linked senior instruments, covering bonds, loans, finance leases, private placements and debentures. We have excluded any of these instruments that did not have a maturity date specified,[14] as well as debenture stocks, intercompany loans, liquidity facilities (including overdrafts and revolving credit facilities, all swaps and all junior debt/subordinated debt).[15] This is aligned with Ofwat's proposed inclusion criteria in its Draft Methodology.[16] Where debt has been issued in a currency other than GBP, this has also been excluded.[17]
- We then calculate the cost of embedded debt for each company as follows:
  - First, we project forward on an annual basis the value of each debt item within each company's debt book. We use the book value for all debt types except index-linked debt, where the carrying value is used.
  - We then calculate, on an annual basis, the real cost of each debt item, accounting for the type of instrument (i.e. fixed, floating, index-linked). The long-run CPIH inflation assumption of 2% is used in deflating all nominal values to CPIH real, with the exception of (a) index-linked debt, which we deflate using each company's estimated outturn inflation rate[18], and (b)

[14] This only affected approximately ten instruments across the sector, a relatively small proportion of the total.

[15] As set out below, we disagree with the exclusion of swaps from the assessment of the cost of embedded debt. However, we do not consider the exclusion of debenture stocks, intercompany loans and liquidity facilities to be inappropriate. Some of these items relate to equity financing (e.g. intercompany loans and debenture stocks). However, it is important that allowances for liquidity costs reflect the realities of operating liquidity facilities in the sector. With regards to junior/ subordinated debt, if Ofwat is seeking to understand the 'all-in' cost of debt based on actual structures, then it could consider this debt in its analysis, even if this is not considered in the 'actual-notional' approach.

[16] Ofwat PR24 Draft Methodology, Appendix 11, Table A1.4

[17] As swaps are not considered, the role of cross-currency swaps would not have been captured in the analysis, leading to an incomplete view of costs on non-GBP instruments.

[18] This is because companies report the nominal value of index-linked debt in APR tables by inflating on the basis of their internal inflation assumptions.

where index-linked debt is linked to the RPI, we apply an RPI-CPI wedge to bring the RPI coupon on the bond into CPI terms (see box below)[19].

- Some of the existing debt book will expire by the start of PR24. We assume in our modelling for simplicity that this debt is refinanced at a fixed rate[20], and use that rate as part of the cost of this embedded debt for PR24.
  - We assume that this is equal to the total amount of maturing debt in each year, plus an additional 10%, as an illustrative assumption for any additional impact of RCV growth on debt financing needs (sector RCV growth from business plans is likely to be different from this figure). We calculate this cost by estimating the iBoxx rate (annual average) for new debt in each remaining year of the 2020 to 2025 period and multiplying that by the value of debt refinanced in that year.
  - We then calculate the expected rate at which this refinanced debt in PR19 will be raised. We assume that all new debt prior to the start of PR24 will be financed at the market iBoxx rate, which we project forward using Bank of England gilt forward curves plus an assumed 1.72% iBoxx-gilt spread.[21]
- Taking the weighted average real cost of debt on an annual basis of the existing debt and the debt to be refinanced in PR19 (weighted by debt value).

Calculation of interest rates in CPI terms

Consistent with Ofwat's Draft Methodology we use a long-term inflation assumption of CPI = CPIH = 2%. We use this to calculate real interest rates in CPIH terms and to project the value of CPIH-index linked debt for both the remainder of PR19 and through PR24. For RPI-index linked debt we convert to CPIH using a CPI/CPIH-RPI wedge. For the remainder of the 2020 to 2025 period, we are consistent with the PR19 Final Methodology which uses long term inflation assumptions of 2% and 3% for CPIH and RPI respectively, with a wedge of 0.98%.[22] For the PR24 wedge, we use a methodology consistent with our approach to adjusting RPI index-linked gilts. However, we take the long-term average over the average length to maturity of the debt book (13 years)[23] rather than 20 years as for the risk-free rate. Using the same approach we estimate a the wedge of around 0.3% - but we note this figure is approximate and subject to uncertainty.

The debt that expires during the 2025 to 2030 is considered to be new debt over the price control (as set out in the next section on the cost of new debt).

[19] In the inflation section above, we discuss how RPI reform could have different implications for the sovereign bond market compared to the corporate bond market, but do not assume any differences for the purposes of our cost of debt analysis in this report

[20] We note that Ofwat has considered a split between fixed and index-linked debt but has not confirmed the relative weightings. For simplicity we have used the PR19 method where this is all fixed interest rates.

[21] Calculated as the 3-year average of the historic A/BBB spread with the historic Bank of England 10-year gilt yield, between 8 July 2019 – 30 June 2022. We do not find the overall result is very sensitive to alternative assumptions on iBoxx averaging period.

[22] This is calculated using the Fisher Equation rather than the simple difference between the two indices.

[23] This is the average length to maturity of the current debt books in 2022. We assume this does not change over PR24.

‘All-in’ versus ‘actual-notional’ costs approach

Finally, we estimate the cost of embedded debt using the ‘all-in’ versus ‘actual-notional’ cost approaches proposed by Ofwat.[24] For the ‘actual-notional cost’ approach we estimate the notional share of index-linked debt based on our notional gearing assumption of 60% and use the PR19 notional structure with 33% of debt index-linked. We assume 10% of this is CPI-index linked, consistent with Ofwat’s 2021 Risk and Return Discussion Paper analysis.[25] This assumes no floating debt. This approach has significant uncertainty prior to confirmation from Ofwat on the notional structure for PR24 and therefore on the weights on fixed and index-linked costs of debt.

Figure 11 below presents a range of estimates using the ‘all-in’ and ‘actual-notional’ cost approaches for large companies only. We present the large company weighted average for the ‘actual-notional’ approach, given the uncertainties for the parameters of this approach. Ofwat has not specified which averaging approach it will use, beyond a focus on large company balance sheets.

Figure 11 Estimates of embedded cost of debt using balance sheet approach for large companies

Estimation approach	Estimate for PR24 (CPIH, real)
‘All in cost’ approach	
Median	2.01 %
Weighted average	2.00 %
‘Actual-notional cost’ approach	
Weighted average	1.80 %

Source: Frontier Economics based on 2022 Annual Performance Reports Table 4B

Note: Large companies are defined as WaSCs and large WoCs (Affinity and South East Water).

A key driver of the lower estimate using the ‘actual-notional costs’ approach relates to the uncertainty in the notional structure that is assumed and therefore in the weights on fixed and index-linked costs of debt. These assumptions are important to ensure that the assumptions made for the notional company are achievable for the sector. Therefore, while in principle we do not necessarily disagree with the use of the ‘actual-notional’ approach, this is highly dependent on the notional assumptions made.

Inclusion of swaps in cost of embedded debt estimation

As set out above, Ofwat has proposed to exclude from its estimate of the cost of embedded debt any consideration of swaps and other debt instruments that companies use to manage their debt and reflected on their balance sheets.

We recognise that there are a number of limitations to including such instruments in the assessment of balance sheet debt, namely:

[24] The ‘all-in’ approach could be affected by changes in inflation. The index-linked debt will become more or less of the total value of the debt book, depending on if inflation is higher or lower than the expectations. In the ‘actual-notional’ approach this is not a consideration because the percentage of index -linked debt is fixed by the notional structure.

[25] https://www.ofwat.gov.uk/wp-content/uploads/2021/12/PR24-and-beyond_Discussion-paper-on-risk-and-return.pdf. This 10% of index-linked being CPIH is calculated by Ofwat on a post-swap basis

- **Difficulty in setting criteria for appropriate swaps to be included in the assessment**. The complexity and range of swaps that companies may hold means that it may be difficult to understand which swaps are of most relevance for inclusion in the cost if embedded debt estimation. In addition, as noted in Ofwat's PR24 Draft Methodology, *"the non-traded status of some swap contracts mean that it may be difficult to establish a market priced rate in a comparable way to establishing yield-at issuance for traded bonds"*.[26] We note, however, that Ofwat does have the power to access the further required detail where such difficulties may arise from companies.
- **Data availability and quality**. A number of data issues might arise that make the analysis less robust or accurate. In order to carry out a robust assessment, sufficient data is needed to understand the relationship between the swaps and bonds, which is not always provided in either the APRs or in companies' financial statements. Other reporting errors or inconsistencies in which swaps are presented between companies may also lead to errors in the estimation.
- **Analytical intensity**. The assessment requires a detailed and thorough review and assessment of individual swaps for each company.

However, excluding such instruments from the estimation of the cost of embedded debt is likely to misrepresent the costs. This is because, while swaps are not debt per se, they do represent a useful and prudent instrument by which companies can efficiently manage risk associated with the debt holdings. Cost of embedded debt analysis that includes the swaps held by companies would better capture companies' actual debt cost in the actual form (e.g. nominal or indexed linked).

In other words, if companies efficiently hold index-linked debt (which Ofwat endorses) it is then only appropriate that they should be allowed to hold inflation swap on nominal debt to achieve the same purpose if it is more efficient to do so.

While a full analysis of companies swaps is not possible given limitations on the data provided in companies' APR disclosures, we set out a worked example to illustrate this point based on analysing a single swap instrument currently held by UU.

UU issued a fixed £100m bond in 2019, with a nominal fixed interest rate of 2.625% and maturing in 2025.[27] This has two associated swaps, a fixed-floating swap, and a CPI swap (with a CPI interest rate of -0.56%). In essence, therefore, the fixed bond has been converted into a CPI-linked bond.

As such, reflecting a fixed nominal bond with 2.625% interest in the balance sheet estimation of the cost of embedded debt will not capture the true cost of nature of the bond that UU actually holds, misrepresenting the costs for holding the debt. Depending on the market movement, this misrepresentation could under- or over-estimate the true cost of debt (in this example the inflation swap taken out prior to the current high inflation likely means that this swap is now out of money for UU, i.e. a cost of debt allowance assuming a fixed nominal 2.625% as per balance sheet excluding swap would underestimate the true cost of debt for UU on this bond). Aggregating this across companies, the 'actual-notional costs' approach will

[26] Ofwat PR24 Draft methodology, Appendix 11, p. 30

[27] As stated in UU's 2022 APR submission, Table 4B

also be further affected, given that it relies on the share of fixed versus index-linked debt for its weightings across the sector.

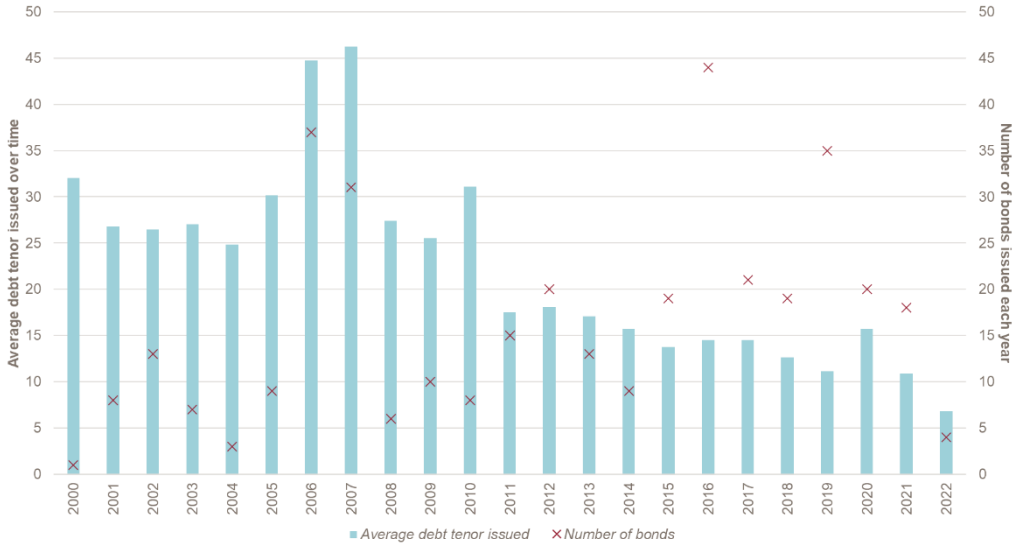
Therefore, while we are not able to estimate the cost of embedded debt including a full analysis of the swaps held by companies in the scope of this report, we believe there is merit in Ofwat doing so.

Cross-checks using benchmark index

In line with Ofwat's proposed approach for PR24, we have further carried out cross-checks on the cost of embedded debt estimated in the previous section using a benchmark index.

In doing so, we have first assessed the average tenor of current embedded debt in the sector, as shown in Figure 12 below.

Figure 12 Average tenor of debt issued by large companies over time



Source: Frontier Economics, based on table 4B of companies' 2022 APR data

Note: Note that this reflects all debt issued in each year, and which are still currently by held companies. It does not include any debt issued that has since expired.

This shows that there is a not insignificant number of bonds that are expected to be held in the sector over the PR24 period and which were issued over the last 20 year period. In particular, we note a relatively high number of current bonds issued in the early 2000s, prior to the global financial crisis.

Given this, we calculate a selection of calibrations of the iBoxx A/BBB Non-Financials 10+ index, as set out in Figure 13 below.

Figure 13 Cross-checks on embedded cost of debt using benchmark index

Benchmark index	Estimate (CPIH, real)
10 year trailing average	1.71%
15-year trailing average	1.75%
20-year trailing average	2.19%
20-16 year collapsing average[28]	2.20%

Source: *Frontier Economics*

Note: *Based on the relevant averages calculated over historic annual iBoxx GBP 10+ A/BBB data (a simple average of daily rates is taken for each financial year). iBoxx rates between the present day and the start of PR24 are projected by using the 10-year nominal spot forward curve and then applying the 3-year average iBoxx-gilt spread. Averages calculated as at 30 June 2022.*

We consider that an approach that adopts a collapsing average is most appropriate. This approach best reflects the average up to the fixed end date for which we are estimating the cost of embedded debt (i.e. at the start of the PR24 period on 1 April 2025), which the trailing average cannot capture.

In line with Figure 15 above, we consider that the collapsing average over the 20-16 year horizon of 2.20% (CPIH, real) to be consistent with the tenor of debt that is expected to be held in the sector at PR24.

This estimate is higher than the cost of embedded debt estimate range using the balance sheet approach above. However, as noted above, the balance sheet approach that excludes swaps is likely to misrepresent the cost of embedded debt, so one must be careful in interpreting this evidence.

Frontier estimate of the cost of embedded debt

We have produced a range of estimates for the cost of embedded debt in line with Ofwat's proposed balance sheet approaches. However, at this stage we note two issues with relying on these estimates. First, given the analysis excludes swaps held on companies' balance sheets, they are likely to misrepresent the cost of embedded debt. Second, our estimate using the 'actual-notional cost' approach is highly uncertain due to assumptions on the notional structure weights that will be used, and whether floating debt is considered in this.

Given this, at this stage we estimate a range for the cost of embedded debt of **1.80% to 2.20% (CPIH, real)** as follows:

- We consider a lower bound estimate of 1.80% (CPIH, real) to be appropriate. This is consistent with our current estimate range using the balance sheet approaches and reflects the current uncertainty we have in the estimates using the balance sheet approach.
- As an upper bound, we rely on the 20-16 year collapsing average of the benchmark index of 2.20% (CPIH, real).

We consider this is a balanced approach at this stage given the lack of certainty in the data using the balance sheet approach, and highlights the case for further consideration following Ofwat's Final Methodology.

[28] Calculated for each year up to the start of the PR24 period as the 20-year average in year 1 of PR24 (FY06 – FY25), the 19-year average in year 2 of PR24 (FY07 – FY25), the 18-year average in year 3 of PR24 (FY08 – FY25), and so on up until the end of the period.

Cost of new debt

Draft methodology proposals

In the PR24 Draft Methodology, Ofwat has proposed estimating the cost of new debt by summing:

- the 6-12 months trailing average of the iBoxx non-financial 10 year + A/BBB indices; and
- an outperformance wedge, including undertaking further analysis to determine the level of outperformance relative to the iBoxx benchmark index.

Ofwat also propose continuing to index the cost of new debt by reconciliating outturn index data at the end of the period. In addition, Ofwat also proposes making an ex-post adjustment for outperformance at PR29 (rather than assuming a given ex-ante level of outperformance).

In this section, we first comment on Ofwat's approach to calculating a benchmark index as well as providing an estimate based on our preferred approach, before addressing issues relating to the outperformance wedge.

Benchmark index for the cost of new debt

At PR19, Ofwat calculated the benchmark index based on a spot figure of the iBoxx A/BBB indices, and cross-checked this with the minimum and maximum rates over the previous two months. While Ofwat has proposed to retain the iBoxx indices for PR24, it has suggested that a longer trailing average *"would strike a good balance between keeping the data sample recent enough to be relevant, while limiting the weight attached to unrepresentative data"*.[29]

We recognise the value in striking a good balance between keeping the data recent while limiting short-run volatility. But we currently do not see the need for Ofwat to switch from daily spot used in PR19 all the way to averages over 6-12 months. We have instead adopted a more modest averaging period of one month when deriving an estimate from index-linked gilts (ILGs), which in our view balances the need to reflect the most up to date market information while not being reliant on a single data point.

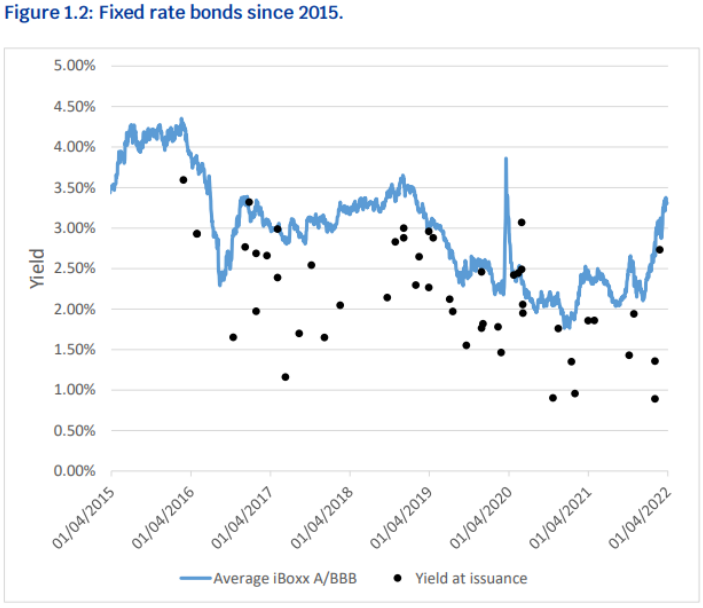
With regards to Ofwat's proposed use of the iBoxx non-financial 10 year+ A/BBB indices, we consider that there are benefits to regulatory consistency from continuing to adopt this index. As Ofwat sets out, the index is aligned to the target credit rating for the notional company. In addition, use of an index with a long-tenor, such as the 10 year+ indices, is consistent with Ofwat's assumption about long-term financing, associated with the long asset lives in the sector.

[29] Ofwat, PR24 Draft Methodology, Appendix 11, page 34

Outperformance on the cost of new debt

In its Draft Methodology, Ofwat considers there is evidence of outperformance of water companies since some companies may be able to issue at a discount, as shown in the figure below.

Figure 14 Ofwat chart on yield at issuance



Source: Ofwat PR24 Draft Methodology, Appendix 10, page 12

Note: Ofwat do not identify the instruments in the chart or provide supporting information

We find several issues with analysis presented in this form:

- First, Ofwat does not provide information on which instruments have been selected for this analysis, and whether they have characteristics, including currency of issuance, that should be taken into account when making comparisons with the iBoxx (which is GBP-based in this diagram).
- Second, Ofwat does not appear to have controlled for either the credit rating or tenor of the bonds included in its assessment. The CMA reviewed similar data in its PR19 redetermination and found that outperformance alleged by Ofwat is explained by differences in tenor and credit rating.
- Finally, Ofwat does not consider the potential flight to safety effects for utilities during the recent (and arguably ongoing) period of high financial market volatility associated with COVID, and have included data from this period.[30] While the spreads of water sector specific debt relative to the more general corporate bond spreads in the iBoxx have been asymmetrically impacted by COVID, it is expected that this asymmetry will fall away with time. Data from 2020 to the present day should therefore be treated with a degree of caution when considering what is suitable for the 2025 to 2030 period.

We discuss in further detail the impact of tenor and rating, and flight to safety below.

[30] As shown in the Market Context section of the report there has been significant financial market volatility.

Adjustments for tenor and rating

As noted above, the CMA has looked into the issue of outperformance in the PR19 redetermination and concluded that *"there is insufficient evidence of like-for-like outperformance of water company debt versus the broader market"*.[31] In particular, the CMA noted that it would not be appropriate to apply an *"outperformance wedge (or any other adjustment) to the cost of new debt"* since:[32]

- most companies in the sector are issuing new debt at or below the notional target, so it is less likely for future issuance to have the same credit rating benefit as past issuance;
- with the completion of Brexit, it is unclear whether companies will retain access to EIB-style debt with more advantageous terms; and
- Ofwat's 'true-up' mechanism with the cost of new debt will result in companies' outturn allowance reflecting subsequent movements in the benchmark and capturing prevailing market rates.

We further note that while Ofgem looked to introduce an outperformance wedge to the allowed return on equity at RIIO-2, the CMA remained unconvinced that such an adjustment is necessary given the range of tools available to Ofgem, and decided to remove the outperformance wedge in the ET, GT and GD redeterminations.[33]

Nevertheless, Ofwat is now claiming that companies *"adopting a diversified issuance strategy in terms of tenor may generate revenue against a benchmark index-based allowance even without evidence of issuing at a discount to the index yield curve".*[34]

This reasoning effectively ignores the fact that companies issuing at lower tenors are bearing additional issuance costs, liquidity costs, and refinancing risks. In previous regulatory periods Ofwat has been clear that differences between actual and notional financing are risks for companies to bear, but now appears to be adopting a different position. Companies bear risk in adopting a range of actual financing positions, and this should not be confused with the concept of outperformance.

Flight to safety

COVID has created a high degree of economic and financial market volatility in the first half of AMP7. Market fundamentals indicate that, during a global systemic shock such as a global financial crisis or a pandemic, firms with regulated assets – like utility companies – should be less volatile than the market overall.

As an example of this, we note that in the redeterminations for PR19, the CMA cited Ofgem's analysis, comparing the iBoxx utilities index with the A/BBB index, and concluded that the regulated utilities sector has been less affected in the debt

[31] CMA redetermination for PR19, paragraph 9.823.

[32] CMA redetermination for PR19, paragraph 9.824.

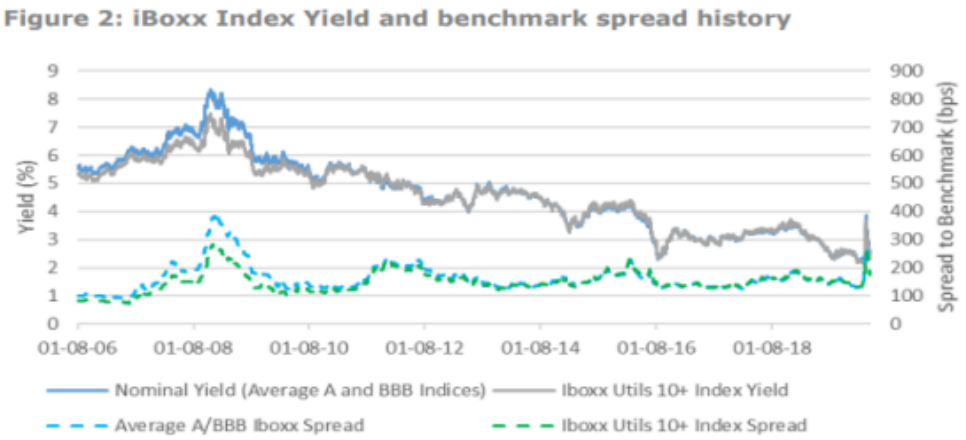
[33] RIIO-2 Energy Licence Modification Appeals, Summary of final determination, paragraph 27-29.

[34] DM Appendix 11, page 34

markets by the global financial crisis (see the data from the 2008/2009 period in Figure 15 below).

Figure 15 CMA analysis of the flight to safety

Figure 9-21: Ofgem chart comparing the iBoxx A/BBB 10+ and the iBoxx Utilities 10+ index



Source: Ofgem

Source: CMA redetermination for PR19, paragraph 9.751.

In order to understand the extent to which COVID may have led to distortions in the debt market, we have analysed the traded spreads of water bonds that share a similar tenor and credit rating as the iBoxx indices. To ensure a like-for-like comparison, we drew bonds that themselves were constituents of iBoxx indices.[35] From this analysis, similar to the global financial crisis, we find that the 'flight to safety' affect was also present during COVID. As shown in Figure 16 below, we find that the average yield on the iBoxx indices was higher than those on the water bonds within it by over 60bps during the initial period of COVID. Prior to COVID, there was only a few basis points difference between the two. We also find that as the pandemic has continued, the spread has persisted, suggesting an ongoing preference for assets perceived as being safer in a highly uncertain environment. Recently, however, these spreads appear to have returned towards pre-COVID norms.

This analysis suggests that any debt market spread comparisons from 2020 to end of 2021 should be treated with a high degree of caution; particularly if Ofwat expects that the 2025 to 2030 period will not include an equivalently high level of economic uncertainty.

[35] Specifically, we focus on bonds issued by WaSCs.

Figure 16 Frontier analysis of spread between iBoxx A/BBB and WaSC bonds

Source: *Frontier Economics, based on iBoxx data and Bloomberg.*

Note: *Bonds from WASCs that featured in either the iBoxx A/BBB 10+ index and with 15-25 years to maturity at the time of analysis were included. Bonds that met this criteria were issued by Northumbrian Water, Severn Trent, Thames Water, United Utilities and Yorkshire Water.*

Ex-post fixed index adjustment

Ofwat states that if it were to find any evidence of outperformance, it would correct for this by using an 'ex-post fixed index adjustment'. This involves (i) calculating an initial outperformance wedge at PR24, and, (ii) reconciliating the outperformance wedge based on market data at PR29.

We see issues with both the initial calculation and the reconciliation methodology proposed by Ofwat:

- First, the outperformance wedge has miscalibration risk. Ofwat is proposing to calculate the outperformance wedge based on historical data. As discussed, there are reasons that historical data may not be reflective of the future. In addition, Ofwat will not be taking into account any of the additional changes it is proposing for PR24. Moreover, the CMA found no such adjustment was necessary given the available evidence.
- Second, we find that there is heightened regulatory risk from an ex-post adjustment. Ofwat recognises this drawback themselves, noting that there would be less early certainty for companies over size of index adjustment. There may also be reduced incentives to try and outperform where there is an expectation that this will be clawed back. Over the long run, this could mean a higher cost of embedded debt for the sector overall (particular where a balance sheet approach to the cost of embedded debt is used). This would be to the detriment of long-run customers. We note that at RIIO T2/GD2 Ofgem tried to introduce a similar ex-post true up mechanism to its outperformance wedge on the return on equity in the hope to assuage companies, but was ultimately appealed by all licensees and quashed by the CMA at its RIIO2 appeals.

As the water sector is embarking on a decades-long programme of investment that will play a central role in the delivery of Net Zero and environmental objectives, it is important to ensure that the good incentives to invest are maintained in the water sector. In our view, Ofwat should not consider mechanisms which harm incentive properties, and which have been quashed by the CMA at previous appeals.

Frontier estimate of the cost of new debt

We estimate a cost of new debt based on the one month average of the iBoxx indices and obtain an estimate of **2.19%** (CPIH, real).[36] We do not consider that any outperformance adjustment is appropriate.

We further note that this estimate will need to be updated based on more up to date market data ahead of the PR24 control period, and will be subject to the true-up mechanism at the end of the period.

Ratio between new and embedded debt

In principle, we would estimate the ratio of new to embedded debt by calculating the proportion of new debt required to be financed each year as a proportion of the total debt requirement each year for PR24.

The new debt requirement is comprised of two elements:

- The replacement of existing debt, which implicitly assumes a 60% notional gearing ratio, as all of this debt is assumed to be refinanced as debt; and
- The financing of additional new debt each year which is required as a result of RCV growth. This is currently uncertain, but we would expect that the large environmental investment challenge that the sector is facing, and the associated level of RCV growth, will increase the needs for new debt on average across the sector

Given the current uncertainty and lack of data regarding the expected level of RCV growth at PR24, at this stage we retain Ofwat's PR19 estimate of the ratio between new and embedded debt of 20%:80%. As more data becomes available, we will consider a more accurate estimate for the PR24 period.

Additional borrowing costs

In the Draft Methodology, Ofwat proposed to retain its estimate of liquidity and issuance costs for PR19, of 10bps. This was based on a range of 3-6bps for issuance costs, and a range of 3.5-4.5bps for liquidity costs.

In principle, we agree with the additional allowance for costs of issuance and liquidity. Ofwat's estimate of these costs also continues to be appropriate based on the evidence available, and is consistent with the estimates used in Ofgem's most recent Draft Determinations for RIIO-ED2.[37]

[36] Based on data taken on 30 June 2022

[37] Table 6, RIIO-ED2 Draft Determinations – Finance Annex

However, companies are subject to further borrowing costs which should be considered and allowed as part of the estimate of the cost of debt. These include the following two items:

- **Cost of carry** – This relates to the cost arising from issuing debt ahead of time. In its PR19 redetermination, the CMA considered a 10bps cost of carry allowance when floating rate debt was also included in the estimate of the cost of embedded debt, as *"Ofwat had previously been explicit that it did not allow a cost of carry allowance as this cost could be offset by lower cost short-term or floating debt"*.[38] Since Ofwat propose to include floating rate debt in its balance sheet approach to estimating the cost of embedded debt for PR24, it is therefore necessary to include a cost of carry allowance. We further note that the 10bps assumed by the CMA is consistent with Ofgem's proposal for ED2.[39]
- **CPIH basis risk mitigation** – This captures the additional costs faced in relation to index-linked embedded debt and new debt, resulting from Ofwat's intention to fully index the RCV for PR24 to CPIH rather than RPI. We note that Ofgem's Draft Determinations for ED2 proposed a CPIH allowance of 5bps, consisting of 3bps for embedded debt and 2bps for new debt. We have replicated Ofgem's methodology using our estimate of the share of embedded debt of 80% (see above), and a proportion of CPIH index-linked debt of 10%,[40] to calculate a CPIH issuance allowance of 2 bps, with 1 bps for embedded and new debt respectively.

Overall, we estimate total additional borrowing costs of **22 basis points** as follows:

Figure 17 Estimate of additional costs of borrowing

Borrowing cost item	Estimate
Issuance costs	6 bps
Liquidity costs	4 bps
Cost of carry	10 bps
CPIH basis risk mitigation	2 bps
Total additional cost of borrowing	**22 bps**

Source: Frontier Economics, based on Ofwat PR19 final determinations, CMA PR19 redeterminations, and companies' APR data for 2022

Conclusion on the cost of debt

Figure 18 sets out our overall estimate of the cost of debt range reflecting the components described above. Overall, we estimate a cost of debt range, in CPIH terms, of **2.10% to 2.42% (CPIH, real).**

[38] Paragraph 9.607, CMA redetermination for PR19. We note that this approach represented an alternative assessment adopted by the CMA when floating rate debt from APR data was included.

[39] Table 6, RIIO-ED2 Draft Determinations – Finance Annex

[40] Calculated by taking the average of CPIH index-linked debt weighted by the RCV of water companies between March 2021 and March 2025.

Figure 18 Estimates of cost of debt components (CPIH, real)

Component	Lower estimate	Upper estimate
Ratio of new to embedded debt	20:80	20:80
Cost of embedded debt	1.80%	2.20%
Cost of new debt	2.19%	2.19%
Additional cost of borrowing	0.22%	0.22%
Allowed cost of debt	**2.10%**	**2.42%**

Source: Frontier Economics

6. COST OF EQUITY – MARKET PARAMETERS

Risk-free rate

Draft methodology proposals

In the Draft methodology, Ofwat highlights that there are five issues that require attention when estimating a risk-free rate, these are:

- Selecting a risk-free rate proxy – where Ofwat highlight different rates that can be used to estimate the risk-free rate;
- Convenience yields – meaning that index-linked gilt yields can underestimate the true risk-free rate;
- Averaging period – that is used when estimating a figure from market data;
- Forecasting approach – which is mainly about whether forward rates are applied; and
- Inflation adjustment – how market data that is denominated is RPI-linked is converted to a CPIH basis.

We agree that this is a suitable structure for approaching the estimate of the risk-free rate and we discuss each of these issues below, highlighting the reasons for the approach we take for each.

Selecting a risk-free rate proxy and averaging period

Index-linked gilts

One key data source for proxying the risk-free rate is the yield on index-linked gilts (ILGs). This is one of our preferred approaches so long as the characteristics of ILGs are considered and accounted for (see discussion on convenience yield below). There are several advantages to estimating the risk-free rate with ILGs as the base data source, for example:

- UK government debt carries a very low default risk. Historical analysis back to the 17th Century highlights that the UK government has never formally defaulted on any its marketable debt.[41]
- Data is available at a range of frequencies and across a wide range of maturities.
- The data is specific to the UK market – and is therefore relevant to Ofwat's regulation of the water sector in England and Wales.
- This is a data source that a range of UK regulators have drawn upon historically when estimating the risk-free rate.

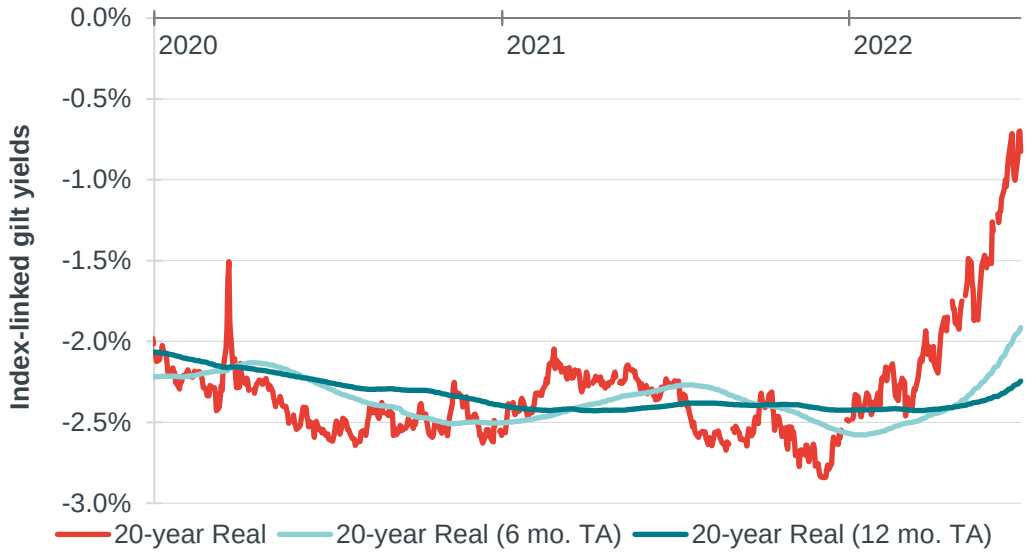
With Ofwat's transition away from RPI to CPIH, one disadvantage with ILG data is the conversion that is required to ensure data is expressed in CPIH terms (given

[41] Ellison and Scott (2020), 'Managing the UK National Debt 1694-2018', American Economic Journal: Macroeconomics 2020, 12(3): 227–257

that ILGs have historically been indexed to RPI), but there is a range of evidence that can be used to make this conversion (see discussion on inflation wedge below).

As shown in Figure 19 below, the yields on 20-year index-linked gilts have risen significantly in recent months. The yield at the end of June 2022 was -0.82% compared to yields of around -2.8% in December 2021. This rise has been associated with a tightening of monetary policy throughout the course of 2022.

Figure 19 20yr index-linked gilt yields



Source: Bank of England, Frontier analysis
Note: 20-year index-linked gilt yields up to 30 June 2022

Another of the issues Ofwat raised in the Draft Methodology was averaging period, for which Ofwat proposes 6 to 12 months. Although we do not consider any in principle problems with this approach, we note that in the current interest rate environment, as shown in Figure 19, this averaging window may underestimate the forward looking interest rate. However, it is not impossible for the interest rate to have settled down at a "new normal" level when Ofwat needs to set the RFR for PR24 Final Determinations. Nevertheless, as set out in the Cost of New Debt discussion,

we have adopted a more modest averaging period of one month when deriving an estimate from ILGs, which better captures the current market expectations of where the RFR will land for PR24. Using data on the 20yr index-linked gilt until the end of June 2022, the one month average is -0.98% in RPI terms.

AAA corporate bond yields

In terms of other risk-free rate proxies, the CMA in the PR19 redeterminations used evidence from AAA-rated corporate bonds when estimating the risk-free rate. This is the highest possible credit rating and implies an exceptionally low default risk, even when applied to corporate bonds rather than government bonds.

Although we note that Ofgem did not consider AAA-rated corporate bond data, and that the CMA found that Ofgem was not wrong in its assessment of the cost of equity, we believe it is reasonable to include AAA-rated corporate bonds in the estimation of the RFR given the CMA's assessment in PR19. Namely that this reflects the lowest risk investment, which is available to all relevant market participants.

We note the potential downward bias of the ILG yield as a proxy for estimating the RFR, due to the unique features of the government bond market which could lead to convenience premium. We also recognise the potential upward bias of the AAA corporate bond yield due to possible default risk premium, inflation premium and/or liquidity premium.

We update the CMA's chosen indices, the iBoxx GBP non-gilt AAA 10+ years and 10-15 year indices. The one-month average for these to the end of June 2022 was 2.91% and 3.06% respectively in nominal terms. Converting to CPIH using a long-run assumption CPIH assumption produces a range from 0.89% to 1.04%.

SONIA swap rates

An alternative proxy that Ofwat are considering employing is long-term SONIA swap rates. In Annex D we set out the reasons why we do not consider that SONIA swap rates are a suitable proxy for the risk-free rate.

Convenience yields

The topic of convenience yields is focused on the extent to which financial instruments such as index-linked gilts have special characteristics such as safety and liquidity which make them particularly desirable to investors. As recognised by Ofwat, these properties increase demand, "potentially reducing their yield below that of a zero-beta asset."

The latest academic literature on whether government bond yields are influenced by convenience is clear – concluding that they are. For example, van Binsbergen et.al (2022), published in the Journal of Financial Economics, finds that:

> *"the yield on a money-like asset is below the risk-free cost of capital, reflecting the liquidity and collateral value of such assets."* [42]

Diamond and van Tassel (2021) also find the presence of convenience yields for a range of developed economies, including the UK, explaining the reasons for this as follows:

> *"In developed economies with minimal risk of sovereign default, government debt is a uniquely safe and liquid financial asset which plays a role similar to money. Government debt can be held by financial institutions to satisfy regulatory requirements, can be pledged as collateral for a low-interest-rate loan, and can be traded by uninformed agents with little or no fear of adverse selection."* [43]

[42] Van Binsbergen et.al (2022), 'Risk-free interest rates', Journal of Financial Economics 143 (2022) 1–29

[43] Diamond and van Tassel (2021), 'Risk-Free Rates and Convenience Yields Around the World'.

The CMA recognised similar during the PR19 re-determinations, stating that:

> *"On balance, the CMA has accepted arguments and evidence that the ILG rate available to the government is unlikely to be a perfect proxy for the RFR, and that the 'true' rate of RFR in the market is likely to be above this level."*

In addition, Ofwat also highlight in their Draft Methodology that the CMA RIIO-2 energy panel considered that there was evidence for a convenience yield in government debt.

Given the clear role of convenience from each of the above, this prompts the question, can a 'convenience-free' risk-free rate be estimated?.

Ofwat's current view is that making an adjustment for convenience, "would be difficult to implement". We do not agree with that assessment. The latest literature provides estimates for a 'convenience premium' that can be added to observations from the government bond market in order to estimate a 'convenience-free' risk-free rate. We observe the following on the latest academic evidence on convenience premiums:[44]

- Estimates for the convenience premium are produced without relying on any specific model of risk (and are therefore are not reliant on the accuracy of a particular theory);
- Estimates are driven by high-frequency observations from financial markets;
- Estimates are produced for a range of time-periods, providing information on how such values change over time, as well as providing long-term averages; and
- Specific estimates are available for the UK.

Given these observations, we consider that the estimates that are now available provide robust evidence that can be used for the addition of a convenience premium.[45] We therefore consider that the most appropriate approach for estimating the risk-free rate where index-linked gilts are being used as the proxy is as follows:

$$Risk - free\ rate = ILG\ yield + convenience\ premium$$

In Figure 19 above we set out the latest evidence on ILG yields, showing that the 20-year yield for June 2022 on average was -0.98%. To estimate the risk-free rate a value for the convenience premium is therefore required. In Figure 20 below we set out estimates from the latest academic evidence.

[44] Focusing on van Binsbergen et.al (2022) and Diamond and van Tassel (2021), both of which use the same methodology.

[45] We note that the publication of this research post-dates PR19.

Figure 20 Convenience premium estimates

Study	Market	Time-period	Estimate (bps)
van Binsbergen et.al (2022)	US	2004-2018	40bps
Diamond & van Tassel (2021)	UK	2005-2020	38bps
Diamond & van Tassel (2021)	US	2005-2020	35bps
Diamond & van Tassel (2021)	Euro area	2005-2020	24bps

Source: van Binsbergen et.al (2022), Diamond & van Tassel (2021)

Note: Diamond & van Tassel estimates are based on 2-year maturities

From this table we see that estimate for convenience premiums are consistent across markets. With average premiums in a tight range from 24bps to 40bps, with the UK at the top-end of that range. Using long-term averages such as this is consistent with Ofwat's focus on long-term financing in the sector.[46]

Importantly, Diamond and van Tassel (2021), which provides UK specific estimates of the convenience premium, find that the US does not earn an unusually large convenience yield. This directly addresses Ofwat's concern that the convenience yield may be a US specific phenomena due to its role as a global reserve currency.

The estimates set out in Figure 20 are based on comparisons to short-term government bonds, this is because options market contracts, which form the basis of the techniques used in these studies, are only available across a certain range of maturities. However, based on the ranges of bond maturity considered in the papers, we note that the estimates produced do not appear sensitive to changes in maturity.[47] For this reason we consider they remain appropriate if applied to longer-term maturities of government debt.

Based on this evidence, we consider if a methodology based on index-linked gilts is being used, then a convenience premium of 40bps should be added.

Forecasting approach

Throughout this report we are focused on the WACC for the 2025 to 2030 period. There is therefore a question about whether today's observations should be combined with forecasts in order to derive a value for that period.

For the risk-free rate, a forecasting tool that has been applied by a range of regulators, including Ofwat historically, are forward rates. Forward rates use information embedded with the yield curve to infer market expectations for future interest rates. Despite their use by many practitioners and regulators, the accuracy of forward rates as a predictive tool has been questioned. Ofwat's Draft Methodology also questioned the accuracy of forward rates – finding that they have overstated rates when compared to observed values in recent years.

The CMA in the PR19 re-determinations did not utilise forward rates due to similar concerns. Specifically, the CMA stated that, "the evidence suggests that in subsequently flat or falling markets they are likely to give an actively misleading input into any estimate."[48]

[46] Diamond and van Tassel (2021) also find that that convenience yields have mostly unaffected by COVID.

[47] For example, see Table 1 of van Binsbergen et.al (2022).

[48] CMA (2021), PR19 re-determinations final report, para 9.234

We agree that forward rates are not an accurate guide to the future, however, we are concerned that both the observations from Ofwat and the CMA are derived from a period of very low interests. We therefore consider it is premature to rule out use of forward rates at this stage given the changing monetary policy environment – as evidence from the next several months may not be consistent with observations from the pre-PR19 period.

We do not apply a forward rate in our estimates of the risk-free rate in this report, but recommend that the evidence on forward-rates is reviewed between now and PR24.

Inflation adjustment

As set out in the inflation section, we assume for PR24 that a long-run assumption for CPIH will be 2.0%, and assume that a long-run RPI-CPIH wedge, consistent with 20-year financing, for PR24 will approximately be 30bps.

Conclusion on risk-free rate

To estimate a range for the CPIH-deflated risk-free rate we combine two data sources.

In Figure 21 below, we set out estimates of a CPIH-deflated risk-free using the method based on a ILG proxy with the addition of a convenience premium estimate. As shown, the output from this method is a risk-free rate of -0.28%.

Figure 21 Risk-free rate estimate by method

Parameter	ILG + convenience premium
ILG yield (RPI)	-0.98%
RPI-CPIH wedge	0.30%
ILG yield (CPIH)	-0.68%
Convenience premium	0.40%
Risk-free rate (CPIH)	**-0.28%**

Source: Frontier calculations

The other data source we draw upon is AAA corporate bond proxy data which produces a range of 0.89% to 1.04%. Recognising any potential liquidity and/or default premiums associated with corporate bonds of this rating,[49] we take the lower of figure of 0.89%. We then symmetrically deduct 40bps. This produces an upper bound figure of 0.49%.

Combining these two we estimate a risk-free rate range of -0.28% to 0.49%.

[49] Academic evidence suggests that these premium for very high quality debt are modest.

Total market return

Draft methodology proposals

In the Draft Methodology, Ofwat proposes deriving a range for the Total Market Return (TMR) using ex-post and ex-ante historical approaches. Ofwat also sets out that forward-looking techniques should not form the primary basis by which TMR is estimated. Ofwat also highlight that it proposes retaining a focus on the fixed-TMR approach.

With regards to ex-post historical approaches Ofwat proposes using long-run equity returns deflated by outturn CPIH and modelled estimates of that time series. This includes the latest ONS back-casts for CPIH that were released in May 2022. Ofwat also set out a preference for using values that are consistent with an investment horizon of around 10 to 20 years and using arithmetic averages from overlapping holding periods – noting some concerns with non-overlapping periods.

Our approach to TMR

Overall approach

Average market returns over a long period of time have been observed to be broadly stable. In the light of this, the primary approach that UK regulators have consistently relied on to estimate TMR is averaging historical stock-market returns over a long period, to provide a robust and stable forward-looking view on what level of return the typical market investor requires. We consider this method is appropriate and have adopted in our previous work in UK regulated sectors.

By relying on long run evidence, rather than seeking to draw inferences and take difficult judgements over how to interpret short run volatility, regulators have been able to create a reasonably stable and predictable approach to estimating TMR. This has helped to build investor confidence and lead to both more stable bill levels and a lower cost of capital over the long term.

We therefore consider that Ofwat's approach for PR24 should be focus on a fixed-TMR approach that is informed by ex-post historical equity returns.

Estimators of historical returns

There is now a long-standing regulatory precedent for estimating historical returns using a range of different methods. This includes both a range of different estimators and averaging/holding periods.

To us it seems sensible and prudent to consider a range of measures, since we consider that no single measure is superior to any other in all regards. Reliance on any single one seems to us to require an undue level of confidence that one approach is right and all the others are wrong. We nevertheless observe, consistent with Ofwat's own view, that the non-overlapping averages may suffer from small sample size issues which may limit its reliability.

We therefore look at the results from the Blume, JKM unbiased, JKM (MSE), Cooper estimators, overlapping and non-overlapping averages, as well as the

DMS adjusted estimator. With regards to holding periods, we look at 5, 10 and 20 years. We consider it appropriate to consider a 5-year holding period, alongside 10-year and 20-year holding periods. This is because there is good evidence that equity shares that are publicly traded have an average holding period of around 5 years, at least for the regulated utility shares.

Deflating historical equity returns

In order to convert the observed nominal returns to real returns data on historical inflation is required. For PR19, and other previous regulatory decisions, there was a number of choices regulators had to make regarding which inflation index to use for which time period. These choices were linked to data availability and the need to express historical real returns on a basis that is consistent with how the RCV is indexed – which was a mix of RPI and CPIH at PR19.

For PR24 Ofwat is proposing full indexation of the RCV to CPIH, this means that the TMR needs to be expressed in CPIH-deflated terms. The conversion of historical time series to CPIH-deflated terms back to 1950 has been made substantially simpler by the recent publication of new ONS back-casts of CPIH data back to 1950 (previously data was only available to 1988). We concur with Ofwat that this new back-cast series should be used as the basis for deflating historical equity returns from the present to 1950. We no longer consider it necessary to consider RPI data with the complete indexation of the RCV to CPIH.

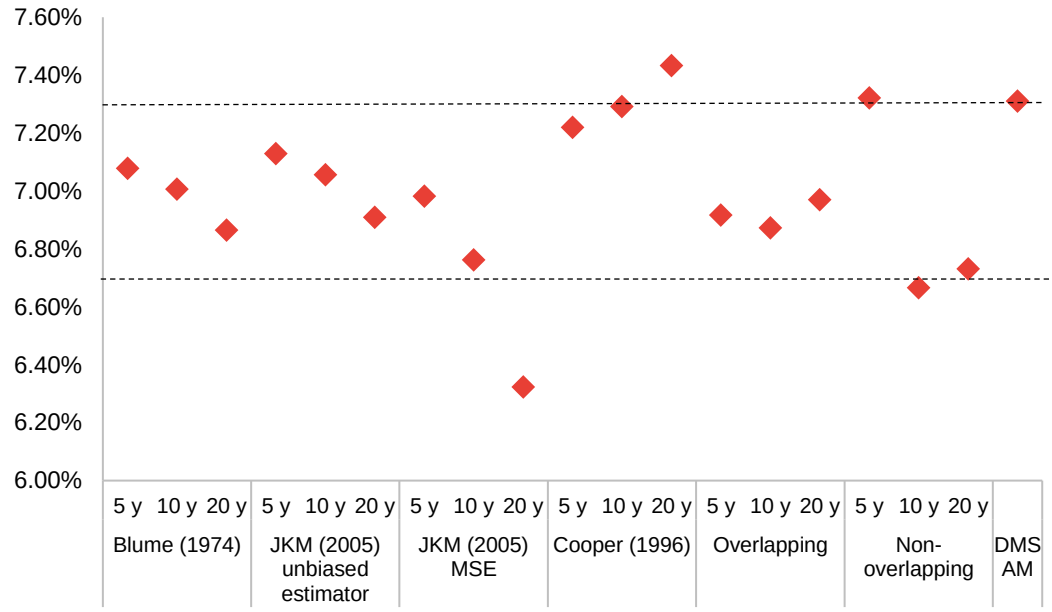
For data prior to 1950 there has been substantial discussion of the different inflation indices that are available. For data prior to 1950 we use the CED (Consumption Expenditure Deflator) series as this is consistent with past approaches of regulators.

Estimating TMR for PR24

In Figure 22 below we show the outputs from the different estimators and holding periods that we analyse. These estimates draw on 122 years of nominal stock return data.[50] The result is that our TMR estimates sit in a wide range of 6.3% to 7.4% in CPIH terms. This relatively wide range is, however, not ideal for the purpose of identifying an appropriate level of the cost of equity for PR24 business plans. We therefore look more closely into the evidence base, in order to identify a narrower range.

[50] Data from 1900 to 2019 is drawn from the Credit Suisse Yearbook, data for 2021 and 2022 is nominal total returns from the FTSE All-Share index. In recent years nominal total returns from the FTSE All-Share index have tracked the nominal returns from the Credit Suisse Yearbook extremely closely.

Figure 22 CPIH deflated long-run equity returns



Source: *DMS, Bloomberg, ONS, BoE, Frontier Analysis*

Note: *CED inflation index used until 1950, CPIH inflation used post 1950*

At the lower end, we identify the JKM (MSE) estimator assuming a 20-year holding period as being an outlier relative to the other values. We therefore exclude this data point which results in a low end value of 6.7%, which is supported by three other data points.

At the higher end, we acknowledge even though we see merit in including evidence from a wide range of estimators, including the Cooper and DMS averaging methods, we note that these have received less attention from the CMA. We are therefore careful in selecting a high end value that is supported by numerous data points - as we did with the lower end of the range. Based on the outputs in Figure 22 we therefore select an high end value of 7.3%.

We therefore estimate a CPIH-deflated TMR range of 6.7% to 7.3%. A key reason that this range is greater than previous ranges estimated by regulators is that the CPIH series from the ONS produces a lower annual inflation rate than CPI. This means that CPIH deflated returns are greater than CPI deflated returns. This CPIH series was not available at the time of PR19 or the PR19 redeterminations.

7. COST OF EQUITY – DE-GEARING AND RE-GEARING OF BETA

This section discusses the issue of de-gearing and re-gearing in the beta estimations and our preferred approach for estimating the cost of equity. This process is also referred to as re-levering and de-levering and we use the terms interchangeably.

What is de-gearing and re-gearing?

Regulators collect raw equity beta values from selected beta comparators, adjust for the effect of financial leverage by de-gearing them into unlevered betas, form a judgement on the appropriate level of the unlevered beta, and then re-gear this preferred unlevered beta back to the assumed notional gearing level of the price control.

This is standard corporate finance practice when estimating beta using a sample of comparators with different gearing levels in order to make like-for-like comparisons.

The de-gearing and re-gearing procedure is predicated on the Modigliani-Miller (MM) theory which states that, under “perfectly efficient market” (no tax and no default premium, etc.), the cost of capital of a company does not depend on its financial leverage, i.e. the WACC should remain broadly constant with respect to gearing.

The Harris-Pringle formula

In reality it is clear that the conditions assumed in the original MM theory does not hold in the case of UK regulated utilities, as the cost of debt is higher than the risk-free rate. As a result, the WACC increases with gearing using the original MM formula.

UK regulators choose an adapted version of the original MM formula, which is called the Harris-Pringle formula. This includes a debt beta in the formula.

This means that for the WACC to be flat, the cost of debt = rfr + debt beta x ERP. In other words, the Harris-Pringle formula allows market risk in the debt spread.

So the Harris-Pringle formula goes some way to addressing the concerns with the original MM formula, in that it takes account of systematic risk associated with corporate debt. But as set out below, it does not account for the default risk premium.

Regulators’ concerns with the Harris Pringle formula

The cost of debt estimate based on UK utility bond yields in reality often exceed what is implied by the application of the CAPM formula (i.e. that the cost of debt should equal the RFR + debt beta x ERP). This is the case in recent price controls from Ofgem, Ofwat and the CMA.

This is not surprising, as the utility bonds carry a level of default risk commensurate with their credit rating, and therefore command a default premium.

As a result, Harris-Pringle still leads to an increasing WACC with an increase in the gearing level. This also explains why:

- The WACC increases more strongly when higher embedded debt cost is included in the WACC calculation, as the resulting cost of debt is even higher, making it further away from the Harris-Pringle level implied by the CAPM formula shown above.
- The WACC increases less strongly when a higher debt beta is assumed, as this increases the CAPM cost of debt estimate, bringing it closer to the actual cost of debt, and hence closer to consistency with Harris-Pringle.
- The WACC increases less strongly when a higher RFR is assumed, as again this increases the CAPM cost of debt estimate, improving the consistency with Harris-Pringle.

Regulators, including Ofwat, are therefore concerned that using the Harris-Pringle to de-gear and re-gear the equity betas of GB regulated utility companies could potentially over-estimate the cost of capital.

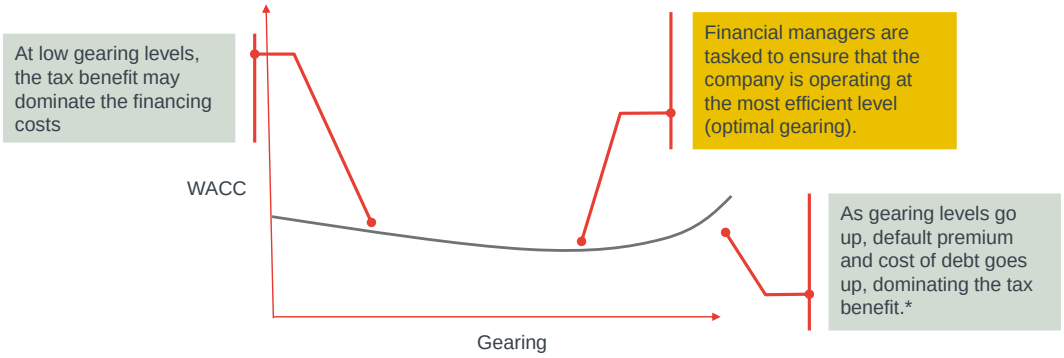
Relevant considerations that regulators have missed

Regulator's concerns on the Harris-Pringle formula leading to a higher WACC at a higher gearing ignore two important elements of the GB regulatory regime. These are tax costs and the regulatory construction of RCV. We explain below that when these two considerations have been taken into account, it is not clear that the Harris-Pringle formula is necessarily leading to over-estimation of the allowed returns.

Corporate tax

MM theory assumes no financing costs but also no tax. The violation of the first assumption is causing the WACC to increase in gearing, but the violation of the second assumption is causing WACC to decrease in gearing. In other words, this is why the cost of capital in reality is often not a flat line, but a U-shaped curve with an optimal level being somewhere between 0% and 100%, shown in the figure below.

Figure 23 Shape of the WACC curve when MM assumptions are violated



Note: We have not discussed here the prospect of the cost of debt increasing significantly at extreme high levels of gearing, which is what drives the WACC curve strongly increasing at the right hand side*

The current debate on whether or not the de-gearing and re-gearing procedure increases the allowed return by increasing the gearing ratio does not taken into account the effect on the cost of corporate tax. This is because the return earned by shareholders are taxable whilst the return earned by debt holders are tax deductible. The higher the gearing ratio, the higher the tax deduction (absent any thin capitalisation rules), and this is especially true when the cost of debt is high.

If this is factored into the trade off on the notional gearing level, it is not clear that a lower notional gearing is always more cost effective, despite the Harris-Pringle increasing WACC issue.

Difference between RCV and EV

The reason why we de-gear with a lower gearing and then re-gear with a higher one is because the observed beta needs to be de-geared at the observed market gearing based on the Enterprise Value (EV), whereas the re-geared equity beta needs to reflect the RCV[51] gearing for the notional company.

The perceived problem with the Harris-Pringle formula (i.e. that it leads to an over estimation of the WACC) only arises because notional gearing (typically 60%) set by regulators is higher than the observed EV gearing of the UK peer group of listed companies (Ofwat PR19 c.55%).

However, it is overly simplistic to state that regulators have produced a higher estimated WACC by assuming a higher than actual level of gearing for the listed companies.

The observed gearing is measured on the beta based on market value of capital, and notional gearing is set in relation to the RCV. When market value of the capital is higher than the RCV, which has been the case in recent years, the observed gearing is lower than the notional gearing, even if the two are equivalent. We note that regardless of the potential reasons causing the higher MAR, the concept here applies.

[51] RCV or Regulatory Capital Value is also referred to as RAV (Regulatory Asset Value) or RAB (regulatory asset base).

In fact, the actual RCV gearing level of the listed companies are close to (sometimes higher than) 60%, despite the fact that the observed market value gearing is lower.

Figure 24 Observed market gearing vs actual RCV gearing

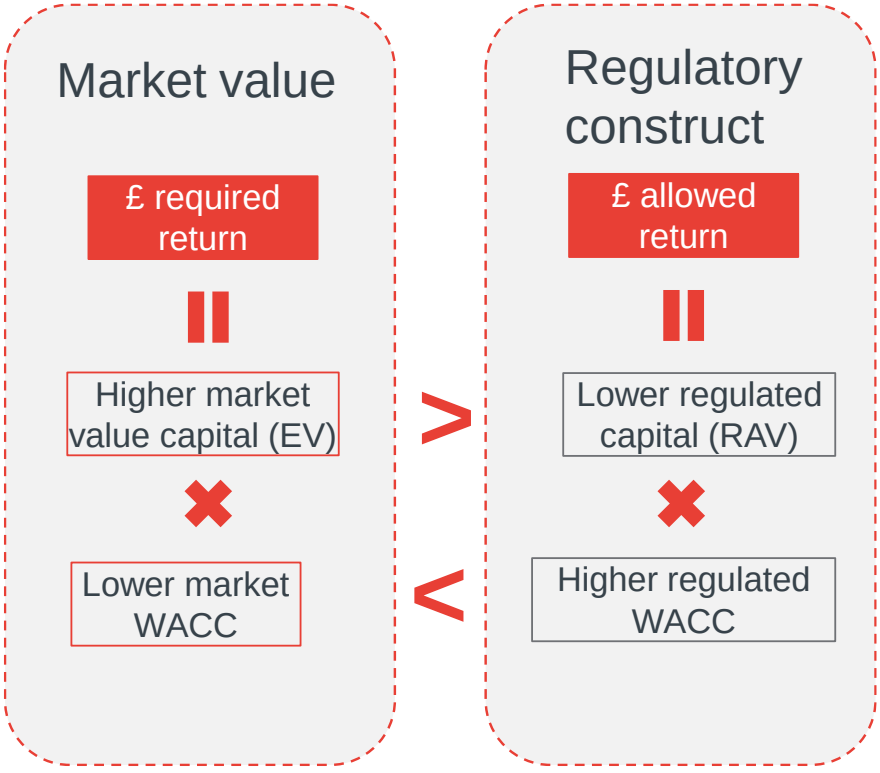
Gearing	Observed market gearing	Actual RCV gearing
UU	50%	>60%
Severn Trent	50%	>60%

Source: Observed gearing values at Ofgem RIIO-GD2 FD, RAV gearing figures taken from Ofwat RCV update 2020

The estimated WACC is transformed to a different value (in this case higher) by converting the observed market gearing level to the RCV gearing level, but this is to account for the fact that in UK regulated utilities the allowed return is awarded to the RCV and not to the market value of capital.

This would be comparable to awarding a WACC based on observed market gearing level to a capital base valued at market level.

Figure 25 Allowed return on EV and RCV



Source: Frontier Economics, for illustrative purposes only.

The market WACC may be lower with a lower observed EV gearing in this setting, but the required return would be the market WACC multiplied by the market value capital (the Enterprise Value). The latter is bigger than the RCV, which is what is causing the EV gearing to be lower than RCV gearing in the first place.

In absolute value, the allowed regulatory return calculated by the RCV multiplied by the (higher) regulatory WACC is more comparable to the required return based on the market value figures.

It is important to note that this mechanism works symmetrically. If the EV is lower than the RCV, then the current de-gearing and re-gearing procedure would lead to a lower WACC at notional RCV gearing than observed EV gearing.

Note here we do not discuss the potential cause of the EV being larger than RCV, which some regulators have argued in the past could have been caused by the allowed return being too high. We discuss this in the section on MAR cross checks in detail and explore why we do not agree with this statement. However, the analysis above only refers to the concern of any overestimation of the WACC due to the de-gearing/re-gearing procedure given the fact that EV is high than the RCV.

In our view, taking into account the relevant GB regulatory circumstances such as the tax benefit and the difference between EV and RCV one cannot definitively conclude that the increasing WACC with gearing phenomenon caused by the Harris-Pringle formula overestimates the cost of capital.

Ofwat's proposed solution to the Harris-Pringle formula issue

Notwithstanding the above explanations, Ofwat has commissioned a discussion paper authored by Mason and Wright, published in 2021. The paper proposed a number of options to the "Harris-Pringle problem", of which Ofwat has chosen one as a candidate for adoption in its PR24 draft methodology consultation (labelled as option 3). In addition, Ofwat has also constructed its own alternative formula which attempts to make the WACC fully invariant to gearing by tweaking the debt beta levels (labelled as option 2).

We list all three options Ofwat listed in its consultation below.

Option 1: Maintaining the PR19 approach: this involves adopting the same de-levering and re-levering approach used at PR19.

Option 2: Adopting a more consistent CAPM-WACC: under this approach Ofwat would set debt beta at the level which would make the CAPM-WACC calculation fully invariant to gearing.

Option 3: Setting the notional gearing equal to listed companies' market gearing: this approach resolves any potential inconsistency by removing the need to make a de-levering and re-levering adjustment.

Our assessment

We assess Ofwat's option 2 and 3 in this section. We will start with option 3, as it is the more straightforward option.

Ofwat proposed option 3

This option is one of those proposed in Mason and Wright's paper, and it involves setting the notional gearing equal to listed companies' market gearing (EV gearing). Ofwat states that it 'resolves any potential inconsistency by removing the need to make a de-levering and re-levering adjustment'.

There is nothing theoretically "wrong" with this approach, and we recognise that it is conceptually correct to de-gear and re-gear using EV, and not book value.

However, as explained above, we do not consider that there is currently any "inconsistency" in the way de-gearing and re-gearing is done. The difference between the EV and RCV creates a difference in the WACC estimate, this same difference is also present in the capital base, to which the WACC is awarded. It can be considered as an automatic adjustment consistent with the GB regulatory regime which only rewards the RCV with an allowed return and not the market value of the asset. It is therefore arguably more appropriate for the notional gearing to reflect the RCV gearing rather than EV gearing of the notional company.

Furthermore, adopting this proposed option 3 would constrain the regulator in its assessment of notional gearing. Going forward, notional gearing would need to be tied to the financial structure of a small number of peers, each of which may be taking choices based on their circumstances, which may not be representative of the wider utility sector or optimal for the industry as a whole. Ofwat should also remember that for the non-listed companies, this adjustment would not be within their control to eliminate even if they wanted to because the entire calculation would be based on listed companies in the sector.

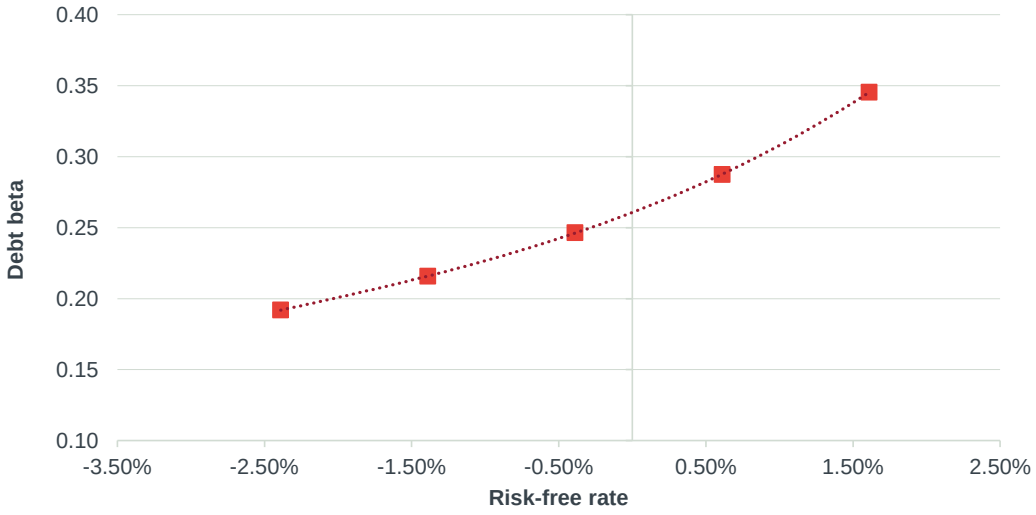
Therefore, in our view, it is not clear at all that this option is superior to the current method.

Ofwat proposed option 2

This option is proposed by Ofwat and is based on the belief that the WACC should be invariant to the gearing so it seeks to force this relation by using the debt beta in the Harris-Pringle formula as a balancing figure. However, such a method suffers from a number of flaws:

- First of all, the same arguments against option 3 explained above apply to a large extent to option 2 as well, i.e. the increasing WACC does not necessarily lead to an over estimation, so Ofwat's starting premise that this needs to be fixed and that WACC should be invariant to gearing is simply not proven.
- Second, Ofwat's proposal to making WACC invariant to gearing is forcing the WACC to be CAPM compliant. In other words, this method is indirectly estimating the debt beta using the observed yield on new debt, and an estimate of the default premium, equity risk premium and risk free rate. This method is therefore extremely sensitive to these other parameters. As we show below simply by varying the risk free rate assumption, the resulting debt beta can be significantly outside a reasonable range of values.

Figure 26 Debt beta implied Ofwat's proposed option 2 with different RFR



Source: Frontier analysis

- Third, it can be seen that Ofwat's illustrative debt beta figure increases from c.0.2 to 0.35 when the RFR moves towards 1.5%. We note that this would be higher than Ofwat's current unlevered equity beta estimate, and clearly implies implausible interpretations of the relative riskiness between debt and equity in the CAPM framework. Since an RFR level close to 1.5% is not entirely unlikely in the future if monetary policy continues to tighten, we caution the use of such a method which can easily be regarded as producing counter-intuitive results, therefore producing more problems than it purports to solve.
- Finally, apart from the uncertainties in the parameters of the WACC formula that could derail the interpretation of the debt beta in what is essentially a goal-seek operation, the added parameter in this approach – the default premium – itself is open to a lot of estimation measurement error. For example, this method depends on the estimates of default probability and the loss given default for the corporate bond. In the fixed-income bond valuation industry, these are some of the most important parameters for analysts to continue evaluating on a daily basis. It is highly questionable to simply take the estimate from one credit rating agency given at one particular time for one particular market, while in reality bondholders will undertake their own proprietary analysis and there are a host of credit rating agencies who all independently produce different estimates for different markets, and these also vary over time.

  If Ofwat introduces such a method at PR24, it can only increase regulatory complexity, because from now on the probability of default and loss given default would become a new parameter of contention, in addition to all of the other parameters in the WACC calculations. Given the significance of the parameters on the result, Ofwat would invariably find itself arguing against companies and their advisors on what the most appropriate credit rating agency/market/time period should be used. Given the purpose that this method is supposed to serve, it is not clear if that would be an efficient use of regulatory resource for PR24 and beyond.

In light of all of the above reasons, we believe that option 2 suggested by Ofwat is not preferrable to the current PR19 method, because it is complex, unpredictable, whilst attempting to provide a solution to something that is not necessarily a problem in the first place.

Further, it is important to recognise that the de-gearing and re-gearing method used in PR19 (and before) only produces higher WACC in gearing if the cost of new debt is lower than the cost of embedded debt, and if the EV is higher than the RCV. These two conditions are capital market dependent and are not an intrinsic feature of the GB regulatory regime. When these conditions are not fulfilled, the de-gearing re-gearing procedure would actually produce decreasing WACC in gearing.

We urge Ofwat to reconsider its position to making adjustments to the well understood and well-established de-gearing and re-gearing procedure, because it currently does not look text-book perfect. In our methodology, we have therefore adopted the traditional Harris-Pringle formula throughout the rest of this report.

8. COST OF EQUITY – BETA ESTIMATION

Unlevered beta

In this section we set out our approach and estimation of the equity beta and therefore ultimately the unlevered beta. This section is organised as follows:

- First, for each of the technical decisions involved in equity beta estimation, we summarise Ofwat's proposed approach at PR24, the relevant regulatory precedent from PR19 and our estimation approach.
- Second, we present our results from the estimation across different comparators, windows and averaging periods. We then interpret our results in the context of setting a forward looking beta for the 2025 to 2030 period.

Draft methodology proposals and our estimation approach

At PR19, both Ofwat and the CMA selected an unlevered equity beta of 0.29. The beta was chosen within a range of betas estimated using a regression based approach and data for Severn Trent (SVT) and United Utilities (UU).

At PR24 Ofwat intends to follow a similar approach to estimate a range of equity betas. To implement its approach, Ofwat would need to make some technical decisions around several key areas:

- Selection of comparator set;
- Data frequency;
- Length of estimation window;
- Length of averaging period; and
- De-levering equity beta.

We have used a similar OLS approach to Ofwat, where we regress changes in total returns against changes in overall market returns. We summarise below Ofwat's proposed approach, the relevant regulatory precedent and our approach in relation to each of these key areas.

Selection of comparator set

At PR19, Ofwat and the CMA both limited their samples to SVT and UU, with Ofwat noting that including Pennon (PNN) and other utilities would introduce *"a component of non-water sector risk to returns"*.[52] In its PR24 Draft Methodology, Ofwat intends to place most weight on data from these two companies. However, it noted that PNN, *"has since June 2020 been a 'pure-play' water company following its disposal of Viridor"* so will review whether to include their data in the final methodology.[53]

Our comparator set is made of the 3 UK listed water companies. In line with regulatory precedent and Ofwat's proposed approach, we consider UU and SVT obvious comparators given they are 'pure-play' water companies. As PNN owned

[52] Ofwat, PR19 Final Determinations – Allowed Return on Capital Technical Appendix,p.62

[53] Ofwat PR24 Draft Methodology, Appendix 11, p14

a non-regulated business before June 2020, we recognise that the beta of PNN before June 2020 might have been affected by the non-regulated business. However, we still consider it useful to consider this evidence, rather than entirely discarding it.

We consider that more weight can be placed on PNN beta estimates for shorter-term regression windows where all, or a significant proportion of, the data has been drawn from the period following the sale of the waste business. This is because data from this period will reflect pure-play water business risk. Where beta windows are longer term or involving several years of averaging, we treat PNN outputs with more caution. We also note that at the point that the PR24 determinations are made the relevance of PNN as a beta comparator would have increased further and therefore it makes more sense to include it in the comparator set at this stage.

Data frequency

Equity beta can be estimated using different frequency of return measure. For example, daily, weekly, or monthly returns have been reviewed by regulators previously, and in some instances quarterly returns have also been considered.

At PR19, both Ofwat and the CMA used daily, weekly and monthly data in their estimations of equity beta. However, in the PR24 Draft Methodology, Ofwat stated that they intend to use only daily betas since *"lower frequency estimates (e.g. weekly and monthly) are less precise as they are based on fewer data points; tend to be more volatile; and are subject to the 'reference day effect'"*.[54]

We agree that, overall, daily betas tend to avoid these issues as these are estimated using a large enough sample size (at least 480 data points if a 2-year estimation window is considered), and daily beta estimates do not suffer from reference days issues.

Evidence from weekly and monthly betas could also be taken into account if appropriate weight is given to this evidence to account for the issues outlined above. For example, when using lower frequency data (e.g. monthly returns) it is appropriate to give more weights to results estimated over a larger estimation window. Reference day issues can be mitigated by taking average of betas estimated over different reference days (i.e. over-lapping samples). We therefore do not consider that weekly and monthly evidence should be 'ruled out' on principle, but agree there are advantages to using betas derived from daily data.

Estimation windows and averaging periods

The raw equity beta regression can be estimated over different estimation windows. The resulting betas can then also be averaged over time over different averaging periods.

At PR19, Ofwat used 1, 2 and 5-year estimation windows. In determining a point estimate, Ofwat relied on daily betas estimated using a 2-year estimation window on the basis that this would provide sufficient data points[55] and include recent data.

[54] Ofwat PR24 Draft Methodology, Appendix 11, p14

[55] If using a 2-year estimation window, the regression of daily returns includes about 480 data points (20 working days per month times 24 months). Instead, a regression of weekly return includes 96 data points (4

It also noted that this approach had historically been a good indicator of betas in the succeeding 5 year period.[56]

However, the CMA disagreed with relying on a 1-year estimation window on the grounds that this could be too short-term and subject to noise.[57] It therefore considered 2, 5 and 10-year estimation windows and 1, 2 and 5-year rolling averages. In its PR24 Draft methodology, Ofwat appears to agree with the CMA approach to estimate betas using 2-year, 5-year, and 10-year estimation windows. However, they did not comment on the use of averaging periods in the new methodology.

There is trade-off between capturing recent market conditions, as well capturing information from more recent regulatory methodologies, and having estimates that are subject to short term market volatility, which may not be reflective of the market more generally. For example, spot estimates vary between days and weeks so using a short term averaging period or estimation window, such as one year, can impact the beta estimations. Likewise, there are also limitations with using longer windows, such as 10 years. Long windows avoid the issue of short term volatility but may also be less reflective of the recent market conditions.

The other important consideration in terms of the estimation window is the impact of the COVID pandemic. A global systemic shock such as COVID can have a significant impact of beta estimates for a sector. For regulated assets – like utility companies – they will often be less volatile than the market overall during these shocks with the result that the betas estimates will be depressed. This is not, in itself, an argument for excluding these shocks from the sample, since the performance of a sector during periods of shock is an important determinant of its risk profile for investors. Nevertheless, with beta estimation windows of between 2 and 10 years it is important to consider whether the COVID pandemic could be biasing the estimate by placing too much weight on a period of global systemic shock.

We note that in the PR24 Draft Methodology, Ofwat consider pandemics to be *"a clear example of a systematic risk whose relevance is unlikely to diminish"*.[58] We consider there is substantial uncertainty over the likelihood and systematic impact of future pandemics. Nevertheless, we agree with Ofwat that excluding pandemic related data or applying bespoke weights to 'COVID affected' data creates selectivity and mis-calibration risks. Therefore, we do not exclude or apply bespoke weights to the underlying returns data. Instead, we favour considering longer averaging periods such as 5 and 10 years which include the COVID affected data but also account for longer run trends. That way the impact of the pandemic is not ignored, and allows for the placing of pandemic affected data into a wider context.

Given that there are advantages and disadvantages associated with both short and long-term estimation windows and averaging periods, it is reasonable to consider

weeks per month times 24 months), and a regression of monthly returns includes 24 data points (equal to the number of months)

[56] Ofwat, PR19 Final Determinations – Allowed Return on Capital Technical Appendix,p.65.

[57] CMA, Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations: Final report, p.859

[58] Ofwat PR24 Draft Methodology, Appendix 11, p16

a range of estimation approaches before coming to a conclusion. We therefore present 2, 5 and 10 year windows covering spot rates, 2, 5 and 10 year averages.

De-levering equity beta

In order to convert raw equity beta estimates into an unlevered beta, we de-lever using the observed gearing from the comparators. Where gearing is expressed as net debt to enterprise value. This is consistent with the approach taken by both Ofwat and the CMA in their PR19 determinations (further rationale for adopting this approach was set out in the preceding section). We match gearing to the regression window being used e.g. a 5-year average gearing figure to de-lever a raw equity beta from a 5-year regression window.

Results

The table below shows our estimates of unlevered betas based on raw equity betas de-levered using observed gearing.

Figure 27 Daily Unlevered Betas

Window	Averaging period	UU	SVT	PNN	Average of Water Companies
2 year	Spot	0.23	0.23	0.27	0.25
2 year	2 years	0.25	0.26	0.29	0.27
2 year	5 years	0.27	0.28	0.32	0.29
2 year	10 years	0.28	0.30	0.33	0.30
5 year	Spot	0.25	0.26	0.28	0.26
5 year	2 years	0.26	0.27	0.30	0.28
5 year	5 years	0.30	0.31	0.34	0.32
5 year	10 years	0.28	0.29	0.32	0.30
10 year	Spot	0.28	0.29	0.32	0.29
10 year	2 years	0.27	0.29	0.32	0.29
10 year	5 years	0.27	0.28	0.31	0.29
10 year	10 years	0.28	0.29	0.30	0.29

Source: Frontier Economics

The short-term (spot and 2 year averaging periods) estimates appear to be lower than the longer term estimates. This appears to be, in part, driven by the recent COVID period where we would expect utility stock betas to be lower.

With regards to setting an overall range based on the estimates presented, we think it is reasonable to use the 5 and 10 year averaging periods to inform the upper and lower bound of this range. This approach takes into account the possibility of future events such as COVID while also taking into account other sources of risk that may impact the betas in the upcoming pricing period. Given the focus on longer term averages, we have used the estimates form UU and SVT to inform our range since PNN has only been a ‘pure play’ water company since June 2020.

This approach, using 2, 5 and 10 year windows and 5 and 10 year averaging periods, gives a range of 0.27-0.31 for the unlevered beta and an average of 0.28. Therefore, this estimate is consistent with both Ofwat and the CMA's estimate of 0.29 in PR19. If we consider PNN on the same basis, we get a range of 0.30-0.34 with an average of 0.32. This gives us confidence that the upper end of the range is still a reasonable estimate for the water sector as a whole.

For the purpose of developing a reasonable final range for CAPM estimation we have symmetrically truncated our range to 0.28-0.30.

Figure 28 Range of beta estimates using 5 and 10 year averaging periods

Frequency	United Utilities	Severn Trent	Pennon	UU and SVT
Daily	0.27-0.30	0.28-0.31	0.30-0.34	0.27-0.31

Source: Frontier Economics

Debt Beta

In this section we set out our approach and estimation of the equity beta. This section is organised as follows:

- First, we summarise Ofwat's proposed approach at PR24 and relevant regulatory precedent from PR19;
- Second, we outline our approach to estimate the debt beta using data on bond returns;
- Finally, we present our results from the estimation across different comparators, frequencies, windows and averaging periods. We then interpret our results in the context of assessing Ofwat's assumption of the debt beta in the upcoming pricing period.

Ofwat's proposed approach at PR24 and relevant regulatory precedent

In PR19, Ofwat commissioned Europe Economics (EE), who used a decomposition approach to provide an estimate of the debt beta. This resulted in a point estimate of 0.125. Although the CMA took account of this evidence, it noted that "the debt beta is difficult to measure and has a relatively small effect on the overall WACC".[59] Based on the evidence presented by both Ofwat and the disputing companies, the CMA set a range for the debt beta of 0.05 to 0.10, with a point estimate of 0.075.

In the PR24 proposed methodology, Ofwat's preferred approach which it calls "more consistent CAPM-WACC" would set debt beta at the level which would make the CAPM-WACC calculation fully invariant to gearing.[60] Ofwat showed, using PR19 final determination values in a numerical example, that this approach this

[59] CMA, Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations: Final report, paragraph 9.517.

[60] Ofwat PR24 Draft Methodology, Appendix 11, p 20

leads to a debt beta of 0.216.[61] However, Ofwat notes that this approach "might not be supported by statistical evidence"[62]

Our estimation approach

In the Section above we reviewed Ofwat's proposals on de-levering and re-levering in detail. Setting out why we have concerns regarding Ofwat's proposed approach in the Draft Methodology. In this report we adopt what Ofwat refers to 'Option 1' which is to adopt the same de-levering and re-levering approach used at PR19.

We therefore focus on estimating a debt beta using an approach which is consistent with how equity beta is estimated. We consider that debt beta estimated using regression techniques are more likely to reflect the systematic risk that debt assets face than indirect methods decomposing the cost of debt into components. This direct approach to estimating debt beta is typically a key source of evidence when estimating debt betas for regulated companies.

We have run OLS regressions using the total returns of bonds issued by companies in the water sector against FTSE All-share total market returns. Given the similarities in approach, this estimation method requires similar technical decisions to be made as with the equity beta estimation. Below we summarise each of these in turn.

Selection of comparator set

As we are basing estimates of equity beta based on the listed water companies, for consistency, we also draw our debt sample from the same companies.

To create a sample of debt instruments we also need to select which bonds should be chosen to estimate the debt beta. In order to choose which bonds to include in our sample for each company, we filtered by the following criteria:

- The bonds had to meet a minimum liquidity score as measured by Bloomberg;
- The bonds had an amount outstanding of above £250m, as a further criteria linked to liquidity;
- The bonds were issued in GBP to be consistent UK based index used in the regression; and
- The bonds were issued before 2016 to provide enough data for the regression analysis.

We chose these criteria for several reasons, the main one being that the bonds must be traded frequently in order to measure the changes in price over time. If this is not the case then we cannot accurately measure how the total returns vary with changes in overall market returns.[63]

[61] Ofwat PR24 Draft Methodology, Appendix 11, Table A1.2, p 21

[62] Ofwat PR24 Draft Methodology, Appendix 11, p 24

[63] Using this criteria, we identified a total of 16 bonds for UU and SVT. Using the above criteria, there are no PNN bonds that are liquid enough to meet the threshold. However, we have included one bond for PNN as estimating a debt beta for all 3 companies will help inform the overall assessment.

Selecting Frequency of Data

Similar to the equity beta estimation, the data used in the debt beta estimation can be based on different frequencies; daily, weekly or monthly. While it is also important to make sure that there is a large enough sample size in the regressions, it must be noted that bonds are often less liquid than stocks. This has been noted by others such as the CMA who have said "Debt beta is generally more difficult to measure than equity beta, as bonds are less well traded than equities"[64]

We are therefore more cautious about using daily data from instruments that are more thinly traded than equities, even with the liquidity filters we have applied. We propose to use weekly and monthly estimates instead. To minimise the effects of the lower sample size, we have excluded the short term monthly estimates such as the 2 year window spot estimate that is based on a regression sample of only 24 observations. We are also able to mitigate issues such as the "reference day effect" by averaging our estimates over the different days of the week and month.

Estimation windows and averaging periods

When considering the length of estimation windows, it is important to note that there is generally a shorter time series of historical data available bonds compared to stocks – this because bonds have a finite contractual term. Therefore, we have not used 10 year averaging periods/windows since there is insufficient data.

Results

The table below shows the range of our estimates of betas. Ranges are derived across different estimation windows and averaging periods.[65] Detailed tables of betas that show how the ranges have been derived can be found in Figure 30 and Figure 31. Out of the range of bond estimates available for each company, we have presented the 25th and 75th percentile estimates for each Frequency/Window/Averaging period combination. This provides a range that is derived from all bonds in the sample while excluding any outliers. The exception to this is Pennon where we only have one bond estimate so the 25th and 75th percentile estimates are the same.

Figure 29 Debt beta estimates

	Three company average
25th Percentile	0.02
75th Percentile	0.06

Source: Frontier Economics

Note: The range for Pennon is the same for both the 25th and 75th percentiles since there was only one bond that could be used for the estimation

If we take the average across companies, we get 0.02 for the 25th percentile bond and 0.06 for the 75th percentile. This provides us with a sensible range to estimate the forward looking debt beta since this is a combination of betas that have been

[64] NATS (En Route) Plc/CAA Regulatory Appeal: Final Report, p13.22

[65] The range of daily betas is derived across all estimation windows and averaging periods. For weekly and monthly betas, we have calculated the range of the average of the weekly and monthly betas across reference days. We have excluded monthly betas estimated over a 2-year window because of the small sample size.

estimated using multiple bonds, frequencies of data, windows and averaging periods. In order to avoid creating an unhelpfully wide range we select a single debt beta value of 0.05 as the point estimate in our WACC estimation.

Figure 30 25th Percentile Debt beta estimates

Window	Averaging Period	Frequency	UU	SVT	PNN	Average
2 year	Spot	weekly	- 0.32	-0.05	-0.05	-0.14
2 year	2 years	weekly	0.06	0.06	0.05	0.05
2 year	5 years	weekly	0.04	0.05	0.03	0.04
5 year	Spot	weekly	0.06	0.05	0.03	0.04
5 year	2 years	weekly	0.07	0.06	0.05	0.06
5 year	5 years	weekly	0.03	0.02	0.00	0.02
5 year	Spot	monthly	- 0.07	0.02	-0.06	-0.04
5 year	2 years	monthly	0.05	0.10	0.08	0.08
5 year	5 years	monthly	0.05	0.10	0.08	0.07

Source: Frontier Economics

Figure 31 75th Percentile Debt beta estimates

Window	Averaging Period	Frequency	UU	SVT	PNN	Average
2 year	Spot	weekly	- 0.15	- 0.00	- 0.05	- 0.07
2 year	2 years	weekly	0.09	0.14	0.05	0.09
2 year	5 years	weekly	0.07	0.10	0.03	0.07
5 year	Spot	weekly	0.10	0.11	0.03	0.08
5 year	2 years	weekly	0.10	0.13	0.05	0.09
5 year	5 years	weekly	0.07	0.05	0.00	0.04
5 year	Spot	monthly	- 0.03	0.04	-0.06	- 0.02
5 year	2 years	monthly	0.10	0.22	0.08	0.13
5 year	5 years	monthly	0.10	0.20	0.08	0.13

Source: Frontier Economics

As shown, The 25th percentile estimates are generally greater than zero and below Ofwat's PR19 estimate of 0.125. The 75th percentile estimates are also, on average, lower than Ofwat's PR19 assumption and all but one are lower than the 0.216 estimate that Ofwat derived using their preferred approach for PR24.Our estimate is therefore significantly lower than the assumption Ofwat's proposed approach in its Draft Methodology. This estimate, which estimates the debt beta directly using a range of available data, highlights the assumption Ofwat is making on debt is unsupported by market evidence. We also note that the debt beta implied by Ofwat's methodology could be even higher where the risk-free rate increases, creating a further gap between its proposed approach and statistical evidence.

While this estimate is lower than the most recent Ofwat final determination in PR19, it is consistent with historical regulatory precedent. In their determination, the CMA used a range of 0.05 to 0.10 for PR19 whilst Ofwat used a debt beta of zero at PR14.

9. COST OF EQUITY RANGE

In this section, we bring together evidence from the preceding chapters to estimate the post-tax cost of equity. We also consider issues regarding a point in the cost of equity range and the use of cross-checks.

Re-levering the beta

In the previous section, we set out estimates for the unlevered beta (0.28 to 0.30) and the debt beta (0.05). In order to convert these inputs into an equity beta assumption for PR24, we re-lever them using the assumed notional gearing of 60%.

Consistent with our approach to de-levering, in order to re-lever we apply the same approach as PR19, which uses the Harris Pringle formula.

Figure 32 below sets out our estimates for the asset beta and equity beta. The asset beta range we estimate is 0.31 to 0.33 and the equity beta range we estimate is 0.69 to 0.74.

Figure 32 Re-levered equity beta estimate

Parameter	Low	High
Unlevered beta (A)	0.28	0.30
Debt beta (B)	0.05	0.05
Observed gearing across the sample (C)	53%	53%
Asset beta (D = A + B*C)	0.31	0.33
Notional gearing (E)	60%	60%
Equity beta (F = [D – E*B] / [1-E])	0.69	0.74

Source: Frontier calculations

Cost of equity range

In the table below we set out our estimate of the PR24 cost of equity range of **4.54% to 5.54% (post-tax, CPIH)**. The equivalent figure estimated by Ofwat at PR19 was 4.20%, and the equivalent figure estimated by the CMA for the PR19 re-determinations was 4.73%.

Figure 33 Cost of equity range

Parameter	Low	High
Risk-free rate	-0.28%	0.49%
Total Market return	6.70%	7.30%
Equity Risk Premium	6.98%	6.81%
Equity beta	0.69	0.74
Allowed return on equity	4.54%	5.54%

Source: Frontier calculations

One key reason for an increase relative to those PR19 estimates is the increases in interest rates that have occurred, and are expected to occur. All else equal, a higher risk-free rate figure increases the allowed return on equity where the equity

beta is lower than one and a constant TMR approach is taken. Another key reason for an increase is the new evidence on CPIH that has become available since PR19. The historical evidence on CPIH inflation is lower than previous estimates of inflation over the same period, resulting in a higher estimate of real historical equity returns.

Cross-checks to the cost of equity

In the Draft Methodology, Ofwat sets out that it considers there is an important role for Market-to-Asset Ratio (MAR) analysis as a cross check. It highlights that there is readily available data from share prices and private transactions on MARs. Specifically, Ofwat proposes that such evidence could be used to support adjustments to the CAPM-derived point estimate for the allowed return on equity.

In Annex C we discuss in detail our concern on the proposed use of MAR evidence and propose alternative ways to interpret market evidence on valuation of shares. We also propose other cross checks that regulators should take into account if evidence such as MAR is to be included as a cross check.

We recognise the need for cross checking the COE estimate from the CAPM exercise, as these are based on a certain branch of finance theory with assumptions that may not necessarily hold in real life. We consider it good regulatory practice for the regulator to impose some real-life cross checks on the its CAPM estimates.

Our main concern with the proposed use of MAR, however, is the prior belief that it should be 1 if the price control settlement is fair and that investors are not expecting the company to outperform regulatory allowances. Although this is true in theory, asset valuations in the real world fluctuate due to a host of reasons that have little to do with the fundamental intrinsic value of the assets. If the underlying assumptions of the prior belief that MAR should be 1 were all fulfilled, we would not observe short-term stock market fluctuations, market sentiment, momentum, bull markets and bear markets. Since we do not live in a world where these assumptions are fulfilled, any cross check that is built on the premise that MAR should equal 1 has therefore little meaning.

However, this is not to say valuation of regulated utility companies is not an important parameter for the regulator to monitor. But still, valuation is only meaningful when it is measured in relative terms, i.e. in comparison with benchmark companies, sectors or the wider market. To that end, we have proposed alternative ways for Ofwat to keep an eye on the valuation of water companies, by looking into standard forms of valuation metrics (such as price earnings ratios, etc.), which allows this relative comparison (MAR is not comparable to other companies that do not have RCV or RAV).

In addition to these more standard valuation metrics, we also propose Ofwat to look at two other cross-checks. These are Dividend Growth Models (DGM) and long-term profitability assessments.

- DGM is a well-established market valuation based method to estimate an implied cost of equity, and does not require the assumption made in the MAR analysis. We consider DGM a superior market value based cross check than

MAR. However, much like MAR, the DGM cross check is also subject to the same limitations as MAR in the sense that the result is based on short-term market valuation data and can fluctuate significantly. It is therefore important that the regulator does not put undue weight on these cross checks, either MAR or DGM, otherwise there is a risk of shifting the regulatory principle from a long-term focus into a short-term one.

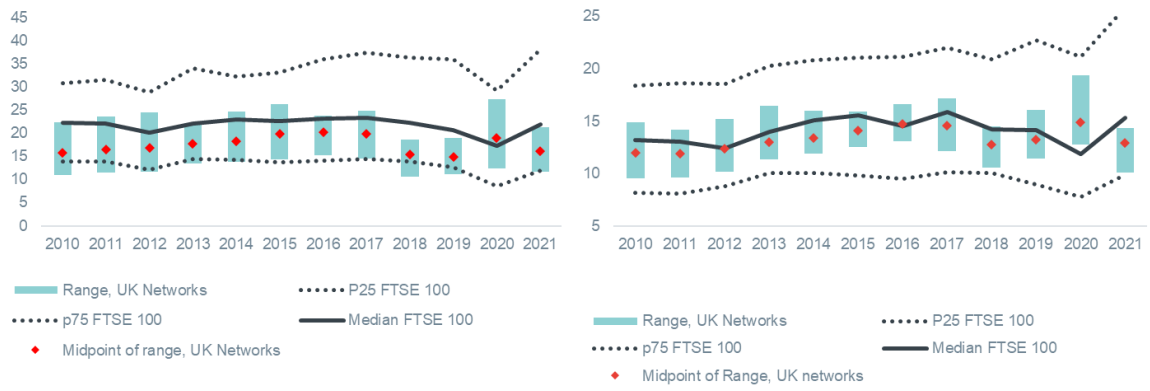
- The long-term profitability cross check is something that we propose Ofwat to look into as a cross check on the allowed returns for PR24. This cross check simply examines the historic profitability (measured in accounting metrics such as Return on Equity) of comparable sectors and the wider market as a whole, to understand the environment that the regulated utilities operate within. Profitability of companies may not be equivalent to expected return for investors in real life, even though economic theory suggests that this should be the case. We propose this as another real-world cross check, to see if the allowed return set by regulators are actually in line with the level of profit that companies have been making in the recent history.

Results of our additional cross checks

Some of our suggested cross checks do not provide a directly comparable range for the cost of equity estimation, but instead a real world check to see if the valuation or profitability of regulated water companies are in line with expectations when compared to benchmarks. However, none of the result of our cross checks, including our DGM cross check which does provide a directly comparable range, suggests that the cost of equity estimated by the CAPM method either by Ofwat at PR19 or by us in this report can be considered too high.

- Unlike the MAR analysis which only shows by how much the companies are valued above its RCV, our relative valuation analysis shows that the valuation of regulated utilities moves in line with wider market and sits where one would expect regulated utilities to sit within the wider market. There is very little evidence in this relative valuation analysis that suggests that regulated utilities are outperforming the rest of the market. (see annex C for more detailed analysis and explanations)

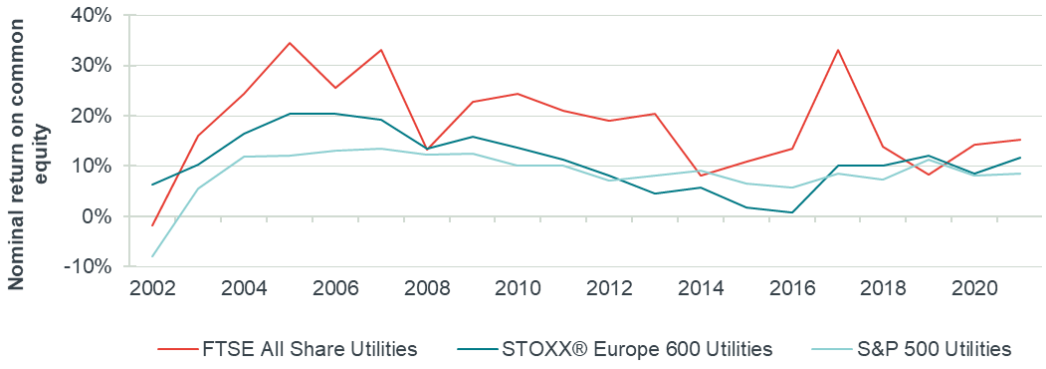
Figure 34: CAPE and Cyclically Adjusted EV/EBITDA, UK networks vs P25, P50 and P75 of CAPE of other FTSE 100 companies



Source: Bloomberg, Frontier Analysis

- The DGM cross-check indicates an implied cost of equity of 5.4%-5.9% (based on water companies only) in our base case scenario for long-term growth. In the most conservative scenario considered, which assumes no real dividend growth in the future, the evidence suggests an implied cost of equity for the water companies of between 4.6%-5.2%, with a mid-point of 4.9%. Furthermore, based on today's dividend and share valuation, for the implied cost of equity to be equal to the 4.19% assumed by Ofwat at PR19, the long term real dividend growth would have to be -0.35% to -1.61% for regulated utility companies in our sample. A negative long-term real dividend growth from the current nominal dividend yield of 4%-5% levels would imply a decrease in the RCV or operating profit of the companies in the long term, which is clearly in contradiction to the general expectation that the water sector will continue to grow in order better tackle environmental issues and cater for the growing population.
- Our assessment of long-term profitability suggests that market-wide profitability has not fallen with the falling interest rates, and profits in the wider utilities sector have been high relative to Ofwat's PR19 allowed return on equity. The figure below shows the trend in (nominal) return on common equity for UK, European and US utility sector indices, between 2002 and 2021. The figure shows volatility in profitability year-on-year (particularly for the UK).

Figure 35 Trends in nominal return on common equity for UK, European and US utility indices



Source: Frontier Economics analysis of Bloomberg data

Absent from the figure is a severe secular downward trend in profitability. This is an important insight and reveals that the accounting profitability of listed utility businesses has not trended downwards to a significant degree (see annex C for more detail on our profitability cross check).

What weight should Ofwat put on cross checks?

No cross-check is perfectly robust, which is why they can only provide a secondary evidence base to help the regulator assess how its CAPM COE range relates to certain perspectives of the real world. Over reliance of certain cross checks, particularly those based on short-term market valuation of the assets, such as MARs especially when combined with an unrealistic prior belief, can lead to greater risks for the sector in the long run, to the detriment of customers.

Reliance on cross-checks introduces a new form of regulatory discretion into determinations, i.e. how to interpret noisy, volatile and potentially contradictory cross-check evidence.

- This in and of itself could dent investor confidence and make the sector less attractive for investors. This is particularly critical in the current environment when substantial investment is needed in the water sector.
- And it is implausible to say that regulators would use cross-checks symmetrically and would draw on them to increase the allowed returns if the numbers run in the other direction. Over time this would lead to censored and asymmetric outcomes.

it is important for Ofwat not to lose sight of the actual purpose of the COE estimation, which is to set an appropriate profitability for the regulated companies. This is not synonymous with calibrating the price control to deliver certain levels of investor valuation (which is the primary concern of the MAR cross-check). Ofwat cannot control the valuation levels of the regulated water companies in reality, no matter how hard it tries, because markets do not always price stocks at their fundamental value. If policy objectives are aimed at achieving certain pre-conceived theoretical valuation levels, Ofwat would face legitimacy challenges if and when high valuation conditions reverse. For example, in a scenario where the economy is in a recession and MAR is lower than 1, through no fault of the price control settlement, these policies would imply the opposite results putting upward pressure on the implied cost of equity in an environment where Ofwat may find it less justifiable to increase the allowed returns above values suggested by long-term methods such as CAPM.

For all these reasons, UK regulators have always consciously avoided using such short-term market-implied evidence to set the allowed equity return. Ofwat is among these regulators, which is why it should continue to use long-term evidence as its primary evidence for setting the COE and should not rely on cross checks based on short-term valuations to set the point estimate in the range.

Point in the range

Ofwat's Draft Methodology proposes that they would create a plausible range for the allowed return on equity based on combining the high and low range for the CAPM parameters – as we have done above.

Ofwat also proposes that that it would ordinarily use the midpoint of this range for the point estimate, and considers that there should be a high evidential bar for moving away from a central estimate, and that this evidence should come from cross-checks.

Generally, we consider it appropriate that regulators aim up when setting a point estimate for the WACC allowance, rather than selecting the mid-point of the range. This is due to the fact that estimating the WACC involves a considerable amount of uncertainty, and costs associated with under- or over-estimating the WACC are asymmetric. This is due to the consequences of setting the WACC too low, which is likely to cause under-investment in the networks and asset base and potentially disruption to service, are greater than the consequences of setting the WACC too high.

As discussed in the market context section, there is continued reason to believe that this asymmetry will be present for PR24. The scale of financing the sector needs in the next several years will be linked to the challenges the sector has to deal with. The scale of these challenges is evident from the Water Resource Management Plans (WRMPs), Drainage and Wastewater Management Plans (DWMPs) and from the latest strategic priorities guidance given to Ofwat, which includes:

- Delivery of net zero operational carbon emissions by 2030;
- Delivery against government targets in the 25 year Environment Plan, including returning 75% of river bodies to their natural state;
- Resilience to a one in 500-year drought by 2040;
- Halving of leakage from current levels by 2050;
- Reduction of PCC to 110 litres per day 2050; and
- Achieving greater flood resilience.

In addition the industry will need to invest to work towards to the government's target of reducing combined sewer overflows (CSOs) by 80% by 2050.

The level of investment in the water sector was also one of the main areas that the CMA considered was likely to make aiming-up necessary in its work for the PR19 redeterminations. In addition to that point, the CMA also emphasised:

- Uncertainty around the distribution of the different WACC parameters; and
- Financeability.

Taking all of the above into account, in its final PR19 decision, the CMA concluded that "there are a number of benefits from choosing a point estimate of the cost of equity above the middle of the range."[66] It concluded with aiming up 25bps above the mid-point of the range on the cost of equity.

Regarding points on financeability, it is too early at this stage without company business plan data to comment on the relationship between this and the point estimate on the cost of equity. Equally, as Ofwat's final methodology is not yet determined, and many important details including the calibration of performance commitments are not finalised, there is still uncertainty about what an appropriate point in the range would look like.

Nevertheless, what is clear at this stage is the potential scale of financing the sector will require to meet customer and government priorities, and the asymmetric risks associated with this in setting a cost of equity that is too low.

[66] CMA, *Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations: Final report,* paragraph 9.1402.

10. ESTIMATING THE WHOLESALE WACC

Applying a single wholesale WACC

As in previous price controls, Ofwat has proposed that a single wholesale WACC be allowed and applied commonly across each of the four wholesale controls at PR24.

Each of the four wholesale controls will have its own level and profile of risk, each driven by a number of underlying characteristics. In theory, therefore, a separate cost of capital could be set to compensate for the impact of different risks faced under each of the wholesale controls.

A full analysis of the extent to which there are any systemic differences in the way that risks are addressed under the current economic regulation across each of the four wholesale controls is outside of the scope of this report. Conceptually, however, the appropriateness of any regulatory options for addressing any differences in the distribution of risks for each of the controls will depend on the nature of each of these different risks, based on the following characterisation:

- *Risk characterised by the design of the regulatory framework.* The design of the regulatory framework and the allowances made within the framework for any given price control may introduce risks. These risks can therefore be minimised/reduced through designing the regulatory framework and/or setting allowances differently.
- *Inherent risk.* This captures any risks that are associated with the operational activities of companies in delivering water and/or wastewater services, and will be driven by factors outside of the regulatory design in the sector, such as uncertainty in outcomes.

In essence, Ofwat can therefore potentially make decisions to affect the risk and return profile through the use of three approaches:

1. *Through the regulatory settlement* for each of the four wholesale controls, i.e. by adjusting cost allowances, PC targets and ODI rates. This option directly addresses any skewness in the profile of returns, but can also compensate for additional volatility in returns for each of the controls.
2. *Applying risk sharing mechanisms*, for example cost sharing rates, or the use of caps and collars and/or reopeners. This option is particularly effective at addressing any additional volatility of returns for each of the controls.
3. *Adjusting the allowed rate of return*. This option compensates for additional volatility (even after any risk-sharing).

We would expect Ofwat to consider and assess the use of these different regulatory options at PR24 to ensure that there is not any persistent skew in the returns under each of the controls. This assessment would need to focus on how the regulatory allowances and targets are set for the different services and also address any differences in the degree of risk in delivering different services.

In principle, while Ofwat could compensate for a skew in returns (i.e. 'an underperformance wedge') through an adjustment to the allowed rate of return (option 3 above), it is generally better practice to address the source of any skew in risk, rather than try to compensate for this through the rate of return. It is the regulator's duty to ensure customers only pay for efficient costs, including cost of capital.

On this basis, we support Ofwat's view that a single wholesale WACC be allowed for all of the wholesale controls.

However, we note one consideration with respect to Ofwat's proposal in the PR24 Draft Methodology to adopt an average revenue control for the bioresources control. This approach represents a move towards opening up the bioresources segment to competition, and may therefore need to be further reviewed at PR29. For example, an approach more akin to the retail segment may need to be applied, with an adjustment made to the appointee WACC to address any additional systematic risk for this part of the business.

Retail margin adjustment

In setting a single wholesale WACC to capture risk across each of the controls (including household retail), an adjustment is required to the allowed returns to reflect that companies are compensated for retail risk through the retail return, i.e. the appointee WACC needs to be adjusted to isolate and deduct any components of the retail margin that double count compensation for systematic retail risk.

We agree with the high-level approach adopted by Ofwat and the CMA at PR19 to estimate the retail margin adjustment, i.e. that the retail margin adjustment be estimated as the retail margin less the cost of fixed asset and working capital financing.

In estimating a retail margin adjustment to the return to apply at PR24, we therefore adopt this same high-level approach, using the data and assumptions set out in Figure 36 below. However, this information reflects that available from PR19, and therefore will be subject to further change as updated information becomes available for the 2025-2030 period.

In the absence of further information, at this stage we assume the same retail margin of 1.0% as at PR19. However, we will review in further detail, in particular in considering the findings from Ofwat's own review of the retail margin for PR24, which we understand it will publish with the WACC estimation in the Final Methodology. We expect that the retail margin will differ from that at PR19 to reflect underlying market changes.

Based on arguments made by various parties as part of the appeals to the CMA at PR19, we have also considered the approach to the estimation of the working capital requirements, in particular with respect to debtor and creditor days. As set out by Ofwat in its corrections as part of its CMA submission, we agree that the calculations of the required revenues for return on working capital should reflect

both debtor and creditor days.[67] In the absence of forecast data for PR24 on companies expected debtor/creditor days, at this stage we have retained Ofwat's assumptions from PR19 of a lower and upper bound of 14 and -3 net debtor days respectively. However, we expect that this will likely need further updates for PR24, with a key driver of any change being increases in meter penetration over the period. [68]

Based on this approach and assumptions, we estimate a retail margin adjustment to the appointee WACC in the range of **7-9 bps.** However, as set out above, this represents a preliminary estimate based on currently available data. It is therefore subject to further updates following Ofwat's Final Methodology (in December 2022) and data shared as part of companies' business plan submissions (in October 2023).

[67] We note that the CMA in its PR19 redetermination set net debtor/creditor days to zero to reflect that it *"see[s] no need to assume that a notionally efficient company should have an additional return to manage the costs of financing working capital balances"*

[68] Metered customers pay in arrears, while unmetered customers pay in advance

Figure 36 Estimation of retail margin adjustment (nominal)

Component	Calculation	Ofwat PR19* estimates	CMA PR19 estimate	Frontier PR24 estimates	Frontier sources
Fixed asset balance (average over 5-year control period))	A	386	386	356	2025-2030 forecasts from PR19 FD financial models
Cost of financing fixed assets	B	5.02%	5.26%	5.14% / 5.74%	Estimate of vanilla appointee WACC
Required revenue for return on fixed assets	**C=A x B**	**19**	**20**	**18 / 20**	
Average annual net debtor days	D	14 / -3	0	14/-3	As described in text, above. Data from companies' PR19 revised business plans
Average annual turnover	E	11,989	-	12,561	2025-2030 forecasts from PR19 FD financial models
Days in year	F	365	-	365	
Average annual working capital requirement	G = (D/F) x E	460 / -99	-	482/-103	
Working capital financing rate	H	3.06%	-	3.06%	Assume same as at PR19 based PR19 revised business plans
Required revenue for return on working capital	**I=G x H**	**14 / -3**	**0**	**15 / -3**	
Total retail-specific capital costs	J = C + I	33 / 16	20	33 / 17	
Allowed revenue apportioned to households	K	93	93	91	Assume in line with PR19 data based on PR19 FD financial models
Required revenue for additional systematic risk	**L=K - J**	**60 / 77**	**73**	**58 / 74**	
Average RCV	M	84,125	84,125	82,594	2025-2030 forecasts from PR19 FD financial models
Required revenue for additional systematic risk	**N = L / M**	**0.07% / 0.09%**	**0.08%**	**0.07% / 0.09%**	

Source: *CMA (17 March 2021) Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations: Final report, p.1028; Frontier Economics, based on source data listed in table*

Note: ** This reflects Ofwat's corrected estimates included as part of its submission to the CMA for the PR19 redeterminations*

11. PR24 WACC ESTIMATE

Our WACC estimate for PR24 is summarised in Figure 37 below. Overall, we estimate a vanilla wholesale WACC for the water sector in the range of **3.01% to 3.58%**. The increase in the WACC relative to that allowed at PR19 is driven mainly by the increase in the cost of equity, with the upper bound of our cost of debt range in line with that allowed at PR19.

Figure 37 PR24 cost of capital estimate (CPIH, real)

Parameter	PR24 estimate		PR19 allowance
	Lower bound	Upper bound	
Gearing	**60%**	**60%**	**60%**
Risk-free rate	-0.28%	0.49%	-1.39%
Total Market Return (TMR)	6.70%	7.30%	6.50%
Equity Risk Premium (ERP)	6.98%	6.81%	7.89%
Unlevered beta	0.28	0.30	0.29
Debt beta	0.05	0.05	0.125
Asset beta	0.31	0.33	0.36
Notional equity beta	0.69	0.74	0.71
Allowed return on equity	**4.54%**	**5.54%**	**4.19%**
Ratio of new to embedded debt	20%	20%	20:80
Cost of new debt	2.19%	2.19%	0.53%
Cost of embedded debt	1.80%	2.20%	2.42%
Additional borrowing costs	0.22%	0.22%	0.10%
Allowed return on debt	**2.10%**	**2.42%**	**2.14%**
Appointee WACC (vanilla)	3.08%	3.67%	**2.96%**
Retail net margin deduction	0.07%	0.09%	0.04%*
Wholesale WACC (vanilla)	**3.01%**	**3.58%**	**2.92%**

Source: *Frontier Economics, Ofwat PR19 Final Determinations*

Note: ** We note that Ofwat corrected this value as part of its submission to the CMA, to a range of 0.07%-0.09%*

12. FINANCEABILITY

In addition to providing an estimate of the PR24 WACC, UU has asked us to consider issues regarding the funding of real RCV growth and equity financeability in the context of listed companies, and also consider debt financeability.

In this section we discuss the importance of financeability and broader risks that Ofwat should consider when assessing the allowed return on capital and the alignment of risk and return.

The section is divided into three parts. First, we highlight the factors Ofwat should consider in order to ensure the PR24 methodology supports a range of financing models by reviewing equity financeability in the context of RCV growth. Second, we consider what an appropriate equity issuance cost allowance for PR24 is. Third, we highlight factors Ofwat should consider when assessing debt financeability.

Equity financeability

Draft Methodology proposals

Ofwat has not given detailed consideration to equity financeability and dividends in the Draft Methodology. There are some remarks regarding Ofwat proposing to set an assumption for dividends, but it does not propose what those assumptions will be and also make reference to an expectations that dividend yields will flex in line with RCV growth.

Connected to this issue, we also note that Ofwat proposes a more restrictive RCV run-off range, and also, more broadly, make references to an expectation that equity will play a greater role in the sector.

Factors for Ofwat to consider on equity financeability

We consider that the direction of travel from the Draft Methodology, if combined with a cost of equity that is set too low could create equity financeability challenges at PR24. In Annex B we set out in more detail the risks to listed company equity financeability in particular – taking into account their specific characteristics – and summarise these below.

Overall, we consider there are risks to an approach that is not sufficiently flexible, and that Ofwat should consider there are factors that can make a difference to how a range of ownership models in the sector can be supported. We find that accounting for these factors is important given the benefits derived from the presence of a range of ownership models. Below we summarise the benefits that are connected to having some pure-play listed companies in the sector, and the factors Ofwat should consider in order to continue to support plurality of ownership models in the sector – including listed companies.

Benefits associated with listed pure-play water entities include:

- Governance – which includes the additional information that listed companies provide, and differences in governance style that cannot be replicated by Ofwat.

- Investor base – opportunities for wider ownership can help support trust and credibility in the sector and different investor bases may help support financial resilience.
- Information – listed companies provide a range of data such as the data that is used for beta analysis as well as real time information on equity values.
- Equity market infrastructure – without listed companies the level of research and market awareness could fall – making new issues or relisting more difficult.

In order to support these benefits, there are a number of factors connected to listed companies that Ofwat should recognise:

- Dividend stability – investors in stocks that fit into the 'income stock' category are likely to favour a degree of dividend consistency, which means Ofwat should not assume that forgoing dividends or greater variation in dividends is costless. Nor should Ofwat assume that the impact of greater dividend variation is equal across the different equity ownership models.
- Financing RCV growth – connected to the above, where gearing levels are maintained, RCV growth cannot be perpetually funded by forgoing or cutting dividends, which means that appropriate provisions for equity issuance need to be made – which includes the costs of equity issuance and setting an allowed return on equity that is sufficient to attract large scale capital, and that considers the practicalities of raising equity – where repeat issuance may be inefficient.
- Marginal cost of equity – it should also be recognised that if the cost of new equity is higher than the cost of existing equity, then it will increase the average cost of equity overall.
- Lower gearing – listed companies have tended to have lower gearing, Ofwat therefore needs to be careful about 'one-size-fits-all' remedies to financial resilience that they perceive.

Building on the above, where new equity is required it is important that appropriate allowances are made for equity issuance costs. This is discussed in the subsection below.

Allowance for equity issuance costs

Draft Methodology proposals

Ofwat recognise the need for equity issuance costs in the Draft Methodology. Namely in situations where RCV growth is significant. However, they do not provide a proposed scale for an allowance and only indicate that is 'may' be provided.

Estimation of equity issuance costs for PR24

When raising equity there are significant costs involved. Companies should be able to recover an efficient allowance for these costs. Costs include both direct costs – such as underwriting fees, professional fees, initial listing fees and marketing costs – as well as indirect costs, such as carry costs.

Carry costs arise as it is efficient to raise equity in larger tranches – for listed companies it is not practical to return the market multiple times to do smaller rights

issues. This means that there is often a delay between the equity being raised and being deployed in the business.

There is clear regulatory precedent for allowing equity issuance costs. Ofwat allowed equity issuance costs of 5% of equity raised in PR09 and Ofgem have also used 5% consistently, most recently in the RIIO-ED2 Draft determinations.[69]

This 5% estimate is consistent with literature estimating equity issuance cost.[70] However, these only focus on direct costs, so are likely to be an underestimate of the full cost of issuing equity, since carry costs have not been considered. There is limited literature available to estimate the cost of carry but we have estimated a cost of carry of approximately 4%-5%. Further details on the assumptions used to generate this range are set out in Annex A.[71]

While the estimate of the cost of carry is dependent on the investment profile of the company, and the deposit rate that is available for excess funds, it is important to make allowance for this and the direct costs associated with issuing equity. Given the existing precedent of using 5% as the cost of equity issuance does not appear to include carry costs, which are especially significant for listed companies, we suggest that it may be useful as a lower bound of the allowance that should be given to the companies issuing equity, and that an allowance for all costs could be closer to 9%-10%.

Debt financeability

Draft methodology proposals

The Draft Methodology suggests that the overall approach to assessing financeability will be broadly consistent with previous determinations. However, Ofwat also makes some more specific suggestions on what the assessment will involve, including:

- A proposal that companies target credit ratings of at least BBB+/Baa1 for the notional company, and that companies should specify the level of each ratio they consider is appropriate for that rating.
- A proposal to consider the average of each metric over the price control period, rather than focusing on individual metrics in a single year.
- A proposal that financeability will assessed on a notional basis.

Factors for Ofwat to consider on debt financeability

Debt financeability is an area that has been discussed at length in previous price reviews. We therefore focus on some of the principles of approach that we view as being important to consider, these are:

- Ofwat should consider a range of sensitivities when assessing whether the headroom in allowances is sufficient for companies to maintain a given rating. Allowances should also need to consider where ratios are in the band – as

[69] See Annex A for more detail on previous regulatory decisions.

[70] For example, “Report on the Cost of Capital provided to Ofgem”, Smithers & Co. (2006)

[71] For details, see Annex A.

there could be greater ambiguity where ratios are on the cusp between two rating bands.

- Ofwat should consider a range of information regarding cash flow timing, this includes reviewing the profile of cash flows and ratios, and viewing these through the lens of rating agencies. We therefore think Ofwat cannot take a narrow view as is currently being proposed – considering price control averages – and needs to also consider data through the lens of rating agencies, which may not align with price control schedules.
- That notional exercises should be calibrated on an objective basis, and not engineered an achieve an outcome where financeability tests are 'passed'. Connected to this, it is important that gearing is set on an objective, evidenced-led basis.
- That actual financeability assessments can act as a complement to notional assessments. For example, we note that the CMA used actual financeability as a cross-check. It is actual financeability that will determine the need for potential equity injections. Furthermore, another consideration is whether actual debt structure differences (for example, proportion of index-linked debt), even at a notional gearing assumption, lead to differences in financeability.
- That the allowed return is set at a level that can attract the financing required. On this point, the replies to Ofwat's December discussion paper highlight the current risk in this area. Namely, we note the responses to the Discussion paper suggested that the proposals were negative for equity investors. In this report we also find that Ofwat proposed methodology, which builds on the December 2021 risk and return discussion paper, would likely drive down the allowed return on equity, with the risk that equity investors will find the water sector less attractive than before. Ofwat should therefore take on board the points raised in this paper when developing their final methodology.

ANNEX A COST OF EQUITY ISSUANCE

RCV growth and notional equity

There are a number of ways that RCV growth can be funded, for example:

- through raising debt
- through retained earnings; or
- through raising new equity.

Where investment needs are greater and RCV growth is expected to be faster, then there are limits to the amount of growth than can be funded through retained earnings. There can also be greater constraints on the retained earnings source of funding investment for listed companies that are considered income stocks – and dividend policy, is matched to this investor preference.

Where a company wants to limit increases in its gearing there are also limits to how much it can use the channel of raising debt. This means that in an environment of high RCV growth, where notional dividend policy is supportive of listed income stocks, and increases in gearing are limited, the need for new notional equity needs to be given full consideration.

Costs of equity issuance

When raising equity there are significant costs involved. Companies should be able to recover an efficient allowance for these costs. Costs include both direct costs – such as underwriting fees, professional fees, initial listing fees and marketing costs – as well as indirect costs, such as carry costs.

Carry costs arise as it is efficient to raise equity in larger tranches – for listed companies it is not practical to return the market multiple times to do smaller rights issues. This means that there is often a delay between the equity being raised and being deployed in the business.

Ofwat recognise the need for equity issuance costs in the Draft Methodology where RCV growth is significant. However, they do not provide a proposed scale for an allowance and only indicate that is 'may' be provided. To help inform what an appropriate allowance would be we review regulatory precedent below.

Regulatory precedent

In the table below we set out a number of regulatory precedents on allowances for the cost of equity issuance. As shown, there is a consistent regulatory precedent for allowing equity issuance costs of 5% of the equity amount issued.

Figure 38 Regulatory decisions including an allowance for cost of equity issuance

Regulator	Price review	Allowance
Ofwat	PR09	5% of equity raised
Ofgem	RIIO-1	5% of notional equity raised
Ofgem	RIIO-GD2/T2	5% for equity issuance costs associated with notional equity.
Ofgem	RIIO-ED2 DD	5% working assumption in line with GD2/T2.

Source: Regulatory determinations

At PR09, Ofwat included an allowance to recognise the transaction costs associated with the cost of new equity issuance, calculated as 5% of equity raised. However, this was only for 3 companies that had the largest RCV growth assumption. In deciding the allowance, Ofwat cite a report from NERA for Water UK which estimates the costs to be 5%. This was reached by considering evidence supplied by companies in consultation and comprised of about 3-4% underwriting fees and 1-2% other costs such as legal and accounting charges.[72]

Building on the approach at PR09, we emphasise that it is important to consider the role for a range of dividend policies and ownership models in the sector when considering whether an equity issuance allowance should be provided, rather than just considering RCV growth in isolation. To provide for the widest range of plurality in the sector Ofwat could make equity issuance allowances available to all companies – this would also have the benefit of reducing regulatory risk.

The table shows that Ofgem has consistently recognised the need to provide an allowances for new equity issuance.

In addition to providing an allowance for the direct costs of issuing equity, we also consider it's important that companies are compensated for efficiently incurred indirect costs. One of these indirect costs is the cost of carry, which we review below.

Illustrative estimate of the cost of carry

Given that existing estimates in previous regulatory decisions and supporting evidence focus on the direct costs associated with raising equity, we have estimated the size of the indirect carry costs using an illustrative model (given we do not yet have PR24 business plan data).

The size of the carry costs is dependent on several parameters for which we have to make assumptions:

- **RCV growth per annum**. Given that the need to raise equity is likely to be when RCV growth is relatively high, we have considered range of RCV growth rates. For simplicity we assume that the investment profile of the notional company is smooth, in line with RCV growth but and that as much investment as possible is funded by equity once it has been raised (to minimise carry costs).

[72] Cost of Capital for PR09 A Final Report for Water UK, NERA (2009), p108

- **Cost of equity**. We have drawn upon the estimates set out in this report to set a range of values for the cost of equity.
- **Deposit rates**. We have tested a range of values given uncertainty around the trajectory for short-term interest rates (as discussed in the market context section), these are centred around the expectations from the Bank of England on the base rate for the 2025-2030 period which is around 2.5% nominal.

The main determinant of the cost of carry is the difference in the cost of equity and the deposit rate that the company can earn before the capital is deployed.

Given this set of assumptions, we estimate the cost of carry to be around 4-5% of the value of equity issued.

As the existing precedent of using 5% as the cost of equity issuance focuses on direct costs, and does not appear to include carry costs, we suggest that 5% can be considered a lower bound given to the companies issuing equity, and that a complete allowance for all costs could be closer to 9%-10%.

ANNEX B EQUITY FINANCEABILITY

In this Annex we consider key issues for equity financeability at PR24. Throughout we highlight points that are of relevance for listed water companies, and emphasise risks of adopting a one-size-fits-all approach to equity financeability in a sector that has a range of ownership models.

This Annex is structured as follows:

- We first outline the draft methodology proposals that relate to equity financeability;
- We then discuss ownership models in the sector, highlighting benefits that are derived from having pure-play listed stocks; and
- We conclude with factors Ofwat should consider in order to ensure their methodology supports a range of financing models.

Draft methodology proposals

Ofwat has not given detailed consideration to equity financeability and dividends in the Draft Methodology. Ofwat makes reference to the PR19 approach to dividends – noting that it set out a base dividend yield of 4% as being reasonable for a company with little RCV growth – but does make proposals specific to PR24. Ofwat notes that, "*where a company must finance material growth of the asset base*", then it may need to reduce base dividend.[73] Ofwat also, more broadly, makes references to an expectation that equity will play a greater role in the sector.

Other proposals in the Draft Methodology also suggest that companies will have less cash flexibility. Specifically, Ofwat is proposing a more restrictive RCV run-off range, and highlights that will set out what this range is in the final methodology.

We also note that Ofwat's recent Financial Resilience consultation also sets out proposals for tightening conditions around paying dividends.

Overall, these proposals indicate companies could have less cash flexibility and will be more constrained in terms of dividends they can pay, particularly where RCV growth is higher.

Ownership models and benefits from plurality that includes pure-play listed companies

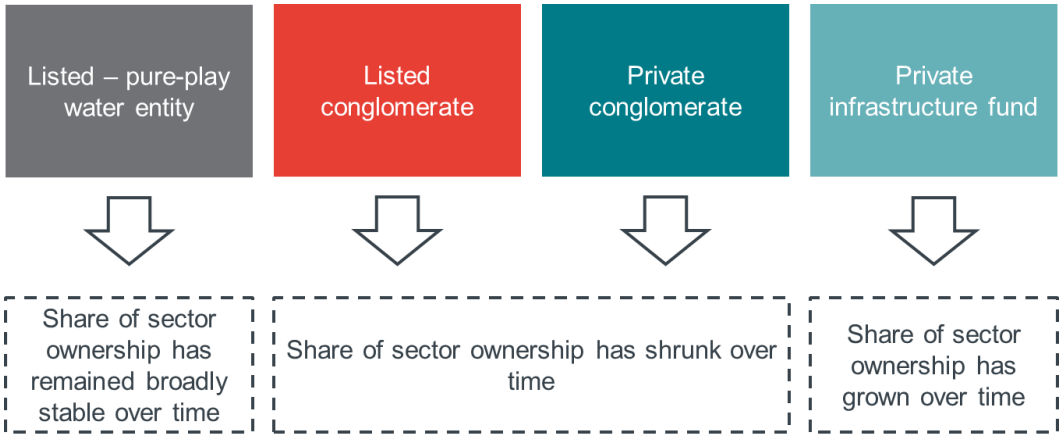
Ownership models

There are a range of ownership models in the water sector in England and Wales, and their share of the sector has changed over time. In Figure 39 we set out four categories of ownership model that have been present in the water sector. These are:

[73] Ofwat PR24 Draft Methodology, Appendix 10, pg.40

- Listed pure-play water entity – where the majority the entity that is listed is engaged in regulated water sector activity.
- Listed conglomerate – where the regulated water sector activity is one part of a larger listed entity that may have activity in other utilities or sectors.
- Private conglomerate – where the regulated water sector activity is one part of a larger entity that is not listed that may have activity in other utilities or sectors.
- Private infrastructure fund – where the regulated water business, and its associated corporate structure, is owned by a single or small number of private infrastructure (or similar) funds and is not part of a larger group.

Figure 39 Sector ownership models



Source: Frontier Economics

As shown in Figure 39 the proportion of the assets in the sector under the conglomerate models has shrunk over time. Over time private infrastructure funds have played a greater role. And in recent years the share of sector ownership in pure-play listed water entities has remained broadly stable.[74]

Benefits from pure-play listed companies in the sector

Below we outline the benefits that are connected to having some pure-play listed companies in the sector, we go on to illustrate the factors Ofwat should consider in order to continue to support plurality of ownership models in the sector – including listed companies.

We group the benefits associated with listed pure play water entities into four categories: governance, investor base, information and equity market infrastructure.

- Governance -
  - Listed companies have governance and reporting structures that give the sector more plurality and provide Ofwat with higher frequency information. For example, many listed companies have quarterly reporting.
  - Listed companies may also have differences in governance style and corporate purpose that cannot be replicated by Ofwat.

[74] There has been some growth from mergers between listed WaSCs and non-listed WoCs in recent years. For example, the acquisition of Bournemouth Water and Bristol Water by Pennon. Pennon's recent disposal of Viridor also means it now more akin got a pure-play entity.

- Listed companies may also respond differently to certain regulatory incentives, which can be helpful in providing information to Ofwat.

- Investor base -
  - Listed companies provide opportunities for wider and more direct ownership, which can help support trust and credibility in the sector.
  - Differences in investor base may also help supporting assessments of financial resilience – as differences in credit metrics may help dis-entangle qualitative and quantitative drivers of credit ratings across the sector.
- Information -
  - Betas, a fundamental component of the CAPM model that Ofwat apply, cannot be directly estimated for the water sector without pure-play listings. In the absence of such observations, there could be heightened perception of regulatory risk, as data from other sectors, or internationally, would play a greater role and be open to wider interpretation.
  - Listed companies provide real time information on equity values. This can be useful in a range of situations, for example, to Ofwat in assessing the impact of their decisions and announcements.
  - Both of these benefits derive from having a few listed pure play entities, the gains diminish after a certain point as more and more companies are listed.
- Equity market infrastructure
  - In the absence of listed companies the level of research and market awareness of issues in the sector would fall – which may increase barriers to financing or re-listing in future.

Given these benefits, we think there are several factors Ofwat should consider when assessing financeability.

Factors for Ofwat to consider

As explained in Section 2, the long-term challenges facing the water sector may require significant investment in the next several years, creating RCV growth. There are limits on how much financing can be provided by the cash flows that businesses in the sector generate from their operations, this means the WACC needs to be set at a level that can attract the requisite financing in the form of new debt and equity.

The limits of financing asset growth from cash generated from operations are shown in the illustrative example below. Using a simplified set of assumptions, as long-run RCV growth rises, the maximum proportion of the allowed return on equity that can be paid out to shareholders decreases if that cash is being used to fund RCV growth.

Figure 40 Payout ratio and RCV growth

RCV growth	Allowed equity return	Max. payout ratio[75]
1%	5%	80%
3%	5%	40%
5%	5%	0%

Source: Frontier calculations

Note: 5% cost of equity an illustrative assumption for presentation purposes

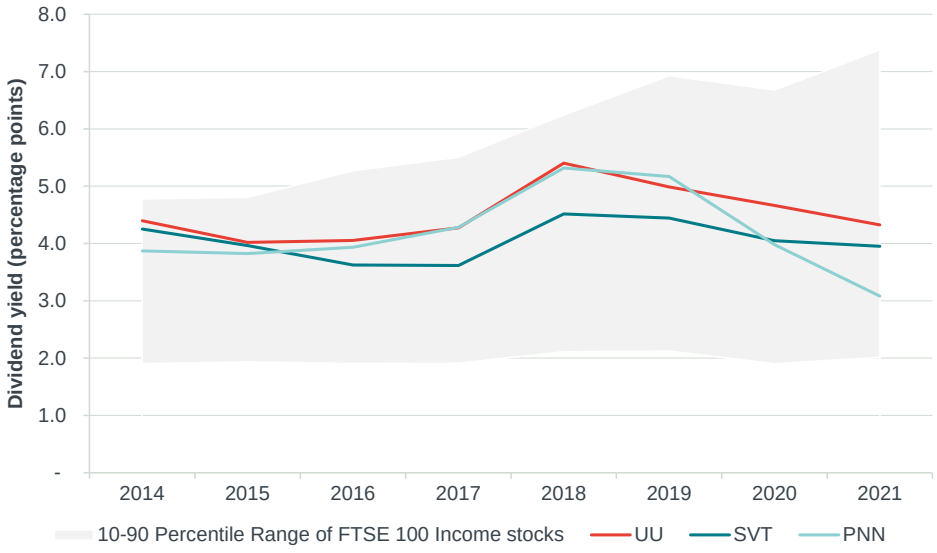
Building on this illustration, Ofwat cannot consider that dividends are perfectly malleable and that changes to dividends are costless. In the case of listed companies, evidence from market data and academic studies shows why this is not costless and why a pragmatic approach is required.

Market data

The stability of utility company cash flows relative to many others sectors means that listed utility companies, including water utilities, are perceived as 'income stocks'. Over time they have attracted an investor base that has preferences for holding assets in this category.

As shown in Figure 41 the dividend yields of listed water stocks in recent years has been in-line with those paid by other companies in the UK stock market that are often considered as being in the income stock category (where the 10th to 90th percentile range of other income stock is shown by the shaded area). The range of other income stocks also shows that it is rare for companies in this category to have a dividend yield below 2%.

Figure 41 Dividend yields of water and income stocks



Source: Bloomberg, Frontier calculations

Note: Shaded area shows 10th to 90th percentile range of other stocks taken from the FTSE 100, dividend yields annualised based on dividend frequency, abnormal dividends not included

[75] We note that the maximum a company can pay out in reality is the real return that it earns, which does not include the RCV inflation indexation.

This chart demonstrates that there is limited flexibility on dividend yields for stocks in this market grouping. Investor preferences for dividend stability are also demonstrated by academic evidence, which we summarise below.

Academic evidence

Academic evidence shows that many corporations have a strong commitment to maintaining a stable level of dividends. For example, Farre-Mensa et.al (2014) surveyed the literature on payout policy, and found that:

- The market responds positively to pay-out increases and negatively to pay-out decreases.
- Dividends exhibit stickiness and are smoothed over time, particularly among large and profitable firms. This is in contrast to share re-purchases which are heavily pro-cyclical and are smoothed to a much lesser extent.
- The fact that dividends exhibit stability is widespread has been known for a long time – and refer to studies highlighting this going back to the 1950s.

The literature also shows that a key change in pay-out policy over the last few years has been the increase in stock re-purchases, but we consider this finding is likely to be of less relevance for a more stable sector with a requirement for significant investment and new financing.

Key difference for Ofwat to recognise in the PR24 methodology

Given the benefits that derive from having pure-play listed entities in the sector, we consider it important that Ofwat takes a pragmatic approach to dividend policy and equity financeability for PR24. Which recognises the plurality of ownership models in the sector. Key differences for Ofwat to recognise are:

- Dividend stability -
  - Dividend yields provided by listed water companies may need to maintain a degree of consistency over time in order to fit into the ‘income stock’ category and be aligned with the preferences of their investor set.
  - Ofwat cannot assume that forgoing dividends, or greater variation in dividends is costless. Market practice and academic evidence shows that that there are risks with assuming dividends are highly malleable.
- Financing RCV growth -
  - There are limits to how much RCV growth, where gearing is kept broadly stable, can be financed by forgoing or cutting dividends. This means that appropriate provisions for equity issuance need to be put in place – this includes cash costs of equity issuance – which may be different for listed companies.
- Marginal vs average -
  - If the cost of new equity is higher than the cost of existing equity – then a rights issue increases the average cost of equity overall. This may not be readily observable in the beta evidence in the market today.

- Lower gearing -
  - The listed companies have tended to have lower regulatory gearing, Ofwat therefore needs to be careful about 'one-size-fits-all' remedies to financial resilience issues that they perceive.

Ofwat should consider these factors in order to ensure their methodology supports a range of financing models.

ANNEX C CROSS-CHECKS ON THE COST OF EQUITY

Introduction

Ofwat proposes to rely on cost of equity implied by the Market to Asset ratios (MARs) to cross-check its CAPM COE estimate. However, Ofwat's interpretation of the evidence needs to be cognizant of the drawbacks associated with the MAR analysis. We spell out in detail what the key issues are with the MAR evidence and propose alternative versions of market-valuation based cross checks that are more robust than the MAR analysis.

We recognise that no single cross-check which has been discussed in recent regulatory debate is sufficiently robust on its own to challenge the CAPM estimate. However, a suite of reasonable cross-checks can collectively provide helpful insight to inform a regulator's decision on CoE settlement for companies.

In this paper, we propose that Ofwat consider two further cross-checks:

- Dividend Growth Model
- Profitability checks

In the remainder of this section, we:

- Describe the approaches. For the MAR cross-check, we discuss how this has been used in recent regulatory debates and suggest improvements.
- Explain the key uncertainties and drawbacks of each approach; and,
- Show the evidence on cost of equity implied by each approach.

As a final step, we discuss the balance which should be ascribed to the CAPM vs cross-check evidence, and on this basis, conclude if the cross-check evidence presented in this paper implies any reconsideration of the CAPM derived CoE.

Market to Asset Ratio (MAR)

Definition of MAR and its use in recent regulatory precedents

A MAR expresses the enterprise value of a given company as a multiple of its RCV.[76] In other words, if a MAR is 1.1x, this means that prospective investors would pay £1.1 per unit of RCV. The MAR has featured frequently as a CoE cross-check in recent regulatory settlements decided by Ofgem, Ofwat, and the CMA.

For example, Ofgem has used MAR evidence to suggest that its RIIO GD2/T2 COE was sufficient, and if anything too high, i.e. that it should set a price control designed to move MAR closer to 1. The (flawed) logic underlying this decision is the regulatory settlement, including the allowed return, causally drives the market valuation of regulated utilities, and thus, a regulator should set an allowed return to equate the market value to the accounting value of the regulatory asset base.

[76] PR24 Draft Methodology, Appendix 11, A1.1.5

The MAR cross-check was appealed by all companies in 2021 Energy Appeals, but the CMA found that Ofgem was "not wrong" in this respect.[77]

Ofwat also considered MARs at PR19. At PR24, Ofwat intends to continue considering the MAR as a cross-check, but would place less weight on Pennon evidence as it is not a pure-play water company.[78]

Use of MAR as a cross-check and its drawbacks

It is not unreasonable for a regulator to cross-check the results of the CAPM using market-based relative valuation metrics, as well as monitor the valuation levels of the entities it regulates.

However, these cross-checks should be interpreted with care and we need to be clear on the main drawbacks of the MAR evidence before drawing meaningful conclusions on the appropriate level of allowed returns:

- First, MAR evidence is by definition market valuation based evidence and therefore only reflects short-term market conditions and is prone to high volatility.
- Second, MARs can only be computed for UK regulated entities, and only looking at the valuation ratios of regulated companies does not provide any indication of wider market sentiment which can affect MARs observed.
- Third, and most importantly it is wrong to simply use a prior belief as what the appropriate level of MAR should be and draw conclusions on the allowed return when we observe a MAR different from that prior belief.

We believe it is on this point that GB regulators have erred in recent regulatory judgements regarding the interpretation of the MAR evidence. More specifically, regulators have set a prior belief that, if the regulatory price control is set fairly, then the efficient notional company should have a MAR equal to 1. The logical extension of this is that a MAR higher than 1 implies a company which is expected by investors to outperform its regulatory assumption, either on cost and incentives or on the cost of capital.

However, this prior belief, while sounding perfectly plausible in theory, may not be true in reality. Even if the regulator forecasts all aspects of the price control accurately (including totex) and all investors believe in expectation the outturn spend of regulated networks is equivalent to the expected spend and there is no room for any outperformance, for MAR to be equal to 1, the following conditions must be met: .

[77] CMA, 28 October 2021, Cadent Gas Limited, National Grid Electricity Transmission plc, National Grid Gas plc, Northern Gas Networks Limited, Scottish Hydro Electric Transmission plc, Southern Gas Networks plc and Scotland Gas Networks plc, SP Transmission plc, Wales & West Utilities Limited vs the Gas and Electricity Markets Authority, Final determination, Volume 2A: Joined Grounds: Cost of equity.

[78] *"While noting that Pennon will fit this category following its recent sale of Viridor, for our early view of the allowed return next year, we anticipate placing limited weight on its data – mainly because of its relatively short tenure as a pure play company from the point of the Viridor sale (28 March 2020), compared to the equivalent Severn Trent and United Utilities tenures extending back to 2006."*

Ofwat, PR24 and beyond: discussion paper on risk and return. https://www.ofwat.gov.uk/wp-content/uploads/2021/12/PR24-and-beyond_Discussion-paper-on-risk-and-return.pdf

i. Markets are efficient. This means that there needs to be perfect information, there are no taxes, transactions are frictionless, and there is no information asymmetry.

ii. All investors are perfectly rational and have perfect foresight. They also all need to employ the identical fundamental valuation approach for regulated networks.

These conditions clearly do not hold in reality. If they did, we would not see as much stock market fluctuation as we do, including bull markets and bear markets, driven by market sentiments and momentum. These factors are unpredictable and certainly outside the regulators' control.

It is therefore problematic to interpret the MAR evidence in relation to a prior belief which is clearly not present in reality. Any conclusion drawn from such exercises are likely to be highly speculative and inaccurate. More specifically, when we observe a MAR higher than 1, this does not necessarily mean that the stock is outperforming in the eyes of investors. In a bullish market, a MAR higher than 1 may be the expectations and the stock may even be underperforming the market and vice versa. The only way to find out if a stock is out- or under-performing is to a relative valuation comparison. We turn to this alternative valuation-based cross check below.

Regulators should take a broader view when conducting relative valuation as a cross-check

If Ofwat should not compare the MAR to 1, then what should it compare the MAR to? The answer is it can compare the valuation of the regulated utilities with the market and with relevant benchmark peers or indices.

We note that the MAR cannot be computed for non-regulated companies without a RCV. This makes comparing valuation levels of regulated utilities with the rest of the market on the basis of the MAR impossible. However, Ofwat can rely on other established valuation ratios which can be compared across.

Generally accepted valuation ratios such as the Price-to-Earnings (P/E) ratio as well as the Enterprise Value-to-EBITDA ratio, do a decent job in assessing whether regulated utilities outperform the rest of the market. This is in fact what equity analysts do on a daily basis when they issue guidance on buy and sell advices to investor clients. These valuation metrics do not require a prior belief which hinges on unrealistic assumptions on market being perfect, as in the case of assuming MAR equals 1. We now turn to these in a bit more detail.

The Price to Earnings (P/E) ratio is the stock price divided by the company's earnings per share for a designated period, generally the past 12 months. The Enterprise Value to Earnings Before Interest, Tax, Depreciation and Amortisation (EV/EBITDA) ratio is simply the quotient of the two, and the last 12 months of EBITDA is generally considered.

The P/E ratio is the most popular metric for considering the relative valuation of equity; and the EV/EBITDA can be considered a good supplementary metric to the P/E ratio as the EBITDA figure contains fewer accounting adjustments.

We can look at these ratios for regulated utilities and check against those of the rest of the market to check if:

- regulated utilities' valuation ratios move in line with the market; and,
- the magnitude of utilities' valuation ratios are in line with or lower than the rest of the market (e.g. median or average demonstrated by the market);

We note that our proposed analysis is not intended as a precise exercise: to do so, we would need to know with confidence the "right" level of valuation ratios for regulated utilities. However, we would expect regulated utilities to have valuation ratios which are in line with the market median/average or slightly lower, as they are generally considered to be income stock thus trade at lower valuation multiples as the market as a whole.

Methodology

In this section we outline our methodology, which broadly consists of constructing the dataset, computing the ratios of interest, and finally, considering how regulated utilities are positioned relative to the rest of the market.

The first step is to construct the relevant dataset. Since our intention is to assess regulated utilities' market valuations relative to the broader market, we consider all companies that were present in the FTSE100 over the period of interest, which is January 2010 – June 2022. In this context, the regulated utilities group consists of the five regulated utilities traded on the FTSE which are National Grid, Severn Trent, United Utilities, Pennon, and SSE. We consider FTSE100 firms suitable for the analysis at this stage, as regulated utilities have frequently been in the FTSE100 and this index contains a list of reputable firms with long histories which can be traced back for more than 10 years. A wider index such as FTSE all share could contain more "growth" stocks with higher PE making the comparison less meaningful.

We then compute the basic ratios. The P/E ratio is simply the stock price at the end of the financial year divided by the earnings per share accrued in that financial year; a similar calculation is conducted to derive the EV/EBITDA ratio.

We note that earnings data has been observed to be volatile. This is due to short-term fluctuations in company performance or arbitrary accounting adjustments. As such, we consider the Cyclically Adjusted Price to Earnings ratio (CAPE),[79] which instead takes the average of the last 10 years of earnings instead of the earnings accrued in the last financial year, adjusted for inflation. Practitioners consider that using average earnings over the last decade helps to smooth out the impact of business cycles and other events, and gives a better picture of a company's sustainable earning power. In our case, this helps to provide a more stable and long-term view of whether utilities are over- or undervalued relative to the rest of the market. The same cyclical adjustment can be applied to the EV/EBITDA ratio.

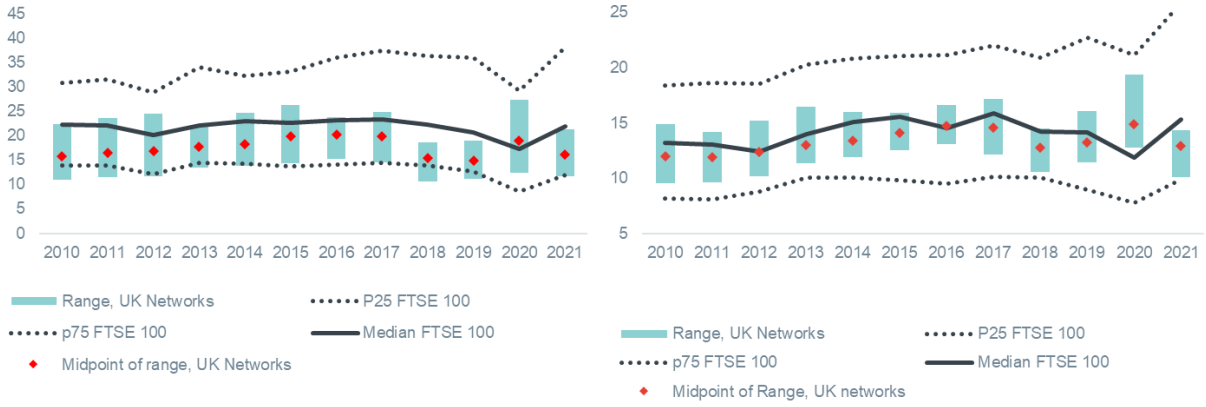
As a final step, we consider the position of regulated utilities relative to the rest of the market. We consider the average, 25th, 50th and 75th percentile of the market ratios as guides.

[79] The CAPE was introduced by Professor Robert Shiller in 1988. https://indices.barclays/IM/21/en/indices/static/shiller.app

Findings

The figures below show the range (minimum and maximum) of the Cyclically Adjusted P/E and EV/EBITDA ratios on UK regulated networks. This is compared against the P25 and P75 (interquartile range) of the same ratios for other FTSE 100 companies over the same period.

Figure 42: CAPE and Cyclically Adjusted EV/EBITDA, UK networks vs P25, P50 and P75 of CAPE of other FTSE 100 companies



Source: Bloomberg, Frontier Analysis

After adjusting for short-term noise in earnings, the range of UK Networks P/E ratios lie in the lower end of the P/E range demonstrated by FTSE 100 companies, i.e. between the P25 and the median. This is broadly true for both the P/E and EV/EBITDA ratio, although it is less consistent for the latter. The mid-point of the EV/EBITDA ratio is systematically slightly less than the FTSE100 median and tracks the market trend very closely.

The above results show that the valuation of regulated utilities moves in line with wider market and sits where one would expect regulated utilities to sit within the wider market. There is very little evidence in this relative valuation analysis that suggests that regulated utilities are outperforming the rest of the market. This is in contrast with the conclusion drawn from looking at MAR evidence where the prior belief is that MAR should be 1, where some higher MARs have been recently interpreted as an indication that the regulatory settlement is too generous.

Dividend growth model (DGM)

Introduction to the DGM

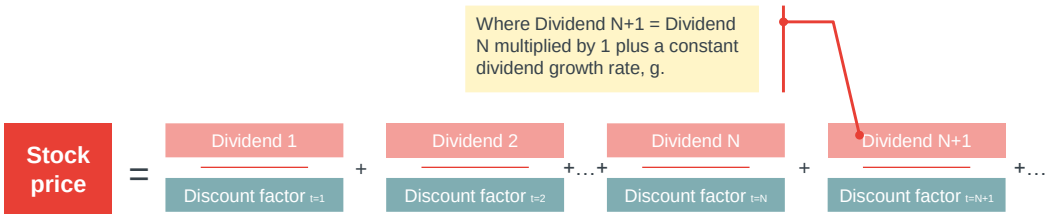
The Dividend Growth Model (DGM) is a well-established, market-implied, forward-looking methodology used for valuation assessment or to estimate the implied the cost of equity given market valuation.

The DGM is a model used to value a company's stock price. It is based on corporate finance theory: the stock price of a company is equal to the present value of the sum of all of its future dividend payments discounted by an appropriate rate. The rate used to discount is an estimate of the cost of equity for that company. If

the stock price and future dividend payments are known, the DGM can be used to backward engineer the cost of equity.

Figure 43 presents a simple visual representation of the DGM.

Figure 43 Visual representation of the DGM



Source: Frontier Economics

Why the DGM is a relevant cross-check

If a regulator wants to consider up-to-date market-implied evidence when setting the cost of equity, the DGM methodology provides a more reliable approach than other alternatives, including the MAR. This is because:

- The DGM model is based on the well-established corporate finance principle that values stock at the present value of all its future discounted dividend payments (the Discounted Cash Flow or DCF model); instead, the MAR does not consider forward cash flows.
- The DGM model does not require any prior beliefs to be made on what an appropriate or target cost of equity should be. Instead, as explained above, the approach adopted by Ofwat and other regulators to use the MAR requires a prior judgement of what an appropriate MAR value should be.

As all other cross-checks, the DGM has some drawbacks. These drawbacks can be addressed as indicated below.

- **Circularity issue**. Relying on the DGM to set the allowed cost of equity would cause a circularity issue. The issue of circularity stems from the fact that i) dividend forecasts depend on the expectations of future regulatory provisions, which are going to be decided by the regulator; and ii) the dividend forecast can influence the regulatory determination if the DGM (which relies on dividend forecasts) is used to set the allowed cost of equity. This circularity issue exists only if the DGM is used to set the allowance. We are not proposing to use the results of the DGM to set the cost of equity allowance, but only as a cross-check.
- **Sensitivity to long-term dividend growth.** The results of the DGM depend on the assumption around the long-term dividend growth. The sensitivity of the results can be addressed by considering a range of results estimated using a range of plausible assumptions about the long-term dividend growth.
- **Volatility of results.** The DGM provides a short term valuation metric, relying on share prices which can be volatile from one period to the next. DGM estimates can therefore move substantially within a short period of time. The same issue exists for all short-term market-implied cross-checks, including the MAR cross-check proposed by Ofwat. For this reason, consideration should be

given to the volatility of the results when weighting the evidence from these types of cross-checks.

Therefore, the DGM should be added as part of the evidence base that is used to cross-check the cost of equity estimates.

Our approach to estimating the cross-check using the DGM

For our cross-check, we used the DGM methodology to derive a range of plausible cost of equity. We estimate the cost of equity for the 5 UK regulated network companies that are listed.

We consider a two-stage DGM, which assumes that dividends grow at different rates over two periods:

- Stage 1: Dividend payments for the years 2023-2025.
- Stage 2: Dividends for 2026 onwards. The DGM results are primarily driven by this stage of the model.[80]

The dividend payments in Stage 1 of the model are based on the companies' stated dividend policies, according to their recent annual reports. These are summarised in the figure below.

Figure 44 Latest dividend policies by company

Company	Dividend policy
United Utilities	Annual growth rate of CPIH
Severn Trent	Annual growth rate of CPIH
Pennon Group	Annual growth rate of CPIH + 2%
National Grid	Annual growth rate of CPIH
SSE	Annual growth rate of RPI up to FY 2023/24, re-basing at 60p in FY 23/24 then annual increases of 5%

Source: *Companies' annual reports.*
United Utilities *– Annual Report and Financial Statements March 2021. Available: https://unitedutilities.annualreport2021.com/media/kfbh3hec/30054-united-utilities-ar21-full-report.pdf*
Severn Trent *– Annual Report and Accounts 2022. Available: https://www.severntrent.com/content/dam/stw-plc/shareholder-resources/2022-reports/ara-report-2022.pdf*
Pennon *– Full Year Results 2021/22. Available: https://www.pennon-group.co.uk/system/files/uploads/financialdocs/pennon-fy22-results.pdf*
National Grid *– Annual Report and Accounts 2021/22. Available: https://www.nationalgrid.com/document/146731/download*
SSE *– SSE PLC Annual Report 2022. Available: https://www.sse.com/media/y5ohomz3/38530-sse-ar2022-web.pdf*

The dividend payments in Stage 2 of the model are derived by increasing the 2025 dividend forecast from Stage 1 by a long-term real dividend growth rate assumption.

Long-term dividend growth forecasts are less certain, so for each company we have considered three growth scenarios, which are summarised in the table below. This mitigates the risk that conclusions are driven by a particular growth scenario assumed.

[80] For example, the present value of the dividends cash flow over Stage 2 account for approximately 86% - 92% of the present value of all dividend cash flows across Stage 1 and Stage 2, depending on the company and long-term growth scenario considered.

Figure 45 Long-term dividend growth scenarios considered

Scenario	Real long term dividend growth rate	Description
Low	0%	Dividends are assumed to be constant in real terms at 2021 levels, i.e. no real growth in the long term.
Base	0.69%	Dividends are assumed to grow at UK long term real dividend growth rate, averaged over 1900-2021. (*Source: DMS 2022 Yearbook)*
High	1.65%	Dividends are assumed to grow at a real rate equal to the OBR's forecast of real GDP growth in 2026.

Source: Real GDP growth is from the OBR's Historical Official Forecasts Database (March 2022).

The low scenario assumes no real dividend growth over the long-term. We consider this scenario a rather conservative scenario as two of the five companies consider expect to have a positive real dividend growth to 2025, and the UK long-term real dividend growth is 0.69%.

A full discussion of the DGM analysis and forecasts that we have used, together with detailed findings can be found in the technical section at the end of this section.

Our key findings

What the DGM cross-check tells us about cost of equity

Figure 46 below presents the implied real cost of equity from the DGM cross-check for the 5 companies under consideration. The values are averages of the cost of equity derived for each working day over the period April 2022 – June 2022. To ease comparison with Ofwat's PR19 estimate, we estimated the cost of equity for a notional company with 60% gearing. We used the same risk free rate used by Ofwat at PR19 and assumed a debt beta of zero.

Figure 46 Implied ranges of cost of equity from the DGM cross-check

Company	Low case scenario	Base case scenario	High case scenario
Pennon Group	4.6%	5.4%	6.5%
Severn Trent	5.0%	5.9%	7.0%
United Utilities	5.2%	5.9%	7.0%
National Grid	5.7%	6.4%	7.5%
SSE	6.8%	7.9%	9.5%
Range (water only)	**4.6%-5.2%**	**5.4%-5.9%**	**6.5%-7.0%**

Source: Frontier Economics

Note: Figures are in CPIH-real terms

The DGM cross-check indicates an implied cost of equity of 5.4%-5.9% (based on water companies only) in our base case scenario for long-term growth. In the most conservative scenario considered, which assumes no real dividend growth in the future, the evidence suggests an implied cost of equity for the water companies of between 4.6%-5.2%, with a mid-point of 4.9%.

In its Final Determination for PR19, Ofwat explain that their point estimate for the cost of equity, 4.19%, is within the range of 3.16% to 5.11% recommended to them by their consultants, Europe Economics.[81] The results of the DGM cross-check support a much higher range than the range considered by Ofwat. This is particularly true for the lower bound of the range, which is 1.44 percentage points higher in the most conservative DGM cross-check than Ofwat's lower bound.

The DGM analysis also shows that the cost of equity for the energy companies is higher than the cost of equity of the water company. This matches our expectations, given that the energy networks' systematic risk exposure is higher than that of water companies due to the structural changes that the energy networks will face in the near future.[82] This empirical finding increase the confidence we can place on our analysis.

Implied long-term dividend growth consistent with Ofwat's allowed cost of equity

To check the reasonableness of Ofwat's PR19 cost of equity, we have used the DGM model to calculate the implied the long-term real dividend growth required for the estimated real cost of equity to be 4.19%.

Figure 47 below presents our findings. The table shows that according to the DGM model the long-term real dividend growth consistent with Ofwat's 4.19% is a negative real growth of between -0.35% to -1.61%. A negative long-term real dividend growth from the current nominal dividend yield of 4%-5% levels would imply a decrease in the RCV or operating profit of the companies in the long term, which is clearly in contradiction to the general expectation that the water sector will continue to grow in order better tackle environmental issues and cater for the growing population.

Figure 47 Implied long-term real dividend growth required for DGM real cost of equity to be equal to 4.19%

	Implied long-term real dividend growth
Pennon Group	-0.35%
Severn Trent	-0.70%
United Utilities	-0.90%
National Grid	-1.61%
SSE	-1.35%
Range (water only)	**-0.35% to -1.61%**

Source: Frontier Economics

Technical section – DGM methodology, assumptions, and detailed findings

In this section, we provide details of the methodology and assumptions we have used to derive our cost of equity figures during DGM. We then present detailed findings.

Estimation of DGM implied cost of equity

[81] Ofwat PR19 Final Determination (page 19). https://www.ofwat.gov.uk/wp-content/uploads/2019/12/PR19-final-determinations-Allowed-return-on-capital-technical-appendix.pdf

[82] We have discussed this topic in our September 2020 report 'Estimating beta for RIIO-2'. https://www.nationalgrid.com/electricity-transmission/document/134626/download

We use a two-stage DGM approach to estimate a raw cost of equity. A two-stage DGM approach assumes that dividends grow at different rates over two periods:

- Stage 1. Dividend payments from financial year 2023 to financial year 2025.
- Stage 2. Dividend payments from financial year 2026 onwards.

Our DGM model equates the stock price to the present value of the dividends paid over these two periods. The companies in our sample pay both an interim dividend and a final dividend, so Stage 1 of our DGM model distinguishes between these two types of dividends.

In formula, our DGM model can be specified as follows:

$$P_t = \sum_{i=2023}^{2025} \left(\frac{DPS_i^{interim}}{(1+r_t)^{d_{i,t}^{interim}}} + \frac{DPS_i^{final}}{(1+r_t)^{d_{i,t}^{final}}} \right) + \left(\frac{DPS_{2025}\,(1+g)}{r_t - g} \right) \left(\frac{1}{1+r_t} \right)^{d_{2025,t}^{final}+1}$$

Where:

- P_t is the stock price at time t.
- i is the year starting on 1 July of calendar year $i-1$ and ending on 30 June of calendar year i.
- $DPS_i^{interim}$ is the forecast of the interim dividend per share for year i expressed in prices at time t. For example, $DPS_{2023}^{interim}$ is the forecast of the interim dividend per share paid in year 2023.
- DPS_i^{final} is the forecast of the final dividend per share for year i expressed in prices at time t. For example, DPS_{2023}^{final} is the forecast of the final dividend per share paid in year 2023.
- DPS_{2025} is the forecast of dividend per share over year 2025, expressed in prices at time t. It is the sum of the interim dividend per share and final dividend per share over year 2025.
- $d_{i,t}^{interim}$ is the distance in years between the date when the interim dividend is paid and t.
- $d_{i,t}^{final}$ is the distance in years between the date when the final dividend is paid and t.
- g is the real growth rate in dividends from financial year 2026 onwards. We have assumed that these dividends are paid one year after the previous dividend is paid.
- r_t is the implied raw cost of equity in real terms.

We calculated the raw cost of equity in real terms. To do so, we expressed the dividend forecasts in prices at time t. We have done so by deflating the dividend forecasts by the expected inflation between t and the day when the dividend is

forecast to be paid. Expected inflation is based on CPI inflation forecasts from the Office for Budget Responsibility (OBR).[83]

Estimation of re-geared cost of equity

After having estimated the implied cost of equity r_t, we calculated a re-geared cost of equity r_t^* using the CAPM methodology with the Harris-Pringle equation (but assuming a debt beta of 0 for simplicity). In formula:[84]

$$r_t^* = RFR + \frac{(1 - g_t)}{(1 - g^*)} \cdot (r_t - RFR)$$

To facilitate comparison with Ofwat's estimate of cost of equity at PR19, we have used the same parameters and approach set by Ofwat:

- RFR is Ofwat's estimate of risk-free rate of -1.39%.
- g_t is the gearing at time t calculated using Ofwat's methodology. This has been calculated as the ratio between the company's net debt and the enterprise value using data from Bloomberg.
- g^* is Ofwat's notional gearing estimate of 60%.

Finally, we have averaged our estimate of re-geared cost of equity r_t^* over the period from 1 April 2022 to 30 June 2022. This mitigates the impact that volatility in share prices might have on the cost of equity.

Long term dividend forecast scenarios

We acknowledge that no dividend growth scenario will perfectly reflect the situation of the companies considered. Therefore, to mitigate the risk that the conclusions of our analysis are driven by a particular assumption around the forecast of the long-term growth in real dividends, we used three different growth scenarios where the long-term growth varies between 0% and 1.65%. We describe these three scenarios below.

Base case scenario

In our base case scenario, the long-term real dividend growth is assumed to be equal to average real dividend growth observed historically in the UK over the past 122 years (from 1900 to 2021). This is 0.69% per year. We sourced the long-term real dividend growth over this period from the Credit Suisse Global Investment Returns Yearbook 2022.[85]

Low case scenario

All dividend forecasts from financial year 2026 are assumed to be constant in CPIH real terms and equal to the 2025 dividend, i.e. no real growth in the long term.

This scenario reflects a conservative view of the growth in the forecast with respect to the companies' dividend policies, as the companies target dividends equal to or greater than inflation (as detailed in Figure 44):

---

[83] Annual CPI forecasts are sourced from the OBR's official forecast database, available at https://obr.uk/data/. We used the OBR's CPI forecasts published in March 2022.

[84] This is essentially the same process as Ofgem's de-gearing and re-gearing, only with assumed debt beta of 0 for simplicity. The ERP and asset beta terms are cancelled out in the transformation, which is why they are not featured in the formula.

[85] Credit Suisse 2022 DMS Yearbook, page 60.

- United Utilities, Severn Trent and National Grid target no real growth in the long term;
- Pennon target real growth of 2% (i.e. the dividend policy is CPIH +2%)
- SSE target a nominal growth annual growth of 5%, which is equivalent to approximately 3.4% real growth per year (if inflation is expected to be in line with the OBR's 5-year forecast of 2%).[86]

High case scenario

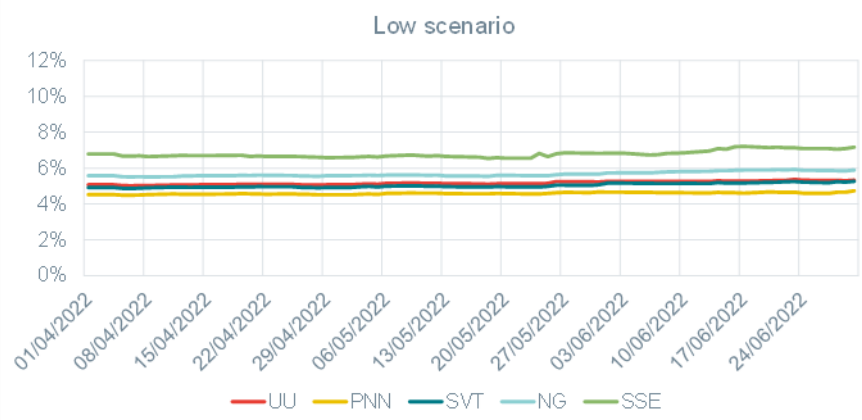
Long term dividends are assumed to grow at a real rate equal to the latest OBR's forecast of real GDP growth in 2026.[87] The latest OBR forecast at the time of writing[88] was published in March 2022 and indicates that GDP is expected to grow by 1.65% in real terms in 2026. The rationale underpinning this this assumption is that as the economy grows, the companies are expected to grow as well.

Estimates of cost of equity

The charts below shows our estimates of the re-geared cost of equity for the 5 companies and the three scenarios considered over the period April 2022 to June 2022.

As can be seen from the charts the estimates vary slightly over time, due to volatility in stock prices. However, the level and relativity of the estimates are preserved. To mitigate the impact of this volatility, we have averaged these estimates over this period. These average estimates are reported in Figure 46.

Figure 48 Estimate of real cost of equity by company and scenario



[86] See the March 2022 OBR's historical official forecasts database, available at https://obr.uk/data/.

[87] See the March 2022 OBR's historical official forecasts database, available at https://obr.uk/data/.

[88] As of 30 June 2022.

Source: Frontier Economics

Long-term profitability assessment

In this section, we discuss long-term profitability, and why it is a relevant cross-check.

In the remainder of this section, we cover the following topics in turn:

- Introduction to the concept of long-term profitability, and why Ofwat should have considered it as a relevant cross-check;
- Our proposed approach and methodology at a high level;
- Key findings from our analysis; and,
- Detailed findings which are supplementary to our Key Findings.

What is long-term profitability

While we consider that the DGM methodology has value as a cross-check, it still suffers from the same short-term market valuation based characteristic, much like the MAR and other alternative valuation metrics we proposed such as CAPE and EV/EBITDA. In our view, if the purpose of the cross check is for the regulator to take a step back and assess whether its CAPM estimates of the COE makes sense in the real world, then it would be reasonable to look into the profitability that is achieved by companies in comparator companies and wider market as a whole.

Accounting profitability metrics such as Return on Equity (post-tax profit expressed as a percentage of equity) in recent history can be informative about the level of profitability that a listed company has achieved and can be expected by the market to achieve. Given that profitability varies year-to-year due to, among other causes, the business cycle, profitability metrics are a useful cross-check when considered over the long-term (i.e. over one or more business cycles).

Why regulators should consider long-term profitability

There is a good reason why the long-term profitability of companies in the market provides a valuable cross-check for CAPM COE estimates.

The regulator does not set the outturn total return that shareholders realise from holding an equity stake in a regulated business. A shareholder's outturn total return depends on:

1. the average price for which shares were bought;
2. the average price for which shares were sold; and
3. the dividends paid while the shares were owned.

(1) and (2) depends on the valuation of the regulated business. Regulatory decisions will influence valuation to a degree, but wider capital market conditions, over which Ofwat has no control, will also exert considerable influence.

On the other hand, the regulator does have a strong influence over (3). This is because Ofwat is effectively setting the allowed level of profitability when it sets the cost of equity allowance. Conditional on the level of efficiency achieved, outturn performance against output targets, the cost of equity allowance implies a specific outturn return on equity (i.e. profitability).

Ofwat should assess how the proposed level of allowed equity returns compares to the outturn level of profitability for comparable businesses (i.e. businesses with a similar aggregate risk profile as WoCs and WaSCs). This cross check therefore provides a useful real-world check on whether or not the allowed return for the regulated companies are reasonable (or potentially too high or too low).

There are limitations to the analysis based on profitability metrics, such as the effect of financial leverage is not considered, and the question of comparability of the benchmarks. Attempting to correct for these limitations would bring the analysis back into the whelm of CAPM, which would defy the point of the cross check. It is therefore important to keep this cross check (like for all cross checks in our view) at a high level and only use it to inform whether or not the CAPM range is broadly in line with reality.

Approach, methodology and assumptions

The long-term profitability cross-check is straightforward to implement. There are three relevant considerations for the cross-check:

- we choose a measure of profitability;
- identify any necessary adjustment to ensure relative comparability of that measure of profitability with Ofwat's cost of equity allowance; and
- identify a suitable set of comparator businesses.

We have implemented the cross-check by using the return on common equity (as reported by Bloomberg). This is a post-tax, nominal measure of profitability, derived from statutory financial statements. It is well-established and transparent.

We recognise that the regulated equity is distinct from the book value equity in statutory balance sheet, and so comparing the cost of regulatory equity with the return on equity of benchmarks measured by book value is not strictly speaking like for like. However, we do not consider this discrepancy invalidates the cross-check, if we are prepared to accept that no cross check is perfect.

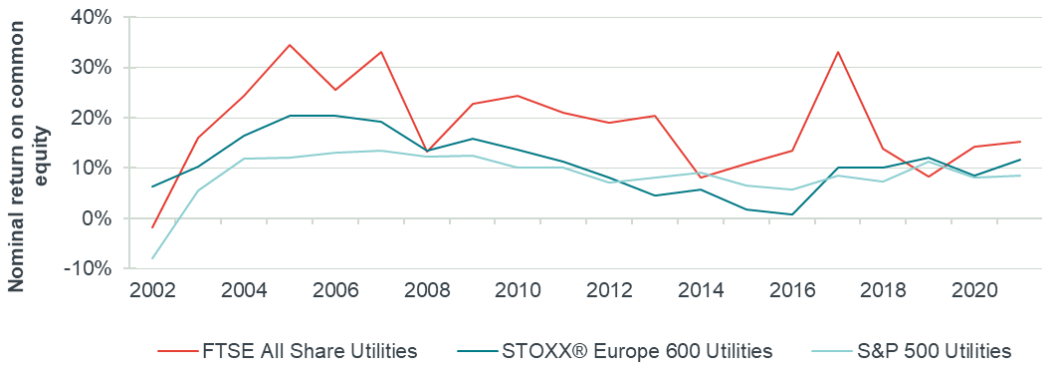
For the cross-check to be useful, we must consider long-term profitability for a suitable set of comparator companies. According to the fundamentals of finance theory, companies with similar systematic risk profiles should have similar expected returns. We therefore look at the return on common equity for utility sector indices and a set of four EU and six US comparator utilities.[89]

We calculate the (arithmetic) mean return on common equity for these utilities and indices over a period of up-to 20 year (2002 to 2021), to the extent the requisite annual data is available from Bloomberg. We present the minimum, maximum and median returns for the various 2002 to 2021 average returns. To provide further context, we also present the trends in profitability.

Results from the long-term profitability cross-check

The figure below shows the trend in (nominal) return on common equity for UK, European and US utility sector indices, between 2002 and 2021. The figure shows volatility in profitability year-on-year (particularly for the UK). Absent from the figure is a severe secular downward trend in profitability. This is an important insight and reveals that the accounting profitability of listed utility businesses has not trended downwards to a significant degree.

Figure 49 Trends in nominal return on common equity for UK, European and US utility indices

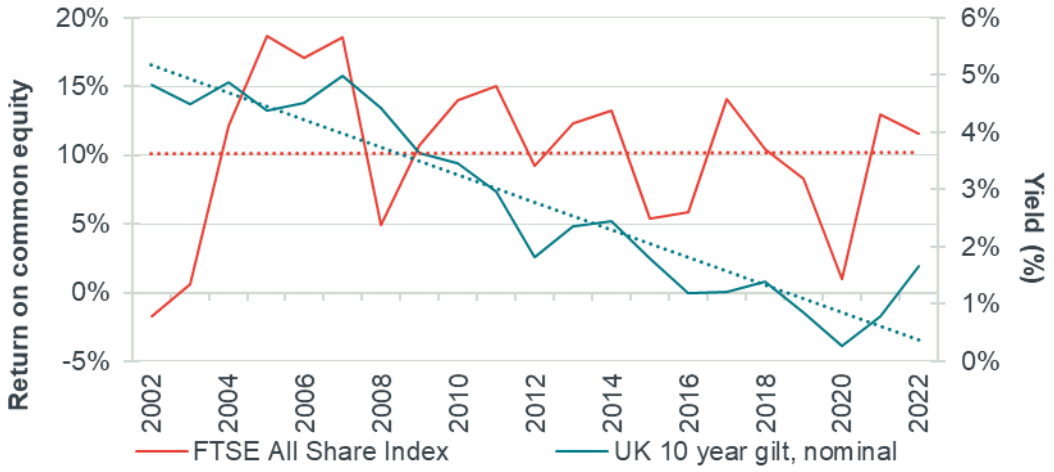


Source: Frontier Economics analysis of Bloomberg data

[89] The utilities sector indices we consult are: S&P 500 Utility Index; FTSE All Share Utility Index, and the Eurostoxx 600 Utility Index. The four EU comparator utilities are: Red Electrica Corp SA; Enagas SA; Terna – Rete Elettrica Nazionale, and Snam SpA. The six US comparator utilities are: Duke Energy Florida LLC; Florida Power & Light Co; Gulf Power Co; Tampa Electric Co, and Georgia Power Co.

We can also show that the lack of a trend in long-term profitability is not confined to the utilities sector. The red line in the figure below shows (nominal) return on common equity for the FTSE All Share Index between 2002 and 2022. The green line show the nominal return on 10-year UK Gilts (i.e. a proxy for the risk-free rate). The dashed lines show the linear trends for the respective return.

Figure 50 Trend in nominal return on common equity for FTSE Allshare index and 10-year UK Gilts



Source: Frontier Economics analysis of Bloomberg data

What these figures show is the disconnection between the so-called "lower-for-longer" interest rate environment and the belief that all assets should therefore require lower returns versus the actual profitability that businesses have been able to make within this environment. It casts doubt on the notion that regulators should set the allowed returns (profitability) of the regulated utilities firmly in line with capital market conditions.

To attract and retain capital, regulated businesses should have the opportunity to generate profits similar to comparable businesses (in terms of risk). Given that Ofwat's cost of equity allowance effectively sets the allowed level of profitability, the cost of equity allowance should be broadly in line with observed average levels of profitability in the long-term.

The table below shows the smallest, largest and median CPI-real return on common equity achieved by comparable investment opportunities averaged over 2002 to 2021 (nominal returns are converted to real terms using outturn CPI inflation figures). The benchmark includes UK, EU and US utility indices, four European utilities and five US utilities. The cost of equity allowance range implied by the cross check spans larger values than implied by Ofwat's primary methodology, CAPM.

Figure 51 Real return on common equity

Benchmark	Average 2002-2021
Low	6.4%
Median	9.3%
High	19.3%

Source: Frontier Economics analysis of Bloomberg data

Notwithstanding the potential difference in gearing levels of these benchmark companies and the difference between regulated equity and book value equity, these figures show that the allowed return set by Ofwat at PR19 can safely be regarded not too high.

A key point to remind ourselves on is the fact that the regulator does not set the return for the asset owners, instead it sets the profitability for the business. There is no guarantee that these two need to converge, as suggested by theory.

For the avoidance of doubt, we are not suggesting that the allowed return should be set at the profitability levels observed in the wider market. The added value of looking into these profitability metrics is to provide a real-life cross check for the regulators to consider whether or not the allowed return determined by its primary method, the CAPM, is broadly in line with the real world. In that sense, this is a valuable cross check to be added into the range of cross checks.

How should these cross checks be used?

No cross-check is perfectly robust, which is why they can only provide a secondary evidence base to help the regulator assess how its CAPM COE range relates to certain perspectives of the real world. Over reliance of certain cross checks, particularly those based on short-term market valuation of the assets, such as MARs especially when combined with an unrealistic prior belief, can lead to greater risks for the sector in the long run, to the detriment of customers.

Reliance on cross-checks introduces a new form of regulatory discretion into determinations, i.e. how to interpret noisy, volatile and potentially contradictory cross-check evidence.

- This in and of itself will dent investor confidence and make the sector less attractive for investors. This is particularly critical at the current environment when substantial investment is needed in the water sector.
- And it is implausible to say that regulators would use cross-checks symmetrically and would draw on them to increase the allowed returns if the numbers run the other direction. Over time this would lead to censored and asymmetric outcomes.

For all these reasons, UK regulators have always consciously avoided using such short-term market-implied evidence to set the allowed equity return. Ofwat is among these regulators, which is why it chooses to use long-term evidence as its primary evidence for setting the COE.

Furthermore, it is important for Ofwat not to lose sight of its task at hand, which is to set a fair return and profit level for companies which are regional monopolies. This is not synonymous with calibrating the price control to deliver certain levels of investor valuation (which is primarily implied by the MAR cross-check). As we have shown above, capital markets clearly experience cycles, with valuation ratios fluctuating over time. If policy objectives are aimed at somehow influencing these valuation levels, Ofwat would face challenges when the recent high valuation conditions reverse.

ANNEX D SONIA SWAP RATES AS A CROSS CHECK

We are concerned that Ofwat seems to suggest that SONIA swaps are a strong candidate for proxying the RFR. SONIA swaps are a source of evidence that Ofgem has previously considered as a cross-check to seeing the RFR with ILG yields. We had reservations about how the data was used by Ofgem, and if the data is employed by Ofwat in a similar manner, then those reservations will continue to apply.

We note that the SONIA swaps have previously been considered lacking in liquidity. And while we note Ofwat's reference to the Bank of England saying liquidity has improved, the data may continue to be volatile, particularly at longer maturities. As such, it remains our view that meaningful inferences cannot be drawn from data pertaining to long duration swaps.

Even if the data did not suffer from reliability issues, in our view a SONIA swap cross-check is of limited relevance because it is not an appropriate proxy for the risk-free rate in CAPM for the reasons provided below.

- In CAPM estimations for long-lived assets, regulators, practitioners and academics typically prefer the use of the yield on a long-term riskless bond as a proxy for the risk-free rate, rather than short-term money market instruments such as treasury bills or interbank overnight rates.
- SONIA is an interbank overnight rate at which banks lend to each other and other financial institutions, so it reflects the market conditions of short-term money market products, loans and other banking credit products.
- Long-term swap rates, as Ofgem used, are interest rate swap (IRS) derivative instrument that swaps a fixed leg of interest payment (the swap rate) with a floating leg payment (the SONIA) between two counterparties. There is no guarantee that prices derived from this synthetic product will mimic accurately a long-term riskless bond yield.
- The predecessor of SONIA, LIBOR, has never been seriously considered a proxy for the risk-free rate by any UK regulators. As such, SONIA, or a long-term SONIA swap has equally limited relevance in our estimation of the risk-free rate, even as a cross-check

It is therefore highly questionable if an interest rate swap derivative product (even with a long contract term) based on a short-term money market interbank overnight rate can be considered as an appropriate proxy for the risk-free rate to be used in the CAPM estimation of the cost of equity of regulated utilities.

frontier economics

www.frontier-economics.com