July 2022

Creating tomorrow, together: consulting on our methodology for PR24

Appendix 11 – Allowed return on capital

Ofwat

About this document

This appendix sets out further detail on our draft methodology for aligning risk and return, summarised in chapter 7 (aligning risk and return) and reflects on the views expressed by respondents to our discussion document on risk and return,[1] published in December 2021.

The focus of this appendix is our proposed methodology for setting the **allowed return**, and the **retail margin**. We also describe our proposed framework for assessment of any claims for **company specific adjustments** to our sector allowed return.

In its January 2022 Economic Regulation Policy Paper, the Department for Business, Energy and Industrial Strategy announced that the UK government would launch a review of utility regulators' statutory duties in 2022. The paper sets out that, in advance of this, regulators should work towards greater consistency, and towards a common methodology, where appropriate for setting the allowed return in price controls. The intention is that this initiative will benefit consumers, businesses and investors. We are working with other regulators to develop this common methodology, which we expect would be adopted on a forward looking basis.

The analysis in this appendix is set out as follows:

- **Section A1.1: Cost of Equity** sets out our proposals for the allowed return on equity. It covers in further detail our proposals on **risk-free rate**, **total market return**, **beta**, **approaches to de-levering and re-levering**, **cross checks to the cost of equity** and **the choice of a point estimate for the allowed return**.
- **Section A1.2: Cost of debt** sets out our proposals for the allowed return on debt. It covers in further detail our proposed approach to **embedded and new debt**, **share of new debt** and **issuance and liquidity costs**.
- **Section A1.3: Company-specific adjustments** sets out our proposals around dealing with requests for a company size-related uplift to the allowed return on debt.
- **Section A.2: Retail margins** sets out our proposed approach to retail margins and the retail margin adjustment.

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[1] PR24 and beyond: Discussion paper on risk and return

A1   Allowed return

A1.1   Cost of equity

We propose to set the allowed return on equity as an estimate of the real return required by the market to invest in the notional water company through the 2025-30 period. We will use the Capital Asset Pricing Model (CAPM) as our primary estimation framework. This represents a continuation of our approach from previous price controls and is aligned with the conclusions of the authors of the March 2018 UKRN-sponsored Cost of Capital Study ("The UKRN Study"). The cost of equity is calculated using the following equation:

$$K_e = R_f + (R_m - R_f)^* \beta$$

Where:
K_e is the expected real return on an investment in the notional water company; R_f is the expected real return on a riskless asset; R_m is the expected real return on the total market; β is the equity beta of the notional water company; and $(R_m - R_f)$ is the equity risk premium.

The CAPM is a model for estimating the market required return on an equity investment over a single period, or investment horizon. We consider this should be long-term, or around 10-20 years, and that R_f and R_m should be estimated at the same horizon, for the sake of consistency.

A1.1.1   Risk-free rate

Introduction and policy background

In the CAPM, the risk-free rate (RFR) is the rate of return on a riskless asset. It is a benchmark for other, riskier financial investments, which have higher yields to compensate investors for this extra risk. We need a proxy for the RFR because in practice no investment is truly risk-free. To estimate it, judgements are required on the following:

A) **Risk-free proxy:** Historically UK regulators have tended to use inflation-linked gilts as the main RFR proxy – as we did at PR19. This approach is aligned with the view of independent academic experts.[2]In its PR19 redeterminations, the CMA used a synthetic index involving 50% weight on RPI-linked gilt yields and 50% weight on AAA-rated corporate bond yields.[3] For its December 2020 RIIO-2 final determinations Ofgem used

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[2] Wright et al., 'Estimating the cost of capital for implementation by UK regulators', March 2018, p.8
[3] CMA, 'Ofwat price determinations, final report', March 2021, p. 790, para 9.241

the long-term SONIA swap rate as a cross check to index-linked gilt yields, noting that at 20 year horizons the CPIH-real risk-free rate was very similar.[4]

B) **Convenience yield:** It has been argued that gilts are distorted by a 'convenience yield' related to their liquidity and safety as financial assets. The CMA RIIO-2 energy panel considered on balance there was evidence of a convenience yield in government debt, however, the RIIO-2 energy panel went on say that this showed index-linked gilts could marginally be improved on rather than proof that reliance on index-linked gilts was an error.[5]

C) **Averaging period:** UK regulators have increasingly moved away from using long trailing averages (ie those reflecting several years of yield data). We note that the CMA PR19 redetermination used a 6-month trailing average which was longer than the 1 month we used in PR19.[6]

D) **Forecasting approach:** for PR19 we used the forward rates-implied increase in yields to uplift our September 2019 index-linked gilt yield to a forecast average for 2020-25. The CMA did not apply such an adjustment in its PR19 redetermination, considering that forward rates do not offer a better assessment of future spot rates than current spot rates.[7]

E) **Inflation adjustment:** In light of the UK Statistics Authority's expected reform of RPI in February 2030, an alternative to the Office for Budgetary Responsibility's view of the long-term RPI-CPI 'wedge' of around 1.0% is needed to convert RPI-linked gilt yields to a CPIH basis.[8]

[4] Ofgem, 'RIIO-2 final determinations: Finance annex', December 2020, p.30
[5] CMA, 'Energy appeals final determination, Volume 2A: Joined Grounds: Cost of equity' p.17, para 5.45
[6] CMA, 'Ofwat price determinations, final report', March 2021, p. 790, para 9.241
[7] CMA, 'Ofwat price determinations, final report', March 2021, pp. 789, para 9.234
[8] Office for Budgetary Responsibility, 'Economic and Fiscal Outlook', March 2022, p.40, para 2.26

Figure A1.1: Risk-free rate proxies in CPIH terms
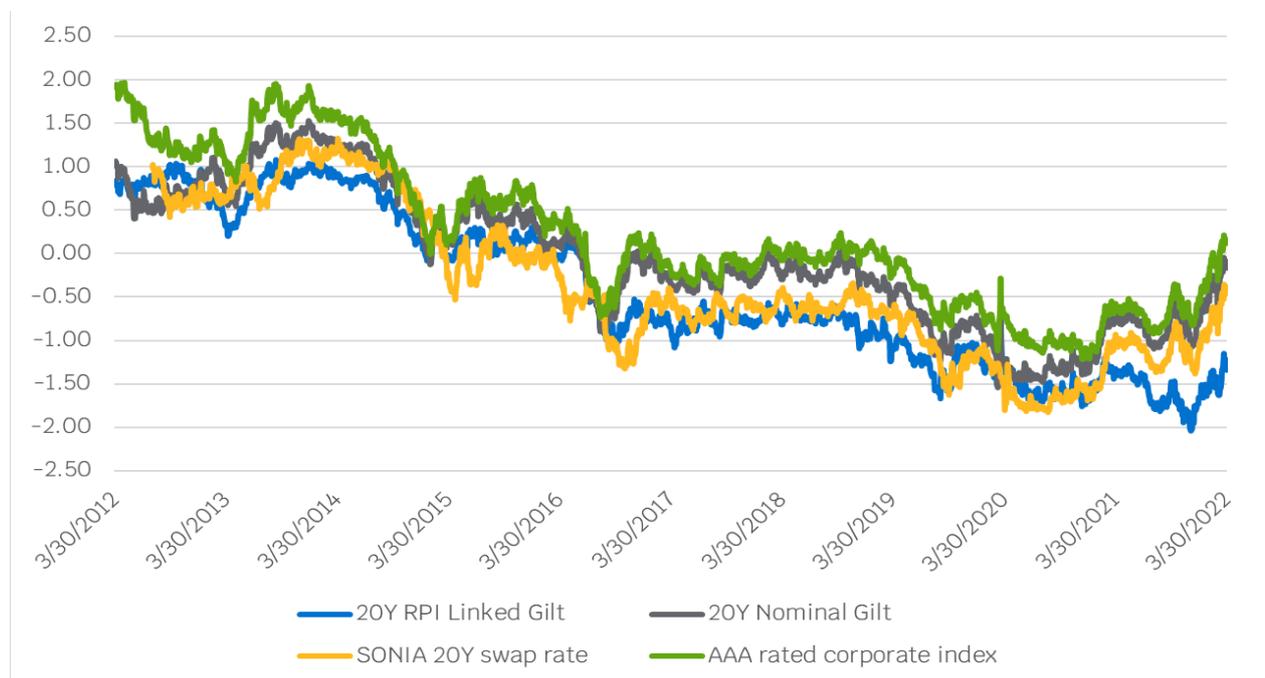
Source: Ofwat analysis of Refinitiv data
Note: Figures are converted to a CPIH basis using an assumed CPIH of 2.0% and RPI of 2.9%.

Figure A1.1 depicts the evolution over the last 10 years of various instruments which have been suggested as risk-free proxies, in CPIH terms. We have for the sake of simplicity converted yields to a CPIH basis using a long-term CPIH assumption of 2.0% and a RPI-CPIH wedge of 0.9%,[9] although the currently volatile inflationary environment means there is significant uncertainty around whether these assumptions match the true market expectation of inflation over the term of the instruments.

Stakeholder submissions and our response

A) Risk-free Proxy

Many stakeholder responses argued against the use of index-linked gilt yields as an unadjusted proxy for the risk-free rate,[10] arguing variously that:

- using gilt yields violates the CAPM requirement that the risk-free rate should be a borrowing and a lending rate for market participants;
- RPI-linked yields are artificially depressed by a 'convenience yield' reflecting the liquidity and safety of the asset.

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[9] This corresponds to the latest OBR estimate as available from Forecast evaluation report December 2019 (obr.uk), and is the same value used by the CMA in its PR19 Final Determination.
[10] Bristol Water, South East Water, iCON, Energy Network Association, Northumbrian Water, Anglian Water, Hafren Dyfrdwy, Affinity Water, South West Water, Severn Trent Water, Yorkshire Water, Southern Water.

Several responses[11] disagreed with the use of SONIA swap rates to inform the risk-free rate, arguing that there was insufficient liquidity at longer horizons and that there were other potential distortions which reduced its validity as a risk-free proxy.[12]

All proxies for the risk-free rate are affected by potential distortions which drive a yield different to that which would apply for the hypothetical pure risk-free rate, as set out in Table A1.1. Calibrating the adjustment to account for these distortions is typically subject to uncertainty and forecast risk. There is therefore a risk that any adjustment may make things worse rather than better.

We therefore propose to draw on gilt yields as our primary source of evidence for the risk-free rate. Index-linked gilts have the desirable property for a risk-free rate proxy of offering inflation protection, high liquidity and negligible default risk. This implies a comparatively limited number of potential adjustments, versus alternatives. Index-linked gilts are also the source of the risk-free rate assumption in numerous past regulatory decisions, and their use as a risk-free proxy is aligned with the recommendations of the 2018 UKRN academic study. As acknowledged later in this section, there however remains uncertainty around how to convert RPI-linked gilt yields to a CPIH basis given the UKSA's 2030 RPI reforms.[13]

Table A1.1: Risk free proxies and potential measurement issues

	Alleged non-'risk-free' features	Additional issues
RPI-linked gilts	• Convenience yield • RPI–CPIH 'wedge' (for CPIH RFR).	• N/A
Nominal gilts	• Convenience yield • Embedded inflation assumption • Inflation risk premium	• N/A
SONIA swaps	• Embedded Inflation assumption • Inflation risk premium	• Relatively new market, with changing liquidity profile.
Synthetic AAA-rated corporates index	• Embedded inflation assumption • Inflation risk premium • Liquidity risk premium • Complexity premium • Default risk premium	• Volatile years-to-maturity make it hard to align to given CAPM investment horizon. • Low sample size

We are considering employing long-term SONIA swap rates and nominal gilt yields as potentially useful cross-checks. While noting arguments that SONIA is too illiquid at longer tenors, we do not consider these concerns sufficiently serious to disqualify SONIA swap rates as a useful datapoint. Firstly, the Bank of England's June 2021 assessment was that SONIA is a

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[11] Affinity Water, Anglian Water, Bristol Water, South East Water
[12] For instance credit and default risk, and distortions arising from Quantitative Easing and regulatory requirements.
[13] The UKSA plans to align the data and methods of RPI to those of CPIH from 2030 onwards.

deep, liquid and transparent risk-free rate proxy for durations of up to 50 years.[14] Secondly, the Bank has from December 2021 started to publish Overnight Index Swap (OIS) spot curves up to 25 years (an increase from the previous 5 years),[15] after emerging evidence of improving liquidity at longer tenors following the transition from LIBOR to SONIA. The CMA in its RIIO-2 redetermination stated that it was unconvinced that the use of SONIA as a cross-check was wrong.[16] However, both SONIA and nominal gilt yields are affected by expected inflation and the inflation risk premium. In periods when these contributing factors are harder to measure, the value of these instruments as cross-checks to a CPIH-real RFR derived using RPI-linked gilts is reduced.

We do not propose to place weight on AAA-rated corporate bonds to inform our risk-free rate estimate. The CMA's PR19 redetermination used a synthetic index of AAA-rated corporate debt to inform the upper-end of its risk-free rate range because of its view that the yield was a more relevant borrowing rate to market participants than index-linked gilts.[17] This notwithstanding, the CMA's RIIO-2 redetermination agreed with Ofgem that the use of such an index was difficult to implement and defend, due to the limited number of index constituents.[18] In addition, we consider that the likely presence of liquidity, inflation, and default risk components in the AAA-rated synthetic index yield is an additional challenge to estimating a risk free rate which should not be affected by these risks.

Furthermore, drawing on a paper by Mason & Wright (2020),[19] we consider that under the CAPM framework used by the CMA (the Brennan CAPM) to justify its use of AAA-rated bonds, it is the identity of the marginal investor (ie whether they are a net lender or borrower) that should determine the level of the relevant risk-free rate in relation to the gilts rate. The representative market investor must, by definition, be a net lender; empirical evidence also shows that investment in water tends to be dominated by institutional investors managing their clients' money. This would suggest that the relevant risk-free rate under the CMA's framework lies very close to that of the index-linked gilt yield.[20]

[14] BoE, 'Deep, liquid, and transparent (DLT) assessment of the Sterling Overnight Index Average (SONIA) Overnight Index Swap (OIS) market - June 2021 | Bank of England', June 2021

[15] BoE, ' Yield curves | Bank of England'. SONIA is the underlying reference rate for Overnight Indexed Swaps (OIS).

[16] CMA, 'Energy appeals final determination, Volume 2A: Joined Grounds: Cost of equity' p61, para 5.167

[17] CMA, 'Ofwat price determinations, final report', March 2021, pp.790, para 9.241

[18] CMA, 'Energy appeals final determination, Volume 2A: Joined Grounds: Cost of equity' p41, para 5.103

[19] Wright et al, 'Comments prepared for Ofwat on the CMA's provisional findings", October 2020, pp. 5-8

[20] For further detail, see: S. Wright & R. Mason: 'Comments prepared for Ofwat on the CMA's provisional findings' pp. 4-10

B) Convenience yield

It has been argued that index-linked gilts have special characteristics as a risk free-rate proxy (safety and liquidity) which make them desirable by investors, increasing their demand and therefore potentially reducing their yield below that of a zero-beta asset.[21]

We are not convinced that it would be appropriate to uplift index-linked gilt yields for a 'convenience yield'. Firstly, as the zero-beta asset is a hypothetical asset without an observable traded yield, there is no clear-cut evidence to prove that it would have a lower (rather than higher) market-priced liquidity and credit risk premium than gilts. This means that the direction of any correcting adjustment would be ambiguous.

Even if we were to take as given the presence of a 'convenience yield', the process for making an adjustment to RPI-linked gilt yields to correct for it would be difficult to implement. This is mainly due to the lack of recent, high-quality UK estimates that could be used to supply a point estimate for the adjustment. Where estimates have been made in the literature, these tend relate to overseas studies and lie in a wide range. Feldhutter and Lando (2008)[22] find a convenience yield of between 30bps and 90bps on US treasury bonds between 1996 and 2005. Krishnamurthy and Vissing-Jorgensen (2012) estimated the average of the liquidity component of the convenience yield to be 46bps from 1926 to 2008.[23] Van Binsburgen et al (2020)[24] estimate a convenience yield of around 40bps on US government bonds over 2004-2018. Dimond and Van Tassel (2021) find that cross-country variations in convenience yield estimates are related to the level of interest rates in each country. A common finding of these studies is that the convenience premium is time-varying and increases in times of financial crisis, further increasing the uncertainty around a fixed point estimate. The cited estimates may also reflect the unique status of the US dollar as the first-ranking global reserve currency.

C) Averaging period

We did not receive responses that discussed the averaging period. We propose to use an averaging period of 6 to 12 months, striking a balance between incorporating information from recent market data while smoothing any undue volatility caused by outliers.

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[21] This is problematic as the CAPM equation at the start of this section suggests the yield of a zero beta asset should be the same as the risk-free rate.
[22] Feldhutter P., Lando D, 'Decomposing Swap Spreads', Journal of Financial Economics 88, 2008
[23] Krishnamurthy A., Vissing-Jorgensen A., 'The Aggregate Demand for Treasury Debt', Journal of Political Economy, 2012, 120 (2), pp.233-267
[24] Van Binsbergen J. H.,Diamond W. F., Grotteria M., 'Risk-free interest rates', Journal of Financial Economics 143 (2022)

D) Forecasting approach

Several responses[25] argued that evidence pointed to future interest rate rises, and thus that the use of a forward rate uplift was appropriate to avoid underfunding.

Figure A1.2: Forecasted versus observed 15-year gilt yields
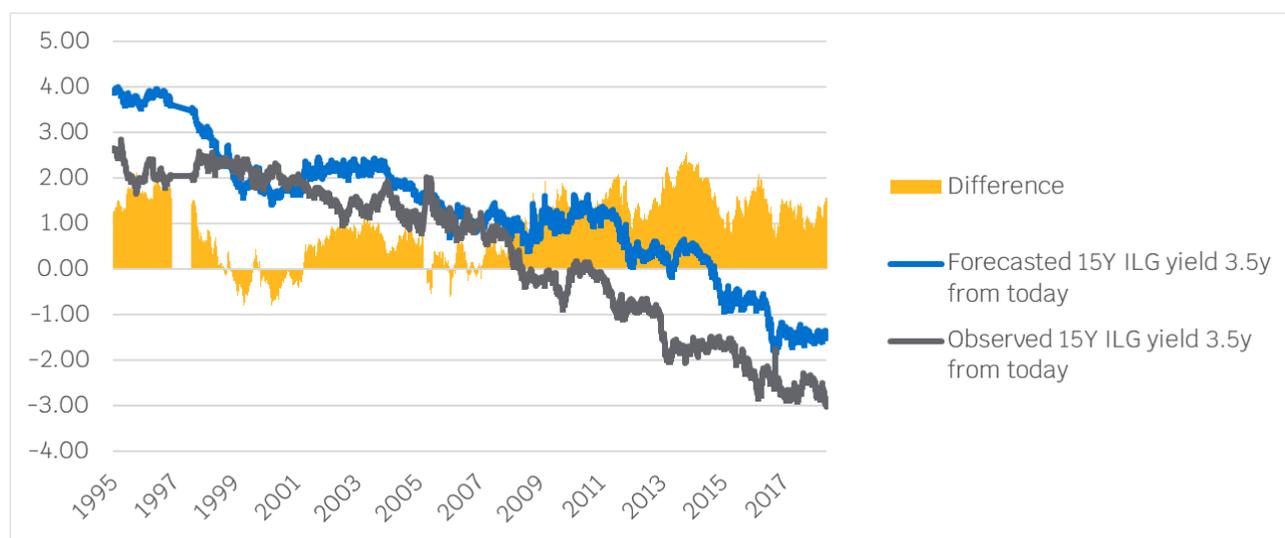
Source: Ofwat analysis of Refinitiv data

Note: Differences compare spot 15Y yields with 3.5Y-lagged 3.5Y forward 15Y yields

As set out in figure A1.2, forward rates have poor predictive power over spot rates, and since the 2008 Global Financial Crisis have tended to systematically overestimate them.[26] We therefore consider that the balance of evidence suggests that forward rates uplifts would reduce rather than improve the accuracy of our PR24 risk free rate estimate.[27]

Our proposal not to introduce a forward rates-implied uplift is consistent with the findings in PwC's cost of equity indexation report,[28] which also concluded that forward rates have a tendency to overstate forecast gilt yields.

E) Inflation adjustment

In question 3.3 of our December discussion paper we asked: **"How should we convert RPI-linked yields into their CPIH-linked equivalents when deriving a RFR point estimate?"** This question was posed in response to the UK Statistics Authority's reform to RPI expected in February 2030, which will result in RPI being effectively aligned to CPIH in data and methods. Some responses suggested a time-varying RPI-CPIH wedge could be derived

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[25] Energy Networks Association, Anglian Water, Affinity Water, South East Water, Southern Water
[26] The thought experiment here is to assess the predictive ability of forward rates towards the middle of the price control period (ie, 2.5 years ahead assuming that the final determination is made 'today'). However, due to limitations in ILG yield curve data at the short end, the analysis focuses on 3.5-years ahead.
[27] CMA, 'Ofwat price determinations, final report', March 2021, p.789, para 9.234
[28] PwC, 'Cost of equity indexation: Evaluating the case for indexation at PR24 and beyond', Figure 3.7

based on evidence from zero-coupon RPI and CPI inflation swap rates.[29] Other responses raised the following concerns about reflecting the 2030 RPI reforms:

- Many responses argued that the impact of the 2030 RPI reforms was uncertain,[30] with several responses citing market evidence on yields which seemed to contradict the premise that markets are pricing a zero RPI-CPIH wedge post-2030.[31] These responses tended to argue for the retention of a long-run RPI-CPIH wedge of approximately 1.0%.
- Thames Water suggested it might be appropriate to use the OBR's estimate at the relevant future point/s in time to cover the period up to 31 January 2030 and assume a zero-wedge based on full convergence for the last two months of AMP8. Other responses suggested a cross-check starting from nominal gilt yields of similar duration and deflated using a long-term fixed CPIH assumption. [32]
- Severn Trent's response argued that, whilst the RPI reform should have no effect on bonds maturing before 2030, if the long-term RPI-CPIH wedge priced in by investors converged to zero then one ought to expect the real yield required by investors to increase by the same amount.

To address this issue, we are exploring different options to form a view on the long-term RPI-CPIH wedge which takes into account the implementation of the 2030 UKSA RPI reforms. We are currently considering the following approaches to convert RPI-linked yields to a CPIH basis:

- **'Do minimum' approach**: This would involve adjusting RPI-linked gilt yields for the OBR's long-term RPI-CPI 'wedge' of around 1.0%, as we did for PR19 final determinations.
- **'Official forecasts' approach**: under this option we 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 (ie, we assume an RPI-CPI wedge of zero) after 2030.[33] The annualised average wedge over the period would then be the geometric average of this series.
- **'Inflation swaps' approach**: an alternative option would be to infer the market-implied long-term expectation of the RPI-CPIH wedge based on rates of zero-coupon RPI swaps and zero-coupon CPI swaps at our chosen CAPM investment horizon.

Our provisional view is that the 'do nothing' approach is unlikely to be 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. This seems unlikely given the high profile of the reforms, which have been consulted on, and which have received considerable media coverage. Given that the RPI-CPI wedge is,

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[29] Northumbrian Water, Affinity Water
[30] iCON Infrastructure, Northumbrian Water, Anglian Water, Affinity Water, South East Water, South West Water, Yorkshire Water, Southern Water
[31] United Utilities, Severn Trent Water, Wessex Water
[32] United Utilities, South Staffs Water, SES Water
[33] Implicit in this approach is that CPI can be treated as a proxy for CPIH.

by construction, due be zero after 2030 following the UKSA reforms, it seems likely that assuming a wedge of around 1.0% for a period of years including the post-2030 period is likely to overstate the true average wedge over this period.

Of the two remaining approaches, we consider 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.

A1.1.2 Total Market Return

Introduction and policy background

The Total Market Return (TMR) represents the expected real return required by the market for being invested in a well-diversified portfolio. In UK economic regulation it is usual practice to use the FTSE All-Share index and its historical antecedents as a proxy for a well-diversified portfolio. To estimate the TMR, regulators and practitioners have tended to draw on historical and forward-looking approaches:

- **Historical approaches** make use of historical data on realized returns over a long horizon (for example, the DMS[34] dataset capturing returns from 1900) to estimate the TMR. They can be further divided in two groups. First, historical **ex-post** approaches – which assume that investors' current expectations of TMR equal historical realised returns. Second, historical **ex-ante** approaches **–** which adjust historical returns for events that are considered unlikely to be repeated.[35]
- **Forward-looking approaches** make use of market prices, investors' sentiment and/or forecasting models to infer forward-looking expectations of the TMR.

Stakeholder submissions and our response

In our December 2021 consultation,[36] we proposed to use as a starting point for PR24 a range derived from historical ex-post and ex-ante approaches and to consider evidence from forward-looking approaches to select a point estimate within the range. We also proposed to use the ONS's CPIH back series from 1947 to 1987 to deflate historical equity returns, subject to quality checks.

We received comments in the following areas:

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[34] DMS (Dimson, March, and Staunton) is a dataset containing historical realised returns captured annually in the Credit Suisse Global Investment Returns Yearbook.

[35] For instance, a repeat of the historical expansion of the price-to-earnings ratio due to investors exploiting diversification opportunities, which boosted capital returns.

[36] Ofwat, 'PR24-and-beyond_Discussion-paper-on-risk-and-return.pdf (ofwat.gov.uk)', December 2021

A) **Weight on historical and forward-looking approaches:** Several respondents disagreed with the use of forward-looking methods because their implementation is overly dependent on the assumptions that need to be made.[37]

B) **Averaging technique:** A few respondents expressed support for the use of arithmetic averages on both overlapping and non-overlapping samples of data,[38] consistent with the approach adopted by the CMA in its PR19 re-determinations.

C) **Treatment of inflation:** Several respondents disagreed with using the new ONS CPIH back series to deflate returns and supported us deflating using both RPI and CPIH as the CMA did in its PR19 re-determinations.[39] Other respondents expressed concerns about the suitability of the ONS's new CPIH back series for the 1947- 1987 period,[40] including whether the new series will be an improvement in quality compared with the existing CPI measure of inflation for the same period.

D) **Composition of proxy for the market portfolio:** Citizens Advice recommended using returns on all assets as opposed to just equities when calculating the TMR, so as to avoid an upwardly-biased estimate of the TMR.

Our proposed approach for the TMR

A) Weight on historical and forward-looking approaches

For PR24 we propose deriving a range for the Total Market Return (TMR) using ex-post and ex-ante historical approaches.

We recognise concerns raised around the subjectivity of some forward-looking approaches, where different judgments around input assumptions can drive a wide TMR range. We therefore agree that forward-looking techniques should not form the primary basis by which TMR is estimated.

In an environment of low interest rates, 'ex-post' historical TMR approaches produce high estimates of the equity risk premium, because they implicitly assume a fixed TMR, with falls in the risk-free rate offset one-for-one by countervailing movements in the equity risk premium. This is a point acknowledged by both 2018 UKRN study authors[41] and the PR19 CMA panel.[42] The alternative approach of directly estimating the equity risk premium through historical averages is used in European and Australian economic regulation and would currently result in a lower TMR estimate. We note that the well-established practice in UK water regulation of estimating TMR rather than ERP (as well as market expectations of interest rate rises) suggests there is a high bar to amending our methodology in this area. We

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[37] Hafren Dyfrdwy, Northumbrian Water, Anglian Water, Affinity Water, South East Water, Severn Trent , Southern Water, iCON, Energy Networks Association

[38] Energy Network Association, Anglian Water

[39] Anglian Water, Affinity Water, South East Water

[40] Energy Network Association, Northumbrian Water.

[41] S. Wright et. al. 'Estimating the cost of capital for implementation of price controls by UK Regulators', March 2018, P48

[42] CMA, 'PR19 redeterminations: Final Report', p1076, para 9.1314

accordingly propose to retain our focus on the fixed-TMR approach in deriving our range for the TMR. We propose retaining forward-looking approaches – and in particular market-to-asset-ratio (MAR) analysis - as a cross-check to the overall cost of equity (see Section A1.1.5).

B) Averaging technique

When deriving ex-post estimates of the TMR, various estimation techniques have been used in regulatory proceedings including:

- **Arithmetic average**: the arithmetic average is an unbiased estimator of returns one year ahead and in the absence of serial correlation[43]. Our approach is however to estimate CAPM inputs consistent with our chosen horizon of around 10-20 years, such that a one year holding period is not appropriate. The arithmetic average can be calculated on overlapping or non-overlapping samples. Using overlapping samples has the advantage of more data points when compared to non-overlapping samples and hence lower year-on-year volatility, but individual data points will be serially correlated. Using non-overlapping samples avoids the issue of serial correlation, but the small sample size and change to the start year for averaging with each subsequent year's worth of data can cause significant year-on-year volatility. This is difficult to rationalise from the perspective of investor expectations.
- **Blume estimator:** Blume[44] proposes an approximately unbiased estimator by taking a horizon-weighted average of the arithmetic and geometric means, with the weight on the geometric mean increasing with the time horizon.
- **JKM estimator:** Jacquier, Kane and Marcus[45] (2005) propose an alternative horizon-weighted average of arithmetic and geometric means, with superior efficiency properties (but worse bias properties) when forecasting the terminal value of a market portfolio, given a sample average return.
- **Cooper estimator:** Cooper (1996)[46] argues that both arithmetic and geometric averages are downward biased estimates of the appropriate discount rate to be used for capital budgeting purposes, and proposes an estimator to correct for this bias.

The CMA's 2021 PR19 redetermination did not find conclusive evidence to favour one estimator from the academic literature over another, and pragmatically focussed on arithmetic averages of 10-20 year holding periods on the grounds that this yielded a similar result to one which included all estimators from the above list.[47]

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[43] For instance A. Damodaran 'Principles of Corporate Finance, 10th Edition' 2011, p96

[44] Blume, 'Unbiased estimators of long-run expected rates of return', Journal of the American Statistical Association, 1979

[45] Jacquier, Kane and Marcus 'Optimal estimation of the risk premium for the long run and asset allocation: a case of compounded estimation risk' Journal of Financial Econometrics, 2005

[46] Cooper I. , 'Arithmetic versus geometric mean estimators: Setting discount rates for capital budgeting', European Financial Management, Vol 2, No. 2. 1996.

[47] CMA, 'Ofwat price determinations, final report', March 2021, p.819, para 9.328

For PR24, we propose to focus on an ex-post arithmetic range derived using the overlapping estimator and 10-20 year holding periods. We have not ruled out including the non-overlapping estimator but consider that it is volatile across years and can yield counterintuitive results,[48] due to the lower number of data points and changing start year for the averaging process. We consider these to be serious drawbacks to its use.

As a cross-check we propose to retain the use of a direct transformation of the whole-period geometric average return to its arithmetic equivalent.[49] This is because the approach is useful to mitigate the distorting impact of exchange rate effects in the historical equity returns data.[50]

C) Treatment of inflation

In our December 2021 discussion document[51], we proposed to use the ONS's CPIH back series that the ONS intends to publish for 1950 to 1988 to deflate historical equity returns, subject to quality checks. We note that this series is now published,[52] and given respondents' concerns about its quality, will be assessing the series and associated publications prior to making a decision for our final methodology. At this stage, we remain of the view that the new CPIH back series is likely to be a more suitable inflation series than historical RPI. This is primarily because, given our intention to fully index the RCV to CPIH for PR24, we will only require a CPIH-real allowed return as opposed to one based on RPI. The ONS's impartiality and expertise in the area of inflation measurement means that it is an appropriate source of historical inflation data.

D) Composition of proxy for the market portfolio

While recognising that the Total Market Return should theoretically encompass the return for all financial instruments, there are significant practical difficulties with calculating such a portfolio. Using a broad index of equities is consistent with guidance contained in the 2018 UKRN academic study on allowed return estimation,[53] and also the CMA RIIO-2 panel's decision for the RIIO-2 GT/ET/GD appeals that this was not an error.[54]

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[48] For instance, the CMA's PR19 estimate of the 20 year overlapping arithmetic indicator in Table 9-3 (6.2%, CED/CPI, RPI-real) was higher than the one year holding period arithmetic average (6.0%, CED/CPI, RPI-real), despite the latter widely being recognised as an upwardly-biased estimator to use for compounding at longer investment horizons.

[49] See Appendix E of S. Wright et. al. 'Estimating the cost of capital for implementation of price controls by UK Regulators', March 2018

[50] See Wright et. al. 'The Cost of Equity Capital for Regulated Companies: A Review for Ofgem', February 2014, p. 9

[51] Ofwat, 'PR24-and-beyond_Discussion-paper-on-risk-and-return.pdf (ofwat.gov.uk)', December 2021

[52] ONS, 'Consumer price inflation, historical estimates, UK, 1950 to 1988 – methodology', 18 May 2022

[53] UKRN (2018), Estimating the cost of capital for implementation of price controls by UK Regulators. A report by Wright, Burns, Mason and Pickford, p.18

[54] CMA, Final determination: Volume 2A: Joined Grounds: Cost of equity (publishing.service.gov.uk), October 2021, p. 71, para.5.202

A1.1.3 Beta

Introduction and policy background

As we outlined in our December 2021 discussion document,[55] to estimate beta, judgement is required on the following:

A) **Listed comparator set:** which companies to use in our estimate of the water sector beta.
B) **Frequency of data**: whether to use daily, weekly or monthly returns. In general, reliance on lower frequency data requires adopting a longer estimation period (see point C) below) so as to ensure that the beta estimates are based on a sufficiently large sample. For PR19 we focused on daily data. The CMA's PR19 redeterminations featured daily, weekly and monthly frequencies.[56]
C) **Estimation period**: Shorter estimation periods capture more recent data but can be more volatile and affected by outliers. Longer periods produce more stable estimates but may be less relevant to the ensuing control period. For our PR19 final determinations[57], we focused on a 2-year estimation period. The CMA's PR19 redeterminations featured 5-year rolling averages of spot, 2-year, 5-year and 10-year data.
D) **Significant events affecting returns or volatility**: A particular consideration is how to reflect data from the period affected by the Covid-19 pandemic in a forward-looking estimate of equity beta.

Stakeholder submissions and our response

A) Listed comparator set

Several responses[58] agreed with placing limited weight on Pennon given its limited history as a pure play water and wastewater company. Anglian Water expressed the view that we should include energy companies to increase the number of comparators. South East Water argued that listed water companies' betas are not representative of the risks faced by a small water-only company, and asked that this risk differential was addressed at source or priced within the cost of equity.

For our early view on the allowed return for PR24, we are minded to place most weight on data from well-established 'pure-play' water companies Severn Trent and United Utilities. Acknowledging that Pennon has since June 2020 been a 'pure-play' water company following its disposal of Viridor (its waste management subsidiary), we will review whether to use the company's data in our final methodology. We note that reflecting this data would not be straightforward due to difficulties in accounting for cash holdings from the disposal of Viridor

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in gearing. The two listed UK energy companies that own regulated networks[59] are not pure play network utilities for the sector we regulate, and have a considerable share of their assets dedicated to unregulated activities. In order to ensure our beta estimates capture systematic risk exposure for the water sector only, for PR24 we propose to not include these energy comparators as datapoints for estimating the notional water company beta.

B) Frequency of data and estimation period

Responses generally supported beta estimation using a range of frequencies and estimation periods.[60] Affinity and South East Water advocated for using structural break analysis to determine the length of estimation period.

For PR24, we propose to estimate betas using 2 year, 5 year, and 10 year estimation periods. This approach helps us strike a balance between using shorter estimation periods (which capture more recent relevant market data but can be subject to greater volatility) and longer periods (which produce more stable estimates but may capture historical market data less relevant to return expectations over 2025–30). The estimation periods also recognise that regulatory reforms can change a sector's systematic risk. For example, before 2015, our determinations were set as controls on tariffs, but since PR14 we have set total revenue controls for wholesale activities, with an accompanying reduction in revenue risk.

We propose not to use structural break analysis to inform the estimation period, as we consider there is merit in the transparency and consistency of using estimation periods that are familiar from regulatory decisions rather than leaving this decision to be decided based on breakpoint analysis. We also note that different specifications of breakpoint test can identify breakpoints at different points in time, making it difficult to establish definitively that a given breakpoint is the right one to base an estimation period on.

We propose to focus on daily data for raw beta estimation; for a given estimation period lower frequency estimates (eg 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", ie beta estimates can differ materially depending on the day of the week or month chosen.[61]

C) Significant events affecting returns or volatility:

In our December 2021 consultation document[62] we asked: **"How should we reflect the period affected by Covid-19 in our approach to estimating beta?"**

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[59] National Grid and Scottish and Southern Energy (SSE)
[60] United Utilities, Thames Water
[61] Keshav Sahadev, Michael Ward & Chris Muller," The impact of reference-day risk on beta estimation and a proposed solution", 2018, Investment Analysts Journal, 47:4, pp.327–342
[62] Ofwat, 'PR24-and-beyond_Discussion-paper-on-risk-and-return.pdf (ofwat.gov.uk)', December 2021

Some respondents[63] stated that all market data should be included to preserve the veracity of the analysis, whereas other respondents[64] argued that the Covid-19 period was a very unusual period unlikely to be repeated, arguing for exclusion of this data or giving it a low weight. Wessex Water argued that one consequence of stripping out significant risk events such as the Covid-19 pandemic would imply not 'funding' them in the allowed return. However, both Southern Water and Yorkshire Water argued it was premature to decide on the fate of Covid-19 affected data given uncertainty around the evolution of the pandemic and its impact on investors' attitudes to risk.

Citizens Advice said we should place greater weight on data from the Covid-19 period. It argued that in periods where material shocks are apparent (such as the Covid-19 pandemic), shares from water companies are safe assets which exhibit low betas, whereas in periods without material shocks, the collective buying and selling of shares from funds who seek to track indices such as the 'FTSE All-Share' is a major driver of equity price correlation, leading to the overestimation of beta as a measure of systematic risk.

We consider that pandemics are a clear example of a systematic risk whose relevance is unlikely to diminish, given research indicating pandemics like the Covid-19 outbreak will become more frequent in future.[65] On this basis, we therefore do not agree it would be appropriate to omit data from Covid-19 affected periods from our analysis. We recognise however, that focusing excessively on a period dominated by Covid-19 may result in a beta estimate that is not reflective of the 2025-30 period. Our current preference to address this issue is through relying on evidence from a range of estimation periods (of 2, 5, and 10 years), ensuring that our approach encompasses data from unaffected periods and a reasonable span of years. We do not propose to apply bespoke weights to the Covid-affected data, as we note that a selective treatment of just one of many sources of systematic risk might miscalibrate weightings for alternative sources of risk that are more relevant to the 2025-30 period.

A1.1.4 Approaches to de-levering and re-levering

Introduction and policy background

If notional gearing differs materially from the market gearing of listed observations, it is necessary to apply "de-levering and re-levering" steps to the beta to reflect the impact of

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[63] iCON, Wessex Water
[64] Northumbrian Water, Anglian Water, Affinity Water, South East Water, South West Water, Severn Trent Water, Southern Water
[65] Marani et al. 'Intensity and frequency of extreme novel epidemics'. August 2021, PNAS Vol. 118, No. 35

these different gearing levels on the equity beta. The formula widely used by UK regulators to apply such adjustment is the 'Harris-Pringle formula'[66].

To reflect differences between market gearing and notional gearing at PR19, we de-levered our raw equity beta using Enterprise Value gearing[67] and re-levered using our notional gearing assumption. This is also the approach the CMA followed in its PR19 re-determinations[68].

Consistent with corporate finance theory and Modigliani-Miller theorem,[69] the WACC obtained after "de-levering and re-levering" should not be sensitive to gearing, but in practice this is often not the case. Recent regulatory decisions have chosen to respond to this issue in different ways:

- For its redetermination of the price controls for NATS (En Route) PLC, [70] the CMA adopted a substantially lower notional gearing level than that chosen by the CAA, reflecting the gearing levels of the companies used in its beta analysis. This highlights that notional gearing changes are one option to address the problem of a WACC that varies with the level of gearing (contrary to corporate finance theory).
- Ofgem's RIIO-2 final determinations noted the issue of re-gearing asset beta resulting in a higher WACC estimate, but used the standard Harris-Pringle approach for de-levering and re-levering.[71] The CMA's RIIO-2 final determination also noted this issue.[72] It said that a lower allowed return on equity than Ofgem's point estimate could be justified by using the actual gearing of its companies in the beta assessment, and that this would be more aligned with Modigliani-Miller theorem.[73]

In its PR19 redeterminations, the CMA panel concluded that, whilst the approach adopted by Ofwat and the CMA resulted in the WACC increasing with gearing, the sensitivity of the WACC to gearing was relatively small.

In their December report which supplemented our risk and return discussion document,[74] Professors Mason and Wright provided an overview of the issues arising from the de-levering and re-levering approach and suggested options to address them:

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[66] The asset beta, β_A, is a weighted average between debt beta, β_D, and equity beta, β_E, where the weights are based on the gearing level, ie: $\beta_A = g \cdot \beta_D + (1 - g) \cdot \beta_E$.

[67] Enterprise value gearing is defined as net debt divided by the sum of market capitalization plus net debt.

[68] CMA, 'Ofwat price determinations, final report', March 2021, pp. 867, para 9.481

[69] Modigliani F., Miller M., 'The Cost of Capital, Corporation Finance, and the Theory of Investment', The American Economic Review, Volume XLVIII, 1958

[70] CMA, 'NATS (En Route) Plc / CAA Regulatory Appeal', July 2020

[71] Ofgem, 'RIIO-2 final determinations, finance annex', December 2021, p40

[72] CMA, Final determination: Volume 2A: Joined Grounds: Cost of equity (publishing.service.gov.uk), October 2021, p. 238, para 5.709

[73] CMA, Final determination: Volume 2A: Joined Grounds: Cost of equity (publishing.service.gov.uk), October 2021, p. 223, para. 5.672

[74] Mason R., Wright, S., 'A report on gearing, price controls, and financial resilience', December 2021.

- **Option I**: Set notional gearing equal to observed gearing.
- **Option II**: Use the CAPM for both debt and equity.
- **Option III**: Use the raw equity beta.
- **Option IV**: Assume that the WACC is constant.
- **Option V**: Depart from the Modigliani-Miller framework.

Stakeholder submissions and our response

Question Q3.2. in our December discussion paper asked: **"Noting the impact of gearing on betas discussed in the report by Professors Mason and Wright, how should we adapt our approach to specifying beta for a company at the notional gearing?"**

One company[75] expressed qualified support for the proposal to use raw equity beta directly (Option III in Mason and Wright report) but stated that we should be cautious when drawing conclusions about the sensitivity of the WACC to gearing. CCW expressed support for alternatives to 'de-levering' and 're-levering' that would not incentivise comparator companies to increase gearing. Two companies[76] noted that Mason and Wright's analysis highlights the limitations of CAPM, and therefore we should consider alternative approaches. All remaining companies expressed a clear preference for maintaining the current approach to de-levering and re-levering. Respondents raised issues with the Mason and Wright assessment in the following areas:

- **Specification of CAPM:** Several responses argued that Mason and Wright reported the results of their test on the sensitivity of the WACC to gearing only on the basis of total debt, and that it should only have been done on the basis of new debt.[77] Respondents suggested this is inconsistent with the Modigliani-Miller framework (which does not incorporate the concept of embedded debt), and leads to a material overestimation of the impact of gearing on WACC.
- **Real-world relevance of Modigliani-Miller theorem:** Some responses noted that, since CAPM is a stylised model which abstracts from real world features, one should not necessarily expect the WACC to be insensitive to gearing, as suggested by the theorem.[78]
- **Use of market gearing for beta assessment:** Some responses[79] argued that the proposal to set the notional gearing equal to market gearing (Option I of Mason and Wright's report) contradicts the CMA PR19 redetermination panel's decision and/or is not supported by sufficient evidence.
- **Gearing measurement:** Two responses disagreed with the approach of adjusting listed company gearing to take account of the market value of debt, pensions and derivatives.[80]

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[75] SES Water
[76] Bristol Water, Dŵr Cymru
[77] Affinity Water, Anglian Water, Northumbrian Water, Southern Water, Yorkshire Water, Energy Networks Association
[78] Affinity Water, Anglian Water, Wessex Water, South East Water, Northumbrian Water.
[79] Affinity Water, Anglian Water, Northumbrian Water, Southern Water.
[80] Southern Water, South Staffs Water

Some responses disagree with the approach of applying a MAR adjustment for re-levering purposes as listed companies' outperformance is not representative of the whole sector.[81] One response[82] argued that it would be more consistent to use an observed gearing based on RCV rather than enterprise value.

- **Risk of circularity and gaming:** Some responses argued that the proposal to set the notional gearing equal to market gearing (Option I of Mason and Wright's report) and the proposal to make a direct use of raw equity beta (Option III) introduces circularity and increases scope for regulatory gaming because the cost of equity estimate becomes entirely dependent on listed companies' gearing levels. [83]

- **Aligning notional gearing with observed gearing:** Some responses argued the NERL example in which the CMA sets the notional gearing in line with comparators' observed gearing is not directly relevant because the difference between observed and notional gearing is significantly smaller in the water sector. [84]

- **Reflecting non-CAPM distortions:** Some respondents[85] stated that, whilst Mason and Wright propose an option based on an application of CAPM to both debt and equity (Option II) and recognise that CAPM is a poor model of debt return, they fail to account for distortions arising from the difference between observed cost of debt and CAPM-derived cost of debt. Two water companies[86] also noted that the discrepancy between observed cost of debt and CAPM-implied cost of debt is exacerbated by an excessively low risk-free rate.

- **Relevance to allowed cost of embedded debt**. One response[87] argued that most options proposed by Mason and Wright (Option I, II, IV, and V) represent either a complete removal (Option II) or a material reduction in embedded debt allowances. One response[88] stated that Mason and Wright's proposed Option II would involve a violation of Ofwat's duties.

- **Regulatory stability:** Some respondents[89] argued that a departure from the current approach undermines regulatory stability and predictability and decreases investors' confidence. One response[90] noted that the topics covered by Mason and Wright's report are complex and have not been sufficiently researched and evidenced to warrant a departure from the traditional de-gearing / re-gearing approach.

Our proposal

We do not agree that any assessment of the sensitivity of the WACC to gearing is invalid on the basis that the allowed return includes features that are not explicitly accounted for by

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[81] Hafren Dyfrdwy, Severn Trent, Energy Networks Association
[82] South West Water.
[83] Affinity Water, Anglian Water, Northumbrian Water,
[84] Affinity Water, Anglian Water, Northumbrian Water,
[85] Affinity Water, Anglian Water, Northumbrian Water, Southern Water
[86] Yorkshire Water, Southern Water
[87] Yorkshire Water
[88] Energy Networks Association
[89] Thames Water, Northumbrian Water, ENA (Trade body)
[90] United Utilities

CAPM. The allowed return can be stripped of those elements that are not accounted for by the theoretical CAPM (ie, taxes, issuance costs, embedded debt, etc.), and the validity of the Modigliani-Miller principle can be assessed with reference to a counterfactual world that matches the stylised assumptions of the CAPM. We nonetheless recognise the challenges to some of the options proposed in Mason and Wright's report and, therefore, we are minded to consider only options that improve conceptual consistency whilst providing a degree of regulatory stability. These are:

- **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 we would set debt beta at the level which would make the CAPM-WACC calculation fully invariant to gearing. [91]
- **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.

How the option of a more consistent CAPM-WACC could work

Option 2: 'Adopting a more consistent CAPM-WACC' is a variation of Mason and Wright's Option II which aims at resolving the distortions arising from the difference between the observed cost of debt and the CAPM-derived cost of debt. Failure to account for this difference would either result in a WACC that always increases with gearing (because the cost of debt used to estimate the WACC is higher than the one that would be implied by CAPM),[92] or in a WACC that is invariant to gearing but implies a (CAPM-derived) cost of debt which is implausibly low and in violation of the longstanding regulatory practice of estimating the cost of debt based on observed debt yields.

We illustrate how Option 2 might work with a numerical example based on Ofwat PR19 final determination values (Table A1.2). Estimation of the expected cost of new debt requires a view on two additional parameters (namely the probability of default and the loss-given default). In the illustrative example below we use publicly available estimates from S&P. S&P estimates the average annualised probability of default for utility companies at 0.44%[93], and the percentage loss given default for the utility sector at 49%.[94] It is necessary to adjust the observed yield on new debt for these two factors to convert it to a return expectation which is what the CAPM seeks to model.

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[91] That is, involving CAPM forward-looking new debt and CAPM forward-looking cost of equity. This does not imply a dilution of our commitment to remunerate embedded debt.

[92] The CAPM-cost of debt equation is: $K_D = r_f + \beta_D \cdot ERP$

[93] See from Table 19 of S&P (2020) "Annual Global Corporate Default And Rating Transition Study" available at: TS20210408160139.PDF (maalot.co.il)

[94] See Corporate Credit Risk Trends in Developing Markets: A Loss Given Default (LGD) Perspective | S&P Global Market Intelligence (spglobal.com)

Because the CAPM framework does not incorporate the concept of embedded debt, we draw a distinction in the table below between the "Forward-looking WACC", which uses the CAPM to estimate a WACC based on an expected cost of equity and new debt; and the "Allowed return", which is a WACC incorporating a CAPM-derived cost of equity and a non-CAPM cost of debt (including embedded debt).

Table A1.2: More consistent CAPM-WACC

|	Ofwat PR19 Final Determination		More consistent CAPM-WACC	
	Value	Formula	Value	Formula
Risk-free rate	-1.39%	r_f	-1.39%	r_f
ERP	7.89%	ERP	7.89%	ERP
Observed gearing	54.2%	g	54.2%	g
Raw equity beta	0.633	β_E	0.633	β_E
Debt beta	0.125	β_D	0.216	$\beta_D = (E[K_D] - r_f)/ERP$
Asset beta	0.358	$\beta_A = g\beta_D + (1-g)\beta_E$	0.407	$\beta_A = g\beta_D + (1-g)\beta_E$
Notional gearing	60%	g_N	60%	g_N
Notional equity beta	0.707	$\beta_{NE} = (\beta_A - g_N\beta_D)/(1-g_N)$	0.694	$\beta_{NE} = (\beta_A - g_N\beta_D)/(1-g_N)$
Cost of new debt	0.53%	K_D	0.53%	K_D
Probability of default	0.44%		0.44%	δ
Loss-given default	49%		49%	λ
Expected cost of new debt	0.31%	N.A.	0.31%	$E[K_D] = (1-\delta) \cdot K_D - \delta \cdot \lambda$
Cost of embedded debt	2.42%	K_{ED}	2.42%	K_{ED}
Share of new debt	20%	σ_D	20%	σ_D
Issuance & liquidity costs	0.10%	γ	0.10%	γ
Overall cost of debt	2.14%	$K_{TD} = \sigma_D K_D + (1-\sigma_D)K_{ED} + \gamma$	2.14%	$K_{TD} = \sigma_D K_D + (1-\sigma_D)K_{ED} + \gamma$
CAPM-cost of equity (raw)	**3.60%**	$E[K_E] = CAPM_{K_E} = r_f + \beta_E ERP$	**3.60%**	$E[K_E] = CAPM_{K_E} = r_f + \beta_E ERP$
CAPM-cost of equity (notional)	**4.19%**	$E[K_{NE}] = CAPM_{K_{NE}} = r_f + \beta_{NE} ERP$	**4.08%**	$E[K_{NE}] = CAPM_{K_{NE}} = r_f + \beta_{NE} ERP$
CAPM-cost of debt	**-0.40%**	$CAPM_{K_D} = r_f + \beta_D ERP$	**0.31%**	$CAPM_{K_D} = r_f + \beta_D ERP$
CAPM-WACC	**1.43%**	$CAPM_{WACC} = r_f + \beta_A ERP$	**1.82%**	$CAPM_{WACC} = r_f + \beta_A ERP$
Forward-looking WACC (raw), expected cost of new debt only	1.82%	$E[WACC(g)] = g\, E[K_D] + (1-g)E[K_E]$	1.82%	$E[WACC(g)] = g\, E[K_D] + (1-g)E[K_E]$
Forward-looking WACC (notional), expected cost of new debt only	1.86%	$E[WACC(g_N)] = g_N\, E[K_D] + (1-g_N)E[K_{NE}]$	1.82%	$E[WACC(g_N)] = g_N\, E[K_D] + (1-g_N)E[K_{NE}]$
Allowed return (raw), including cost of embedded debt	2.81%	$WACC(g) = g\, K_{TD} + (1-g)E[K_E]$	2.81%	$WACC(g) = g\, K_{TD} + (1-g)E[K_E]$
Allowed return (notional), including cost of embedded debt	2.96%	$WACC(g_N) = g_N\, K_{TD} + (1-g_N)E[K_{NE}]$	2.92%	$WACC(g_N) = g_N\, K_{TD} + (1-g_N)E[K_{NE}]$

Source: Ofwat analysis of PR19 final determinations and

As set out in the table above, under the more consistent CAPM-WACC approach there is no difference between the observed cost of debt adjusted for default, and the CAPM-derived estimate of new debt costs – both are calculated as 0.31%.

Furthermore, under the CAPM–WACC approach, the CAPM–WACC can be expressed in CAPM form ($CAPM_{WACC} = r_f + \beta_A ERP$ in the table above) or, alternatively, as a weighted average between the expected cost of equity and the expected cost of debt ($E[WACC(g_N)] = g_N E[K_D] + (1 - g_N)E[K_{NE}]$ in the table above). The reason for comparing both equations is to demonstrate through inspection that the former formula (involving zero gearing) gives the same WACC (1.82%) as the more consistent CAPM–WACC involving new debt and a debt beta calibrated to keep the forward-looking WACC constant. It is important to note, however, that due to our regulatory framework including embedded debt, we would still expect the overall allowed return to be sensitive to changes in gearing.

This is set out in Figure A1.3 below, which shows the forward-looking WACC with CAPM-derived cost of equity and new debt as a flat green line. Including embedded debt in this WACC calculation (grey line) creates a schedule with WACC increasing with gearing, although the steepness of the line is not as acute as the PR19 approach (blue line). While we note in section A1.23 that changes in notional gearing could reasonably be supposed to affect the share of new debt, and hence the allowed cost of new debt, in the below chart we have assumed for simplicity's sake that the proportion of new debt is kept constant with gearing changes.

Figure A1.3: Sensitivity to notional gearing under the more consistent CAPM–WACC
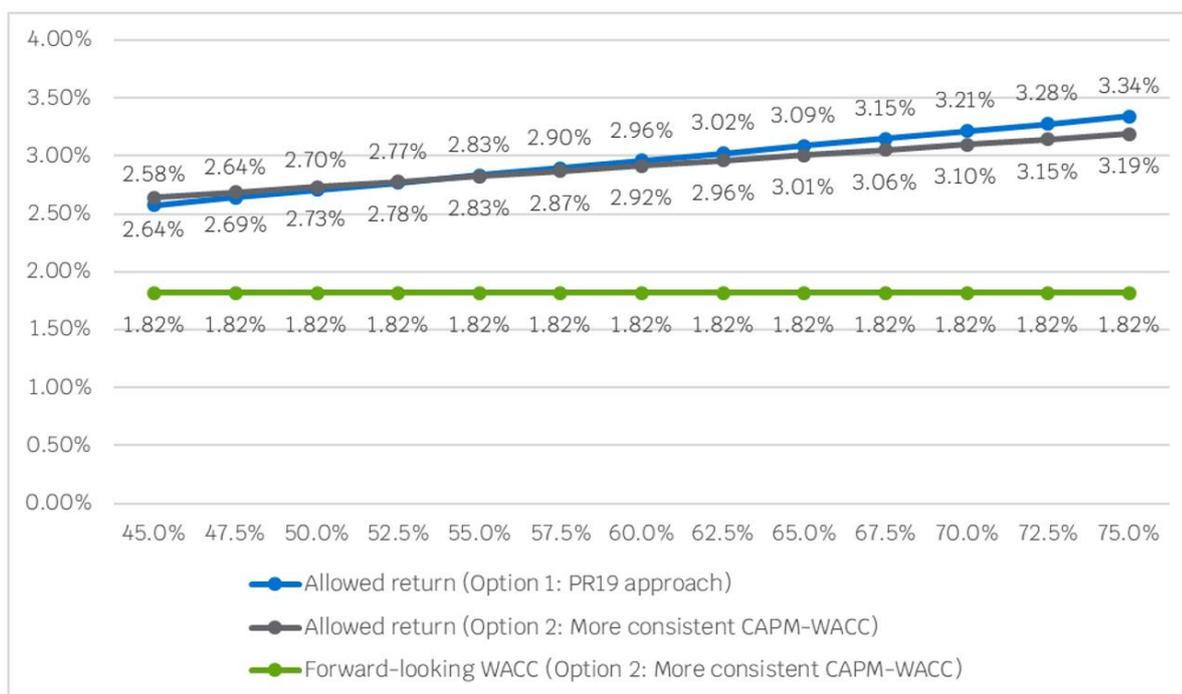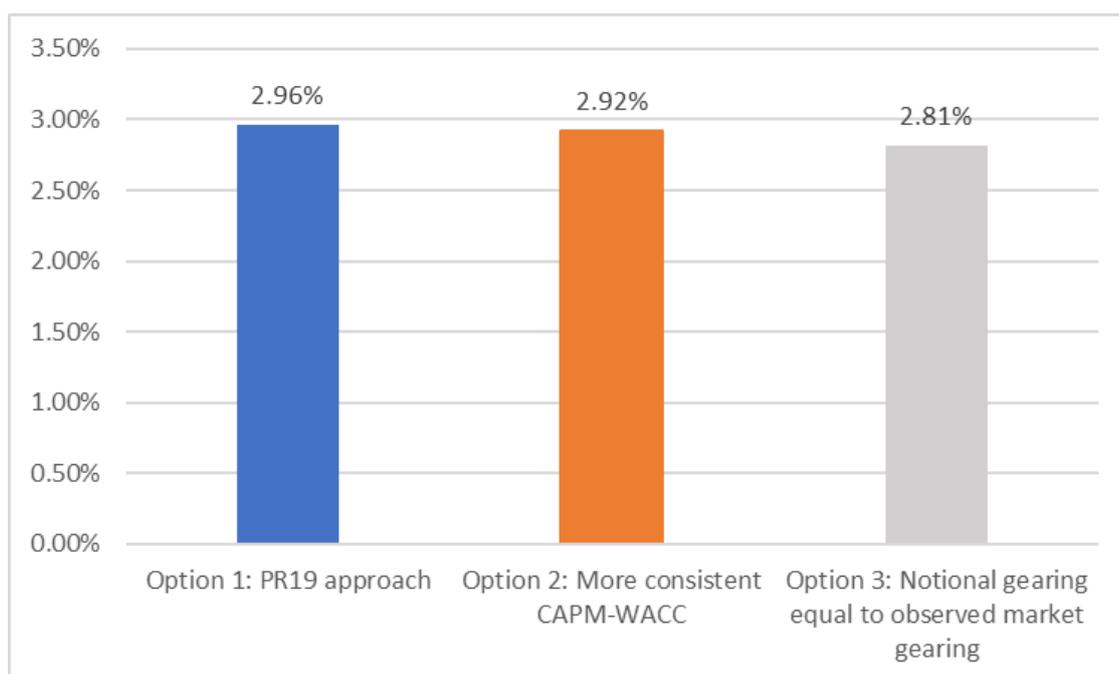

Source: Ofwat analysis of PR19 Cost of Capital model.

Initial assessment of our proposals

Figure A1.4 compares the allowed return from our three options, using PR19 final determination parameters. As the figure sets out, there is a relatively small difference (4bps) between Options 1 and 2, while Option 3 would imply a more substantial drop from our PR19 final determinations allowed return (15bps).

Figure A1.4: Allowed return under different options

Source: Ofwat analysis of PR19 Cost of Capital model.

Table A1.3 below provides a qualitative assessment of each option by highlighting their main advantages and drawbacks.

Table A1.3: Qualitative assessments of the options proposed

Option	Advantages	Drawbacks
Option 1: maintain the PR19 approach	• Consistency with existing regulatory practice.	• No guarantee that the WACC is invariant to gearing • Debt beta value is typically not consistent with the CAPM-WACC framework (ie there is a wedge between observed and CAPM-implied cost of debt). • WACC sensitivity to gearing is exacerbated if difference between notional and observed gearing increases and/or debt beta value is too small.

Option 2: more consistent CAPM-WACC	• Allowed return on equity and new debt is estimated consistently with the CAPM-WACC framework • Forward-looking WACC is insensitive to gearing as required by Modigliani-Miller theorem. • Full freedom to choose the notional gearing level without the risk of incurring inconsistencies and contradictions within the CAPM framework.	• The debt beta value implied under this option might not be supported by statistical evidence. • Judgement needed around parameters (prob. of default, and loss-given-default).
Option 3: notional gearing equal to listed comparator gearing	• Supported by some regulatory precedent (CMA NERL appeal). • Simple approach. Removes the need for de-levering /re-levering adjustment and potential inconsistencies associated with it. • No need to form a view on the debt beta value.	• Listed comparator gearing may be unsuitable for the notional company. • Introduces circularity and limits regulator's freedom to amend notional gearing to reflect changes in the regulatory regime or external circumstances.

Based on our preliminary assessment, our preferred option is **Option 2: More consistent CAPM-WACC**. The reasons are as follows:

- it provides the most consistent application of the CAPM framework. Unlike Option 3, Option 2 does not introduce circularity issues, and, unlike Option 1, it preserves the Modigliani-Miller principle of the forward-looking WACC being invariant to gearing;
- our indicative assessment suggests only a relatively small movement in the allowed return (4 basis points) relative to the approach adopted at PR19; and
- we acknowledge that the debt beta value implied by Option 2 is likely to be higher than the value typically used in prior regulatory decisions. However, given the typically large confidence intervals around direct econometric estimates of debt beta, it is not wholly implausible.

A1.1.5 Cross checks to the CAPM cost of equity

Our proposed implementation of the CAPM as set out in this document is reliant on significantly backwards-looking data, particularly on TMR, where we propose to capture over 120 years of historical evidence. One implication of this approach may be an allowed return which is slow to adapt to changing market conditions. Because our objective is to set an allowed return aligned with investors' expectations over 2025-30, it is therefore important to cross-check our CAPM-derived estimates against estimates from alternative approaches underpinned by more recent and forward-looking data.

We consider there is an important role for **Market-to-Asset Ratio (MAR)** analysis as a cross-check, given readily available share price data and data on private equity transactions in

water. A MAR expresses the enterprise value[95] of a given company as a multiple of its RCV. A MAR above 1 indicates the market is willing to pay a premium over the regulated asset value of the business. While a MAR above one is not necessarily a sign of an over-generous approach to setting the allowed return, higher MAR multiples may be difficult to explain using reasonable assumptions for future outperformance on other drivers of return (ie service and efficiency). We consider in such cases that it would be reasonable to consider whether some of the premium may be attributable to expected financing performance, and so whether this supports an adjustment to the CAPM-derived point estimate for the allowed return on equity as discussed below.

A1.1.6 Choice of a point estimate for the allowed return

We propose that we would report a plausible range for our allowed return on equity based on combining the high and low ranges for each of the three CAPM components we will estimate for the notional water company.

For our point estimate we propose that we would ordinarily use the midpoint of this CAPM-derived plausible range. We consider there should be a high evidential bar for moving away from this central estimate, limited to evidence from our market cross-checks. We expect that any adjustment would be modest, and would in any case lie within the endpoints of our CAPM-derived cost of equity stated range.

A1.2 Cost of debt

For PR24, we propose to retain the PR19 framework for setting the allowed return on debt. This will involve a weighted average of new and embedded debt costs and an allowance for issuance and liquidity costs.

A1.2.1 Embedded debt

Introduction and policy background

Embedded debt is the debt which remains on regulated companies' balance sheets for the duration of the price control. For PR19 final determinations we set a fixed allowance for embedded debt, drawing on two approaches:

- **Benchmark index approach:** We used a 15-year trailing average of the iBoxx GBP 10+ A/BBB-rated non-financials index to set an allowance, making a downwards adjustment of

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[95] Defined as net debt plus share capitalisation, subtracting value of non-regulated businesses

25 basis points, as we deemed water companies were on average able to systematically outperform the index by at least this amount.[96]

- **Balance sheet approach:** We analysed instrument-level debt data provided by companies, focusing on 'pure debt'; ie fixed, floating rate and index-linked instruments, and excluding non-standard instruments and most swaps. We considered a number of benchmarks and placed most weight on the large company median.

At PR19, we focused on the benchmark index approach as our primary approach, with the balance sheet approach used as a cross-check. However, the CMA's PR19 redeterminations were most focused on using the balance sheet approach to estimate an allowance, with the benchmark index approach only used as a cross-check to avoid overcompensating companies. Its analysis did not include an adjustment to the index comparable to the approach used at PR19, although it did feature a 'matching adjustment' to reflect the impact of debt with different characteristics to the constituents of the iBoxx indices.

In our December consultation document we proposed to set a PR24 allowance placing most weight on the balance sheet approach at PR24, with the benchmark index approach used as a cross-check. We also set out that we were not minded to include derivative costs in our cost of debt allowance, on the grounds that they do not directly finance expenditure, are NPV neutral at the point of issuance, and are typically issued for reasons relating to companies' actual structures.

Stakeholder submissions and our response

Question 4.1 of our December discussion paper asked**: "Do you agree with our proposed role for benchmark bond indices in crosschecking a cost of debt allowance based on a balance sheet approach?".** Respondents raised issues in the following areas:

- **Detail around balance sheet approach:** Several responses requested further detail on how we would implement this. [97]
- **Derivatives**: Most responses argued we should not exclude all derivative costs from our balance sheet approach. Points raised included that:
    o The CMA included such costs in its 2021 PR19 redetermination;[98]
    o These costs mostly related to prudent financing strategies;[99]
    o Our proposals to fully index to CPIH and potentially increase the notional share of index-linked debt was inconsistent with excluding swaps;[100]

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[96] The average discount to the iBoxx A/BBB for nominal fixed-rate bonds of >10yrs duration at issue over 2000-2018 was 31 basis points.
[97] Affinity Water, Anglian Water, Northumbrian Water, South East Water, Southern Water, Wessex Water
[98] Anglian Water, Bristol Water, Northumbrian Water, Southern Water
[99] Affinity Water, Anglian Water, South East Water, United Utilities Water, Welsh Water
[100] Hafren Dyfrdwy, Northumbrian Water, United Utilities

- o Excluding them could present a misleading view of actual borrowing costs;[101]
- o We could instead exclude a smaller subset of derivatives whose role was not related to economic hedging (eg 'kick-the-can' swaps). [102]
- **Refinancing risk:** Thames Water argued that a reliance on the balance sheet approach risked introducing refinancing risk, as companies would be incentivised to issue relatively cheaper shorter tenor debt.
- **Detail around benchmark index cross-check:** Several responses requested further detail on how we would implement this.[103]
- **Transparency:** Several responses requested that we should provide the details of our benchmarking calculations for transparency, and to allow scrutiny of our decisions.
- **Single cost of debt allowance:** Several responses argued that a single sector allowance was problematic, as it created winners and losers for reasons that were outside of management control (eg scale).[104]
- **Treatment of long-dated historical debt:** Several responses argued for suitable weight to be placed on pre-2010 debt given it would still influence borrowing costs for PR24.[105]
- **Treatment of subordinated/junior debt:** Dŵr Cymru argued that subordinated debt reduced the cost of senior tranches through improving their credit rating, and therefore that it would be perverse to reflect these lower costs in our allowance without the contribution of the junior tranches.

Our proposed approach for embedded debt

Detail around balance sheet approach

We propose that the primary source of evidence for our balance sheet approach will be companies' most recent annual data on outstanding instruments from the Annual Performance Report (Table 4B). This approach will make maximum use of the sector's debt issuance data (including pre-2010 data), and therefore stands the best chance of informing a cost of debt that is reasonable and reflective of the sector's issuance costs.

As the interest costs of this data are reported at the end of the last financial year, we will need to make adjustments to make it relevant for 2025-30. In particular we propose to:

- use assumptions about long-run inflation, to project forwards the principal outstanding of index-linked instruments over 2025-30;
- adopt refinancing assumptions for debt falling due before April 2025; and

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[101] Anglian Water, Northumbrian Water, Southern Water, United Utilities
[102] Anglian Water, Northumbrian Water, South East Water, Severn Trent
[103] Affinity Water, Anglian Water, Southern Water
[104] Portsmouth Water, South East Water, SES Water, South Staffs Water, Yorkshire Water
[105] Thames Water, United Utilities, Yorkshire Water

- use yield–at–issuance instead of coupon rate to determine interest cost, where bond pricing is at a premium or discount to face value.

As at PR19 we propose for PR24 to focus on pure debt costs for our balance–sheet based estimate. Our proposals are summarised in Table A1.4.

Table A1.4: Proposed inclusion criteria for balance sheet approach.

	Included?	Rationale
Bond / Loan / Debenture / Private Placement	Yes	• Standard instruments with clearly debt-like characteristics.
Finance Lease	Yes	• Effectively a secured loan
Debenture Stock	No	• Typically has equity-like characteristics
Preference shares	Potentially	• May be more debt-like or equity-like.
Intercompany loan / Holdco debt	No	• Typically has equity-like characteristics.
Liquidity facility / Overdraft / RCF	No	• Cost accounted for in issuance and liquidity allowance.
Junior / Subordinated / Class B debt	No	• Low-ranking repayment priority may result in sub-investment grade issue rating. • Typically associated with highly-geared structures; not relevant to a notionally-geared company.
Interest rate swaps	No	• Lacking in debt-like characteristics • Issuance may reflect actual structure considerations. • Not necessary for the purpose of understanding underlying debt costs. • Not included in previous price reviews or by other UK regulators.

We see merit in placing weight on two estimation approaches, to appropriately reflect our objective of an allowance which is reflective of notional company characteristics and the sector's actual debt issuance;

- **'All-in' cost:** We propose that we would use all 'pure debt' costs on a given company's balance sheet to estimate a company-level weighted average cost of debt.
- **'Actual-notional' cost:** This would feature a weighted average of each company's overall actual 'pure debt' a) fixed-rate nominal, and b) index-linked borrowing rates, using the notional share of index-linked borrowing to provide the weights.

We propose to set a single sector allowance which will be informed by the large companies which jointly account for >98% of outstanding sector embedded debt,[106] though companies outside this definition will have an opportunity to request for a company-specific adjustment (See section A1.3 below).

A single allowance presents all companies with strong incentives to seek low cost debt while managing risk, and is consistent with our approach from recent price reviews. We acknowledge that it is liable to drive a range of out- and under-performance based on companies' current debt position. However, the principle that companies are responsible for their financing choices has been a core part of our regulatory framework since privatisation.

We do not agree that our approach risks incentivising excessively short-term issuance. While it is usually true that shorter maturity debt is cheaper, companies must balance this benefit against the increased refinancing risk and exposure to interest rate changes that a short-term issuance strategy implies.

We will decide on the statistic for assessing the allowed cost of debt in our early view cost of capital to ensure the allowed cost of embedded debt is representative of the sample of the companies. This will depend on the distribution of company-level interest costs and the presence of outliers.[107]

We propose that we would share a model of how we have converted each company's instrument level data to a projection for 2025-30 with each respective company itself, and a high-level model explaining derivation of our sector benchmark but without disclosing the underlying instruments. This should help support transparency and proper application of our methodology, without undermining commercial sensitivity.

Junior debt

Our main reasons for proposing to exclude these instruments are that they tend to feature in highly-geared (ie >70%) balance sheets and are in some instances sub-investment grade. Moreover, while it is true that such debt would incur losses before more senior tranches, it cannot be considered to operate as a buffer against shocks as equity might because coupon payments are not typically discretionary. We consider the higher interest cost and gearing from taking on such debt would erode debt service capacity and credit quality, thus tending to increase the cost of all further borrowing rather than decreasing it.

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[106] Source: Ofwat analysis of 2021 Annual Performance Reports
[107] The mean is held to be a representative measure when the distribution of the data values is symmetrical and there are no clear outliers. The median may be preferred if the distribution of data values is skewed or when there are clear outliers.

Interest rate swaps

Swaps can often fulfil a useful risk management role as part of companies' treasury strategy. However, having considered stakeholder responses, we are not convinced that including swap costs in our cost of embedded debt allowance would improve its accuracy as a proxy for efficient debt costs, with the following reasons particularly significant:

- **Swaps are not debt:** Several responses were aligned with this sentiment; stating that the main purpose of swaps was to hedge risks (ie not to finance expenditure). While swaps can be used with debt instruments to synthetically replicate other debt instruments (eg index-linked debt), they are not a necessary part of debt issuance. Including swap costs in benchmarking does not therefore lead to a deeper understanding of the underlying cost of debt. Furthermore, we note cases where swaps have created new risk exposures, weighing on credit quality.[108]
- **Treating swap cashflows as costs can be misleading:** Using net swap cashflows for some swaps (particularly those that reprofile cashflows from future control periods) as a guide to their effective costs could present a misleading picture of their economic substance. In addition, the complexity and 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.[109]

Finally, we do not consider that the proposed full transition of the RCV to CPIH indexation requires us to assume swaps are used to switch RPI debt to a CPIH basis. We discuss our draft proposals for RCV indexation in Appendix 10 –Aligning risk and return.

Benchmark index cross-check

We note several issues with using an index-based approach to directly inform an embedded debt allowance, which are liable to lead to an overstatement of efficient costs:

- **Inclusion criteria:** The iBoxx A/BBB 10+ non-financials index used for PR19 does not reflect relatively lower-cost funding sources (ie private placement, floating-rate or EIB debt) which are present in water sector balance sheet debt.
- **Constraints on the notional company:** Using yields from a benchmark index to proxy for efficient notional costs may not align with reasonable assumptions for the notional company. For instance, the weighted-average yield-to-maturity for the iBoxx A/BBB index has stayed close to 20 years since 2000, but the average in recent years for the water sector is around 15 years,[110]

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[108] See Ofwat, 'Financial resilience in the water sector: a discussion paper', December 2021, Section 2.2, pp. 15-19
[109] For PR19 we used yield-at-issuance instead of coupon rate for bonds that had issuance proceeds different to their face value. This was as we considered the former to be a better guide to the effective interest rate.
[110] Ofwat, 'PR14 review: discussion paper on findings', Figure 5.7, p73

- **Weighting:** We would expect an equally-weighted trailing average to place too much weight on historic years. This is because issuance in more recent years will increasingly reflect demand for new debt for refinancing purposes as well as to finance new RCV.

These issues notwithstanding, there may be benefits to including an index-based approach to cross-check the cost of embedded debt derived using the balance sheet approach. In terms of index used, our expectation is that we would draw on the iBoxx A/BBB non-financials indices.

We see merit in using a collapsing trailing average approach.[111] We note however that results from assuming debt is issued consistently at a single tenor may be misleading given the sector has in practice issued at a range of different tenors. This is important, because the shape of the yield curve can drive outperformance even if bond issuance is distributed uniformly in terms of tenor.

This is set out in Figure A1.5, which depicts the thought experiment of bonds issued in a uniform distribution of between 0 and 40 years, at the rate implied by the calculated iBoxx curve depicted by the black line.[112] The grey line represents the cost of debt allowance, which is fixed to correspond to an issuance tenor of 20 years. The green shaded area of outperformance is larger than the red area of underperformance. We conclude from this that assuming issuance at a high fixed tenor such as 20 years may overstate the actual cost of borrowing even for an issuance strategy that is well-diversified and not weighted towards issuing at the short end of the yield curve.

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[111] As explained by the CMA PR19 Final Determination (see footnote 2668) "A collapsing average is a measurement methodology that 'drops' one year of the trailing average every year. For example, a 15-year collapsing average over the 5-year price control period would be an average of the 15-year, 14-year, 13-year, 12-year and 11-year averages. This methodology attempts to mimic the impact of moving through the price control period, so that (in this example), if we start with a 15-year trailing average of embedded debt, by the end of the first year we will have 14 years of embedded debt and one year of new debt, and so on".

[112] We have calculated this curve using the methodology in Nelson, C.R., Siegel, A.F. (1987). Parsimonious modeling of yield curves, Journal of Business, 60(4), pp. 473–489

Figure A1.5: Implied A-rated iBoxx non-financials yield curve and indicative fixed allowance
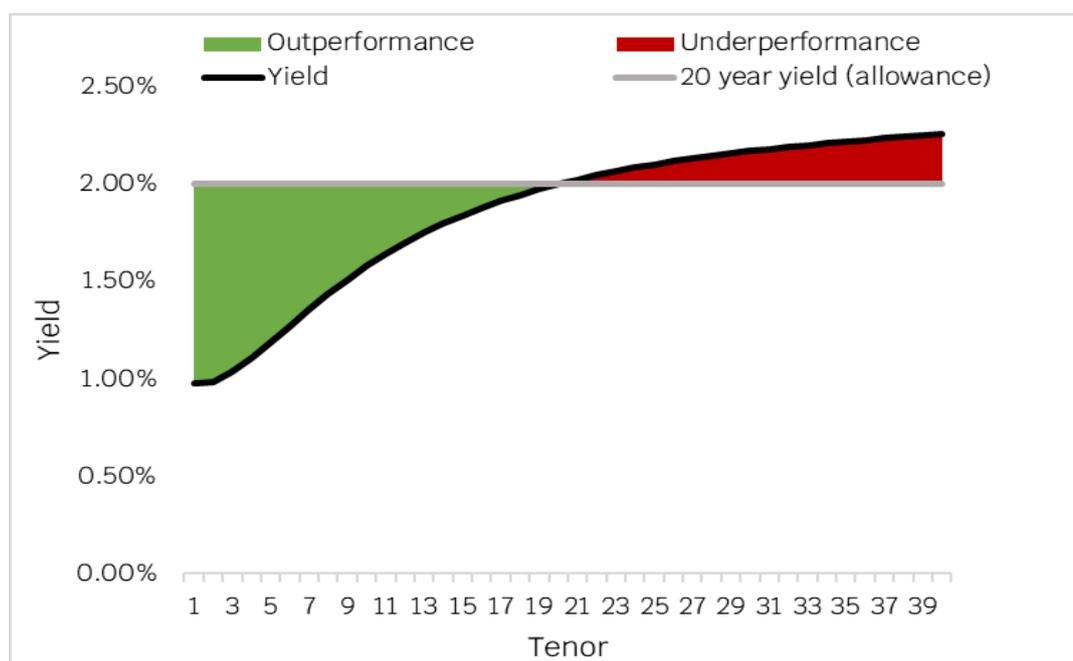
Source: Ofwat analysis of IHS Markit data and Nelson & Siegel (1987)

Note: Chart interpolates a curve using the daily yield and tenor of the iBoxx A nonfinancials 1–3y, 3–5y, 5–7y, 10–15y, 10+y and 15+y indices on 24/02/2020

A1.2.2 New debt

Introduction and policy background

New debt is the proportion of debt which will be issued during the price control period. It is used to finance new RCV and refinance existing debt as it matures.

At PR19, we introduced indexation for the allowed cost of new debt. We set an initial allowance using a one month average of the level of the iBoxx A/BBB non-financials 10yrs+ index, uplifted to the midpoint of 2020–25 using forward rates, and adjusted by deducting 15 basis points to account for an expected bond issuance discount relative to the benchmark index. We said that at PR24 we would reconcile the allowance for variance in outturn iBoxx A/BBB data against this allowance.

The CMA's PR19 redeterminations adopted a similar approach to our PR19 final determinations. The CMA however used a longer (6 month) trailing average to derive its initial new debt allowance, and it did not include a benchmark index adjustment, arguing that there was insufficient evidence to justify it. It also did not make an adjustment for market-implied interest rate rises, arguing that this adjustment did not improve the forecasting

accuracy of simply using spot rates, and that such an adjustment was unnecessary given the end-of-period reconciliation which would take place.

We proposed in our December discussion document that we would retain indexation of new debt, and that we would keep under review the case for applying an adjustment to the iBoxx A/BBB index. We provided analysis suggesting that, since 2020, the average discount to the index was 55 basis points, which we considered could support such an adjustment.

Stakeholder submissions and our response

Question 4.2 of our December discussion paper asked: **"Given the persistent issuance discount of water company bonds against the iBoxx A/BBB index, how should this be reflected in our new debt allowance-setting?".** Respondents raised the following issues:

- **Benchmark index adjustment:** Many responses argued that our finding of a discount to iBoxx A/BBB was not 'like-for-like' because our analysis did not control for credit rating and tenor. Responses tended to cite the CMA's assessment that controlling for these factors did not strongly support such an adjustment.
- **Accurately capturing PR24 financing conditions:** Several responses argued it would be problematic to use a fixed adjustment to the iBoxx A/BBB, index for the PR24 (2025-30) period, as contributing factors were liable to vary over time.
- **Credit rating:** Responses argued that PR24 water company credit ratings were likely to be below the weighted average Baa1 rating for the iBoxx A/BBB (and so driving a premium not a discount).
- **Floating rate debt:** Responses tended to argue that our indexation mechanism would already capture market interest rate movements. [113]
- **EIB debt:** Responses argued this would not drive a discount for new debt as the UK was not eligible for such financing post-Brexit.[114]
- **Flight to safety:** Some responses argued that some of the measured discount could be accounted for by a 'flight to safety' during the economic turmoil of the Covid-19 pandemic, and that it was not appropriate to assume this would persist. [115]
- **Index calculation mismatch:** One response cautioned against our approach of comparing the yield-at-issuance with the index value on the day, arguing that this was not a like-for-like comparison and that the index was a year-average yield. [116]
- **Maintaining incentives:** Some responses argued that applying an index adjustment would harm incentives to issue efficiently; for instance encouraging more short-term debt (and thus raising refinancing risk). One response argued that we should not be concerned about an issuance discount on new debt, as such debt would benefit customers through influencing the embedded debt benchmark.[117]

[113] Affinity Water, Bristol Water, Northumbrian Water, Southern Water
[114] Affinity Water, Northumbrian Water, Southern Water
[115] Affinity Water, SES Water
[116] United Utilities
[117] South Staffs Water

- **Transition to full indexation of the RCV by CPIH:** In light of our proposal to move to full CPIH indexation, some responses[118] argued for an allowance to manage basis risk and a liquidity premium due to the immature CPI(H)-linked bond market.

Our proposed approach for new debt

We propose to retain our benchmark index as the average of the A and BBB rated iBoxx GBP non-financials 10+ indices, due to its consistency with the credit rating stated as the target for the notionally-structured company in chapter 8 of our consultation document (BBB+/Baa1), its use in other regulatory determinations over time, and the high number of instruments included in the index. We intend to keep under review the appropriateness of this index should it turn out to be incompatible with the characteristics of the notional company.

We propose to continue indexing the cost of new debt as at PR19. This will reduce forecasting risk and promote an allowance that is closer to the actual cost of issuing in line with our benchmark index.

Consistent with our decision on the risk-free rate (see section A1.1.1), we consider that for our initial allowance a longer length of trailing average in the range 6-12 months would strike a good balance between keeping the data sample recent enough to be relevant, while limiting the weight attached to unrepresentative data. As with the risk-free rate, we do not propose to introduce a forward rates uplift; we agree with the CMA PR19 panel's conclusion that there is little evidence it would lead to more accurate estimate.

Benchmark index adjustment

We disagree with stakeholder responses that suggest any adjustment must consider spread-to-benchmark controlling for both credit rating and tenor.

We consider it reasonable to control for credit rating, given the target credit rating of BBB+/Baa1 for the notional company at PR24. In principle this rating roughly aligns with the average credit rating implied by the iBoxx A/BBB index and so it is unlikely that credit quality will make a material contribution to the yield discount for the notional company.

However, we consider there is evidence (for instance in Figure A1.5) that 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. We consider that revenue earning potential would be enhanced yet further by skewing issuance to below the approximately 20 years to maturity featured in the iBoxx. Given that the average bond tenor-at-issuance in recent years for the water sector is around 15 years,[119] it is

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[118] Thames Water
[119] Ofwat, 'PR14 review: discussion paper on findings', Figure 5.7, p73

valid to ask why customers should continue to pay a premium for financing costs corresponding to a tenor that is higher than that which is observed on average in the sector.

For each date on which a relevant bond has been issued, we can construct a hypothetical 'iBoxx yield curve' for both the A and BBB rating. These iBoxx yield curves will be constructed using the iBoxx GBP non-financials 3-5, 10-15 and 15+ indices, for A and BBB-rated series. We intend to use this analysis to decompose the drivers of the issuance discount into the relevant explanatory factors.

Our further analysis will aim to establish the extent to which water companies are able to issue at a discount to our benchmark index, and to what extent this can reasonably be extrapolated to the circumstances of the notionally-structured company.

If we are satisfied that the notional company would also issue at a discount, this raises the question of whether customers should share in the financial gain implied by this, and the best way of achieving this. In Table A1.5 we summarise the options we have considered and in Table A1.6 discuss the potential advantages and drawbacks, with a view to promoting fairness to customers yet providing a reasonable allowance to companies for their cost of new debt.

Table A1.5: Options for addressing discount to benchmark index

Option	Explanation
a) Ex-ante fixed index adjustment	This approach would involve calculating average spread-to-benchmark at issuance for post-2015 water bonds, controlling for drivers of yield that are not relevant to the notionally-structured company. We would report our calculation for draft and final determinations. We propose that it would be deducted from our initial and post-reconciliation cost of new debt allowance.
b) Ex-post fixed index adjustment	As for a), but the average spread-to-benchmark calculation would be applied using outturn data for 2025-29 for the reconciliation process recalculating the cost of new debt allowance. We would still use the approach set out in a) to calculate an initial allowance based on an index adjustment, which would be subject to reconciliation based on outturn data for both the index adjustment and market movements in the index as part of PR29.
c) No adjustment	This approach would seek to use the unadjusted iBoxx A/BBB index to set the allowed return on new debt.

Table A1.6: Options for addressing discount to benchmark index

Option	Advantages	Drawbacks

a)	Ex-ante fixed index adjustment	• Simple approach, consistent with PR14 and PR19. • More certainty over revenue impact • Tackles issue of too-high allowance.	• Forecast risk – adjustment may turn out too low or high relative to the spread-to-benchmark achieved in water bond issues over 2025-30.
b)	Ex-post fixed index adjustment	• Simple approach. • Substantially removes forecast risk – adjustment based on observed discount-to-index data for 2025-30 • Tackles issue of too-high allowance.	• Less early certainty for companies over size of index adjustment, as would be decided based on outturn data emerging over the course of the PR24 (2025-30) control.
c)	No adjustment	• Simplest approach	• Risks that customers will pay too much relative to actually-incurred debt costs.

Overall, we consider that Option b) may have the greatest net benefits. It would clearly tackle any issue of customers paying a too-high allowed cost of new debt. It would also use outturn data to substantially reduce the risk of forecast error in calibrating the appropriate size of the index adjustment.

Transition to full indexation of the RCV by CPIH

Financing choices and hedging policies applied under actual company structures are matters for companies to address. We would expect sufficient and convincing evidence to be provided if respondents consider there is a reason to adjust the benchmark allowed cost of new debt for a company with the notional structure. We set out further relevant detail in Section 2 of Appendix 10: 'Aligning risk and return' around the issue of incremental costs arising from our proposed changes to RCV indexation.

A1.2.3 Share of new debt

The assumed share of new debt in the notional company determines the weights attached to new and embedded debt costs in the overall cost of debt allowance. The share is an average over the PR24 period (2025-30).

Introduction and policy background

In making our PR19 final determinations, we considered three approaches to estimating the share of new debt:[120]

- **Notional approach:** This assumed that the average years-to-maturity of the sector's debt could be used to estimate the average share of refinancing debt over the control period, to which we added notional debt from new RCV additions. This gave a range of 20% to 21%.
- **Company-led data approach:** This is based on company forecasts for in-period debt issuance and balances of embedded debt based on debt paydown and accretion of index-linked debt. Applying this approach to data submitted in revised business plans resulted in an average share of new debt over 2020-25 of 14% to 17%.
- **Notional-actual hybrid approach:** This approach modelled embedded debt as in the company-led data approach. For new debt, we projected balances based on instruments falling due in-period and assumed that all new RCV would be financed with new debt minus the contribution of equity as set out in our financial modelling. This gave a range of 17% to 18%.

We concluded that an assumption of 20% new debt best reflected the evidence, placing less weight on the lower range estimated for the company-led data approach.

The CMA's PR19 redeterminations point estimate of new debt share (17%) drew both on company data on projected debt maturing and projected debt for new RCV financing. The CMA rejected making company-specific assumptions for the share of new debt.[121]

Our proposed approach for the share of new debt

We are minded to estimate the share of new debt by modelling average balances of new and embedded debt over the PR24 (2025-30) period, and constructing this estimate based on the separate contributions of refinancing and new RCV formation.

For our early view we will need to make judgments about reasonable assumptions underpinning these two sources of new debt demand, as we will not have business plans or firm estimates of RCV growth. We will need to refine these assumptions taking account of information in business plans at draft and final determinations.

While notional trailing average approaches can provide a useful cross-check, we consider that the simplifying assumption of debt issued at a constant rate and tenor-at-issuance (and hence a constant refinancing rate) may not be a good fit for the more diverse issuance

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[120] Ofwat, 'Allowed return on capital technical appendix', December 2019, pp. 75-77
[121] CMA, 'PR19 Final determinations, final report', pp.969-973

actually observed in the sector. For this reason we propose to place less weight on such approaches.

As set out in Chapter 7 of our consultation document, there may be benefits to adopting a lower notional gearing level at PR24. If so, we would expect the notional company to retain its prior balance of embedded debt and for gearing reductions to be achieved by a higher share of equity in new financing. This implies a constraint on new debt volumes, thus we would expect a reduction in notional gearing to reduce the share of new debt in overall borrowings for the notional company.

A1.2.4 Issuance and liquidity costs

Introduction and policy background

For PR19, our overall allowance of 10bps was informed by a range of 3-6bps for issuance costs,[122] and a range of 3.5-4.5bps for liquidity costs,[123] resulting in a rounded overall estimate of 10bps. The CMA's PR19 final determinations used 10bps as a point estimate for sector issuance and liquidity costs, as it did not consider our PR19 estimate was materially improved by disputing company submissions.[124] It did, however, allow Bristol Water an increment of 5bps to reflect the higher-than-average liquidity and issuance costs potentially faced by small companies.[125]

Our proposed approach for issuance and liquidity costs

Recent regulatory decisions in water such as the CMA's 2021 PR19 redeterminations support retaining the use of the 10bps issuance and liquidity costs allowance as a reasonable. If respondents consider an alternative figure to be more appropriate this should be supported by sufficient and convincing evidence relevant to the circumstances of the water sector.

A1.3   Company-specific adjustments

Introduction and policy background

At PR19 we allowed a higher cost of debt allowance for only two companies - Portsmouth Water and South Staffs Water – on the basis that these companies satisfied our three

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[122] Estimate based on 72 issues over the 1993-2017 period (average 3bps) featuring 72 issues over the 1993-2017 period and an estimate of 6 bps for Artesian debt.
[123] Estimate based on internal analysis suggesting a 10% liquidity requirement and 35-45bps costs.
[124] CMA, 'PR19 Final determinations, final report', p.970, para. 9.903
[125] CMA, 'PR19 Final determinations, final report', p.1007, para. 9.1035

assessment criteria.[126] We did not allow a cost of equity uplift, and this was not formally requested by any small company as part of their request for a company specific adjustment.

The CMA did not apply one of the three test criteria – the customer benefits test – in its assessment of whether to allow Bristol Water a company-specific uplift. Bristol Water ultimately received a company specific increase of 0.30% to its cost of embedded debt and a 5bps uplift to reflect higher issuance costs. The CMA did not accept Bristol Water's request for a new debt and cost of equity uplift or its request for a lower share of new debt assumption.

Stakeholder submissions and our response

Question 4.3 of our December discussion paper asked: **"Do you agree with our proposal to restrict company specific adjustments to reflect only factors due to small size, and to remove the benefits test?".** Respondents raised the following issues:

- **Benefits test:** Most responses supported the removal of the customer benefits assessment. Responses tended to argue this element was excessively resource-intensive, inappropriate, and was rejected by the CMA.
- **Customer support assessment:** CCW argued that in the absence of a benefits assessment, a rigorous customer support assessment would be necessary to gain assurance that customers understood what they were paying for and were content it justified higher costs.
- **Market solutions:** South West Water argued out of principle that small-size related uplifts were not in customers' best interests and it would be more efficient for such companies to merge, consolidate or pool resources.
- **Non-interest costs:** Several responses raised the issue of higher non-interest (eg issuance and liquidity) costs for smaller companies,[127] with some responses noting that both the CMA (for PR19) and Ofgem (For RIIO-2) had allowed an uplift to account for this.
- **Actual costs cross-check:** South East Water argued that the CMA had for its PR19 final determination for Bristol Water used a cross-check to company actual costs and that this would be an appropriate feature for PR24.
- **Balance sheet approach:** Bristol Water proposed a balance-sheet approach using small company data, cross-checked by applying the historical range of 25-40bps to the sector allowance, and with no company getting more than its actual debt costs.
- **Efficiency test:** South Staffs proposed that if companies could prove issuance was efficient, costs should be passed through to customers, including a feature whereby instruments that passed this test would not need to be re-checked at future price reviews.

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[126] the tests were based on evidencing Levels, Customer Support and Customer Benefits
[127] Affinity Water, Portsmouth Water, Bristol Water

- **Extent of management control:** Several responses disputed our claim that that timing and tenor were management decisions not linked to company size.[128]
- **International issuance:** Thames Water argued for an uplift for the costs associated with international issuance due to having saturated demand for its debt in GBP sterling markets. It argued that encouraging diversification could have benefits from both a notional and actual perspective, in terms of increasing financial resilience.

We consider company size to be a relevant factor to an assessment of a request for a company-specific adjustment to the allowed cost of debt. Companies have proposed other factors relevant to benchmarking performance, but these are either substantially under direct management control (ie timing, tenor), or can have their effects mitigated through a diverse debt issuance strategy (ie market conditions, strategy of other firms). Protecting companies from these factors would dilute future incentives to issue debt efficiently. It would also be unfair on customers to share in the downside in cases where currently high-cost instruments were below our benchmark for historical periods but customers did not share in the benefits.

Neither are we persuaded that we should depart from our well-established approach of adjusting our notional sector benchmark with an uplift, in order to instead assess whether individual instruments are efficiently-incurred or to set a benchmark using small company actual costs. We consider that instrument-level efficiency reviews would be disproportionately resource-intensive, complex, and unlikely to present clear efficiency incentives. We consider that using a benchmark drawn from small company costs would involve too few datapoints to be robust, and might result in passing the risk of historic financing decisions under companies' control (ie timing and tenor) to customers in a way which would also likely dilute incentives to issue efficiently in future.

While a number of water companies have and do issue in currencies other than Pounds Sterling, we are not convinced that it would be reasonable to assume customers of the notional company ought to incur additional costs of debt raised in alternative currencies due to saturating the market for their sterling-denominated debt. This is as this state of affairs is rare - seemingly only affecting one water company.

Maintaining a customer support assessment will provide a measure of protection to customers from bearing inefficient costs. It is appropriate to consider whether customers should automatically fund higher costs when market solutions (eg mergers) can address diseconomies of scale at lower cost to customers. For instance, the acquisition of Bristol Water by the owner of South West Water (Pennon Group) on 3 June 2021 has resulted in

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[128] Bristol Water, South Staffs Water, Yorkshire Water

undertakings to maintain separate reporting, to remove the company-specific uplift, and share half the merger-specific synergies to 2025 with both companies' customers.[129]

Our proposed approach for Company-Specific Adjustments

We propose to require that small companies seeking a cost of debt uplift should clearly indicate this and provide compelling evidence in support of their claim – in particular:

Levels assessment: applicants would need to provide evidence justifying any higher debt costs faced by a notional small company based on its size, relative to large company benchmark.

Any claimed uplift should only compensate for financing diseconomies of scale at the point of debt issuance, rather than factors more directly under management control (ie timing and tenor). This is consistent with our long-held view that companies and their investors should bear the risks of their choices on financing decisions.

Customer support assessment: applicants would need to provide evidence that their customers support funding an uplift. This should not be limited to a survey – companies should seek to understand customers own views in their own words rather than, for instance, solely relying on research that involves multiple-choice questionnaires.

We expect that our minimum quality criteria would encompass:

- that companies' customer engagement is supported by a sufficiently large and representative sample of the customer base,
- that the impact of the uplift on customer bills has been clearly portrayed against the counterfactual of no uplift; and
- that elicited support for the uplift is based on information that fairly portrays the issue.

Where customer research is used to support a claim, we expect companies to achieve the standards for high quality research if it is to carry weight in our assessment.

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[129] CMA, 'Undertakings given by Pennon Group PLC to the CMA pursuant to section 33D of the WIA 1991, as amended by the WIA 2014'.

A2   Retail margins

Introduction and policy background

For PR19 we used a household retail net margin of 1.0%, based on analysis of comparator company accounts and previous regulatory decisions by Europe Economics. The consultancy concluded 1.0% was an appropriate retail margin for 2020-25.

A retail margin adjustment to the appointee WACC is required to avoid double counting compensation for systematic retail risks. Because we set allowed returns using data which captures risk from all controls (including retail), we need to adjust the return to reflect that retail risk is remunerated via the retail margin. The retail margin adjustment is based on the part of retail margin revenues not accounted for by fixed capital costs and working capital. For this reason, at PR19 we adjusted the appointee allowed return on capital to calculate a wholesale allowed return on capital.

At PR19, the retail margin adjustment (expressed as a percentage of RCV) used to derive the wholesale allowed return on capital from the appointee allowed return was 0.04%. At PR19 CMA appeals, disputing companies raised issues with our PR19 approach, notably the absence of the measured income accrual in our approach and around treatment of retail creditor balances (which disputing companies argued should be excluded as an intercompany balance). The CMA's PR19 redetermination supported the approach of deducting the return attributable to retail activities from the appointee return, but it recalculated the size of the adjustment by starting with the notional retail margin of 1% and subtracting its view of the return required by the retail business (excepting that pertaining to systematic risk). The retail margin adjustment determined by the CMA PR19 redetermination panel was 0.08%.

Stakeholder submissions and our response

We did not ask a question on retail margins in our December discussion document, however, in response to our May discussion paper,[130] Yorkshire Water set out it did not agree with the CMA's assumption of nil net working capital days.

Yorkshire Water also stated that "a sense check" of the retail margin deduction on the actual retail margin is required, as it considers that the CMA's 0.08% retail margin deduction equates to a retail margin of only 0.2%. We consider that this figure is misleading, as it does not appropriately reflect the elements of the retail margin covering working capital and return on fixed capital assets – both elements covered by our retail margin.

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[130] Ofwat, 'PR24 and beyond: Creating tomorrow, together', May 2011

We acknowledge Yorkshire Water and Northumbrian Water's argument to the CMA that a vanilla WACC should not be used in the calculation of the required pre-tax retail margin, and instead a pre-tax WACC should be applied. However, we agree with the CMA's assessment that it is not appropriate to fund equity investors' corporation tax costs in the return on equity. We also agree with the CMA's judgement that a retail margin adjustment of zero would significantly over-reward the companies.

We note issues raised with our treatment of debtor and creditor days in estimating working capital balances, and consider that our assessment may be best focused on using the financial model as the source of the working capital assumption.

Our proposed approach for retail margins

We intend to set a retail net margin for the household retail control and propose to review whether the PR19 figure of 1.0% remains appropriate. We envisage looking at evidence from comparator companies, other regulated sectors, and submissions from water companies.

We propose to continue to apply a retail margin adjustment to avoid double counting compensation for systematic retail risk, and that this should be estimated as the retail margin minus the cost of working capital and fixed asset financing. We propose to use modelled working capital balances from the financial model as our input to the retail margin adjustment calculation. This is as it is liable to be more consistent with our overall determination, and should pick up the correct contributors to working capital balances.

Ofwat (The Water Services Regulation Authority) is a non-ministerial government department. We regulate the water sector in England and Wales.

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