WACC in the context of Risk, Return and Resilience at PR19: Ernst & Young report

Chapter 9: 3rd Party Report

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A report produced for United Utilities by Ernst & Young LLP (EY), setting out EY's opinion on the appropriate WACC for AMP7 and AMP8, and the appropriate residential retail margin for AMP7 for the UK water sector.

United Utilities Water Limited

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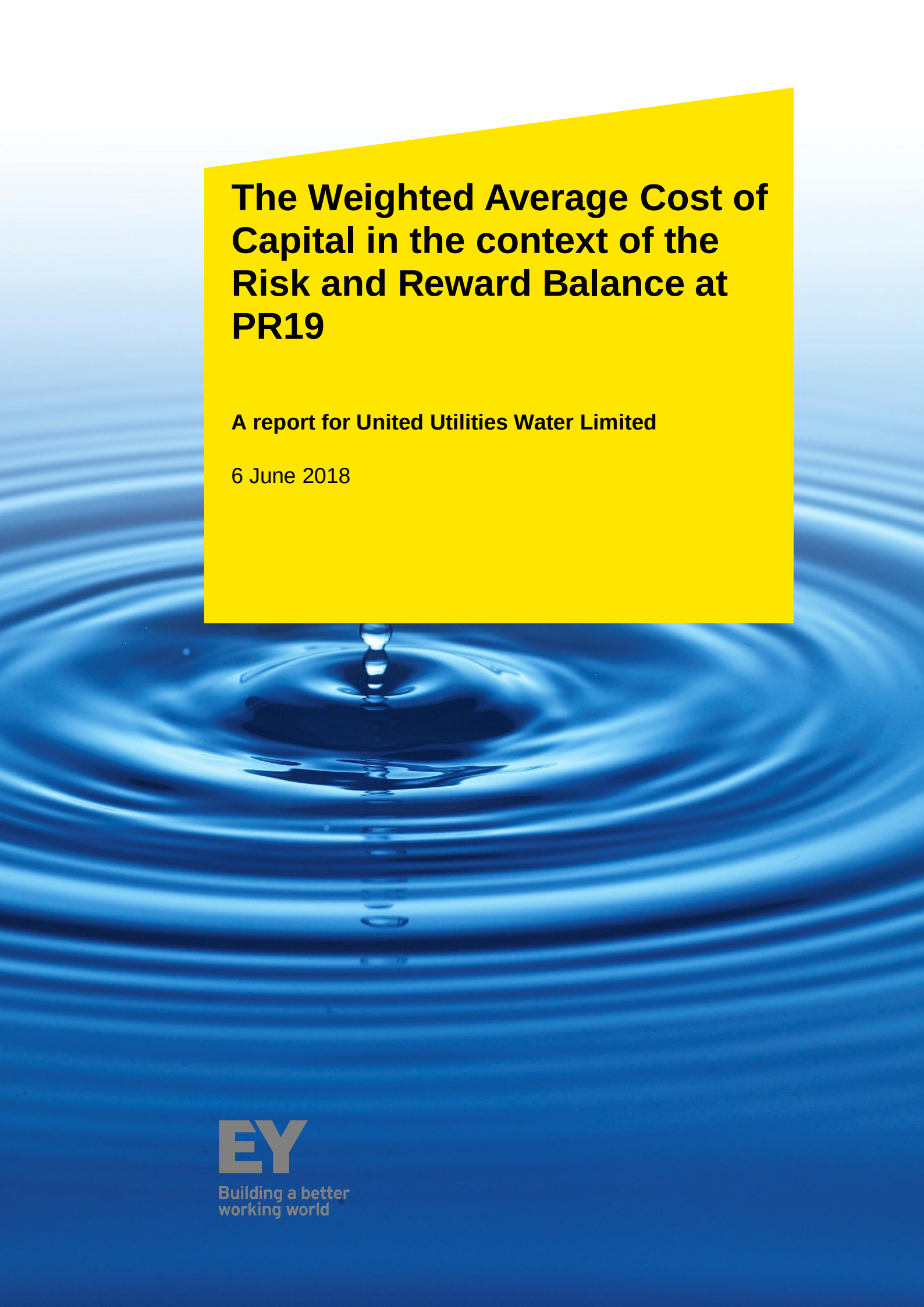

The Weighted Average Cost of Capital in the context of the Risk and Reward Balance at PR19

A report for United Utilities Water Limited

6 June 2018

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Glossary

Acronym	Description
ACTS	Average cost to serve
AMP	Asset Management Plan
CAGR	Compound Annual Growth Rate
Capex	Capital expenditure
CAPM	Capital Asset Pricing Model
CIS	Capex Incentive Scheme
CPI	Consumer Price Index
CPIH	Consumer Price Index including Owner Occupier Housing
DEFRA	Department for Environment, Food & Rural Affairs
DPC	Direct Procurement for Customers
EBIT	Earnings Before Interest and Tax
EBITDA	Earnings Before Interest, Tax, Depreciation and Amortisation
EU	European Union
FD	Final Determination
HH	Household
KPI	Key Performance Indicators
NEC	Notionally Efficient Company
NHH	Non household
NPV	Net Present Value
ODI	Outcome Delivery Incentive
ONS	Office for National Statistics
Opex	Operating expenditure
PAYG	Pay As You Go
PC	Performance Commitment
PR	Price Review
RCM	Revenue Correction Mechanism
RCV	Regulatory Capital Value
RoRE	Return on Regulatory Equity
RPI	Retail Price Index
Totex	Total expenditure
WACC	Weighted Average Cost of Capital
WaSC	Water and Sewerage Company
WoC	Water only Company
WRMP	Water Resource Management Plan
WTP	Willingness to pay

Contents

Executive Summary

Investors in water companies face a variety of risks reflecting the underlying performance of the business, the economic and financial environment, the ability of management to mitigate those risks and the design of the regulatory framework. Companies can also earn rewards (or returns) through a number of channels, including the allowed cost of capital applied to the Regulatory Capital Value (RCV) and the residential retail margin. United Utilities' (UU's) PR19 business plan, and Ofwat's price control determinations, will have to consider all the sources of risk and reward and try to align them i.e. ensure the amount of reward should be commensurate with the amount of risk.

If the cost of capital is set inconsistently with the risks which UU is being asked to accept, UU may not be able to deliver the services required by customers, nor continue to attract and retain equity investment – with consequent negative impact on share prices – and may face the possibility of a credit rating downgrade resulting in an increased cost of debt. On the other hand, customer bills could in future rise further than what is necessary to cover the efficient costs of delivering the services required, potentially reducing the legitimacy of UU's business in the long run. Consequently, securing a sustainable risk and reward package at PR19 is critical to UU's ability to finance its functions by allowing UU to access capital markets as and when required on affordable terms over the 2020-25 period and beyond, while delivering its obligations to customers.

Accordingly, to support UU in developing a robust assessment of an appropriate risk and reward balance for its PR19 business plan, UU has commissioned EY to advise on:

- compensating risk through reward:
  - the appropriate 'base' cost of capital for the industry over the 2020-25 period, taking into account the latest financial market information, economic developments, and regulatory assessments (Section 2); and
  - the residential retail margin which should be allowed for the 2020-25 period (Section 3);
- the appropriate 'base' cost of capital for the industry over the 2025-30 period (Section 4); and
- how to test if risk and reward are aligned through return on regulatory equity (RoRE) analysis and financeability testing (Section 5).

Our work has taken into account Ofwat's PR19 methodology decision (December 2017) and focuses on advising on how to calibrate the risk and reward package within the basic regulatory framework that Ofwat has laid out. Where relevant we comment on Ofwat's proposals, but the primary focus of this report is setting out an independent view on the risk and reward package at PR19. Our work does not take into account Ofwat's April 2018 "putting the sector back in balance" consultation.

The allowed cost of capital for the 2020-25 period

Estimating the cost of capital in the context of significant financial and economic uncertainty (e.g. Brexit) is challenging. We have therefore had regard to a range of different methodologies and data sources as part of forming our views on an appropriate Weighted Average Cost of Capital (WACC) for PR19.

We have adopted the Capital Asset Pricing Model (CAPM) framework as our primary method for estimating the cost of equity, noting this is the method principally employed by economic regulators and the Competition and Markets Authority (CMA) in the UK. Our analysis of the key CAPM parameters indicates that:

- while the UK is currently experiencing historically low interest rates and market forecasts indicate only a modest rise (of around 70 basis points) in gilt yields between now and the middle of AMP7, there is significant uncertainty (acknowledged by the Bank of England) around the outlook, and it is not certain that the low interest

rate environment will persist over the 2020-25 period. Moreover, historical periods of low equity returns, such as World War I, World War II and the 1970s oil price shocks, have all been followed by periods of prolonged above-average equity returns. Consistent with this, historical equity returns have tended to be more stable over a 30 year horizon than a 10 year horizon. The case for abandoning the established UK regulatory practice and adopting an estimate of the total market return (TMR) less than long run historical averages suggest is not strong. We therefore consider an assumption that total market returns will be in a range of 5.0 – 6.5% (real, Retail Price Index (RPI) inflation stripped terms) over AMP7 to be reasonable.

- index-linked gilt yields and deflated nominal gilt yields are both at historically low levels. Long-maturity yields are currently negative and long-term trailing averages are in a range of around 0.0 – 0.5%. Economic theory suggests that a negative real risk-free rate would be consistent with an economy that was expected to shrink over the long term, so we consider a negative real risk-free rate difficult to support. Instead, we place more weight on longer term trailing averages.
- consistent with recent UK regulatory precedent, we estimate the Equity Risk Premium (ERP) by deducting our estimate of the risk free rate from our estimate of the TMR. This implies a range of 5.0 – 6.0%. We note this is consistent with evidence from long-run historical returns data and recent survey evidence and with recent commentary from the Bank of England.
- asset betas for listed English water companies, estimated over various historical periods and using a range of data frequencies and techniques, are in a range of about 0.30 – 0.40. The top end of this range is slightly above the range supported by regulatory precedent from the CMA and other sectoral regulators, but some increase in asset betas since PR14 is consistent with some of the changes to the regulatory framework that Ofwat has introduced for PR19 e.g. introduction of more market forces into upstream markets. We therefore consider an asset beta range of 0.30 – 0.35 is appropriate for PR19.
- average gearing of the water and sewerage companies has been around 60 – 65% over the past few years and remains consistent with an investment grade credit rating (based on the methodologies published by credit ratings agencies). Accordingly, we adopt a notional gearing range of 60 – 65%.

Combining these estimates suggests a range for the cost of equity of 4.3 – 5.75% (real, RPI-stripped, post-tax terms). Estimates of the listed water companies' cost of equity using a Dividend Growth Model (DGM) broadly corroborate this range, noting that the DGM estimates are sensitive to the long-term growth rate assumption used.

We consider evidence from benchmark indices for investment grade credit rated corporate bonds and water companies' actual debt costs to inform our views on the cost of debt. Our analysis indicates:

- long term trailing averages of benchmark bond indices suggest the RPI-stripped real pre-tax cost of debt could be around 1.7 – 2.4%. The top end of this range is higher than the RPI-stripped real cost of water companies' existing bond debt, which we calculate to be around 2.1 – 2.2%. If European Investment Bank (EIB) loans are taken into account, the real cost of debt may be lower. Moreover, the cost of existing debt may decrease between now and the PR19 Final Determination given that interest rates are expected.to remain at very low levels over the intervening period. We therefore adopt an RPI-stripped real cost of existing debt in a range of 1.5 – 2.0%.
- coupons on recent bond issuances expressed in real RPI-stripped terms have been in a range of about -1.0 to -0.3%, but the lower end of this range is below the real cost of debt implied by benchmark non-financial iBoxx indices deflated for expected inflation. The upward sloping yield curve suggests yields may rise by about 70 basis points between now and the middle of AMP7, so we assume that the real RPI-stripped cost of debt over the AMP7 period will be around 0.0% – 0.5%.
- transaction costs relating to debt issuance and cash holding costs relating to the maintenance of liquidity may add about 0.1 – 0.2% to the cost of debt.

Assuming a 75%/25% split between embedded and new debt, the estimates above imply a real, RPI-stripped, pre-tax cost of debt in a range of 1.2 – 1.8%, inclusive of transaction costs, on average over the AMP7 period.

Combining the estimates of the costs of debt and equity together, Table 1 below summarises our estimate of the real RPI-stripped WACC for PR19.

Table 1: WACC range – RPI stripped terms

	EY estimates		Comparison ranges	
	Min	Max	PR14	PR19 Final Methodology
Gearing (%)	65	60	62.5	60
Cost of equity (post-tax, %)	**4.3**	**5.75**	**5.65**	**4.01**
Cost of debt (pre-tax, %)	**1.2**	**1.8**	**2.59**	**1.33**
Appointee WACC (vanilla)	**2.3**	**3.4**	**3.74**	**2.40**

To convert this RPI-stripped real WACC into a Consumer Price Index including Owner Occupier Housing (CPIH) stripped real WACC, we need an estimate of the difference between RPI and CPIH inflation. In the absence of forecasts of CPIH from institutions such as the Bank of England, Office for Budget Responsibility or HM Treasury, and noting that CPI and CPIH inflation are closely correlated, we rely on various independent estimates of the wedge between RPI and CPI inflation. These estimates suggest the long-term wedge between RPI and CPIH is around 1.0 – 1.3%, implying a CPIH-stripped real WACC of 3.3 – 4.7%.

Weighting the RPI-stripped and CPIH-stripped Appointee WACCs together on a 50/50 basis implies an overall Appointee real vanilla WACC of 2.8 – 4.0%. This weighted average WACC would increase over the 2020-25 period, all else equal, as more weight is gradually placed on the CPIH WACC as new additions to RCV will be added to the CPIH-linked RCV and multiplied by the CPI
We select the mid-point of our WACC ranges as our point estimate, consistent with the approach adopted by the CMA in the most recent Bristol Water appeal. Our point estimate of the water industry base WACC for PR19 is therefore 2.85% in real RPI-stripped terms and 4.0% in real CPIH-stripped terms.

The allowed residential retail margin for the 2020-25 period

At PR14, the net margin for retail services was set at 1.0%, applicable to households in England and both households and non-households (consuming below 50 Ml a year) in Wales. Ofwat's assessment of the household retail margin was based on a combination of benchmarking against margins in other sectors and past regulatory decisions, and a cross-check using a return on capital method (involving applying the Appointee WACC to an estimate of capital employed in the retail businesses).

To inform our views on the appropriate residential retail margin for PR19 we have examined:

- recent regulatory precedents on this issue, including from the CMA's energy markets inquiry and Ofwat's own review of non-household retail margins (PR16);
- actual retail margins reported by water companies in both the household and non-household segments; and
- changes in the regulatory framework and environment that Ofwat has proposed for PR19 and the implications for the risk of the residential retail business.

Our analysis suggests that an appropriate EBIT margin at PR19 is in the range of 0.5 – 2.0%. The upper end of the range is based on the CMA's assessment, during its energy markets inquiry, that an EBIT margin of 2% was appropriate in a competitive energy supply market

and that the risk of a residential retail water business is likely to be no higher than an energy supplier. This is noting that the residential retail water market is not open to competition and water retailers are not exposed to similar levels of wholesale price volatility. However, the ability of retailers to disconnect non-paying customers in the water sector is more limited than retailers in the energy sector.

It is difficult to quantify the differences in risk between the residential retail water sector and other utility sectors, but we consider an EBIT margin of around 1.0 – 1.5% would be a reasonable range for PR19. In the absence of a strong rationale to adopt a figure towards the top or bottom of our range, we recommend using an EBIT margin of 1.25%.

The allowed cost of capital for the 2025-30 period

We have adopted the same basic methodology to estimate the WACC for the 2025-30 period as for the 2020-25 period: we estimate an RPI-stripped real WACC using a CAPM framework taking into account financial market data, economic forecasts and relevant theory and literature. As part of our work, and in agreement with UU, we have made a number of simplifying assumptions including that there will be no changes to the regulatory and policy framework around the English and Welsh water sector between PR19 and PR24.

Our analysis of the key cost of equity parameters for the 2025-30 period is as follows:

- based on long run historical stock market returns data, and following the work of Mason, Miles and Wright (2003) and updates of that report for Ofgem and the UK Regulators Network, we assume that the total market return is broadly stable over the longer term. This was the same approach we adopted for the PR19 WACC, so we adopt the same range for the TMR at PR24 i.e. 5.0 – 6.5%;
- gilt and ILG yield data suggests only a modest rise in government bond yields between the middle of AMP7 and AMP8, which implies a relatively modest increase in the real risk free rate over this period. This would be consistent with a “lower for longer” interest rate environment. We discussed in relation to the AMP7 WACC why we do not consider it appropriate to assume the UK economy is in a lower for longer environment. We therefore consider that an alternative approach to estimate the real risk free rate is more appropriate. In this regard we note a body of academic literature which suggests that the real risk-free rate should be equal to long run potential GDP growth, which may be around 2.0% based on available independent medium term GDP growth forecasts. We infer from this that the real risk free rate should rise back to around 2.0% as the economy “normalises” in future. We also note the duration of previous periods of low market returns have not lasted for as long as the current one, so we expect the economy and returns to “normalise” at some point over AMP8. We assume a real risk-free rate of 1.0 – 1.5% for the AMP8 period, consistent with a modest rate of increase in interest rates from the end of the AMP7 period (when we have assumed the real risk free rate will still be very low) towards 2.0% by the end of AMP8;
- combining the TMR and risk free rate estimates descried above, we estimate the ERP for AMP8 in a range of 4.0 – 5.0%. We note that this is consistent with long run historical returns data and with regulatory precedent;
- we assume an asset beta of 0.30 – 0.35 for AMP8, the same as for AMP7, in the absence of any obvious reason to assume otherwise. We note that this is consistent with our assumptions of no changes in the regulatory and policy framework between PR19 and PR24 and with regulatory precedent which has tended to be fairly stable over time. We note it is also consistent with recent research for the UK Regulators Network that suggests asset betas for utilities are fairly stable over time; and
- we assume gearing in a range of 60 – 65%, the same as for AMP7. This is based on observed outturn industry average gearing having been fairly stable in recent years and that the 60 – 65% range is consistent with the investment grade credit rating we assume water companies will continue to want to hold into the future. It is also consistent with our assumption of no changes in the regulatory and policy landscape between PR19 and PR24.

Combining the estimates above we conclude on an RPI-stripped real cost of equity of 4.4 – 5.9%.

Our assessment of the key cost of debt parameters for PR24 is as follows:

- We calculate an RPI-stripped real cost of embedded debt of 1.25 – 1.44% at the start of AMP8, i.e. 31 March 2025. This is based on rolling forward the existing stock of debt (i.e. as of February 2018) and assuming debt is raised over the 2020-25 period in line with our assumed AMP7 cost of debt.;
- We estimate an RPI-stripped real cost of new debt in a range of 2.5 – 3.0% over the period. This is based on combining our estimate of the real risk-free rate for AMP8 with an assumption that debt spreads remain broadly in the ranges we have observed historically.. This is similar to the real cost of debt in the early to mid 2000s, prior to the global financial crisis; and
- We assess that an 80/20 embedded/new split is appropriate for estimating the cost of debt at PR24. This is based on analysis of how much existing (February 2018) debt is likely to mature over the period, the amount of debt raised during the 2020-25 period which may mature during 2025-30 (noting average water company bond tenors) and taking into account the acceleration in the capex programme between AMP7 and AMP8 which might be required to continue to justify a 75/25 split at PR24.

Combining the estimates above we conclude on an RPI-stripped real cost of debt of 1.6 – 1.95%.

Table 2 below summarises our overall estimate of the WACC for PR24 and compares it to our estimate for PR19. As the table shows, we estimate an RPI-stripped real vanilla WACC of 2.6 – 3.5% for PR24, slightly above the equivalent range for PR19. The estimated WACC range is relatively consistent between AMP7 and AMP8 because we consider the expected medium and long term TMR is broadly stable over time and we estimate that water companies will continue to be able to raise relatively low cost new debt over the 2020-25 period, such that the embedded cost of debt may be lower by PR24 than at PR19.

Table 2: EY estimated WACC ranges – RPI stripped terms

	AMP8		AMP7	
	Min	Max	Min	Max
Gearing (%)	65	60	65	60
Cost of equity (post-tax, %)	**4.4**	**5.9**	**4.3**	**5.75**
Cost of debt (pre-tax, %)	**1.6**	**1.95**	**1.2**	**1.8**
Appointee WACC (vanilla, %)	**2.6**	**3.5**	**2.3**	**3.4**

To convert this RPI-stripped real WACC into a CPIH-stripped real WACC, we again use the long-term ”wedge” between RPI and CPIH of around 1.0 – 1.3%, which we have confirmed is broadly in line with expected RPI inflation of 3.0 – 3.5% based on the inflation swap curve and a comparison of gilt and ILG yields over the AMP8 period.

Adopting these estimates of inflation implies a CPIH-stripped real WACC of 3.6 – 4.8%.

Weighting the RPI-stripped and CPIH-stripped Appointee WACCs together on a 25/75 basis – taking into account that the CPIH linked proportion of RCV will grow over time - implies an overall Appointee real vanilla WACC of 3.2 – 4.2%. This weighted average WACC would start off lower at the beginning of the 2025-30 period, but increase over the period as new additions to RCV will be added to the CPIH-linked RCV
We select the mid-point of our WACC ranges as our point estimate, consistent with our approach for the AMP7 WACC. Our point estimate of the water industry base WACC for PR24 is therefore 3.1% in real RPI-stripped terms and 4.2% in real CPIH-stripped terms.

Testing the risk and reward package to ensure it is balanced

The risk and reward package will need to be tested from a number of different angles. Financeability testing and Return on Regulatory Equity (RoRE) analysis will be important to determining the acceptability of the risk and reward package to debt and equity investors.

We have reviewed Ofwat's proposed approaches in both areas at PR14 and in the PR19 methodology decision. Our key findings include:

- Ofwat's proposed RoRE ranges may not be available to a notionally efficient company (NEC) in practice: the upside which Ofwat claims is available does not, on our analysis, appear to be achievable by an NEC because the cost and outcome targets Ofwat proposes to set are challenging to meet – meaning outperformance may be more difficult to achieve than Ofwat assumes – and the financial rewards which Ofwat assumes are available appear to be smaller than stated. Some adjustment to the cost and outcome targets may be appropriate to restore the deliverability of these RoRE ranges for an NEC or, failing that, an upward adjustment to the allowed cost of equity might be required to ensure investors expected rate of return on equity equals the cost of equity;
- Ofwat's proposed approach to financeability testing has several dimensions, some of which appear reasonable e.g. we agree with Ofwat's proposals to consider financeability on both the actual and notional balance sheet basis. However, Ofwat continues to propose to use a set of financial ratios that differ from those used by the credit ratings agencies despite the CMA challenging this approach at PR14. We recommend using the same ratios, definitions of those ratios and threshold tests as the credit ratings agencies; and
- Ofwat expects companies to explain their choice of target credit rating, rather than setting out a target it expects companies to be able to achieve. In the absence of guidance from Ofwat our assessment of the cost of capital at different credit ratings suggests that targeting an A- or BBB+ rating would be likely to deliver the lowest cost of capital and continued access to financial capital markets during periods of financial market turmoil.

These issues are considered in more detail in Section 5 of the report.

How to align risk and reward if they are not in balance

Assuming that the asset beta used to calculate the allowed "base" industry WACC is appropriately calibrated (i.e. reflects the systematic risks borne by equity investors), an equity investor will expect to earn a rate of return equal to the allowed rate of return unless other elements of the price control package mean that returns are expected to be higher or lower. The impact of other aspects of the price control are captured in the RoRE framework, as discussed above. The risk and reward package would, therefore, be in balance if the distribution of the RoRE range around the allowed base cost of equity is the same as the distribution of risk underpinning the beta estimate (which in a CAPM framework will be assumed to be normally distributed).

If the RoRE range is skewed, either positively or negatively, adjustments may need to be made to other elements of the risk and reward package. One potential solution to this issue could be to revisit the calibration of cost efficiency targets, cost sharing incentives, Performance Commitments (PCs), Outcome Delivery Incentives (ODIs) and CMeX/DMeX (i.e. the key regulatory levers which can influence risk).[1] Adjusting how challenging the targets in each of these areas is, or the scale of rewards and penalties available for out/underperformance, could increase or decrease the amount of RoRE upside and downside available. Another potential solution could be to adjust the allowed cost of equity to restore the balance between investors' required rate of return on equity and the expected rate of return.

[1] PCs are the levels of service which companies commit to delivering. ODIs are the financial rewards and penalties which companies earn or incur if standards of service exceed or fall short of the PCs. CMeX and DMeX are incentive mechanisms specifically linked to customer experience and developer experience.

1. Introduction

Investors in water companies face a variety of risks reflecting the underlying performance of the business, the economic and financial environment, the ability of management to mitigate those risks and the design of the regulatory framework. Comopanies can also earn rewards (or returns) through a number of channels, including the allowed cost of capital applied to the Regulatory Capital Value (RCV) and the residential retail margin. United Utilities' (UU's) PR19 business plan, and Ofwat's price control determinations, will have to consider all the sources of risk and reward and try to align them i.e. ensure the amount of reward should be commensurate with the amount of risk.

If the cost of capital is set inconsistently with the risks which UU is being asked to accept, UU may not be able to deliver the services required by customers, nor continue to attract and retain equity investment – with consequent negative impact on share prices – and may face the possibility of a credit rating downgrade resulting in an increased cost of debt. On the other hand, customer bills could rise further than what is necessary to cover the efficient costs of delivering the services required, potentially reducing the legitimacy of UU's business in the long run. Consequently, securing a sustainable risk and reward package at PR19 will be critical to UU's ability to finance its functions by allowing UU to access capital markets as and when required on affordable terms over the 2020-25 period and beyond, while delivering its obligations to customers.

In order to balance risk and reward in its PR19 business plan UU will need to form a view on the various components of the risk and reward balance, such as the appropriate cost of capital and residential retail margin. UU will also need to identify ways of testing whether its PR19 business plan appropriately balances risk and reward, such as through RoRE analysis and financeability testing. Ofwat has set out some views on these issues as part of its PR19 methodology decision (December 2017), but an alternative independent assessment of these issues can also help UU decide what an appropriate approach to these issues to adopt in its PR19 business plan might be.

In this context, UU has commissioned EY to advise it on selected aspects of its risk and reward package for PR19. Specifically, we have been asked to advise on:

- the 'base' cost of capital for the sector for AMP7 and AMP8, taking into account the latest financial market information, economic developments and Ofwat announcements;
- the residential retail margin for the sector for AMP7; and
- the appropriate approach to RoRE analysis and financeability testing.

Where relevant we comment on Ofwat's proposed approach to PR19 set out in its December 2017 methodology decision,[2] but the primary focus of this report is setting out an independent view on the risk and reward package at PR19. Our work does not, however, take into account Ofwat's April 2018 "putting the sector back in balance" consultation as this is outside of the scope of work for this report.[3]

This report is structured as follows:

- Section 2 discusses the cost of capital for the 2020-25 period;
- Section 3 discusses the residential retail margin for the 2020-25 period;
- Section 4 discusses the cost of capital for AMP8; and
- Section 5 discusses the approach to RoRE analysis and financeability testing.

EY's work has benefitted from discussions with (i) an independent regulatory expert, Maxine Frerk, who was formerly a Senior Partner at Ofgem responsible for the RIIO-ED1 price controls; and (ii) an independent academic expert, Professor Raphael Markellos, who is a leading academic on finance theory at University of East Anglia.

All opinions expressed, and any errors included, in this report are those of EY.

[2] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review, December.
[3] See Ofwat (2018) Putting the sector back in balance: Consultation on proposals for PR19 business plans, April.

2. The Weighted Average Cost of Capital for the 2020-25 period

2.1 Our approach to the WACC

The WACC is a key input to the determination of allowed revenues, since allowed returns are calculated as WACC multiplied by the Regulatory Capital Value (RCV). The WACC is also difficult to estimate, given a wide range of available relevant financial, economic and company data and an extensive literature – including both academic literature and a body of regulatory precedent - about the best way to estimate it. Given its prominence, and the degree of judgement involved in its estimation, the WACC has always been a keenly debated topic at past price control reviews in the water sector.

In some ways, PR19 will be similar: WACC will continue to be an important input to the price control determination. But in others it will be different: Ofwat has set out early views on the WACC in its PR19 methodology decision published in December 2017 (summarised in more detail below).

Box: summary of Ofwat's early view of the cost of capital for PR19 in its methodology decision

As part of its PR19 methodology decision in December 2017, Ofwat has set out an "early view" of the cost of capital for PR19. Ofwat calculates a nominal cost of capital which it then deflates into real Retail Price Index (RPI) inflation and Consumer Price Index including Owner Occupier Housing (CPIH) stripped terms using expected long term inflation and an estimate of the wedge between RPI and CPIH. A deduction is then made from the Appointee cost of capital to calculate the wholesale cost of capital because returns to investors from residential retail activities are separately compensated through a retail margin. The various estimates of the cost of capital are presented in Table 3 below.

Table 3: Ofwat's early view of the cost of capital for PR19

	Nominal	Real CPIH	Real RPI	PR14
Total market return	8.60%	6.47%	5.44%	6.75%
Risk free rate	2.10%	0.10%	-0.88%	1.25%
Equity risk premium	6.50%	6.37%	6.31%	5.50%
Unlevered beta (no debt beta)	0.32	0.32	0.32	0.30
Debt beta	0.10	0.10	0.10	0
Asset beta (including debt beta)	0.37	0.37	0.37	0.30
Equity beta	0.77	0.77	0.77	0.80
Cost of equity	7.13%	5.03%	4.01%	5.65%
Cost of embedded debt	4.64%	2.58%	1.59%	2.65%
Cost of new debt	3.40%	1.37%	0.38%	2.00%
Ratio of new to embedded debt	70/30	70/30	70/30	75/25
Uplift for issuance and liquidity costs	0.1%	0.1%	0.1%	0.1%
Cost of debt	4.36%	2.32%	1.33%	2.59%
Gearing	60%	60%	60%	62.5%
Appointee cost of capital	5.47%	3.40%	2.40%	3.74%
Retail margin deduction	-0.1%	-0.1%	-0.1%	-0.14%
Wholesale cost of capital	5.37%	3.30%	2.30%	3.60%

Source: Ofwat (2017) Delivering Water 2020: Our methodology for the 2019 price review - Appendix 12: Aligning risk and return p172, 174 and p177.

Ofwat expects its early view on WACC will inform companies' business plans. Ofwat's guidance is, however, based on its own interpretation of a range of market evidence which it has considered, but other information is available and different interpretations are possible. UU has therefore sought a second alternative opinion on what an appropriate assumption for the WACC at PR19 might be.

In this context, UU has asked EY to independently estimate the English and Welsh water industry's cost of capital at PR19. Noting that our aim is to provide an independent estimate of the WACC, this report presents our own analysis rather than a commentary or critique of Ofwat's PR19 methodology consultation. Where appropriate we do, however, comment on aspects of Ofwat's assessment.

We set out our estimate of the WACC in this section of the report. We begin with a discussion of a number of methodological issues, before turning to individual components of the WACC. We set out our estimated range for the industry WACC in the conclusion to this section.

2.1.1 A "base" industry WACC

The estimate of the WACC presented in this section is developed independently of the rest of the overall risk and reward balance. It is based on "top down" analysis of financial, economic and industry data, rather than "bottom up" analysis of the risks borne by investors i.e. the underlying business risk adjusted for management action to mitigate risk and the effects of the regulatory framework to allocate risk to different stakeholders.

2.1.2 Macroeconomic context

Estimating the WACC to apply over the 2020-25 period is a challenging exercise.

Economic and financial market conditions are currently somewhat different to long-run historical averages. In particular, interest rates are at all time historical lows, substantially below "normal" levels.

This dichotomy between current and long-run historical evidence means both types of evidence need to be considered and the amount of weight to attach to each considered carefully. An estimate of the cost of capital which placed too much weight on current financial market conditions could turn out to be much lower than the WACC which ultimately prevails over the 2020-25 period. On the other hand, an estimate of the WACC which relied too heavily on long-run historical data (as a proxy for "normal" financial market conditions) might turn out to be too generous if current financial market conditions persist over the 2020-25 period.

Forward-looking evidence from financial markets and independent forecasters can be helpful for forming a view on whether, and how quickly, current market conditions might revert back towards more "normal" levels. However, the economic and financial outlook is uncertain, as we discuss in more detail in Section 2.2.1. While the financial markets do not expect interest rates to rise rapidly in the near term, the Bank of England has noted the outlook for interest rates is very uncertain and some independent forecasters expect interest rates to rise much more quickly than the consensus view. It is not certain that the UK will remain in a "lower for longer" interest rate environment over the 2020-25 period, as we have discussed in more detail in a separate report for UU.[4] It is also not clear how representative the past may be of the future, with the UK set to withdraw from the European Union over the coming years.

Recognising the issues above, in forming our views on the WACC for PR19 we have had regard to long-run historical, current and forecast financial market and economic data. Our analysis and estimates are based on currently available information and may need to be updated if financial or economic conditions change markedly between now and submission of the PR19 business plan to Ofwat and/or Ofwat making its determinations for PR19. Recognising this risk, we have tended to place marginally more weight on long-run historical and forecast data than on current market evidence.

[4] See EY (2017) The cost of equity at PR19 – a report for United Utilities Water Limited.

2.1.3 A real or nominal WACC?

Ofwat has indicated that it will index RCV to a combination of RPI and CPIH inflation, starting with 50/50 split on existing RCV at 1 April 2020 and applying 100% CPIH inflation indexation to RCV additions.

The split indexation of the RCV means that a real cost of capital in both RPI-stripped and CPIH-stripped inflation terms will be required: the corresponding portions of RCV will be multiplied by these WACCs to calculate the overall allowed return.

In its PR19 methodology consultation Ofwat adopts the convention used by its advisers, PwC, and estimates a nominal WACC which is then deflated into RPI-stripped and a CPIH-stripped WACCs. It is possible that Ofwat prefers this approach as it would be consistent with making less use of RPI inflation at PR24 and beyond, but no justification has been advanced by Ofwat for taking this approach instead of starting from an RPI-stripped real WACC and converting that to a CPIH-stripped WACC.

In theory it would be possible to calculate the WACC in nominal terms and then deflate it separately into each of an RPI-stripped and CPIH-stripped real WACC using expected RPI and CPIH inflation. However, Ofwat's traditional approach has been to estimate a real cost of capital directly and continuing to do so would enable Ofwat to draw on tried and tested methods and make the results more directly comparable to regulatory precedents. If a real cost of capital was estimated directly using traditional methods, including by reference to RPI linked index-linked gilt yields and water company bond yields, the resulting WACC would be RPI-stripped. Inflating this figure up for expected inflation would produce an equivalent nominal WACC, which could then be deflated back into CPIH-stripped real terms using a forecast of CPIH inflation. Both approaches should ultimately be equivalent, but we consider that the ability to use tried and tested methods and comparability with existing regulatory precedents means that estimating an RPI-stripped WACC directly is the preferable method. Using a nominal WACC also requires an additional step in the analysis: whereas using an RPI-stripped WACC as the starting point only requires an estimate of the "wedge" between RPI and CPIH inflation, using a nominal WACC as the starting point requires an estimate of both the "wedge" between RPI and CPIH inflation *and* an estimate of either RPI or CPIH inflation.

Noting the above, we conduct our analysis in RPI-stripped real terms to draw on tried and tested data sources and to facilitate comparison to regulatory precedent. Recognising Ofwat's seeming preference for using nominal data, we also discuss nominal data where relevant.[5]

2.1.4 Approach to the cost of capital

We use a standard formula for calculating the cost of capital in the context of UK economic regulation:

$$\textit{Real vanilla WACC} = (1 - g) \times K_e + g \times K_d$$

where:

- Ke is the real cost of equity in post-tax terms, the return required by the providers of equity;
- Kd is the real cost of debt in pre-tax terms, the return required by the providers of debt; and
- g is gearing, defined as the value of debt divided by the total value of equity and debt (E+D).

[5] While we do not agree with Ofwat's approach and it is not necessary to estimate a nominal WACC to estimate a real WACC, UU has requested that we provide nominal values for all parameters so that it can complete Ofwat's PR19 Business Plan tables. We have therefore converted each relevant parameter into nominal terms for this purpose and for this purpose alone. Because we do not estimate a nominal WACC these values should not be regarded as such: they are simply the real WACC and parameter estimates converted into nominal terms using expected RPI inflation for the price control period. These values are summarised in Appendix B.

Approach to the cost of equity

There is a range of academic models for estimating the cost of equity, including the Capital Asset Pricing Model (CAPM) and the Dividend Growth Model (DGM). There has been extensive debate amongst practitioners and academics about the most appropriate theoretical models for estimating the cost of equity and no clear consensus exists. However, the CAPM is a widely understood model and is commonly used by investors, practitioners and by regulators in the UK. Consequently, notwithstanding that the CAPM has some theoretical shortcomings and is not without its criticisms, we have used the CAPM as our primary tool for estimating the cost of equity. The CAPM is estimated using the following formula:

$K_e = r_f + \beta \times (R_m - r_f)$

where:

- r_f is the risk free rate of return that an investor can expect to earn on a risk free investment;
- Rm is the overall expected return of the market. $(Rm - r_f)$ is the equity risk premium (ERP), which is the premium that investors expect over the risk free rate for investing in the equity market; and
- β is a statistical measure of an equity's exposure to 'systematic' or 'market' risk. It is a measure of how the rate of return on the equity varies with the rate of return on the market portfolio.

We note that there are various more complex versions of CAPM that have been developed over the years to try and address some of the shortcomings of the model, e.g., to try and take into account skewness or kurtosis among the probability distribution of potential rates of return.

Alternatives to the CAPM

Some economic regulators have made use of alternative models as cross-checks on the results generated by CAPM. Accordingly, we have explored the appropriateness of using some of these alternative models. While a wide range of models exist, these have not gained traction with economic regulators in the UK with the exception of the DGM, which is often used as a cross-check on the CAPM.

The DGM requires forecasts of dividend payments in order to determine the market value of an asset and is generally used for listed equities that pay dividends to their shareholders. Being a relatively straight-forward model to implement, applying the DGM to comparator companies may potentially provide a useful cross-check on our CAPM results. We return to the DGM analysis later.

Approach to the cost of debt

There are a range of sources of evidence on the cost of debt, including:

- the water companies' actual debt costs, measured by reference to either coupons or yields on their bonds;
- benchmark bond indices, such as iBoxx; and
- debt spreads or premiums over government bond yields.

We have also had regard to the proportion of debt that is fixed or index-linked, and the weights to attach to the costs of new and existing debt. Transaction and liquidity management costs are also taken into account.

2.2 Cost of equity

2.2.1 Total market return

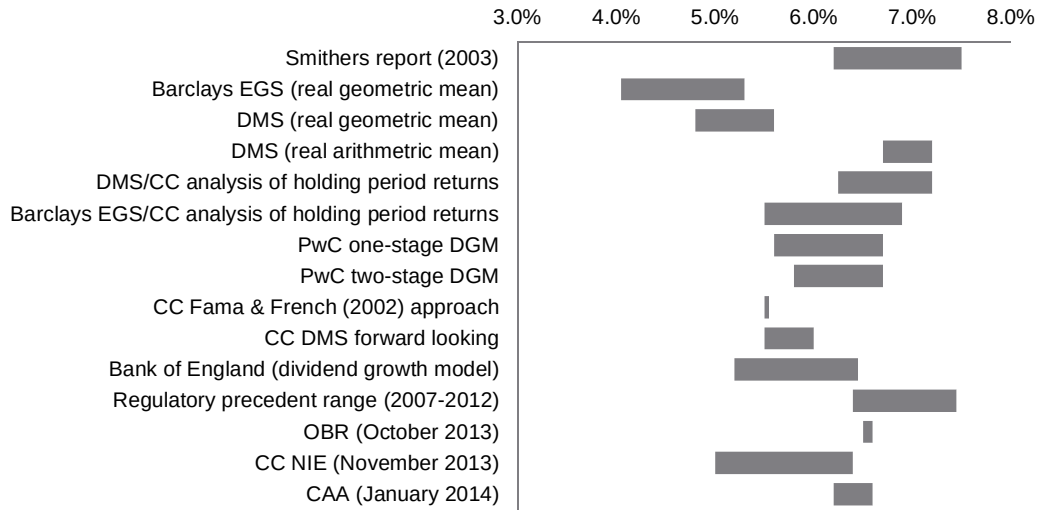
The total market return (TMR) equals the sum of the risk-free rate (RFR) and the equity risk premium (ERP) in the CAPM formula above. The TMR can be estimated directly, or as the

sum of the RFR and ERP, but estimating the TMR directly has been the more typical approach of UK economic regulators in recent years. This was the approach adopted by Ofwat at PR14.

At PR14, Ofwat's determinations of RFR and ERP implied a total market return (TMR) of 6.75%.

In the Risk and Reward Guidance, Ofwat reviewed a wide range of sources of evidence about total market returns, reproduced below. On the basis of this evidence, Ofwat considered that a range for the TMR of 6.25 – 6.75% was appropriate.

Figure 1: Total market return evidence considered by Ofwat at PR14

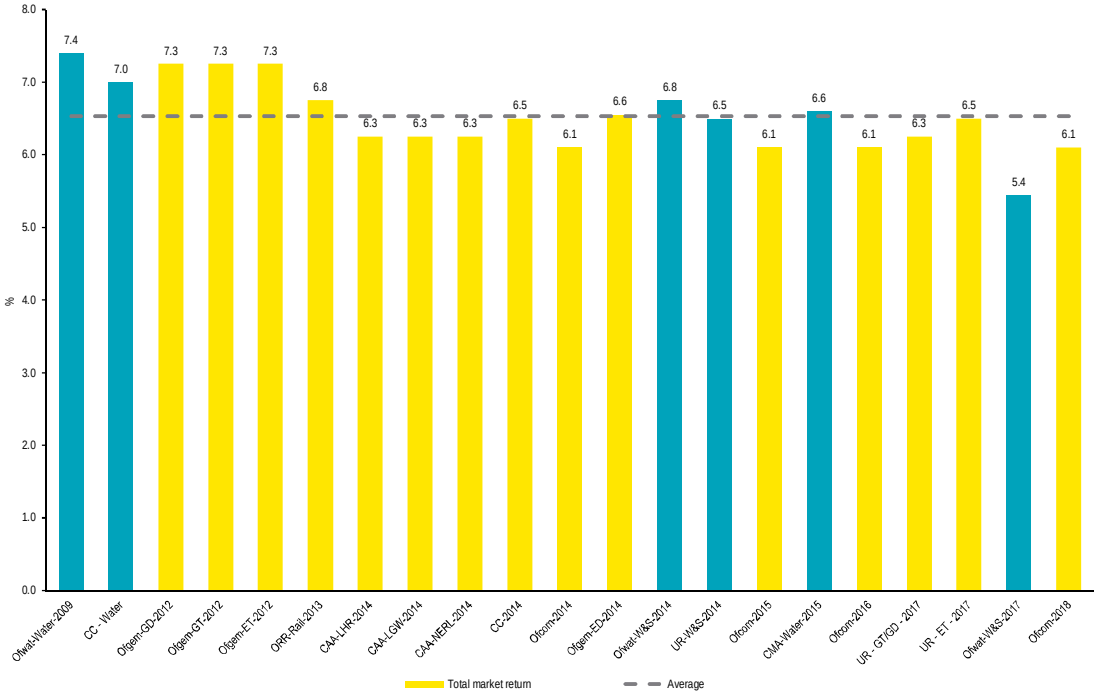


Source: Ofwat, Setting price controls for 2015-20 – risk and reward guidance Jan 2014[6]

Ofwat's assessment was at the upper end of, but consistent with, the assessment of the TMR adopted by numerous economic regulators in the UK. As illustrated in Figure 2 below, most UK economic regulators have used a very similar range for the TMR – since 2014, all but Ofwat's PR14 Final Determination and the CMA's subsequent consideration of Bristol Water's appeal, have been in a range of 6.0 – 6.5% (real, post-tax).[7] Ofwat's early view of the total market return for PR19 (shown as Ofwat W&S 2017 in the chart below) is, however, markedly lower than past determinations by UK economic regulators.

[6] See Ofwat (2014) Setting price controls for 2015-20 – risk and reward guidance, p13
[7] The regulatory precedents we present in this report exclude Ofgem's most recent decision on Interest During Construction for OFTOs and electricity interconnectors as that analysis of WACC is used for a very different purpose to the current one. We also exclude recent determinations for the gas transmission networks in Northern Ireland as the regulatory arrangements applicable to those businesses are materially different.

Figure 2: Past regulatory decisions on total market return

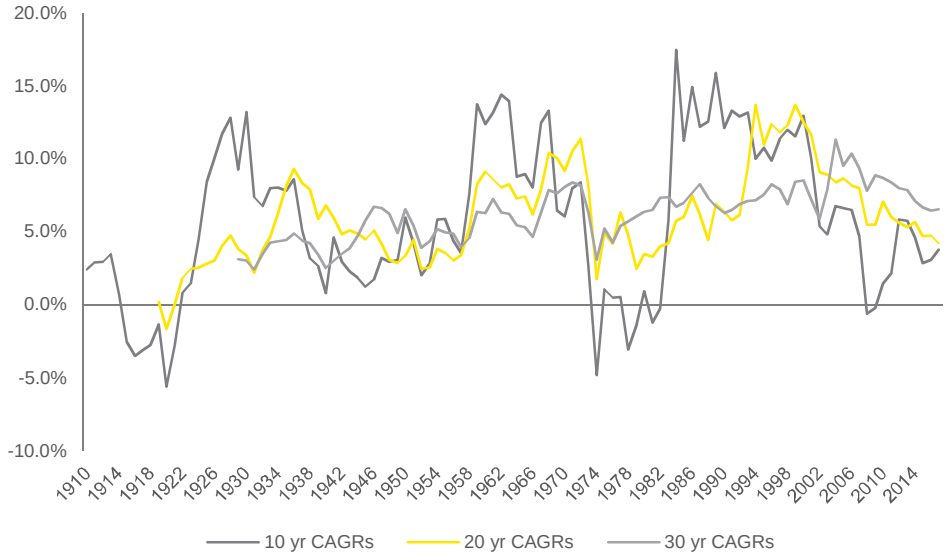


Source: UKRN, Cost of Capital Annual Update Report 2017 and various regulators' price control determinations

The approach adopted by UK economic regulators is based on the underlying stability of long-term rates of return on the UK equity market. Using Dimson, Marsh and Staunton (2018) data to update discussion presented in Wright, Mason and Miles (2003)[8] and Siegel (1998)[9] we have calculated compound annual growth rates (CAGRs) of equity returns on the FTSE over 10 year, 20 year and 30 year horizons since the data set began in 1899. This analysis, summarised in Figure 3 and Table 4 below, clearly shows that 30 year returns are much more stable than 10 year returns. This is consistent with many academic papers that have found an inverse relationship between the risk-free rate and the ERP.[10] It is also consistent with the Bank of England having noted that one of the key drivers of low interest rates in recent years is the "very high equity risk premium".[11]

[8] See Wright, Mason and Miles (2003) A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK, February, p32.
[9] See Siegel (1998) Stocks for the Long Run, McGraw-Hill, 2nd Edition.
[10] See a number of examples including,
a) Graham and Harvey (2016) The Equity Risk Premium in 2016, August, p12 which found a negative correlation of 51.7% between the ERP and real government bond yields using US data, which they attributed to investors engaging in a "flight to safety and accept[ing] low or negative … yields – and at the same time demand[ing] a high risk premium for investing in the equity market".
b) See also De Paoli and Zabzcyk (2009) "Why do risk premia vary over time? A theoretical investigation under habit formation", Bank of England Working Paper No. 361 and Damodaran (2016) Negative Interest Rates: Impossible, Unnatural or Just Unusual?, March, which argued that negative real interest rates should be accompanied by assumptions of slower long-term economic growth and higher risk premiums.
c) See Rajan (2005) Has Financial Development Made the World Riskier?, National Bureau of Economic Research Working Paper 11728, which argued that low interest rates makes saving unattractive and encourages investors to assume larger risks which in turn driver higher yielding markets.
d) Lopez and Reyes (2009) Real Interest Rate Stationarity and Per Capita Consumption Growth Rate, University of Cincinnati, Economics Working Paper Series, which highlights the stable relationship between the real interest rates and economic growth.
[11] See Reuters (2016) Carney speaks about Brexit and BoE's response, July.

Figure 3: Rolling averages of historical UK total market returns (real)



Source: EY analysis of Dimson, Marsh and Staunton (2018) data

Table 4: Rolling average CAGR of UK market returns over various maturity lengths

	Annual returns	10-year CAGR	20-year CAGR	30-year CAGR
Average	7.3%	5.8%	6.1%	6.2%
Standard Deviation	19.4%	5.2%	3.1%	1.8%

Source: EY analysis of Dimson, Marsh and Staunton (2018) data

The stable TMR assumptions adopted by UK economic regulators also helps to provide predictability to potential investors about the future rate of return that might be allowed. This helps to attract long-term capital into the infrastructure sectors, enabling customers to benefit from lower cost of capital over the long-term.

In our view, very compelling evidence would be required to justify proposing a different approach to setting the TMR. We therefore propose to adopt a TMR assumption consistent with UK economic regulatory precedent and evidence on the stability of long-term rates of equity returns.

We note that there has been some debate about whether the TMR assumption should be revised downward as a result of the prolonged period of very low interest rates that the UK has experienced over the past several years since the financial crisis. For example, in the final determination of NIE's appeal in 2014, the CC considered that the TMR may change over time and reduced its assessment of the TMR from 5.0 – 7.0% to 5.0 – 6.5%.[12]

Subsequently, and even more recently, in Bristol Water's appeal of PR14, the CMA confirmed the range adopted in the NIE appeal.[13] In both of those cases the CC / CMA chose a point estimate for the TMR at or towards the top of its range. Even in very recent regulatory determinations in 2016 and 2017, a TMR of 6.1 – 6.5% (real, post-tax) has been adopted.[14]

Reinforcing that conclusion, we note that an independent academic study commissioned by Ofgem in 2014 concluded that the total market return continued to be more stable and predictable than the risk-free rate or the equity risk premium and: [15]

[12] See Competition Commission (2014) Northern Ireland Electricity price determination, paragraph 13.146.
[13] See Competition and Markets Authority (2015) Bristol Water plc, p332.
[14] See for example Ofcom (2017) Wholesale Local Access Market Review, April, p281, paragraph A16.75 and UREGNI (2017) Northern Ireland Electricity Networks Ltd: Transmission and Distribution 6th Price Control (RP6), June, p223.
[15] See Wright and Smithers (2014) The Cost of Equity for Regulated Companies: A Review for Ofgem, p2.

> "We conclude that, with unchanged methodology the assumed real market cost of capital feeding into WACC calculations would be lowered by around ½% point (or at most ¾ % point). Based on Ofgem's previous assumptions, this would bring it down to around 6¾ %, or (at the lowest) 6½%. This figure is at the very top of the CC's assumed range of 5 to 6½%."

More recently, an independent study for the UK Regulators Network concluded that the original study by Mason, Miles and Wright (2003)[16] for a group of UK regulators which had recommended adopting a stable TMR estimate over time remained appropriate. Specifically, the UKRN study concluded:[17]

> "… regulators should continue to base their estimate of the [TMR] on long-run historic averages, taking into account both UK and international evidence, as originally proposed by [Mason, Miles and Wright]. We suggest a modest downward adjustment of the original range proposed by [Mason, Miles and Wright], to a range of 6 – 7%, primarily reflecting a smaller adjustment from geometric to arithmetic returns."

Financial market data also supports a conclusion that the TMR is broadly stable over long periods of time. For example, the analysis of historical market returns presented in Figure 3 above shows that there have been previous periods where 10 year CAGRs of returns decreased (e.g. during World War I and II and the oil price shocks of the 1970s), but eventually rates of return increased and long term trailing averages reverted back towards their mean. Indeed, in each of the three episodes mentioned, 10 year rolling averages of market returns exceeded historical averages in the years following the period of unusually low rates of return, suggesting that returns might "catch up" some of the low returns experienced during those periods. These past episodes suggest that the current period of low equity returns is not unprecedented by historical standards – indeed, returns have been much lower in some past episodes, but have subsequently bounced back – and therefore this is not a reason to expect that rates of return will not increase again over the 2020-25 period.

We also note that Spierdijk, Bikker and van den Hoek (2012)[18] found that mean reversion tends to be faster during periods of high economic uncertainty caused by major economic and political events, which tends to suggest that the market return could be expected to revert to longer term trend levels faster during the current period of heightened economic and political uncertainty in the UK.

Dividend Growth Model (DGM) analysis (setting long-term dividend growth equal to GDP growth forecasts) also tends to support a conclusion that the TMR has not decreased materially since PR14. Specifically, DGM analysis suggests the expected market return on the FTSE All Share has been fairly stable in a range of about 5.5 – 7.0% (real, post-tax) over the period since 2012 (see Figure 4 below).[19]

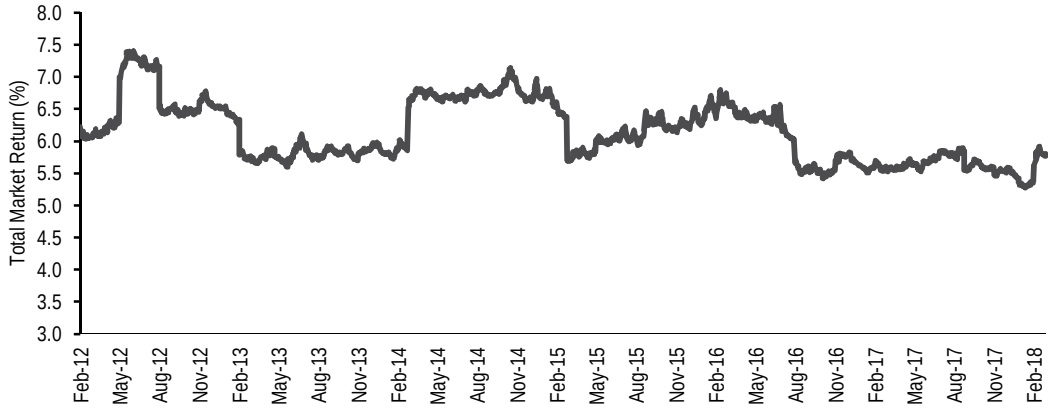
[16] See Mason, Miles and Wright (2003) A study into certain aspects of the cost of capital for regulated utilities in the UK

[17] See UK Regulators Network (2018) Estimating the cost of capital for implementation of price controls by UK regulators: an update on Mason, Miles and Wright (2003), p48. It is not entirely clear if the UKRN report is presenting an estimate of the TMR in RPI-stripped or CPI-stripped real terms, but we note that Appendix E of that report suggests that there would be little difference between these two estimates using long term historical data. For example, the first two columns of Table 1 of that Appendix compare "UK, £ (DMS)" figures which appear to be in RPI-stripped terms with "UK, £ (CPI)" figures which appear to be in CPI-stripped terms but the two sets of figures are no more than 25 – 30 basis points different over 100+ years of data.

[18] See Spierdijk, Bikker and van den Hoek (2012) Mean reversion in international stock markets: an empirical analysis of the 20th century, Journal of International Money and Finance, Volume 31, pp228-249.

[19] Our approach to estimating the DGM is discussed in more detail in Section 2.2.5.

Figure 4: DDM-based estimates of the total market return (FTSE All Share)



Note: Data up until 28 February 2018
Source: Bloomberg, HM Treasury data, EY analysis

Overall, while market conditions will change from price review to price review, history shows that significant deviations in market rates of return from long-term averages have been transitory. Consistent with this view, there is regulatory precedent and academic support for assuming a stable TMR in the range of 5.0 – 6.5% when estimating the cost of equity for UK regulated utilities. This range is consistent with the most recent determinations by the CMA on this issue.

Key finding: we estimate the TMR to be in a range of 5.0 – 6.5% in real, RPI-stripped, terms.

We note that TMR is much more stable when measured in real terms than in nominal terms, as illustrated in Figure 5 and Table 5 below. This may be another reason to favour estimating the WACC directly in real RPI-stripped terms than in nominal terms.

Figure 5: Historical real and nominal UK total market returns (30-year CAGR (%))

Source: EY analysis of Dimson, Marsh and Staunton (2018) data

Table 5: Historical real and nominal UK total market returns (30-year CAGR (%)) – summary statistics

	Nominal	Real
Average	10.6%	6.2%
Standard Deviation	3.9%	1.8%

Source: EY analysis of Dimson, Marsh and Staunton (2018) data

2.2.2 Risk free rate

At PR14, Ofwat set a real risk-free rate of 1.25%. This figure was unchanged between Ofwat's PR14 Risk and Reward Guidance (January 2014) and Final Determinations. Ofwat did not comment on the risk-free rate in the PR14 Final Determinations.[20] In the Risk and Reward Guidance Ofwat noted that yields on ILGs with 10 years to maturity were close to zero, but that forward rates indicated yields on government bonds were likely to rise.[21] Ofwat concluded on a range of 0.75 – 1.25% for the real risk-free rate and adopted a point estimate of 1.25%.

Since PR14, index linked gilt (ILG) yields have continued to fall. Yields on ILGs with 5-30 years to maturity have been negative – with a few exceptions – for most of the past few years and all of the period since PR14.

ILG yields on longer maturity bonds may be most relevant to determining the risk-free rate for water companies, which finance themselves over the long-term (reflecting the long-lived nature of their assets). Over longer historical time periods the difference between average yields on ILGs with 10 year, 20 year and 30 year maturities are relatively modest i.e. between -0.02% and -0.24% for a 10 year trailing average and 0.44% – 0.54% for a 15 year trailing average.

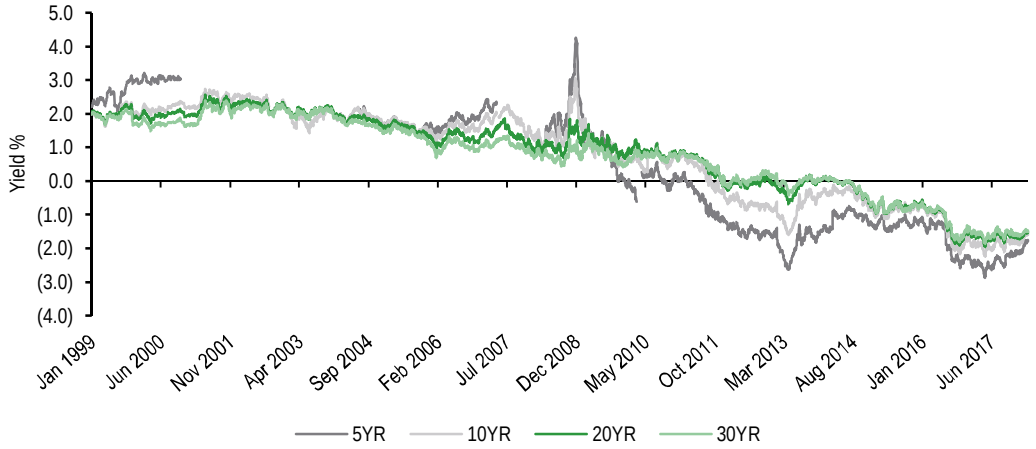
Table 6: Average index-linked gilt yields (%)

		Maturity (years)			
	Period to 28 February 2018	5	10	20	30
Historical averaging period	6 month	(2.12)	(1.79)	(1.62)	(1.55)
	12 month	(2.31)	(1.86)	(1.65)	(1.58)
	2 years	(2.14)	(1.71)	(1.52)	(1.45)
	5 years	(1.68)	(1.09)	(0.84)	(0.80)
	10 years	(0.84)	(0.24)	(0.02)	(0.05)
	15 years	(0.25)	0.44	0.54	0.45

Source: Bank of England index-linked gilt data daily figures, EY analysis

[20] See Ofwat (2014) Setting price controls for 2015-20: Final price control determination notice: policy chapter A7 – risk and reward.
[21] See Ofwat (2014) Setting price controls for 2015-20 – risk and reward guidance, p15. Specifically, Ofwat compared the 10 year gilt yield implied to apply on September 2017 with the current 10 year gilt yield.

Figure 6: Index-linked gilt yields over time



Note: Data up until 28th February 2018
Source: Bank of England data, EY analysis

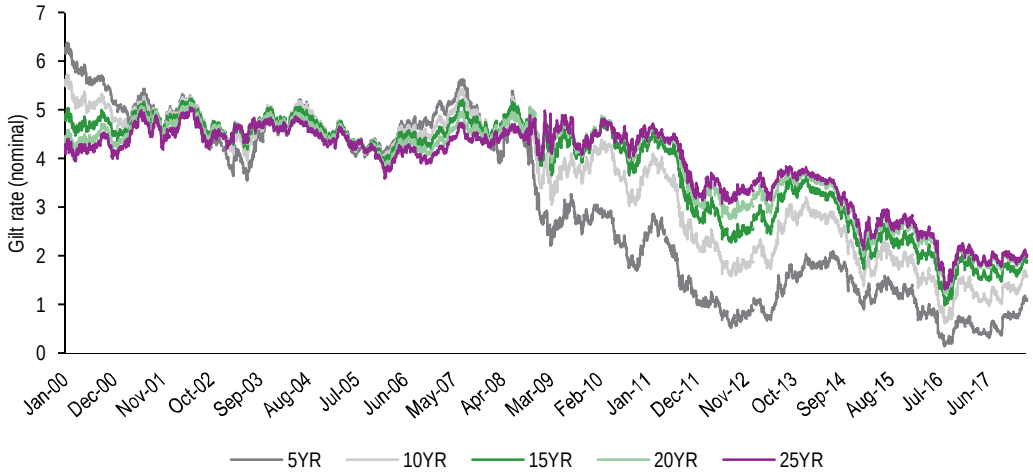
As a cross–check on evidence from ILGs, we have also considered the real yield implied by nominal gilts. Table 7 and Figure 7 below present evidence on the yields on nominal gilts over the past 15 years or so. Like ILG yields, nominal gilt yields have decreased over time and are now at historically low levels. Long-term historical averages (10 – 15 year averages) of long-maturity (15+ years) nominal gilt yields have been around 3.1 – 3.7%, implying an average real yield similar to that implied by ILG yields (assuming expected long-term RPI inflation of around 3% over the past 10 – 15 years).

Table 7: Average nominal gilt yields (%)

		Maturity (years)				
Period to 28 February 2018		**5**	**10**	**15**	**20**	**25**
Historical averaging period	6 month	0.82	1.38	1.76	1.95	1.98
	12 month	0.64	1.27	1.69	1.91	1.95
	2 years	0.62	1.26	1.70	1.94	2.00
	5 years	1.11	1.88	2.34	2.59	2.69
	10 years	1.72	2.63	3.11	3.35	3.42
	15 years	2.69	3.29	3.60	3.73	3.74

Source: Bank of England Nominal Gilts Daily rates, EY analysis

Figure 7: Nominal gilt yields over time



Note: Data up until 28th February 2018
Source: Bank of England data, EY analysis

On the face of it, the decrease in ILG yields and real yield derived from nominal gilts may suggest the risk-free rate has decreased since PR14.

However, whether the risk-free rate is as low as the yield evidence suggests is less clear. The yields could be distorted below the risk-free rate if market participants were not factoring in future market developments for some reason: yields on bonds are inherently forward-looking as investors price in expectations about future interest rate movements to ensure that the opportunity cost of investing in an alternative bond at a later date is taken into account, but the yields would not be reflective of market expectations if some other factors were driving investors' decisions to purchase particular securities.

A number of factors may have distorted ILG yields, such as quantitative easing (QE) by the Bank of England, a flight to quality prompted by heightened uncertainty around the economic and financial outlook and by pension fund demand. However, these "distortions" have been considered by the Competition and Markets Authority (or its predecessor the Competition Commission) at various appeal and inquiry hearings in recent years and the ultimate conclusion has been that these factors do not represent a reason not to estimate the real risk-free rate using ILG yield data, or indeed, to aim up from that data. During the recent energy markets inquiry, the CMA noted:[22]

> "In previous reports in the last ten years, we paid attention to distortions in the index-linked markets that may affect the shape of the yield curve. In Bristol Water (2010), the Competition Commission (CC) noted that shorter-dated index-linked yields were affected by action by the authorities to address the credit crunch and recession and were therefore less relevant to estimating the RFR. In inquiries prior to 2010 the CC put less weight on longer-dated maturities, noting possible distortions from pension fund asset allocation policies. As we explained in NIE (2014), the effects of monetary policies and pension fund dynamics are increasingly well understood by the markets. Consequently we expect the market prices of index-linked gilts to incorporate effectively expectations of the effects of these factors and therefore to provide a reasonable guide to future returns."

Assuming that ILG yields are not distorted by any of the factors listed above, the markets' expectations about future interest rates can be derived from yield curve data. Specifically, that the yield curve is upward sloping may suggest that ILG yields are expected to rise over time.[23] To obtain an indication of how much government bond yields might increase we have

[22] See CMA (2015) Energy market investigation – analysis of cost of capital of energy firms, p6.
[23] We note that longer dated ILG yields may incorporate a greater term risk premium than shorter dated ILG yields i.e. the higher yield may not reflect an expectation that interest rates will rise, just a risk premium to compensate for the risk that interest rates will rise. Other factors, such as liquidity, may also affect these yields.

taken a similar approach to Ofwat at PR14 and compared yields on nominal gilts over various maturities. We note:

- comparing the 2 year and 7 year nominal gilt yields on 28 February 2018 (0.73% and 1.30%) indicates yields between 1 March 2020 and 28 February 2025 (roughly the AMP7 period) are expected to be around 1.52% per annum;
- a similar exercise involving 2 year and 12 year nominal gilt yields (1.72%) on 28 February 2018 indicates yields between 1 March 2020 and 28 February 2030 are expected to be around 1.91% per annum;
- a similar exercise comparing the 5 year and 15 year nominal gilt yields (1.08% and 1.86%) indicates yields between 1 March 2023 (close the middle of AMP7) and 28 February 2033 are expected to be around 2.26% per annum. In other words, the 10 year forward gilt rate on 1 March 2023 is about 2.26%; and
- comparing the implied 10 year forward gilt yield derived above (2.26%) to the 10 year gilt yield on 28 February 2018 (1.57%), suggests gilt yields are expected to increase by about 70 basis points between now and the middle of AMP7.

If a similar increase in ILG yields was expected, then that would imply that some uplift to current ILG yields would be appropriate if the real risk-free rate is being estimated by reference to current ILG yields. This would still imply negative ILG yields. Moreover, the implied increase in yields would not be sufficient to see long-term trailing averages of ILG yields increase from current levels – the yields dropping out of the historical average would be higher than the new ones being added in.

There are, however, reasons to be cautious about inferring from the yield curve that interest rates will remain low throughout the 2020-25 period. The yield curve reflects the market's central case expectations, but events may not turn out as expected by the market and interest rates could rise more quickly (or more slowly) than the market expects.

The UK economy is in a state of unprecedented uncertainty with the future of the relationship between the UK and the European Union (EU), and the rest of the world, in the process of being re-negotiated before the UK leaves the EU in March 2019. There may be a transitional period that applies after the UK leaves the EU before any new arrangements come into place. Depending on the outcome of the negotiations, the UK may continue to have free trade with the rest of the EU or trade could be materially less free than it has been. Trade with the rest of the world could increase if new free trade agreements can be negotiated. The exchange rate could appreciate or depreciate depending on the outcome of these negotiations. And interest rates could go up, particularly if inflation rises or if the UK was to have its credit rating downgraded as a consequence of the agreement reached with the EU.

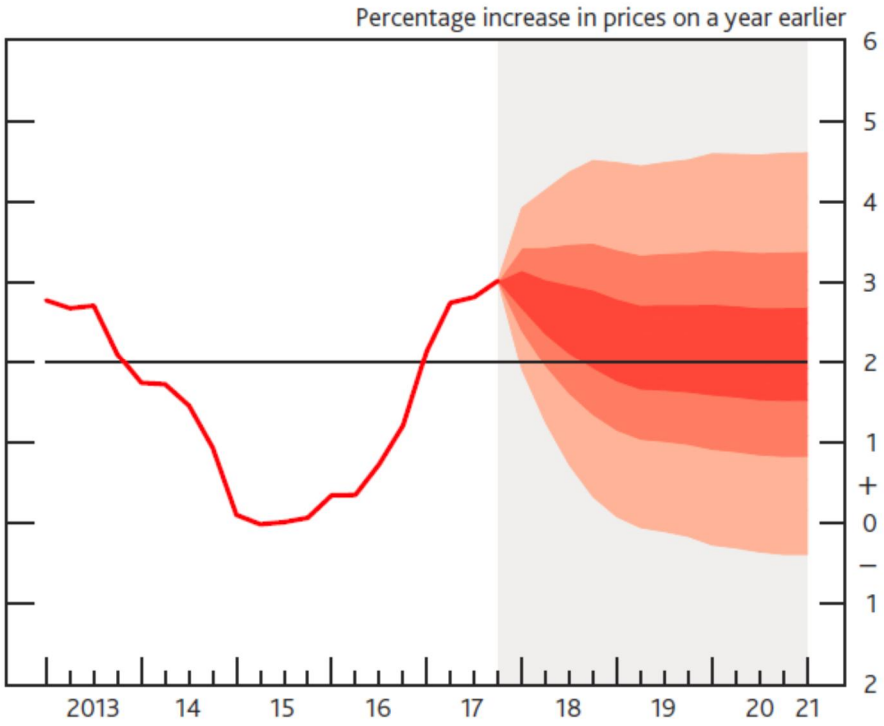
The Bank of England, in its May 2017 Inflation Report, highlighted the uncertainty around the interest rate outlook:[24]

> *"The persistence of these factors will be crucial for the long term outlook for UK real interest rates and for the path of monetary policy over coming years. Demographic effects are likely to persist for a long time yet. And global productivity growth may well remain below pre-crisis rates for some time to come. But the future rate of productivity growth is highly uncertain, and market expectations of interest rates can change quickly and may be influenced by perceptions of risk. There is, therefore, considerable uncertainty over how persistent the period of low global interest rates will be."*

The Bank of England's own analysis indicates there is significant uncertainty around the outlook for the economy. Figure 8 shows the Bank of England's analysis of CPI inflation projections based on market interest rate expectations. This analysis shows that CPI inflation could be within a wide range from about -0.5 to +4.5% over the 2018–20 period based on current interest rate expectations. The higher that CPI inflation is, the more likely it is that the Bank of England might raise interest rates to reduce inflation back towards its target.

[24] See Bank of England (2018) Inflation Report, February, p4-5.

Figure 8: Bank of England analysis of market-implied outlook for CPI inflation

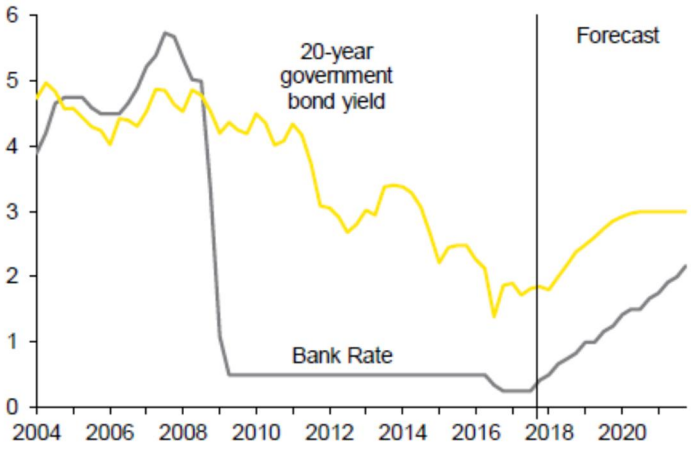


Source: Bank of England Inflation Report, February 2018, p36.

Independent forecasts of bank rate can provide another indicator of the uncertainty around the outlook. HM Treasury publishes medium-term independent forecasts of various economic indicators on a quarterly basis. In the most recent medium-term forecasts from February 2018, the range of forecasts for bank rate in 2022 ranges from -0.5% to 4.5%.[25] By comparison, the range of bank rate forecasts in November 2014 – just before PR14 Final Determinations – was in a narrower range of 1.1 – 3.7%.[26]

As another indication of the uncertainty around the outlook for interest rates, we note that the EY ITEM Club[27] – the only non-governmental economic forecasting group to use the HM Treasury model of the UK economy – is forecasting that bank rate could rise much more quickly than the market-implied data (see Figure 9 below).

Figure 9: EY ITEM Club forecasts of bank rate (%) (Winter 2017)



Source: EY ITEM Club

[25] See HM Treasury (2018) Forecasts for the UK economy: a comparison of independent forecasts February, p18.
[26] See HM Treasury (2014) Forecasts for the UK economy: a comparison of independent forecasts, November, p19.
[27] See EY (2017) EY ITEM Club Winter Forecast, p14.

The speed at which QE is unwound in future, and the impact that this has on different parts of the yield curve, is also uncertain. In its November 2015 Inflation Report the Bank of England stated that "the MPC's current expectation is that it is unlikely to reduce the stock of purchased assets from its current level of £375 billion until Bank Rate is around 2%".[28] However, subsequently the Bank of England Governor has commented that unwinding of QE could begin with bank rate lower than 2%.[29] The Bank of England Governor also acknowledged that the gilt and ILG yield curves might be influenced by unwinding of QE by the Federal Reserve in the USA[30] which makes it even harder to predict the impact of unwinding QE on the gilt and ILG curves.

Noting the uncertainty around the economic outlook, it is difficult to be confident that interest rates and the cost of equity will not rise before or during the 2020-25 period. A higher estimate of the real risk-free rate than that implied by current ILG yield data may be appropriate.

We also note that there is some evidence that real interest rates are mean reverting. For example, both Kim and Ji (2011)[31] and van den End (2011)[32] have found some evidence that real interest rates are mean reverting and in the case of van den End (2011) that this mean reversion is stronger when interest rates are further from their equilibrium value. If real interest rates are mean reverting then this would suggest placing some weight on long term trailing averages rather than spot rates when forming a view on the appropriate real risk free rate.

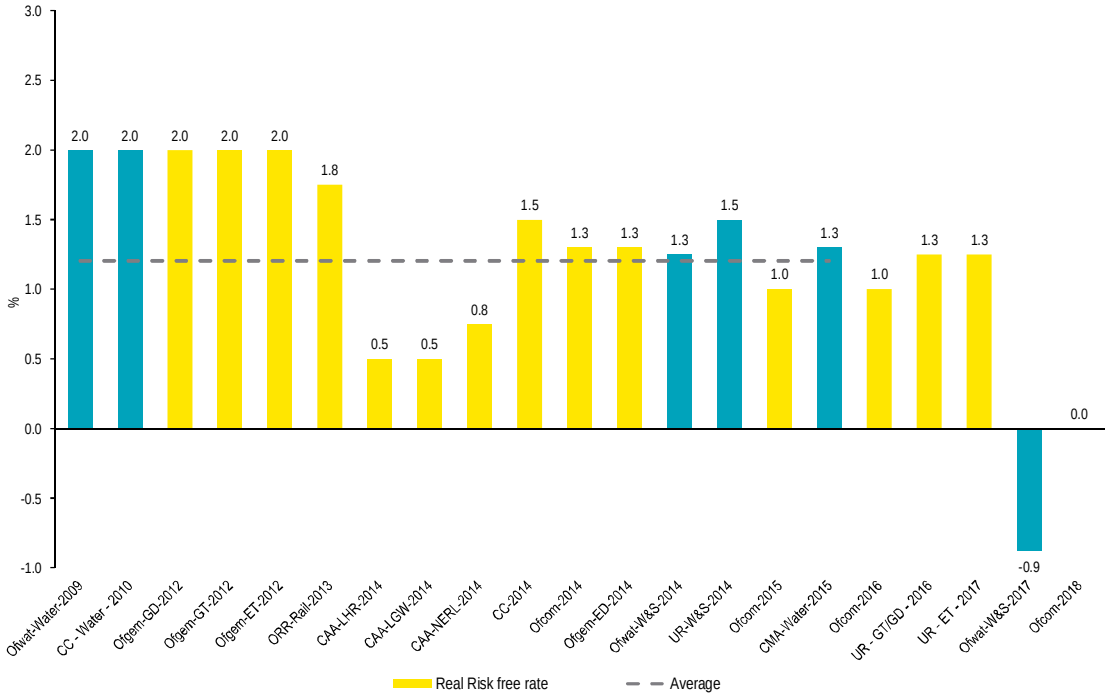
Noting the difficulties interpreting yield curve data, alternative approaches that provide a cross-check on this evidence may be useful. One such alternative approach to estimating real risk-free rates is to consider long-term real GDP growth rates. In equilibrium, the real risk-free rate and real GDP growth rate should be equal.[33] Real long-term GDP growth rates for the UK have been forecast to be around 2.0% over the past 5 years (discussed in more detail later), implying a real risk-free rate of around 2.0% in the long-term. While the UK economy is not currently in a long-term equilibrium, this may suggest that over time the yields on ILGs should eventually revert to a figure closer to 2.0%. This may be another reason to aim up from current market data when estimating the real risk-free rate.

Another reason to adopt a real risk-free rate higher than implied by ILG yield data is consistency with regulatory precedent. Economic regulators should and do place significant weight on being consistent in their decision making over time. This is important to providing investors with confidence about the predictability and stability of the regulatory regime. Past decisions by economic regulators are, therefore, another important source of information that Ofwat and water companies should have regard to. Recent decisions on the risk-free rate by UK economic regulators are summarised in Figure 10 below. Very few economic regulators in the UK have ever adopted a real risk-free rate below 1.0%, and even the most recent regulatory determination by Ofcom – which is more recent than Ofwat's "early view" of WACC – is significantly higher than Ofwat's estimate.

We note that a recent report for the UK Regulators Network argued that the risk-free rate should be estimated based on current market evidence, rather than longer term trailing averages.[34] However, consistent with the approach taken by UK economic regulators in the past, we do not consider that the approach advocated in that report is appropriate. We note that because we have assumed the TMR is broadly stable over time (which is consistent with the approach taken in that UKRN study), if we adopt a higher estimate of the risk-free rate, we will also adopt a lower estimate of the ERP.

[28] See Bank of England (2015) Inflation Report, November, p34.
[29] See https://www.marketnews.com/content/mni-boe-carney-may-not-need-bank-rate-2-qe-unwind
[30] See https://www.marketnews.com/content/mni-boe-carney-may-not-need-bank-rate-2-qe-unwind
[31] See Kim and Ji (2011) Mean reversion in international real interest rates, Economic Modelling, Volume 28, Issue 4, pp1959-1966.
[32] See van den End (2011) Statistical evidence on the mean reversion of interest rates, De Nederlandsche Bank Working Paper No 284, March.
[33] See Damodaran, Estimating Risk Free Rates, p9.
[34] See UKRN (2018) Estimating the cost of capital for implementation of price controls by UK regulators: an update on Mason, Miles and Wright (2003), p31.

Figure 10: Past regulatory decisions on risk-free rate



Source: UKRN, Cost of Capital Annual Update Report 2017 and Ofgem, Ofwat and Ofcom publications.

Conclusion on the risk-free rate

Overall, the evidence from ILG yields points to a fall in the real risk-free rates compared to PR14. Placing more weight on longer-term trailing averages, consistent with Ofwat's approach at PR14 and the approaches most UK economic regulators have adopted, we estimate the real risk-free rate is likely to be in a range of 0.0 – 0.5% taking into account currently available data.

Key finding: we propose that a real risk-free rate of 0.0 – 0.5% be used to calculate the real RPI-stripped WACC at PR19.

2.2.3 Equity risk premium

At PR14, Ofwat determined an ERP of 5.5%. This was based on deducting their estimate of the real risk-free rate from an estimate of the Total Market Return (TMR).

As noted earlier, consistent with UK regulatory precedent, we propose to estimate the ERP by deducting our estimate of the RFR from our estimate of the TMR.

We note that there are several other ways to estimate the equity risk premium ("ERP"), though there is no general agreement as to the best approach. We consider this evidence below as a cross-check to our assessment of the ERP derived from estimates of the TMR and the RFR.

Historical approaches

Using historical data to estimate the ERP is a well-established approach, based on the assumption that the realised ERP observed over a long period of time is a good leading indicator of the expected ERP i.e. that expected returns remain constant over time and average realised returns reflect the expected return. Many papers have been published on this topic over the years, discussing – among others – whether an arithmetic or geometric average (or a blended average) of historical outturn data provides the best estimate of investors' expectations and whether any adjustments to historical data are required to reflect various factors such as luck and survivorship bias.

The first careful study of the historical equity risk premium for UK stocks appeared in Dimson and Brealey (1978) with an estimate of 9.2% per annum over the period 1919–1977.[35] As further data has become available, more up to date calculations of the historical excess returns on equities over riskless assets have been provided. One source of such data frequently considered in UK economic regulatory decisions is the Dimson, Marsh and Staunton yearbook. The latest figures are shown below.

Table 8: Estimates based on historical returns data 1900-2017

	Geometric mean	Arithmetic mean
UK	3.7	5.0
USA	4.4	6.5
World	3.2	4.4
World excl. USA	2.8	3.8
Europe	3.0	4.3

Note: An arithmetic average is the aggregation of a series of numbers divided by the count, whereas a geometric mean looks at the typical value of the series of numbers by using the product of their values, and is used more commonly when determining the performance of an investment or portfolio.
Source: Dimson, Marsh and Staunton 2018

The arithmetic average reflects the return than an investor could expect to earn in one year, whereas the geometric average reflects returns that could be earned on average over the whole of the sample. If an investor has a short investment horizon the arithmetic average will be more appropriate, whereas if an investor invests for an extremely long period the geometric average may be more appropriate. If investors' holding period is somewhere in between these extremes, some weighted average of the arithmetic and geometric averages may be appropriate.

Using historical data to estimate the forward looking ERP has its challenges. The past is implicitly being assumed to be a good indicator of the future, but this may not be the case e.g. because the level of risk of the stock index, or the risk aversion of investors, may change over time.

Various adjustments are often made to outturn historical data. Mehra and Prescott (1985) tried to explain why the ERP implied by historical data was so high when compared to the risk-free rate, which they referred to as the 'equity premium puzzle'. Fama and French (2002), among others, have also explored this issue.[36] Fama and French try to forecast what investors would have expected to earn in the past. They do this by estimating the capital gain investors expected to earn (so excluding the dividends they expected to receive) using data on dividend yields and earnings growth. Fama and French estimated an ERP of 5.5% for the UK in their 2002 paper. More recently, Dimson, Marsh and Staunton (2017) undertook a similar exercise to decompose the outturn excess return on equities into various components. Adjusting for non-repeatable factors they suggest that investors can expect an arithmetic mean risk premium of around 4.5 – 5.0%.

Survey approach

Another approach to estimate the equity risk premium is quite direct: ask a panel of finance experts for their estimates and take the mean response. This is the survey approach.

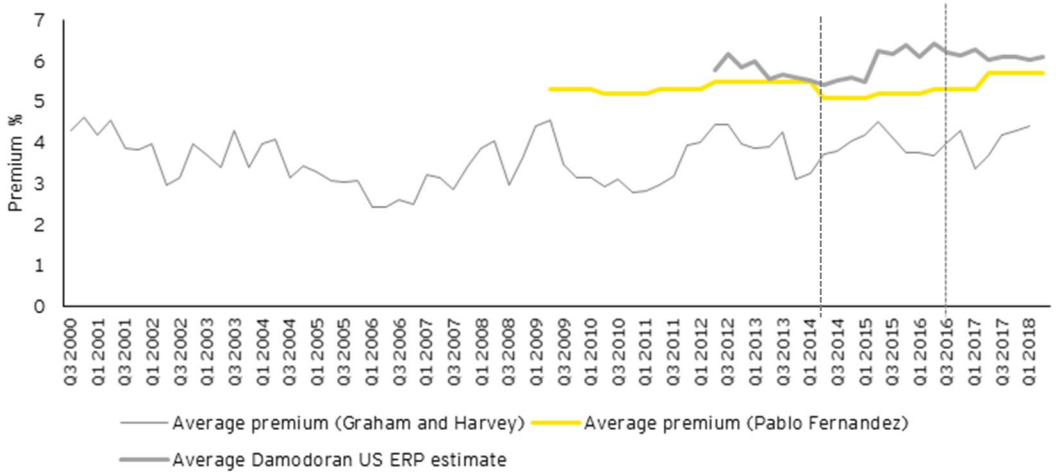
A number of survey-based estimates of the ERP for the USA are available, including:

- Professor Damodaran, of the Stern Business School, reports an implied equity risk premium each month. He measures the expected return on the S&P 500 relative to the risk-free rate. His latest published, March 2018, equity risk premium was 6.12%;[37]

[35] Perold (2004) "The Capital Asset Pricing Model", Journal of Economic Perspectives – Volume 18, No.3, Summer.
[36] See Fama and French (2002) "The equity premium", Journal of Finance, April.
[37] See http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html and add the equity risk premium and country risk premium estimates together.

- a survey on the market risk premium, conducted by Pablo Fernandez of the University of Navarra, summarises the total market risk premium used by respondents in their required return calculations. The latest results of this survey show that in 2018, the average required total market risk premium in the USA was 5.4%;[38] and
- Graham and Harvey estimate the ERP through surveys of Chief Financial Officers (CFOs) over the period from 2000 to 2017 and estimate the ERP to be 4.42% for the USA as of December 2017.[39]

Figure 11: Equity risk premium estimates over time



Note: The above equity risk premium estimates have been obtained via surveys taken by analysts, professors and companies.
Sources: Graham and Harvey Survey 2018, Pablo Fernandez Survey 2017, Damodaran estimates 2000-18.

Market commentary

While none of the survey based estimates cited above have changed markedly since PR14, the Bank of England has noted that the ERP has increased significantly in the UK in recent years. For example, senior figures at the Bank, including the Governor Mark Carney, have commented:

- "Risk premia on UK-focused equities have risen by 300 bps relative to the S&P500. Implied volatilities on sterling currency pairs also continue to be higher than for other major currencies."[40]
- "The Bank's calculations show that the equity risk premium (ERP) may have roughly doubled from its perhaps unsustainably low level at the turn of the century during the dot-com boom. This rise in the ERP has been working vigorously against the fall in the risk-free rate."[41]
- "The equity risk premium has risen sharply."[42]
- "What is unusual about the current environment and amplifies it is that you have extremely low interest rates and very high equity risk premium - the equity risk premium in the UK has gone up quite substantially. It has been rising over several years substantially and in the last few weeks."[43]

The Bank has attributed this to a flight to quality and linked it to the low yields available on government securities:[44]

[38] See Fernandez, Pershin and Acin (2018) Market Risk Premium and Risk-Free Rate used for 59 countries in 2018: a survey, Table 2.
[39] See Graham and Harvey (2016) The equity risk premium in 2018.
[40] See Carney (2018) Report to Treasury Committee, 9 February.
[41] See Taylor (2016) Banking in the tundra, Official Monetary and Financial Institutions Forum City Lecture, London, 25 May.
[42] See Carney (2016) Uncertainty, the economy and policy, 30 June.
[43] See Reuters (2016) Carney speaks about Brexit and BoE's response, 12 July.
[44] See Carney (2016) Resolving the climate paradox, Arthur Burns Memorial Lecture, Berlin, 22 September.

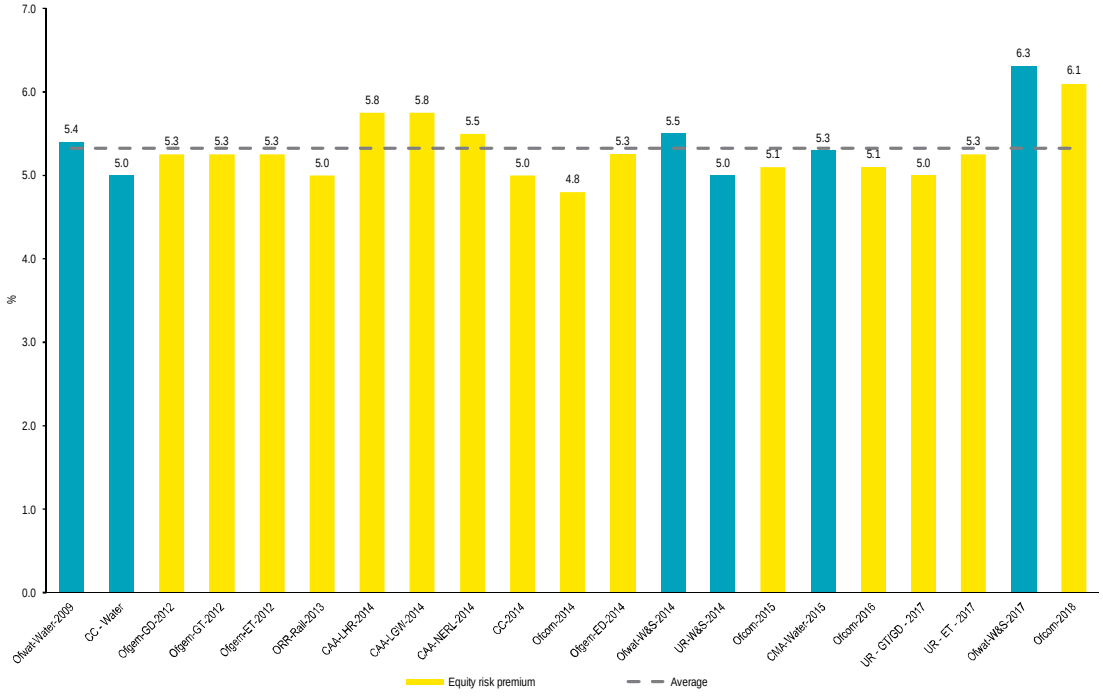
> "In the UK and Germany, real interest rates are negative as far as the eye can see. Even in the US, real 30-year rates are well below 1%. Low bond yields suggest that market is discounting low future growth, accounting for some of the wedge between those yields and equity dividend yields. Indeed, year in, year out, earnings forecasts have proven wildly optimistic. However, risk premia are also likely playing a role. Put simply, investors are not only less optimistic about future growth, but are also less certain about that subdued outlook. They are demanding a discount on risky assets to compensate, and seeking risk-free assets instead."

The inverse relationship between ERP and risk-free rate is one that has also attracted much debate over the years. For example, Graham and Harvey (2016) found a negative correlation of 51.7% between the ERP and real government bond yields using US data, which they attributed to investors engaging in a "flight to safety and accept[ing] low or negative … yields – and at the same time demand[ing] a high risk premium for investing in the equity market".[45,46] In a similar vein, Damodaran has argued that negative real interest rates should be accompanied by assumptions of slower long-term economic growth and higher risk premiums.[47]

Regulatory precedent

As Figure 12 below illustrates, a number of recent regulatory determinations adopted ERPs of around 5.0 – 5.25%, lower than Ofwat's assumption at PR14. Ofwat's decision was towards the upper end of the range of decisions by economic regulators in recent years.

Figure 12: Past regulatory decisions on equity risk premium



Source: UKRN, Cost of Capital Annual Update Report 2017 and Ofgem, Ofwat and Ofcom publications

These decisions needs to be placed in the context of the TMR that various economic regulators have adopted, noting that this has become the more prevalent approach to estimating the ERP amount UK economic regulators in recent years.

[45] See Graham and Harvey (2016) The equity risk premium in 2016, p12.
[46] See also, for example, De Paoli and Zabzcyk (2009) "Why do risk premia vary over time? A theoretical investigation under habit formation", Bank of England Working Paper No. 361.
[47] See Damodaran (2016) Negative interest rates: impossible, unnatural or just unusual?

Conclusion on the ERP

There is a significant body of evidence described above which indicates that the TMR is stable over the long term and that a reasonable approach to estimating the ERP is therefore to deduct an estimate of the RFR from the TMR. Adopting such an approach using the estimates of the TMR and RFR presented earlier in this report implies an ERP of around 5.0 – 6.0%.

By comparison, the various pieces of evidence relating to the ERP we have considered above include:

- Long run historical returns data, which implies an ERP in a range of about 3.7 – 5.0% (geometric average to arithmetic average) for the UK;
- Survey data which suggests that the US ERP might be expected to be around 5.7 – 6.1%. Noting that historical data suggests the US ERP might be higher than the UK ERP, the survey data might imply a lower range for the UK ERP; and
- Past decisions by UK economic regulators which have often adopted an ERP in a range of about 5.0 – 5.25%.

These estimates of the ERP are towards the lower end of, or slightly below, the range we estimate for the ERP. However, our estimate of the ERP is consistent with the lower RFR we have estimated than most other regulators and with the inverse relationship between the RFR and the ERP acknowledged by many academics and by the Bank of England. It is also lower than the ERP estimate that Ofwat has proposed for PR19.

Key finding: Combining an estimate of the TMR of 5.0 – 6.5% and an estimate of the RFR of 0.0 – 0.5%, our estimate of the ERP is in a range of around 5.0 – 6.0%.

2.2.4 Beta

At PR14, Ofwat assumed an asset beta of 0.3. This was based on a calculation of asset betas for the three large listed water companies – Pennon, Severn Trent and United Utilities. The asset betas were calculated using both five years of monthly data and two years of daily data.[48] Those equity betas were then subject to a Blume adjustment before being de-levered to arrive at an estimate of the asset beta.[49] The de-levering and re-levering of betas was undertaken using the Modigliani-Miller formula i.e. Beta (asset) = Beta (equity) x (1 – gearing), where gearing is defined as Net Debt / (Net Debt + Equity).[50]

Ofwat's asset beta estimates were close to 0.30 using both five year and two year estimates, but the CMA's analysis in the Bristol Water appeal of PR14 calculated asset betas of below 0.20 using 5 years of monthly data. Part of the reason for the lower estimates was the CMA did not use the Blume adjustment because they did "not consider that the evidence suggests that water companies' equity betas will converge to one".[51]

The CMA discussed at some length the appropriate time period and the frequency of data to use in the beta calculations before concluding on its use of 5 years of monthly and 2 years of daily data approaches.[52] This topic has been discussed at length previously in other regulatory determinations and the CMA's approach appears to be settled.

Noting the above, to estimate what the CMA's approach would imply:

- we have used market data for the three listed WaSCs i.e. UU, Severn Trent plc and Pennon Group;
- we have estimated betas using 2 years of daily data and 5 years of monthly data;

[48] See Ofwat (2014) Setting price controls for 2015-20: Final price control determination notice: policy chapter A7 – risk and reward, p35
[49] It was not clear from Ofwat's publications that they had used a Blume adjustment, but the CMA stated that Ofwat had made this adjustment: see CMA (2015) Bristol Water plc, Appendix 10.1, para 86. The Blume adjustment adjusts raw equity betas towards one assuming Beta (future) = Beta (past) x 0.6667 + 0.3333.
[50] Our analysis of betas uses book values of net debt rather than market values of net debt on the basis that this information is easier to obtain.
[51] See CMA (2015) Bristol Water plc, Appendix 10.1, para 86.
[52] See CMA (2015) Bristol Water plc, Appendix 10.1, para 87 and following.

- we have not applied any Blume or Bayesian adjustments to these estimates;
- we assume a debt beta of zero;[53]
- we use the FTSE 100 as the reference market;[54]
- we have de-levered using the Modigliani-Miller formula and average gearing data for each of the companies over the estimation window i.e. a 2 year average of gearing data for the 2 year beta estimate; and
- we re-lever using the same formula and our assumption about the notional gearing assumption in the WACC (discussed later).

Our estimates of raw equity betas are shown in Table 9 below. We do not present estimates of beta using 2 years of monthly data as there are too few data points to provide robust estimates. The analysis suggests equity betas have been around 0.59 – 0.66 for the listed water companies using 2 years of daily data, but could be as high as about 1.17 using 5 years of monthly data.

Table 9: Comparator company equity beta estimates against FTSE100

	Daily			Monthly		
	UU	SVT	PNN	UU	SVT	PNN
2yrs	0.59	0.61	0.65			
5yrs	0.66	0.66	0.62	1.01	1.17	0.75

Note: The above analysis has been undertaken for United Utilities, Severn Trent Water and Pennon Group PLC for data up until 28 February 2018
Source: Bloomberg, EY analysis

The asset betas implied by these raw equity betas are summarised in Table 10 below. The implied asset betas are in a range of about 0.27 – 0.38 for the listed water companies using 2 or 5 years of daily data, but in a range of 0.43 – 0.59 when estimated using 5 years of monthly data.

Table 10: Comparator company asset beta estimates against FTSE100

	Daily			Monthly		
	UU	SVT	PNN	UU	SVT	PNN
2yrs	0.27	0.31	0.38			
5yrs	0.31	0.33	0.36	0.47	0.59	0.43

Source: Bloomberg, EY analysis and assumptions
*Note: The above analysis has been undertaken for United Utilities, Severn Trent Water and Pennon Group PLC for data up until 28 February 2018. Asset betas have been de-levered using βa = βe * (1-g). Gearing is calculated as Net Debt divided by Enterprise Value.*

Table 9 and Table 10 both show a significant difference in betas when calculated using either daily or monthly data. One possible explanation for this difference is the Epps effect and differences in the liquidity of the stocks in question. The Epps effect occurs when the empirical correlation between the returns of two different stocks decreases as the sampling frequency of data increases. To address these issues we have estimated betas using the Dimson method.

[53] Our analysis assumes a debt beta of zero, though Ofwat proposes a debt beta of 0.10 in its PR19 methodology decision. We have not analysed the debt beta in detail because we note that it will make little difference to the estimates of equity beta at the assumed notional gearing level unless the companies used to calculate the raw equity betas (which are then de-levered to asset betas) have gearing materially different to the notional level. That is not the case for the water companies used to estimate betas in this report. Consequently we do not anticipate that the debt beta assumption would have a material impact on our estimates of the equity beta. We note that many economic regulators have also assumed a debt beta of zero. We also note that the gearing range we have assumed is consistent with a strong investment grade credit rating, which is consistent with relatively little risk being borne by debt investors as a result of default and suggests little systematic risk would have been transferred to debt investors at these levels of gearing.
[54] We note that our results are not sensitive to using this market index or the FTSE All Share.

Dimson's beta (1979)[55] attempts to correct for the effect of microstructures in daily data by using current, lagged and leading market returns to explain returns of an individual stock:[56]

$$R_j = a_j + \sum_{k=-5}^{k=+5} \beta_{jk} R_{m,t+k}$$

where, $R_{j,t}$ is the time series return on individual company's share, $R_{m,t}$ is the time series returns on the market index and $\beta_{j,k}$ is the coefficients on the various lags, leads and contemporaneous market returns. Dimson's beta is then calculated by summing up all the $\beta_{j,k}$ terms.

Our estimates using the Dimson beta approach are shown in Table 11 below. The Dimson equity betas are estimated to have been around 0.71 – 1.00 using 2-5 years of daily data, implying asset betas in a range of around 0.36 – 0.58.

Table 11: Dimson beta estimates (daily data, relative to FTSE100 index)

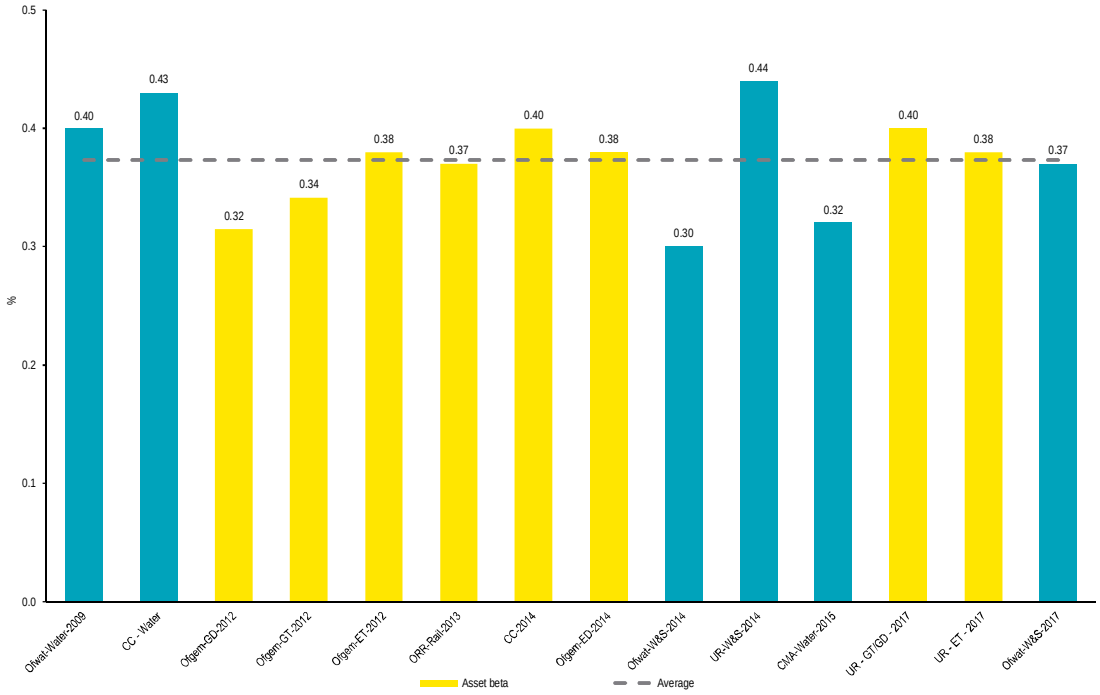
	Equity betas			Asset betas		
	UU	SVT	PNN	UU	SVT	PNN
2yrs	0.78	0.97	1.00	0.36	0.49	0.58
5yrs	0.78	0.84	0.71	0.36	0.42	0.40

*Note: The above analysis has been undertaken for United Utilities, Severn Trent Water, Pennon Group PLC, National Grid UK, SSE plc for data up until 28 February 2018. Asset betas have been de-levered using βa = βe * (1-g). Gearing is calculated as Net Debt divided by Enterprise Value.*
Source: Bloomberg, EY analysis

The estimates of asset betas using Dimson techniques are similar to the asset betas calculated using 5 years of monthly data presented above. This might suggest that an asset beta of broadly 0.35 – 0.60 could be appropriate for PR19. We note, however, that water company equity and asset betas have increased materially in recent months as the share prices of the water companies have decreased significantly but the FTSE 100 and FTSE All Share have not. The divergence in share prices and the wider equity market could reflect recent announcements by Ofwat about the PR19 methodology, but may also be linked to increasing debate about a possible re-nationalisation of the water industry. It is difficult to determine the impact that these factors may have had on betas, but we note that an asset beta of over 0.40 would appear to be out of step with regulatory precedents, as illustrated by a range of decisions shown in Figure 13 below.[57] Further, Ofwat and CMA precedent suggests than an asset beta of around 0.30 – 0.35 would be more appropriate i.e. below the range of our estimated betas.

[55] See Dimson (1979) "Risk Measurement when Shares are Subject to Infrequent Trading", Journal of Financial Economics, Vol. 7.
[56] We use five lagged, five leading and contemporaneous market returns in line with Damodaran: see http://people.stern.nyu.edu/adamodar/pdfiles/papers/beta.pdf, footnote 3.
[57] In addition to the decisions illustrated, below we also note that the CMA has recently concluded that an asset beta of 0.4 for firmus energy, a gas distribution network operating in Northern Ireland, is reasonable: see CMA (2017) Firmus Energy (Distribution) Limited v Northern Ireland Authority for Utility Regulation.

Figure 13: Past regulatory decisions on asset beta



Source: UKRN, Cost of Capital Annual Update Report 2017 and various regulators publications. The betas shown are as stated by the regulators, so may incorporate different assumptions about debt beta.

Another way of considering the asset beta for PR19 is to consider the extent to which the risks faced by equity investors may have changed in the period since PR14. In this regard, we note that a slightly higher asset beta than at PR14 may also be consistent with a number of changes that Ofwat has proposed to the regulatory framework for PR19, such as:

- the introduction of additional markets in bio-resources and water resources, which could potentially increase companies' exposure to market forces and therefore increase systematic risk;
- the introduction of volume risk in bio-resources activities (rather than the application of a revenue control); and
- the transition from RPI inflation to CPIH inflation, which introduces some basis risk between revenues linked to CPIH inflation and RPI inflation linked debt and which exposes investors to more regulatory risk because the transition is dependent on future Ofwat decisions to be value neutral in NPV terms.[58]

The PR19 methodology decision and the associated implications that the next price control will include challenging totex and performance targets as well as a lower WACC may have also contributed to investor perceptions of heightened regulatory risk and reduced independence of the economic regulator.

On the other hand, the introduction of debt indexation and tax sharing mechanisms both potentially dampen volatility of returns to equity and might reduce betas relative to PR14.

The asset betas estimated for listed water companies will also reflect the risks of other companies within the water companies' groups, such as non-household retail businesses. These other businesses are likely to be higher risk than the core regulated water company, but are also very small parts of the overall group so would not be likely to have a material impact on the asset beta.

Noting all of the evidence above, both quantitative and qualitative, the appropriate asset beta assumption for PR19 appears likely to be higher than at PR14.

[58] Ofwat has acknowledged this possibility: see Ofwat (2016) Water 2020: our regulatory approach for water and wastewater services in England and Wales, p70.

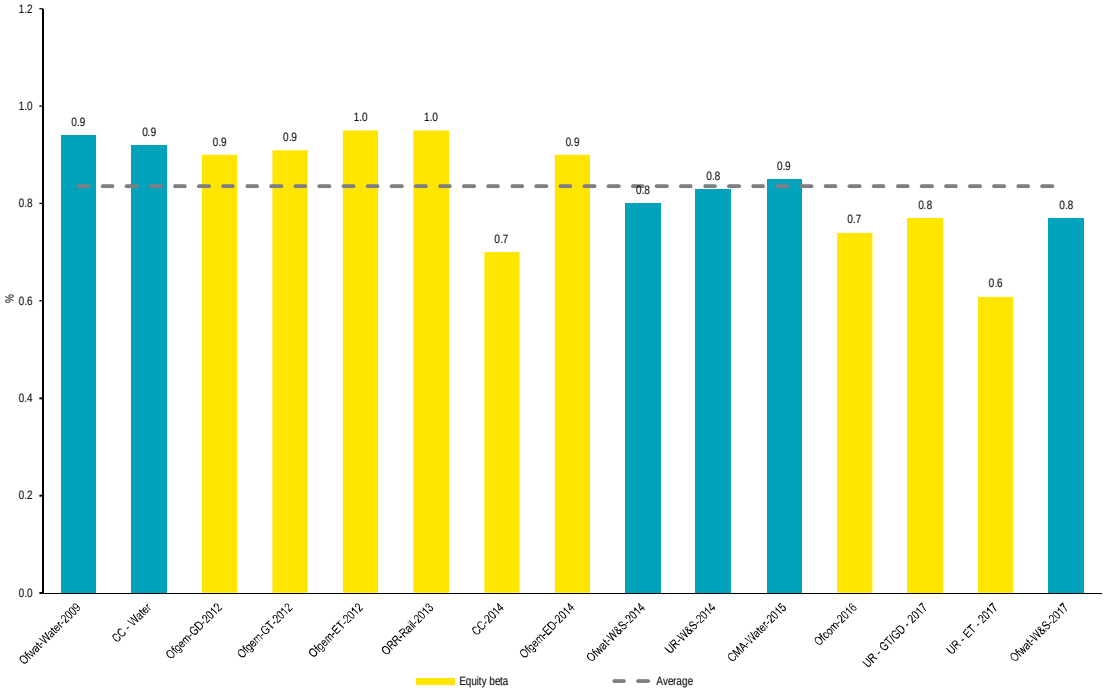
Key finding: asset betas for water companies appear to be in the range of 0.30 – 0.40. A figure towards the lower end of this range would be more consistent with regulatory precedent and represent a smaller increase from PR14, so we use a range of 0.30 – 0.35.

Adopting an asset beta range of 0.30 – 0.40 and a gearing range of 60 – 65% (discussed later), the implied equity beta is in a range of approximately 0.85 – 1.0 (matching the low asset beta with the high gearing, consistent with standard corporate finance theory that suggests companies with lower systematic risk can adopt higher gearing, all else equal).

An equity beta range of 0.85 – 1.0 would be consistent with the top end of the range of recent regulatory precedents in the utilities (electricity, gas and water) sphere, as shown below in Figure 14. However, if those regulatory precedents are restated using a constant gearing of 62.5%, the equity beta determinations of UK economic regulators for the electricity, gas and water sectors are in a marginally higher range of 0.8 – 1.1, as shown below in Figure 15. This is similar to the 0.85 – 1.0 range we have suggested. We also note the Northern Ireland Utility Regulator's decision of an equity beta of almost 0.9 (using an asset beta of 0.4 and gearing of 55%) for firmus energy was recently upheld on appeal by the CMA.[59]

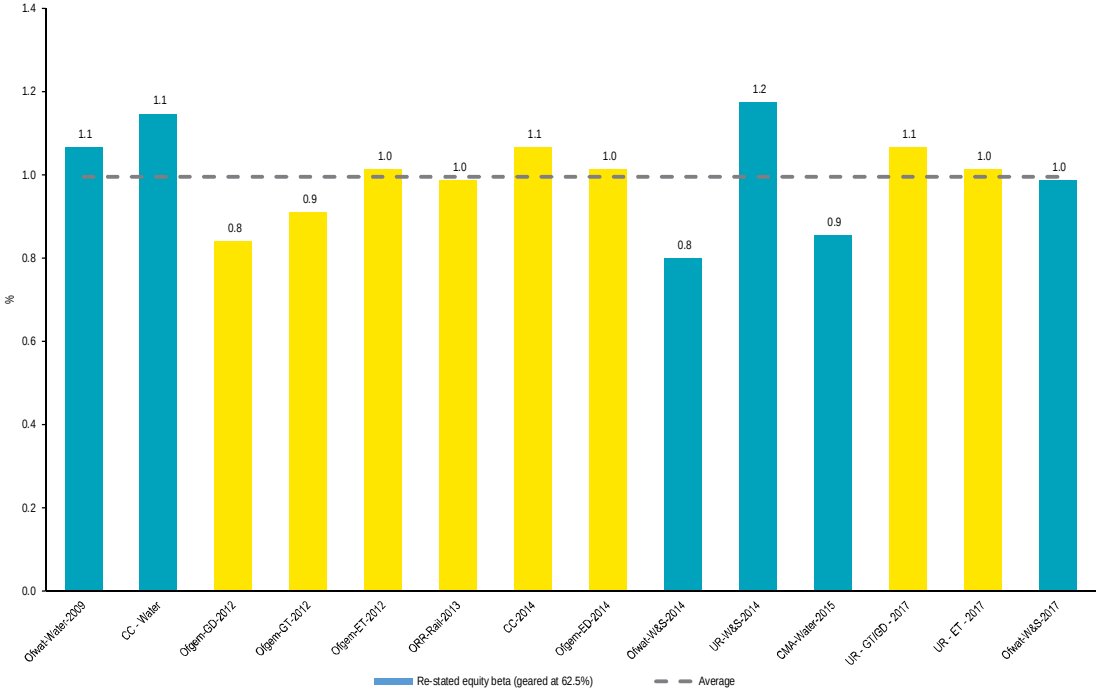
[59] See CMA (2017) Firmus Energy (Distribution) Limited v Northern Ireland Authority for Utility Regulation: Final determination, June.

Figure 14: Past regulatory decisions on equity betas



Source: UKRN, Cost of Capital Annual Update Report 2017 and Ofgem and Ofwat publications

Figure 15: Restated equity betas, constant gearing of 62.5%



Source: UKRN, Cost of Capital Annual Update Report 2017 and Ofgem and Ofwat publications. The equity betas have all been calculated using the asset betas stated by the regulators re-geared at 62.5% and assuming a debt beta of zero.

2.2.5 Dividend growth model analysis

An alternative approach to estimating the cost of equity to the CAPM is the Dividend Growth Model (DGM).

In its simplest form the DGM estimates the cost of equity equal to the dividend yield plus an expected long-term growth rate of dividends.

Therefore, to apply the DGM data on dividend yields is required and forecasts of long-term growth rates. The forecast long-term growth rate assumption has been the subject of some conjecture in the past and different assumptions are possible. One approach is to assume that in the long-run, when the economy is in steady state, dividends would grow at the same rate as the economy.

The DGM can be applied to an individual stock – such as one of the listed water companies – or to the stock market as a whole. If applied to an individual company, the DGM provides an estimate of the cost of equity for that company. If applied to the market, the DGM provides an estimate of the cost of equity for the market as a whole, i.e., the total market return. We presented our analysis of market returns earlier.

We have referred to the government's "Forecasts for the UK economy" for long-term real GDP growth. This is a summary of published material produced on a monthly basis of which February, May, August and November's editions contain 5-year medium term forecasts, as seen in the table below.

Table 12: Medium-term GDP forecasts

Independent average	2012	2013	2014	2015	2016	2017	2018
February	2.4	2.2	2.4	2.2	2.2	1.9	1.7
May	3.1	2.2	2.4	2.4	2.1	1.9	
August	2.5	2.2	2.4	2.3	1.7	1.6	
November	2.7	2.3	2.3	2.3	1.8	1.5	
Average	**2.7**	**2.2**	**2.4**	**2.3**	**2.0**	**1.7**	

Source: Independent forecasts of the UK economy: https://www.gov.uk/government/collections/data-forecasts

The use of real GDP growth forecasts has been critiqued by the CMA in the past: the CMA has stated that it considers the assumption that long-term dividend growth will be equal to long-term GDP growth as "essentially arbitrary" and that the growth rate should be lower and may be around 0.0 – 0.5% based on historical dividend growth rates.[60]

GDP forecasts are commonly used in DGM estimates of the cost of equity for utilities by economic regulators in the USA[61] and by practitioners and equity analysts because utilities are expected to grow broadly in line with the wider economy. Using the GDP growth forecasts above, the DGM results suggest that the cost of equity for the listed water companies is in a range of about 5.3 – 6.0% (real, post-tax) using recent market data, but has been slightly higher over a longer historical period.

We will use these results as a cross-check on our CAPM estimates of the cost of equity.

[60] See https://assets.publishing.service.gov.uk/media/54edfe9340f0b6142a000001/Cost_of_capital.pdf, para 33.
[61] See for example *FERC Order in Docket No. EL11-66-001, Opinion No. 531 (issued June 19, 2004), affecting New England Electric Transmission Owners (Bangor Hydro-Electric; Central Maine Power Company; New England Power Company (d/b/a National Grid); Nstar Electric (now Eversource); Unitil Corp, et al.). In re: Martha Coakley, Mass. Attorney Gen. v. Bangor Hydro-Elec. Co., 139 FERC ¶ 61,090 (2012).*

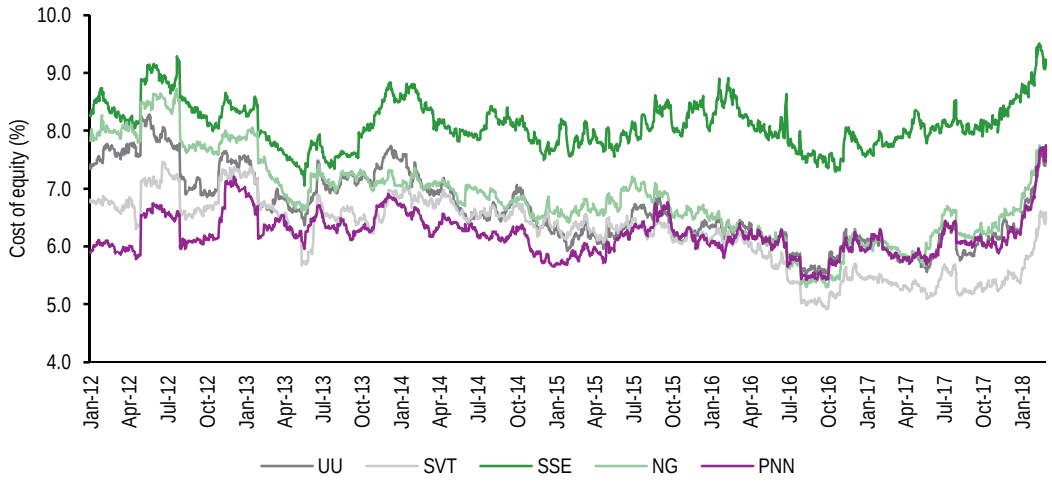
Table 13: DGM based cost of equity estimates

Period to 28 February 2017	UU	SVT	PNN	SSE	NG
6 month	6.47	5.59	6.41	8.48	6.70
12 month	6.19	5.46	6.19	8.26	6.41
2 years	6.09	5.48	6.06	8.04	6.16
5 years	6.44	6.05	6.17	8.03	6.58

Note: Data up until 28 February 2018

Source: Bloomberg, HM Treasury data, EY analysis

Figure 16: DGM-based estimates of the cost of equity



Note: Data up until 28 February 2018

Source: Bloomberg, HM Treasury data, EY analysis

2.2.6 Cost of equity conclusion

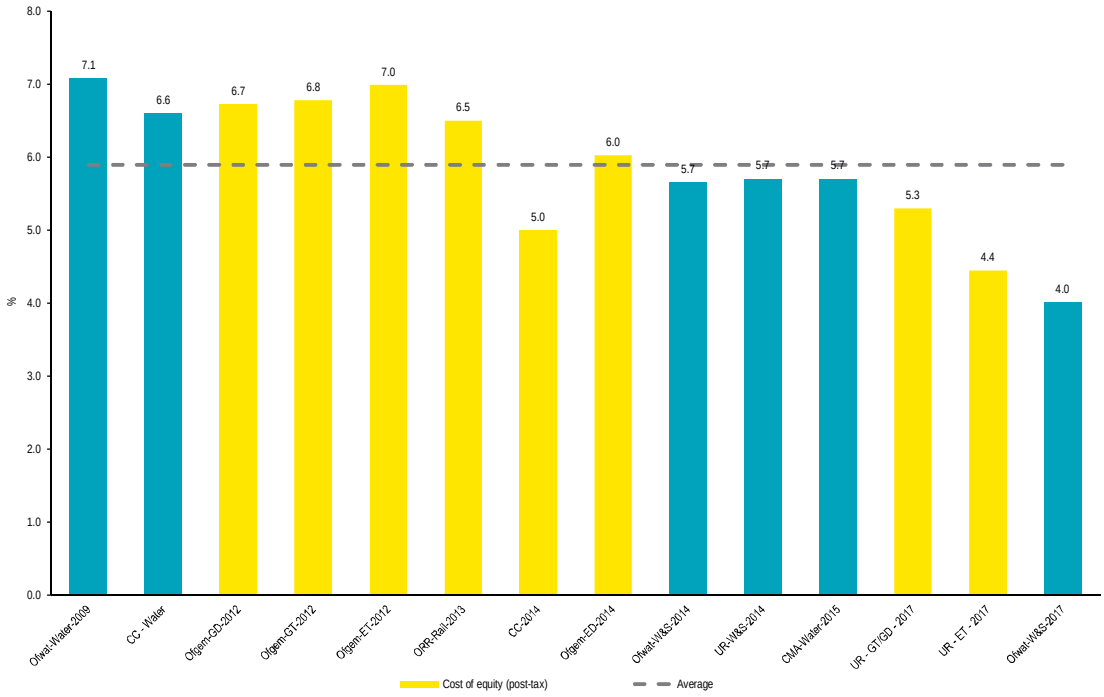
Table 14 below summarises the key findings in relation to each of the parameters, as set out in the discussion above. In combination, these estimates for the CAPM parameters imply a real, RPI-stripped, post-tax cost of equity in a range of 4.3 – 5.75%.

Table 14: Key cost of equity parameters

	EY estimate		Comparison ranges	
	Min	Max	PR14	Ofwat early view for PR19
Total market return (%)	5.0	6.5	6.8	5.4
Risk-free rate (%)	0.0	0.5	1.25	-0.9
Equity risk premium (%)	5.0	6.0	5.5	6.3
Debt beta	0.0	0.0	0.0	0.0
Asset beta	0.30	0.35	0.3	0.4
Equity beta	0.86	0.88	0.8	0.8
Gearing (%)	65	60	62.5	60
Cost of equity (real, post-tax, %)	**4.3**	**5.75**	**5.65**	**4.01**

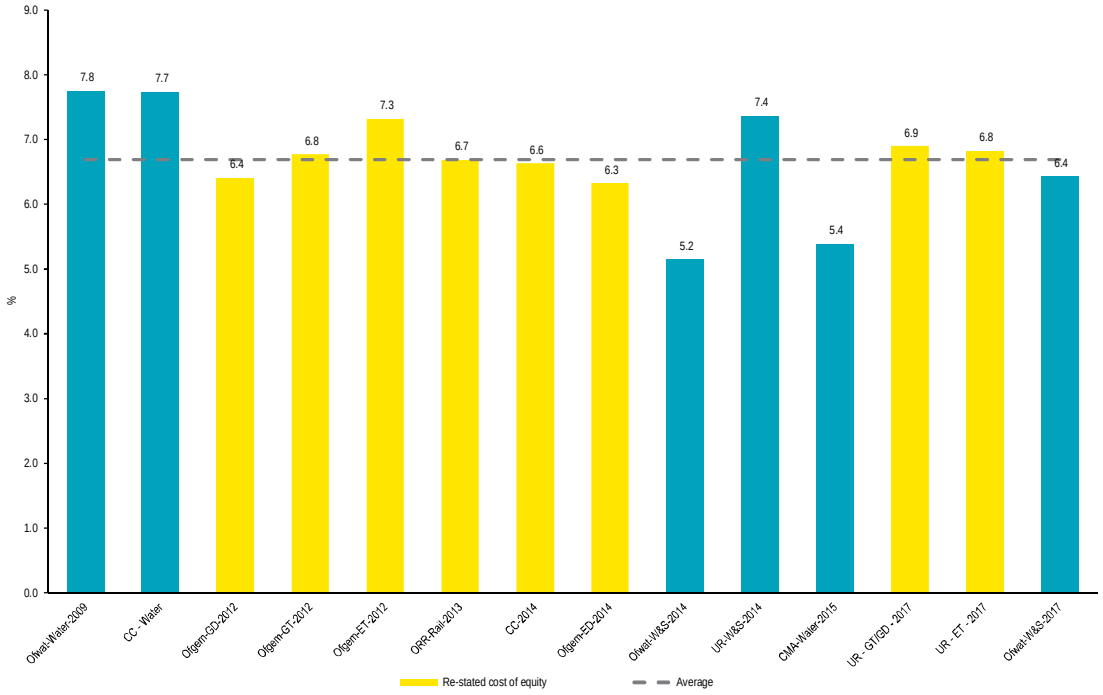
A cost of equity in a range of 4.3 – 5.75% would be lower than most regulatory precedents, which have generally been in a range of about 5.5 – 6.0% (see Figure 17) in recent years (or slightly higher re-stated on the same notional gearing basis: see Figure 18). The range is, however, similar to the most recent regulatory determinations and is accordingly higher than Ofwat's proposed range for the cost of equity at PR19.

Figure 17: Past regulatory decisions on cost of equity (post-tax, real)



Source: UKRN, Cost of Capital Annual Update Report 2017 and Ofwat and Ofgem publications

Figure 18: Past regulatory decisions on cost of equity (post-tax, real), restated at 62.5% gearing



Source: UKRN, Cost of Capital Annual Update Report 2017 and Ofwat and Ofgem publications and EY analysis

2.3 Cost of debt

At PR14, Ofwat set a cost of debt equal to 2.59% (real, pre-tax) based on an assessment of the costs of existing (2.65%) and new debt (2.0%) (weighted 75/25) and incorporating 10 bps for transaction costs. In relation to existing debt, Ofwat had regard to both iBoxx bond indices and yields on water company bonds. Ofwat considered the iBoxx indices and recent bond issuances by water companies (of which there were relatively few) in forming a view on the cost of new debt. Ofwat adjusted upwards from the then-current iBoxx indices for the purposes of setting the allowed cost of new debt to reflect expectations that interest rates might rise over AMP6.

Ofwat has provided fewer details about its views on the cost of debt for PR19 than the cost of equity. Ofwat has, however, proposed to change its approach to calculating the cost of new debt for PR19. Specifically, Ofwat has decided to adopt a cost of debt indexation mechanism for new debt only.[62] The cost of existing debt will continue to be set at a fixed level in advance for the whole price control period. Ofwat's PR19 methodology indicates Ofwat will set the cost of existing debt by reference to water companies' actual debt costs and the cost of new debt by reference to benchmark bond indices[63], such as the iBoxx indices it used at PR14 (discussed in more detail below), potentially subject to an adjustment for out/underperformance of the benchmarks by water companies and for transactions costs.

Ofwat's proposed approach to PR19 involves setting different costs of debt for new and existing debt. We agree with this basic approach, recognising there could be a material difference between the cost of new and existing debt at PR19. This is because since PR14 bond yields have continued to decrease and – as we discuss later – water companies have been able to raise new debt very competitively, but the cost of water companies' existing debt will not have decreased as quickly as the reduction in market interest rates. This is because a very substantial proportion of water industry debt is long-dated and will not be refinanced during AMP7. The cost of that debt will largely be fixed over the period (although it should be recognised that a proportion of debt could be floating rate).

In the context of potentially markedly different costs of new and existing debt, and of differing approaches to setting the costs of new and existing debt, it is important to continue to draw a distinction between the costs of existing and new debt when calculating the overall cost of debt.

Noting the above, our work on the cost of debt has focused on:

- the proportions of new and existing debt i.e. how much weight to place on the costs of each;
- the cost of existing debt; and
- the cost of new debt.

We discuss each of these topics below.

2.3.1 The proportions of new and existing debt

As noted above, Ofwat assumed a 75/25 split of existing and new debt at both PR09 and PR14. However, in its early view of the WACC Ofwat has assumed a 70/30 split.[64] Our analysis in Table 15 shows that approximately 25% of the industry's currently outstanding bonds will mature before the end of the AMP7 period, with around 75% maturing further into the future.

An assessment would need to be made of the industry's AMP7 capex programme to form a view on the amount of new debt that may need to be raised, but on the basis of this analysis

[62] We have not been asked to comment on whether the decision to index the cost of new debt is a good idea or not. The cost of new debt will be indexed at PR19, so we have factored that into our assessment of the cost of debt below.
[63] See Ofwat (2017) Delivering Water 2020: Our methodology for the 2019 price review – Appendix 12: Aligning risk and return, chapter 6.
[64] See Ofwat (2017) Delivering Water 2020: Our methodology for the 2019 price review – Appendix 12: Aligning risk and return, p73.

a new/existing debt split of around 75/25 may continue to be reasonable (i.e., the same as Ofwat's assumption at PR09 and PR14). This estimate of the split should be revisited once more detailed information about AMP7 expenditure plans become available.

Table 15: Proportions of debt maturing over various time frames

	Proportion maturing pre 2020	Proportion maturing 2020-2025	Proportion maturing post 2025
Bond debt	5.4%	18.5%	76.0%

Note: Based on bonds denominated in GBP and with fixed coupons and bullet maturities. The principal outstanding on inflation linked bonds has been estimated by grossing up the amount originally issued for outturn RPI inflation since the data of issuance.

Source: Bloomberg, EY analysis

2.3.2 The cost of existing debt

At PR14 Ofwat determined that the cost of existing debt was 2.65% (real, pre-tax, excluding transaction costs) based on a ten year trailing average of long-maturity A and BBB rated benchmark bond indices.[65]

There are different ways of estimating the cost of existing debt.

One approach could be to calculate the weighted average cost of existing water company debt and use that industry-wide average as a benchmark cost of debt.

Our analysis of water companies' existing debt suggests that the weighted average cost of existing debt is around 2.1 – 2.2%, based on both index-linked debt and nominal debt (deflated into real terms).[66,67]

Table 16: Weighted average cost of existing bond debt

	Proportion	Weighted average cost (nominal)	Weighted average cost (real)
Nominal	60.2%	5.13%	2.06% (1)
Index-linked	39.8%		2.21%

Note: (1) assumes expected RPI inflation of 3.0%, based on breakeven inflation data from Bloomberg for the end of February 2018, and calculates real cost of nominal debt using the Fisher formula. This analysis does not take into account the costs of bank loans, including European Investment Bank (EIB), loans.
Source: EY analysis of Bloomberg data

Another approach is to consider historical averages of benchmark bond indices. iBoxx bond indices are widely used for this purpose. Long maturity indices are more relevant to the water industry because water companies typically issue bonds with long maturities. Long term trailing averages are more appropriate for the water industry because water companies' outstanding debt has been raised over a period of many years.

Long term trailing averages of iBoxx A and BBB rated non-financial 10+ and 15+ bond yields, deflated for expected RPI inflation, suggest that the real cost of debt could be in the order of 1.7 – 2.4%.

[65] See Ofwat (2014) Setting price controls for 2015-20: Final price control determination notice: policy chapter A7 – risk and reward, pp37-38.
[66] We deflate for expected RPI inflation over the medium term, on the assumption that this will provide the best estimate of the real cost of existing debt over AMP7.
[67] We make no adjustment for any possible inflation risk premium embedded in nominal bond coupons. This is because investors in water companies' nominal debt would still need to be compensated for this risk, so it is a real cost to water companies that needs to be funded through the cost of debt allowance.

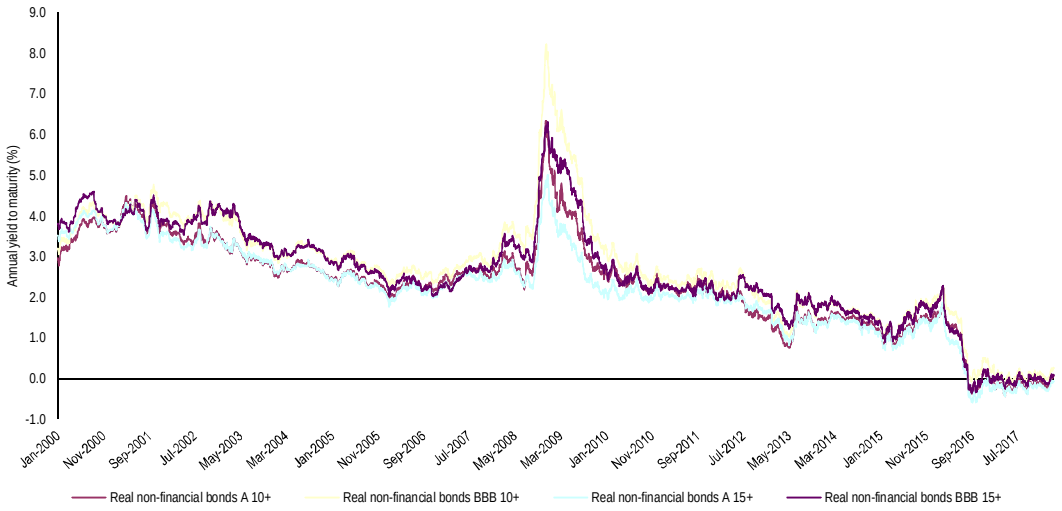
Table 17: Average annual yields to maturity A and BBB-rated bonds (real)

	Maturity			
Period to 28 February 2018	A 10+	BBB 10+	A 15+	BBB 15+
Spot	0.05	0.24	(0.09)	0.08
6 month	(0.13)	0.08	(0.20)	(0.02)
12 month	(0.17)	0.06	(0.22)	(0.04)
2 years	0.12	0.38	(0.03)	0.19
5 years	0.84	1.12	0.74	1.04
10 years	1.74	2.20	1.55	1.97
15 years	2.02	2.44	1.87	2.26

Note: The above table denotes the annual yields to maturity for non-financial, GBP-denominated bonds, deflated for breakeven inflation measured over a 10 and 15 year horizon respectively.

Source: iBoxx Markit and Bloomberg data up to 28 February 2018, EY analysis

Figure 19: A and BBB-rated bond yields to maturity over time (real)

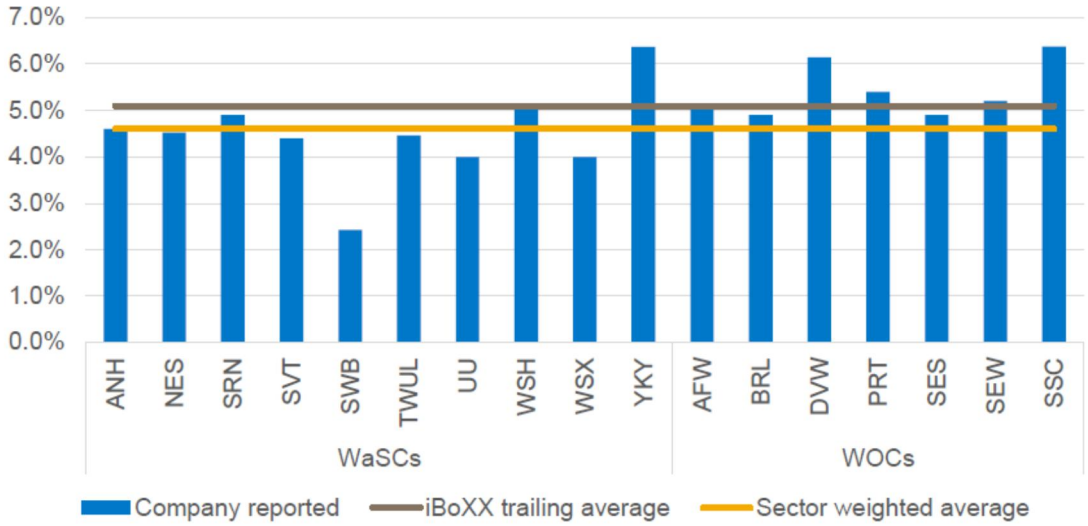


Note: The above shows the annual yields to maturity for non-financial, GBP-denominated bonds, deflated for breakeven inflation measured over a 10 and 15 year horizon respectively.
Source: iBoxx Markit and Bloomberg data up to 28 February 2018, EY analysis

In isolation, long run historical benchmark bond yield data from the iBoxx indices, deflated into real terms, implies a cost of existing debt around 1.7 – 2.4%. However, some adjustment to the iBoxx indices might be required if the implied cost of debt is materially different from the actual cost of water companies' debt.

In this respect, Ofwat indicated in its PR19 methodology decision that water companies were outperforming a 10 year trailing average of A and BBB 10+ iBoxx indices by 23 – 50 basis points, as illustrated in Figure 20 below.

Figure 20: Ofwat's analysis of water company cost of debt relative to the iBoxx index



Source: Delivering Water 2020: Our methodology for the 2019 price review – Appendix 12: Aligning risk and return, p74.

This lower cost of debt is similar to a "halo" effect that has been discussed in other regulated sectors, particularly the gas and electricity networks. However, other available estimates of the "halo" effect suggest it may be somewhat lower than Ofwat's analysis suggests. Consultants have previously advised Ofwat:[68]

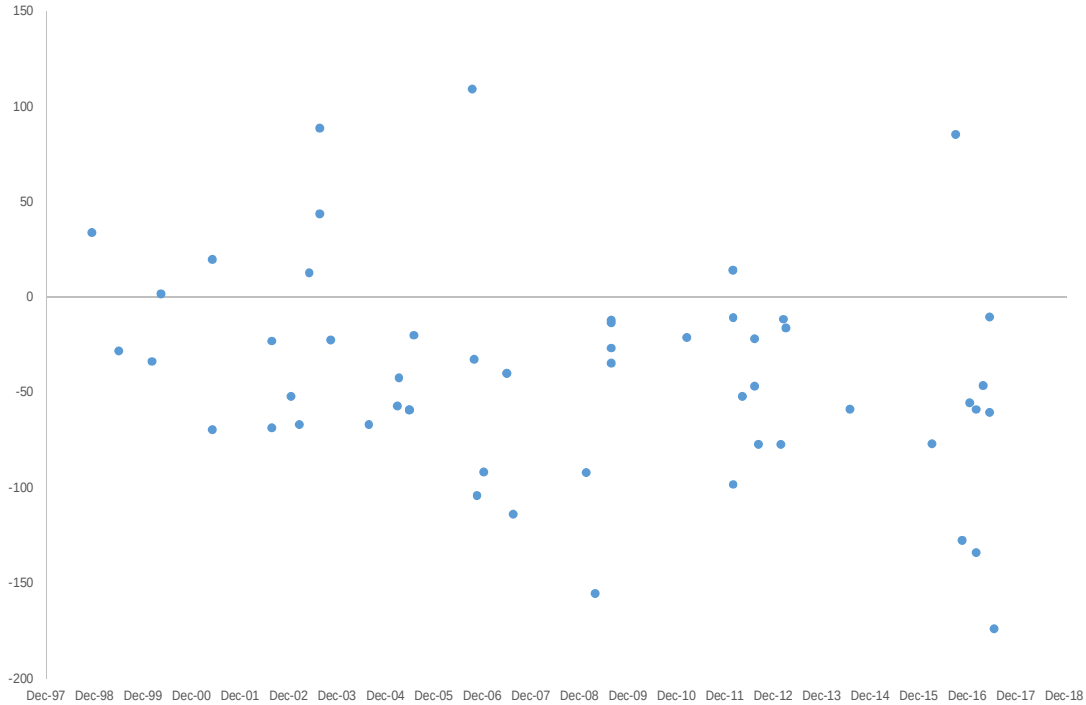
> *"Over the past ten years the average difference between the yield of water bond issues and the prevailing iBoxx index has been -15 basis points, i.e. yields at issue have been, on average, 15 bps lower than the iBoxx index."*

The CMA also concluded the halo effect was somewhat smaller, albeit for electricity distribution companies, during the appeal of RIIO-ED1.[69] In that case the CMA appears to have concluded that the halo effect was around 20 basis points on average, similar to what Ofgem had originally concluded in the RIIO-ED1 determination.

To explore this issue we have compared the coupons on nominal fixed rate Sterling-denominated bonds to the average of the A and BBB non-financial iBoxx bond indices with 10+ years to maturity (i.e. the indices which Ofwat proposes to use) on the same day as the bond was issued. The results of this analysis shown in Figure 21 below suggest that coupons on water company bonds have been about 40 bps lower on average than the contemporaneous average yield on the A and BBB non-financial iBoxx bond indices with 10+ years to maturity. Our analysis does not attempt to match the tenor of the water company bonds to the iBoxx index e.g. by comparing a bond with shorter tenor to an iBoxx index with shorter tenor. Our analysis also does not attempt to compare a bond to the iBoxx index with the same credit rating e.g. an A rated bond with an A rated index. Nor does our analysis take into account inflation-linked bonds, foreign currency denominated bonds, bonds with any non-standard features (e.g. call options) or European Investment Bank (EIB) and bank loans, all of which could increase or decrease the size of the estimate halo effect. A more detailed analysis might produce a different result. We also note that there has been significant variability i.e. some bonds have been issued at a bigger discount to the iBoxx indices, while others have been issued at a premium, so it may also be appropriate to consider a range around these estimates.

[68] See PwC (2013) Cost of capital for PR14: Methodological considerations, footnote 26, p36.
[69] See CMA (2015) British Gas Trading v The Gas and Electricity Market Authority: Final Determination, p147 and following.

Figure 21: Comparison of the coupons on water company bonds to iBoxx indices



Source: EY analysis of Bloomberg and iBoxx data. Nominal, fixed rate, bullet, Sterling-denominated bonds only. Data points show difference between coupon on bonds and average of A and BBB non-financial corporate 10+ bond indices. A positive value indicates the coupon was above the iBoxx indices and a negative value indicates the opposite.

We note that in its PR19 methodology Ofwat ultimately proposed to use a halo effect of 15 basis points even though it considered this to be "conservative".[70]

Overall, and particularly noting that there is uncertainty around the size of any halo effect to deduct from the cost of debt implied by iBoxx indices, it seems appropriate to place more weight on the cost of water companies' actual outstanding debt i.e. to estimate the industry's cost of embedded debt directly (and thereby negate the need to estimate a halo effect). This suggests a real cost of existing debt of around 2.1 - 2.2% may be appropriate based on data up until the end of February 2018 (see Table 16) if bond debt is representative of overall debt costs. However, we note that Ofwat indicated in its PR19 methodology decision it had calculated the cost of water companies' existing nominal debt at the end of March 2017 was 4.6%.[71] This is lower than the 5.1% we calculated, shown in Table 16 above. Our analysis only took into account Sterling-denominated bonds, whereas Ofwat's analysis presumably incorporates bank loans and foreign currency denominated bonds and private placements.

Noting that some non-bond debt may be lower cost than the estimated RPI-stripped real cost of debt we have presented above, and that the cost of existing debt may continue to decrease between now and the PR19 Final Determination (given that interest rates are expected to remain very low over the intervening period), we consider appropriate to adopt an RPI-stripped real cost of existing debt a little bit lower than the raw data and analysis we have presented above would indicate.

Key conclusion: we estimate that the RPI-stripped real cost of existing debt at PR19 is in a range of 1.5 – 2.0%.

[70] See Ofwat (2017) Delivering Water 2020: Our methodology for the 2019 price review - Appendix 12: Aligning risk and return, p75.
[71] See Ofwat (2017) Delivering Water 2020: Our methodology for the 2019 price review - Appendix 12: Aligning risk and return, p74.

2.3.3 The cost of new debt

At PR14 Ofwat set a cost of new debt of 2.0% (real, pre-tax) based on A and BBB rated long-maturity benchmark bond indices adjusted for expected changes in interest rates (calculated from the slope of the yield curve).[72] Ofwat placed significant weight on current market evidence, prompting it to reduce its proposed cost of new debt significantly between its January 2014 risk and reward guidance (2.65%) and the December 2014 PR14 Final Determinations.

Bond issuances by water companies and other UK utilities since PR14 have typically achieved a cost of debt significantly below Ofwat's assumed cost of new debt of 2.0%.

As the tables below illustrate, many companies have been able to issue bonds with coupons of close to or less than 0.0% in real terms. The effective cost of some of those bonds has been even lower i.e. the bonds have been issued at a discount to face value in order to preserve a coupon above 0%. The effective coupons on some RPI-linked bonds have been between -0.5% and -0.9%, while effective coupons on CPI-linked bonds have been about the same once converted to RPI-stripped real terms (e.g. by deducting off around 0.8 – 1.3% for the typical difference between RPI and CPI inflation, as discussed in more detail in Section 2.6 below).

Table 18: Recent bond issuances by UK water companies and other utilities

Bond issuances 2015-2018	2015	2016	2017	2018
Nominal				
Number	5	4	9	1
Amount	£1,085,000,000	£1,065,796,000	£2,060,000,000	300,000,000
Min amount	£40,000,000	£65,796,000	£60,000,000	300,000,000
Max amount	£350,000,000	£400,000,000	£300,000,000	300,000,000
Average amount	£217,000,000	£266,449,000	£228,888,889	300,000,000
Min coupon	0.72%	1.63%	1.13%	2.50%
Max coupon	3.63%	3.50%	2.88%	2.50%
Average coupon	2.02%	2.79%	2.24%	2.50%
Inflation-linked *				
Number	2	6	5	
Amount	£50,000,000	£153,500,000	£235,000,000	
Min amount	£25,000,000	£20,000,000	£32,000,000	
Max amount	£35,000,000	£38,000,000	£60,000,000	
Average amount	£30,000,000	£25,583,333	£47,000,000	
Min coupon	0.01%	0.01%	0.01%	
Max coupon	0.18%	0.38%	0.39%	
Average coupon	0.1%	0.11%	0.22%	

Note: based on bonds denominated in GBP and with fixed coupons and bullet maturities. Investment grade bonds only, i.e., any bonds issued by holding companies are excluded. Excludes Thames Water bond noted (1) on following page. Data up to 28 February 2018. (*) the inflation-linked bonds shown comprise both RPI and CPI linked bonds, such that the coupons on the bonds are not directly comparable – further details of coupons on individual bonds are provided in the tables below.

Source: EY analysis of Bloomberg data

[72] See Ofwat (2014) Setting price controls for 2015-20: Final price control determination notice: policy chapter A7 – risk and reward, p38.

Table 19: Recent nominal bond issuances by UK water companies and utilities

Issuer name	Issue date	Maturity date	Issued amount £m	Coupon	Rating
Southern Gas Networks PLC	03/02/2015	03/02/2025	350	2.50%	BBB+
Northern Powergrid Yorkshire PLC	01/04/2015	01/04/2025	150	2.50%	A-
Western Power Distribution PLC	06/11/2015	06/11/2023	500	3.63%	BBB
Thames Water Utilities Cayman Finance Ltd	18/12/2015	18/12/2034	40	0.75%	A-
Thames Water Utilities Cayman Finance Ltd	21/12/2015	21/12/2027	45	0.72%	A-
Thames Water Utilities Cayman Finance Ltd	25/02/2016	25/02/2028	300	3.50%	A-
Affinity Water Programme Finance Ltd	22/08/2016	22/08/2042	65.8	3.28%	A-
Northumbrian Water Finance PLC	11/10/2016	11/10/2026	300	1.63%	BBB+
Severn Trent Utilities Finance PLC	05/12/2016	05/12/2031	400	2.75%	BBB+
Thames Water Utilities Cayman Finance Ltd	23/12/2016	09/04/2058	400	7.74%(1)	A-
Thames Water Utilities Cayman Finance Ltd	24/01/2017	24/01/2024	250	1.88%	A-
Thames Water Utilities Cayman Finance Ltd	24/01/2017	24/01/2032	250	2.63%	A-
Anglian Water Services Financing PLC	15/03/2017	15/06/2027	200	2.63%	BBB
Thames Water Utilities Cayman Finance Ltd	03/05/2017	03/05/2023	300	2.38%	BBB-
Thames Water Utilities Cayman Finance Ltd	03/05/2017	03/05/2027	250	2.88%	BBB-
Severn Trent Utilities Finance PLC	08/06/2017	07/09/2021	250	1.13%	BBB+
Western Power Distribution South West PLC	16/11/2017	16/05/2029	250	2.38%	BBB+
Affinity Water Programme Finance Ltd	22/11/2017	22/11/2033	60	2.70%	A-
Severn Trent Utilities Finance PLC	04/12/2017	04/12/2022	250	1.63%	BBB+
Dwr Cymru Financing Ltd	24/01/2018	31/03/2036	300	2.50%	A

Note: based on bonds denominated in GBP and with fixed coupons and bullet maturities. Investment grade bonds only, i.e., any bonds issued by holding companies are excluded. (1) bond was issued at a price of almost twice face value, implying an effective coupon of about half of that shown. Data up to 28 February 2018.

Source: Bloomberg data

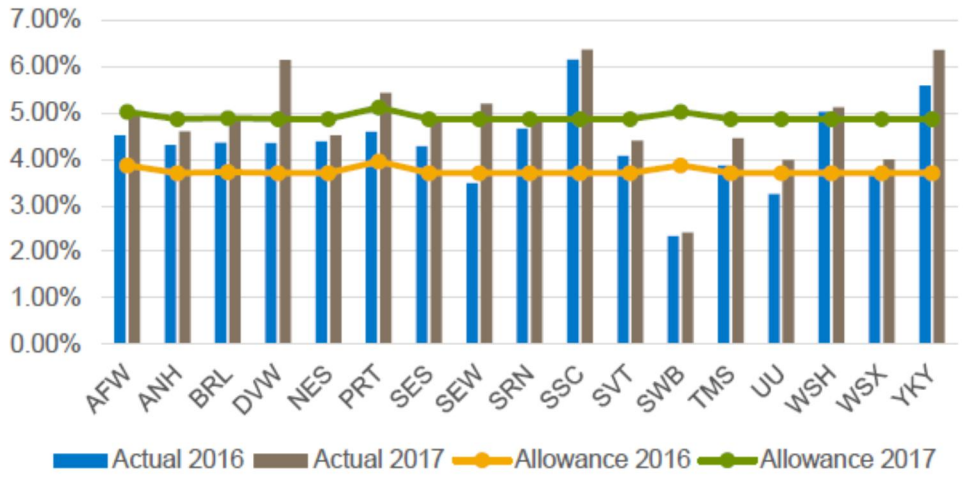
Table 20: Recent inflation-linked bond issuances by UK water companies and utilities

Issuer name	Issue date	Maturity date	Issued amount £m	Inflation index	Coupon	Effective yield	Rating
United Utilities Water Finance Plc	23/04/2015	23/04/2025	25	RPI	0.01%	0.013%	BBB+
United Utilities Water Finance Plc	23/04/2015	23/04/2030	35	RPI	0.18%	0.178%	BBB+
United Utilities Water Finance Plc	30/09/2016	30/09/2028	20	RPI	0.01%	-0.889%	BBB+
United Utilities Water Finance Plc	30/09/2016	30/09/2036	26.5	RPI	0.01%	-0.77%	BBB+
United Utilities Water Finance Plc	09/12/2016	09/12/2031	20	CPI	0.25%	0.245%	BBB+
United Utilities Water Finance Plc	09/12/2016	09/12/2031	38	RPI	0.01%	-0.555%	BBB+
United Utilities Water Finance Plc	09/12/2016	09/12/2036	29	RPI	0.01%	-0.421%	BBB+
United Utilities Water Finance Plc	09/12/2016	09/12/2036	20	CPI	0.38%	0.379%	BBB+
United Utilities Water Finance Plc	10/02/2017	10/02/2037	60	CPI	0.09%	0.093%	BBB+
Western Power Distribution South Wales PLC	14/03/2017	14/03/2029	50	RPI	0.01%	0.01%	BBB+
United Utilities Water Finance PLC	05/10/2017	05/10/2048	32	CPI	0.36%	0.36%	A-
United Utilities Water Finance PLC	05/10/2017	05/10/2057	33	CPI	0.39%	0.39%	A-
Affinity Water Programme Finance Ltd	22/11/2017	22/11/2042	60	CPI	0.23%	0.23%	A-

Note: based on bonds denominated in GBP and with fixed coupons and bullet maturities. Investment grade bonds only, i.e., any bonds issued by holding companies are excluded. Data up to 28 February 2018.
Source: Bloomberg, United Utilities publications (e.g. https://www.unitedutilities.com/corporate/investors/credit-investors/credit-investor-news/2017-credit-investor-news/) and Affinity Water website (https://stakeholder.affinitywater.co.uk/financial-overview.aspx)

We note that a significant portion of recent index-linked bond issuance has been undertaken by UU. To the extent that UU's cost of debt is not representative of the industry's costs – for example, because UU outperforms the industry on average – some adjustment to these costs may be appropriate to arrive at a representative industry-wide estimated cost of debt. In this regard, we note that UU has achieved one of the lowest costs of debt in the industry: according to Ofwat analysis, UU's real cost of debt may be about 1.0% below the industry average (see Figure 22 below). Assuming this outperformance has been maintained in the bond issuances described above, some uplift to these observed coupons may be appropriate. Since UU's issuances have been amongst the cheapest bond issuances described above, this may suggest placing less weight on the low end of the range of effective real interest rates on new water company bond issuances.

Figure 22: Ofwat analysis of real cost of debt compared to PR14 allowance



Source: Ofwat (2017) Monitoring financial resilience, p19.

All else equal, the analysis above may suggest that the cost of new debt could be materially lower at PR19 than PR14 – assuming that market conditions remain as favourable over the next couple of years. However, as discussed in relation to the risk-free rate, there may be some reasons to expect interest rates to rise. There are also reasons to expect demand for water company debt to decrease in coming years:

- changes in pension arrangements by the UK government, particularly allowing retirees to draw down pensions in lump sum, may have reduced demand for annuity products and weakened the demand by pension funds for matching long-dated inflation-linked assets;
- Basel III/Solvency II may have reduced insurance funds' appetite for long-dated corporate bonds with weaker investment grade credit ratings; and
- the introduction of Base Erosion and Profit Shifting (BEPS) rules on corporation tax could potentially reduce the ability of some investors to efficiently structure investments from a tax perspective (increasing tax costs going forward), reducing investor appetite.

Reduced future access to European Investment Bank loans – following Brexit – might also increase the overall cost of debt.

Our analysis of forward rates in relation to the risk-free rate also implied that yields on medium-term government bonds might rise by around 70 basis points between now and the middle of AMP7 (see Section 2.2.2 above). All else equal, this would suggest the cost of new debt in the middle of AMP7 would be about 70 basis points higher than it is now.

On the other hand, economic regulators have argued in the past that adopting debt indexation can allow them to set a lower cost of debt. This is because, they argue, they have "aimed up" when setting the cost of debt in the past, noting the risks that interest rates could rise.

Overall, the cost of new debt appears to be significantly lower than it was at PR14. A range of -1.0 to -0.3% is broadly consistent with coupons on recent bond issuances expressed in RPI-stripped real terms. Evidence from deflated iBoxx bond yields – see Table 17 and Figure 19 above – also suggests current real costs of new debt would be around -0.2 to 0.1% in RPI-stripped terms. iBoxx bond indices have however, as noted earlier, often exceeded the coupons at which water companies have been able to issue new debt: historical analysis indicated that water company coupons had averaged about 40 basis points below the contemporaneous average yield on A and BBB rated iBoxx non-financial 10+ years to maturity indices, suggesting a range of -0.6 to -0.3% may be more appropriate.

Adding 70 basis points to these ranges suggests a RPI-stripped real cost of new debt might be about 0.0 – 0.5% at PR19. Ofwat's estimate of the cost of new debt in its "early view" of the WACC for PR19 was 0.38% (real, RPI-stripped terms), within the range estimated here.

It is worth noting that this is an average allowance over the period: taking into account that the cost of new debt will be indexed and should automatically adjust upwards if interest rates rise, the cost of new debt at the start of the period is likely to be between the -1.0 to -0.3% range on recent bond issuances and the 0.0 – 0.5% cost that might apply on average over the period.

Key conclusion: we estimate, based on currently available data, that an appropriate RPI-stripped real cost of new debt at the beginning of PR19 is around -0.5% to 0.0%. This figure would then adjust automatically over the remainder of the 2020-25 period in line with Ofwat's cost of new debt index. The RPI-stripped real cost of new debt would be expected to rise gradually over the course of AMP7, based on the current shape of the yield curve. We estimate an appropriate average RPI-stripped real cost of new debt over AMP7 would be around 0.0 – 0.5%.

2.3.4 Evidence on debt premiums

Another approach to estimating the cost of debt is to add a debt premium (or spread) to the risk-free rate. We consider this as a cross-check to the analysis above.

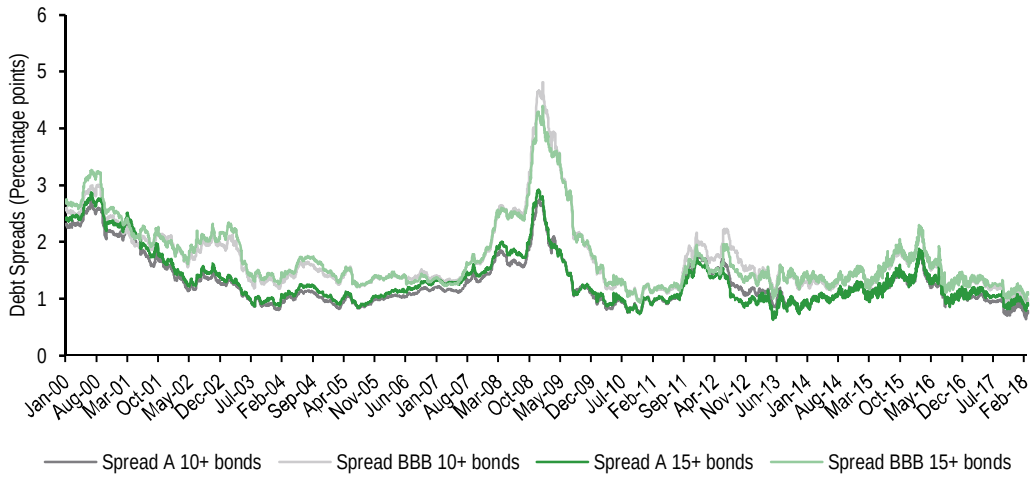
Comparing yields on iBoxx bond indices to yields on gilts provides one estimate of the debt premium. Debt spreads have narrowed since the financial crisis – long-maturity A rated non-financial corporate bonds have had spreads of around 0.8 – 1.0% in recent months, but longer term historical averages are marginally higher at about 1.0 – 1.1%. Corresponding long maturity BBB rated bonds have had spreads of around 1.0 – 1.2% in recent months, but again longer term historical average spreads have been marginally higher at about 1.3 – 1.4%.

Table 21: Average debt spreads over various time frames (%)

Period up to 28 Feb 2018	A 10+	B 10+	A 15+	B 15+
6m	0.81	1.03	0.93	1.12
12m	0.90	1.13	1.00	1.20
2yrs	1.01	1.28	1.10	1.33
5yrs	1.08	1.37	1.11	1.41

Notes: iBoxx A and BBB non-financial bond indices used.
Source: iBoxx Markit data, Bank of England data, EY analysis

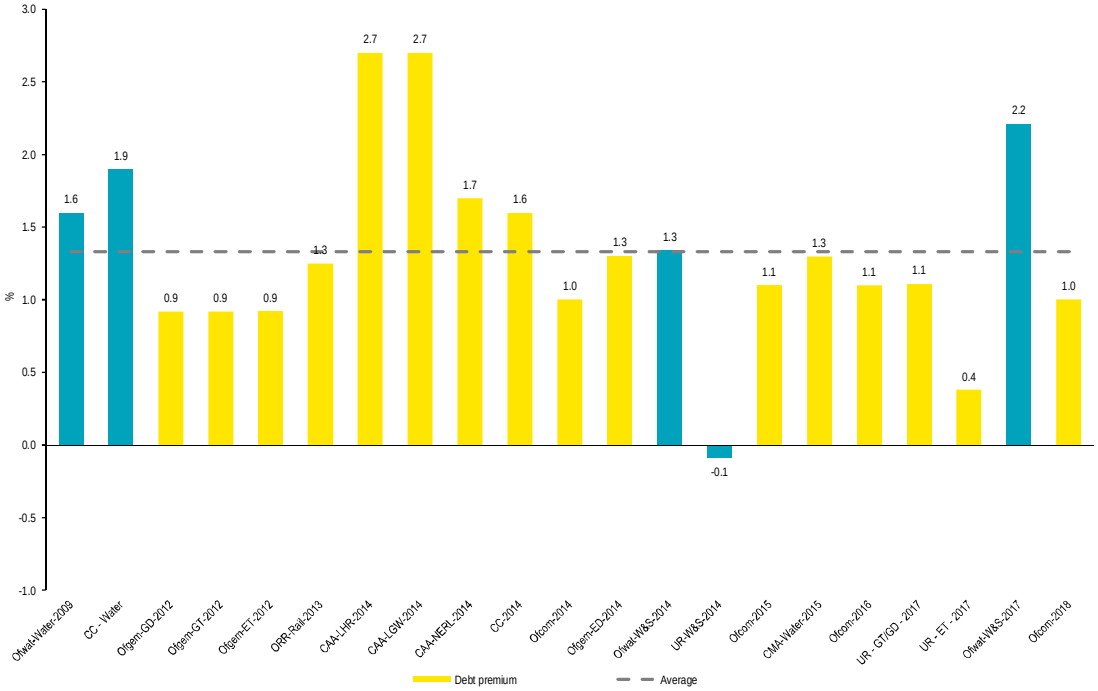
Figure 23: Debt spreads over time



Notes: iBoxx A and BBB non-financial bond indices used. Data up until 28 February 2018
Source: iBoxx Markit data, Bank of England data, EY analysis

Spreads in the order of 1.0 – 1.5% are similar in magnitude to those implicit in the cost of debt determinations of economic regulators in recent years as shown in Figure 24, albeit many of those regulatory decisions are towards the lower end of the range.

Figure 24: Past regulatory decisions on debt premium



Source: EY analysis of UKRN, Cost of Capital Annual Update Report 2017 and Ofgem, Ofwat and Ofcom publications. Debt premium calculated as the allowed cost of debt less the allowed risk-free rate.

Adding these spreads to index-linked gilt yields produces another estimate of the real cost of existing debt. Adding a debt premium of about 1.0 – 1.5% to 10 year trailing averages of long-maturity ILG yields (in a range of about 0.0 – 0.6%, see Table 6) gives an estimate of the cost of existing debt of about 1.0 – 2.0%. Similarly, with recent long-maturity ILG yields around -1.5%, the implied real cost of debt would be around -0.5 to 0.0%. In both cases we have used ILG yields with 20 – 30 years to maturity to reflect the long term borrowing that water companies might be expected to undertake with their revenue streams underpinned by long-lived assets.

2.3.5 Debt issuance and liquidity management costs

The discussion above has only considered the direct costs of debt, not the upfront transaction and issuance costs, or any ongoing liquidity – cash holding – costs associated with raising and maintaining debt. However, these are a real world cost for companies and a range of economic regulators have considered these costs in various decisions over the years. At PR14 Ofwat allowed a 0.1% uplift to the cost of debt for these costs.[73] During Bristol Water's appeal, the CMA also deemed that an uplift of 0.1% for issuance costs was appropriate. The CMA also commented that an additional 0.2% uplift for the costs of maintaining minimum cash balances was appropriate when modelling the company on an actual capital structure basis (but not on a notional basis).[74] Earlier decisions, also found an uplift to the cost of debt was appropriate. For example:

- the Competition Commission added 20 basis points to the allowed cost of Northern Ireland Electricity's debt for issuance costs and fees during its appeal;[75] and
- during Bristol Water's appeal of PR09, the Competition Commission decided an uplift of 0.1% for issuance costs was appropriate and an additional 0.2% for maintaining minimum cash balances was also included.[76]

During the RIIO-ED1 price review, Ofgem estimated that the cost of "issuance costs and other fees" was around 20 basis points for the electricity distribution network companies.[77] Noting all of the above, an uplift to the cost of debt for transaction costs of 0.1% seems a reasonable minimum consistent with regulatory precedent. The treatment of cash holding costs is less clear cut with some regulators supporting their inclusion and others not.

Another source of evidence on the cost of bond issuance is the Financial Conduct Authority's investment and corporate banking market study. In that investigation the FCA found that the fees on a bond with 15-40 years maturity issued by an investment grade credit rated issuer would attract fees in a range of about 0.20-0.45% of the amount issued.[78] The amount that these costs would add to the effective interest rate on a bond depends on the exact life of the bond and its coupon. However, assuming a bond with a bullet maturity profile issued with a coupon of 3.0% and a life of 30 years, up front fees of 0.2% would add about 8 basis points to the effective interest rate. If the up front fees were around 0.45% then the additional cost would be about 21 basis points. While we do not have information on the exact issuance costs experienced by water companies when issuing bonds, this evidence tends to suggest that the regulatory precedent cited above (which suggests transaction costs would add at least 0.1% to the cost of debt) is reasonable, if possibly a touch conservative.

Credit ratings agencies expect water companies with investment grade credit ratings to maintain enough cash or cash-like facilities available to meet its cash requirements for at least 12 months. The cost of maintaining these facilities will therefore depend on the amount of cash the business requires access to. In the case of UU in 2016/17, the capex programme was around £800m and UU was maintaining cash balances of about £250m and £725m of undrawn committed bank facilities.[79] UU's cash is held in the form of short-term money market deposits with prime commercial banks.[80] UU's accounts indicate that they earned £0.9m in interest on cash deposits for the year. This much interest on an average cash balance over the year of £230m implies an interest rate of about 0.4%. This compares to the cost of issuing a nominal bond at an interest rate of around 3.0%. Assuming the cost of cash equals the difference between what money can be borrowed at and the interest rates on deposits, then the cost of maintaining the cash facilities might be around £6.5m for the year.[81]

[73] See Ofwat (2014) Setting price controls for 2015-20: Final price control determination notice: policy chapter A7 – risk and reward, p42
[74] See CMA (2015) Bristol Water plc – Appendices, para 46 – 52 of Appendix 10.
[75] See Competition Commission (2014) Northern Ireland Electricity Limited price determination - Final Determination, para 13.76.
[76] See Competition Commission (2010) Bristol Water plc - Appendices, Appendix N, para 48.
[77] See Ofgem (2014) RIIO-ED1: Final determinations for the slow-track electricity distribution companies: Overview, pp91-92.
[78] See Financial Conduct Authority (2016) Investment and corporate banking market study - Interim Report: Annex 7 - Fee outcomes and international comparisons, p11.
[79] See http://unitedutilities.annualreport2017.com/media/83269/united-utilities-ar2017-web-ready.pdf, p129 and p152.
[80] See http://unitedutilities.annualreport2017.com/media/83269/united-utilities-ar2017-web-ready.pdf, p43.
[81] This is calculated as (3% - 0.4%) x £250m of cash.

Spread across UU's debt portfolio of about £6bn, this would equate to around 11 basis points on the cost of debt, which is not dissimilar to estimates by the CMA described above. If the cost of maintaining revolving credit facilities, such as commitment fees, was added, then the overall cost would be higher, but as we do not have good information on the cost of credit facilities and the cost estimated is similar to regulatory precedent we do not take these other costs into account.

Key finding: Combining the regulatory precedents and the information supplied by UU, our assessment is that an uplift to the cost of debt of 0.1 – 0.2% is appropriate to compensate for transaction and liquidity management costs.

2.3.6 Cost of debt conclusion

Table 22 below summarises the key findings we have presented in the discussion above.

In combination, these factors imply a real, RPI-stripped, pre-tax cost of debt in a range of 1.2 - 1.8%, inclusive of transaction costs, on average over the 2020-25 period.

Table 22: Key cost of debt parameters

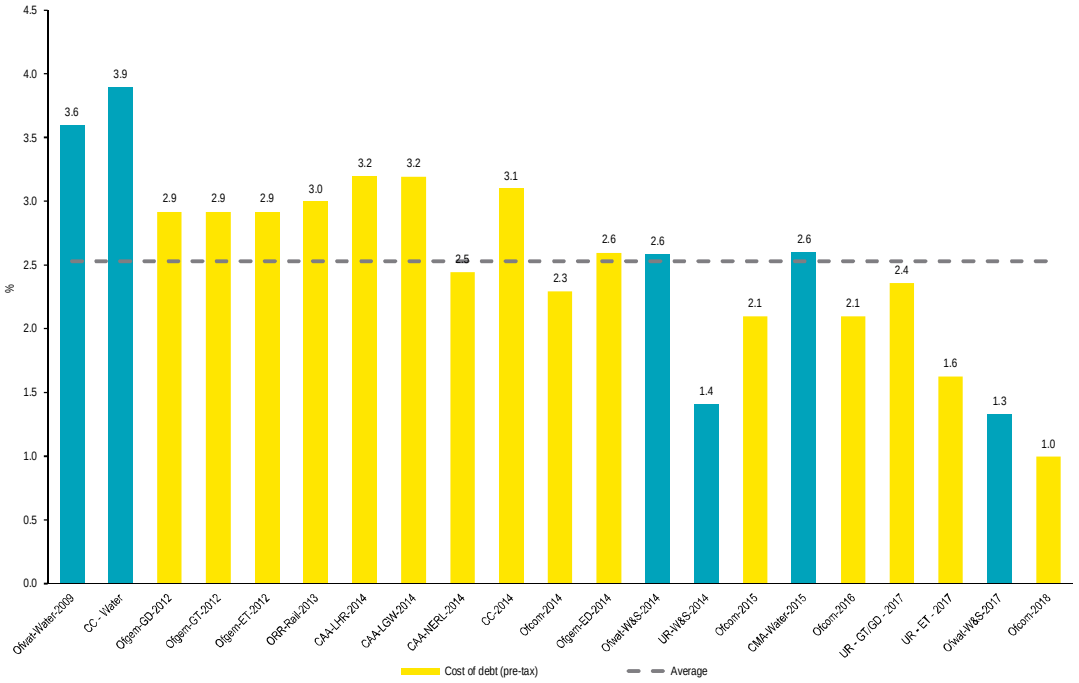
	EY estimate		Comparison ranges	
	Min	Max	PR14	PR19
Cost of existing debt (real, pre-tax, %)	1.5	2.0	2.65	1.59%
Cost of new debt (real, pre-tax, %)	0.0	0.5	2.00	0.38%
Existing/new split	75/25	75/25	75/25	70/30
Transaction costs (%)	0.1	0.2	0.1	0.1
Cost of debt (real, pre tax, %)	1.2	1.8	2.59	1.33

We note that the lower end of this range is lower than past decisions for the cost of debt for similar water and energy network companies, as shown in Figure 25 below. While the credit ratings assumed by economic regulators, and therefore the allowed costs of debt, should be similar across sectors, if regulated water and energy networks are able to raise debt more cheaply than other companies with the same credit rating, it would be most relevant to compare our analysis of the cost of debt to regulatory precedents for those particular sectors.

While the estimated cost of debt is lower than many recent regulatory determinations, the evidence from bonds issued by water companies and other economic regulators over the past 2 years suggests a very low cost of debt can currently be achieved in the market place. Meanwhile, the cost of water companies' portfolio of existing debt has continued to decrease since PR14. Combined with the water industry's record of being one of the most efficiently financed sectors and a cost of debt lower than past determinations does not seem unreasonable.

It is also worth noting that the chart showing regulatory precedents below does not include the annual updates to Ofgem's cost of debt allowance based on its indexation methodology. Ofgem's approach has produced a cost of debt of 2.22% for the 2017/18 year for those companies using a 10 year trailing average approach and a figure of 1.49% for Scottish Hydro Electricity Transmission where more weight is placed on recent data. In electricity distribution, Ofgem applied a "trombone" approach, increasing the length of the trailing average from 10 to 20 years over time. Those indices will continue to fall between now and PR19 if yields and expected inflation stay at current levels.

Figure 25: Selected past regulatory decisions on cost of debt (real, pre-tax, %)



Source: UKRN, Cost of Capital Annual Update Report 2017 and various regulators publications

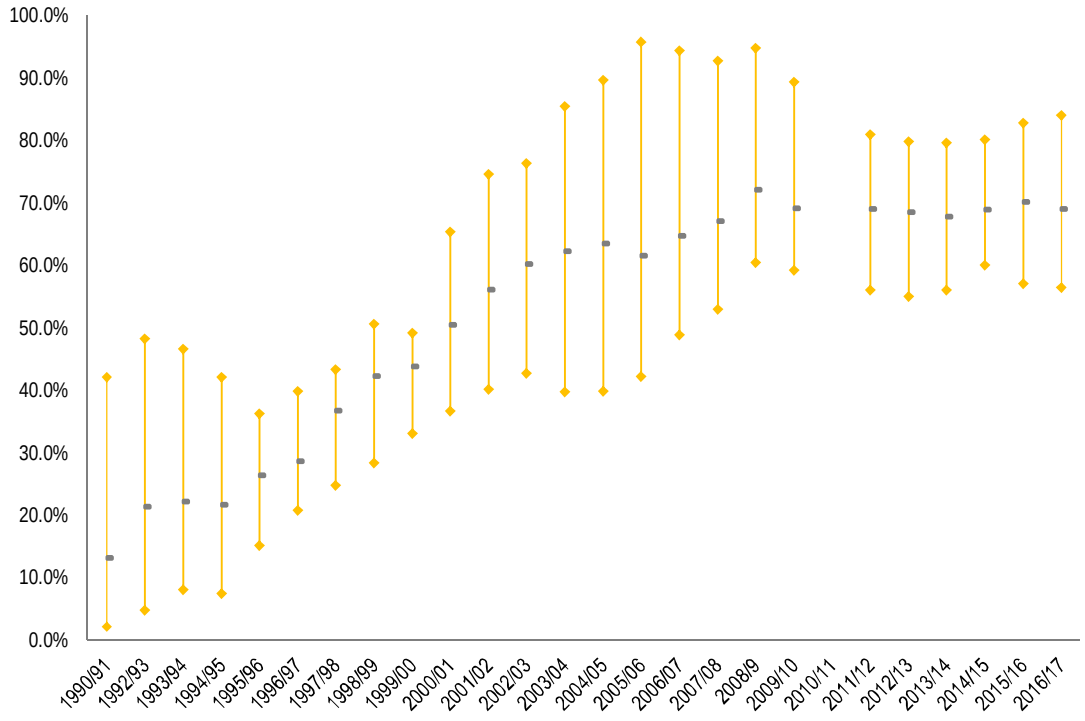
2.4 Gearing

Ofwat adopted a notional gearing assumption of 62.5% at PR14, at the top end of its 60.0 – 62.5% range.[82] The CMA also adopted a gearing assumption of 62.5% during Bristol Water's appeal of PR14.[83]

As Figure 26 blow illustrates, average gearing of the water and sewerage companies (WaSCs) is around 65 – 70% and has been fairly stable around this level over the past few years, though there are a range of different capital structures across the industry.

[82] See Ofwat (2014) Setting price controls for 2015-20 – risk and reward guidance, p9.
[83] See CMA (2015) Bristol Water plc - report, para 10.28.

Figure 26: WaSCs gearing over time



Note: 2010/11 data was not reported by Ofwat
Source: Ofwat publications, EY analysis

As we discuss later in relation to financeability testing, credit rating agencies, such as Moody's, continue to assess that gearing of less than 70% is consistent with an investment grade credit rating.

Noting that actual gearing levels and credit ratings agencies' views are little changed since PR14, there does not seem to be a strong case for a significantly different gearing assumption at PR19.

The cost of capital is not typically very sensitive to the gearing assumption (if other parameters are adjusted for the gearing assumption appropriately).

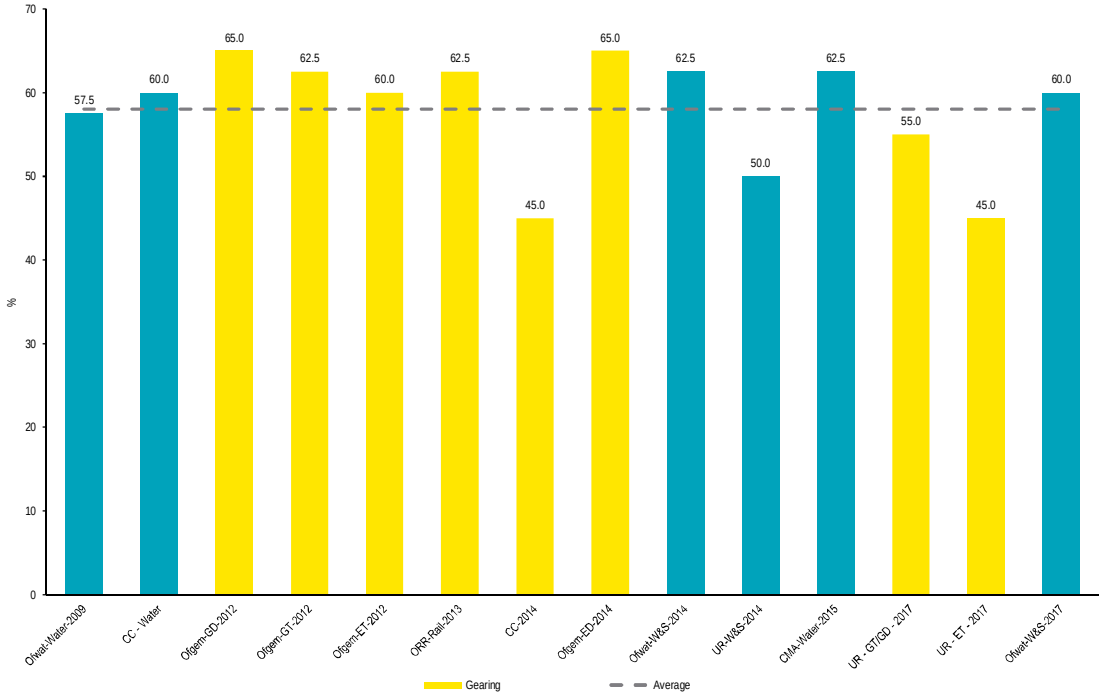
Key finding: We have therefore assumed a range of 60 – 65% in our analysis.

We note this is broadly similar to a range of recent regulatory precedents. We also note that the CMA recently concluded that a gearing assumption of 55% for firmus energy – a gas distribution network in Northern Ireland – was not inappropriate.[84]

We note that our estimate is broadly aligned with Ofwat's own "early WACC" view that gearing should be 60%.[85] We note that Ofwat bases its view on evidence that some companies had reduced gearing since PR14 and a wider trend towards reducing debt to enterprise values across the corporate sector in the UK and Europe in the last few years. However, sector average gearing remains above 60%, as does the gearing for many of the companies in the sector, so it is not clear to us that a reduction in gearing is appropriate, but as noted above Ofwat's estimate is within our range and the WACC is not very sensitive to the gearing assumption.

[84] See CMA (2017) Firmus Energy (Distribution) Limited v Northern Ireland Authority for Utility Regulation.
[85] See Ofwat (2017) Delivering Water 2020: Our methodology for the 2019 price review – Appendix 12: Aligning risk and return, pp20-21.

Figure 27: Past regulatory decisions on gearing (%)



Source: UKRN, Cost of Capital Annual Update Report 2017 and various regulators publications

2.5 Market to asset ratios

The RCV equals, in theory, the discounted future allowed returns under the regulatory regime i.e. the RCV x WACC forecast into perpetuity and discounted back at the WACC equals the RCV. But this is only true if the company performs in line with all of the regulator's assumptions.

In theory, the companies can be valued at more than their RCV if some outperformance is expected. For example, by generating additional returns through outperformance of totex, ODIs, the cost of capital or other features of the regulatory framework, additional value can be created over and above the RCV.

Consequently, the amount that investors are willing to pay to buy water companies reveals information about their expected rate of return on those investments. An acquisition value greater than the RCV of the target company indicates that the investor expects to be able to outperform the regulator's allowances.

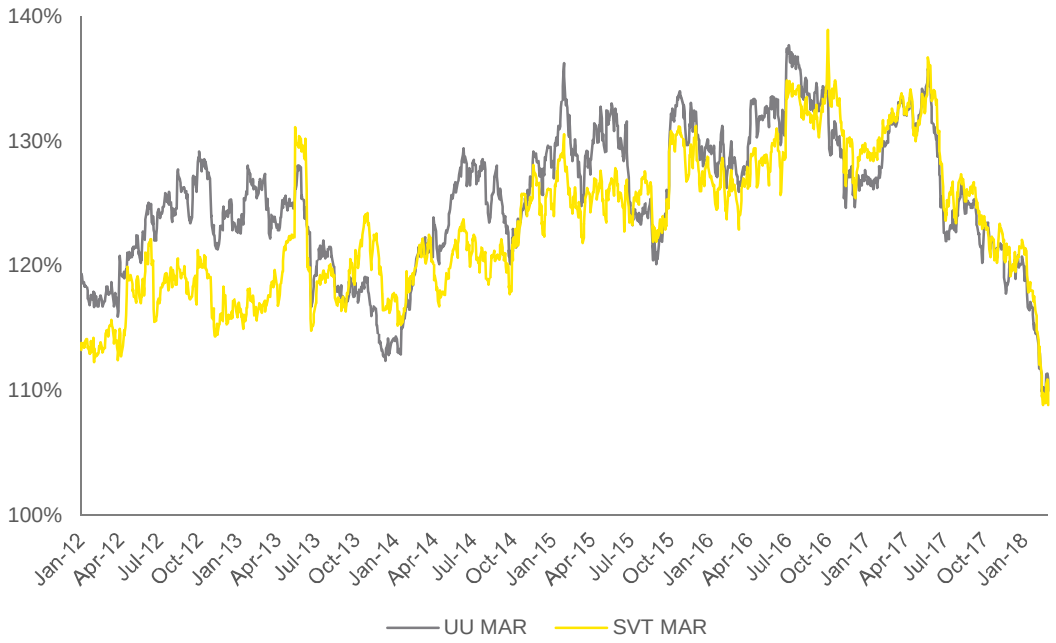
There have been a number of transactions in the water and wider regulated network sectors in the UK in recent years, despite tightening economic regulation. For example, there have been takeovers of Portsmouth Water, Bournemouth Water and Dee Valley Water and acquisitions of minority shareholdings at several companies. These transactions are summarised in Figure 29 overleaf. As the data shows, recent transactions have continued to be at significant premiums to RCV, some of them well above even the long-term historical average premium from our sample of transactions of about 30% i.e. investors have on average been willing to pay about 1.3x the RCV.

Another source of evidence on MARs is the market capitalisation of the listed water companies relative to their RCVs. Figure 28 below presents MAR analysis based on stock market data for the two listed "pure play" water companies: United Utilities and Severn Trent Water.[86] The analysis suggests that MARs increased from around the 110 – 115% range to

[86] We focus on United Utilities (UU) and Severn Trent Water (STW) because these two companies undertake relatively little non-regulated activity i.e. the Appointed water company comprises the vast majority of the corporate group. These companies can be regarded as close to "pure play" and their MARs reflect an assessment of the performance of the water business. In contrast, South West Water (SWW) is a smaller proportion of Pennon Group

closer to 130% following PR14, but have recently decreased again (as water company share prices have fallen, potentially in response to more information becoming available about Ofwat's proposed approach to PR19 and/or increased debate about possible renationalisation of the water industry).

Figure 28: Market to Asset Ratios from listed water companies



Source: EY analysis of Bloomberg and Ofwat data up to 28 February 2018.

Interpreting what MARs imply about investors' required rates of return on equity is not straightforward and caution must be exercised when interpreting such analysis. The primary difficulty with inferring the cost of equity from MAR analysis is that there are a range of different sources of outperformance (e.g. totex, ODIs/PCs, CMeX/DMeX, cost of debt, inflation, number of retail customers etc) which investors may have incorporated into their valuations, and it is difficult to observe or estimate the extent of assumed outperformance in many cases. While equity analysts' reports and other commentary can sometimes provide insight into the assumed levels of outperformance of some aspects of the regulatory framework, their forecasts are typically in a wide range and necessarily reflect a degree of subjectivity.

The true underlying market value of a company may also be difficult to measure: while market valuations can be observed, these may not always solely reflect investors' expectations about the performance of the business e.g. investors may pay a premium for a controlling stake or to avoid a competitive auction process. The deal flow and transaction premia may also reflect a surplus of capital searching for a safe asset class.[87] There is also debate in the academic literature about whether mergers create the value acquirers expected them to.[88]

Further, with respect to the evidence from listed water companies we note, however, that the relationship between RCV and market value appears to have changed in recent years (since PR14) for the listed water companies. During this period RCV growth for these companies

and its MAR would be influenced by an assessment of performance of its non-regulated business, including Viridor – a UK waste business.

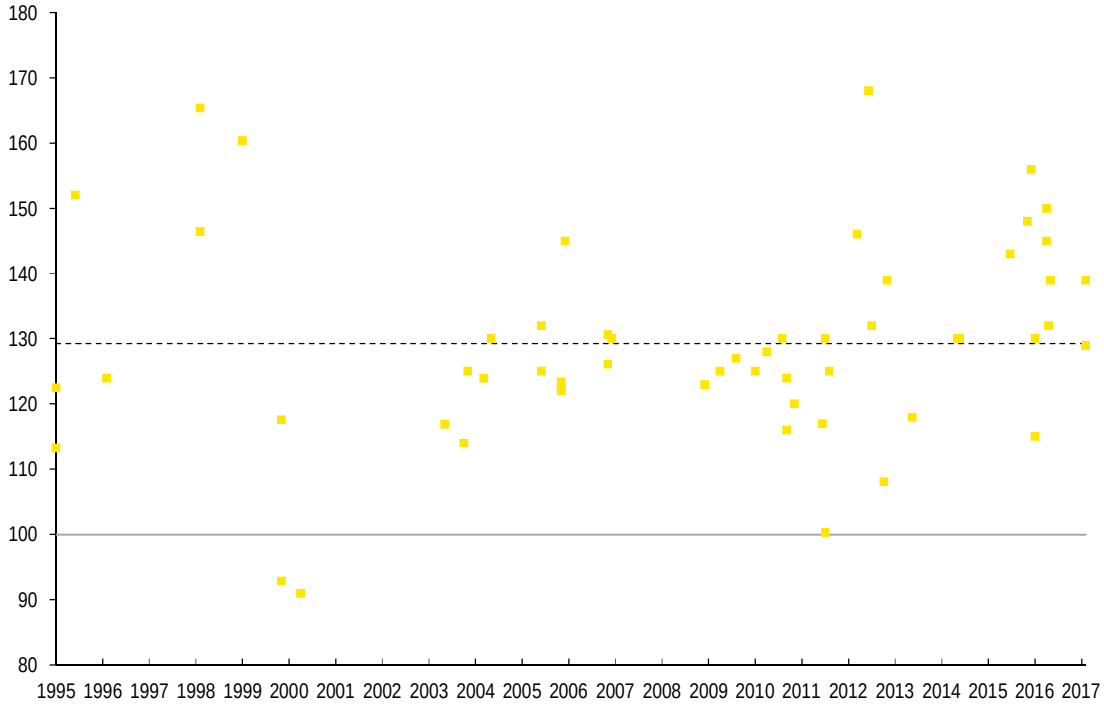
[87] We note that other commentators have also advanced a range of reasons why MARs and transaction premia might reflect expectations of outperformance rather than a lower-than-allowed cost of equity: see for example UK Regulators Network (2018) Estimating the cost of capital for implementation of price controls by UK regulators: an update on Mason, Miles and Wright (2003) p66 and Appendix J.

[88] See, for example, Andrade, Mitchell and Stafford (2001) New Evidence and Perspectives on Mergers, Journal of Economic Perspectives, Volume 15, Number 2 for a discussion of whether mergers create or destroy value for acquirers and targets.

has been very limited while the wider stock market – and water company share prices – have risen to close to all-time high levels. The change in the relationship between market valuation and RCV growth since PR14 might, unless it can be robustly explained, suggest placing less weight on this kind of MAR evidence.

Overall, because there are so many assumptions underlying the interpretation of MAR analysis, it is very difficult to draw precise inferences about the cost of equity. Consequently, we have not attempted to infer what the MAR evidence we have gathered implies about the cost of equity. We note, however, that the evidence is broadly consistent with the wider discussion in this report about a possible reduction in the WACC since PR14.

Figure 29: Market to asset ratios from past transactions involving UK regulated utilities



Source: Macquarie Research, EY analysis

2.6 Forecasts of RPI and CPIH inflation

RCV and customer bills have traditionally been indexed to RPI inflation in the UK water sector. However, Ofwat has argued that RPI inflation is no longer an appropriate measure of inflation for it to use. It has argued that CPIH inflation would be a more appropriate measure to use, but recognising the implications of switching away from RPI inflation Ofwat has proposed to gradually transition from one to the other. Specifically, for PR19 Ofwat has decided that revenues and bills will be indexed to CPIH inflation and that RCV will be indexed to a combination of RPI inflation and CPIH inflation. Ofwat has decided that the opening RCV on 1 April 2020 will be indexed to RPI and CPIH inflation on a 50/50 basis, with any additions to RCV indexed to CPIH. The effect of this is that the proportion of RCV indexed to CPIH will increase over AMP7.

Ofwat has also decided that it will use two different real WACCs, one in RPI-stripped terms and the other in CPIH-stripped terms, to calculate allowed revenues (by multiplying the relevant WACC by the corresponding proportion of RCV). This means that we need to estimate a real WACC in each of RPI and CPIH terms.

Our analysis presented above, in keeping with traditional approaches to estimating the cost of capital for regulated utilities in the UK as explained in Section 2.1.2, has been aimed at producing an RPI-stripped WACC estimate. To convert from this RPI-stripped estimate to a CPIH stripped estimate, an estimate of the expected wedge between RPI and CPIH inflation over the AMP7 period is needed. The RPI-stripped WACC can then be grossed up for the wedge.

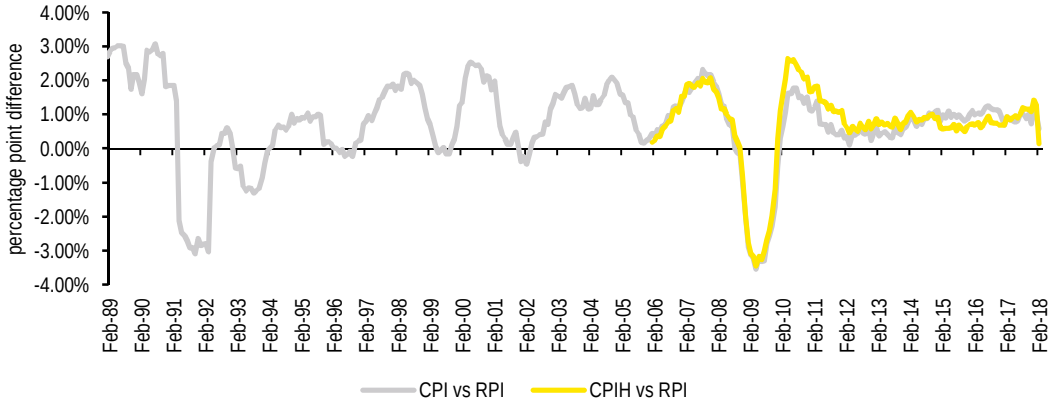
Obtaining robust forecasts of RPI and CPIH inflation over a 2-7 year period (2020 – 2025 relative to today) into the future is not straight-forward. Readily available forecasts from independent bodies (e.g., Office for Budget Responsibility) are typically over a much shorter horizon. There are also, to our knowledge, no published forecasts of CPIH inflation from bodies such as the Bank of England, HM Treasury or the OBR.

The absence of readily available forecasts raises a question about how best to forecast CPIH or the wedge between RPI and CPIH inflation.

Economic regulators have typically forecast long-run RPI inflation by assuming that CPI inflation will average close to the Bank of England's 2.0% target over the long-term and adding on a "wedge" for the expected difference between RPI and CPI inflation.[89] Adopting a similar approach for forecasting CPIH inflation would require a forecast of the expected wedge between CPIH and RPI inflation.

Adopting this approach would need to take account of the differences between the RPI, CPIH and CPI rates of inflation. CPI and RPI differ because they cover a different basket of goods and services and in the way that they are calculated.[90] CPIH differs from CPI because it also includes a measure of housing prices. The difference between RPI and CPI inflation has been significant over many years, particularly since a number of changes to RPI inflation around 2010, but CPI and CPIH inflation have been closely correlated and one does not seem to be systematically higher than the other. These differences are illustrated in Figure 30 below.

Figure 30: CPI compared to RPI inflation since 1988, CPIH compared to RPI inflation since 2006



Source: ONS data up to February 2018, EY analysis

This suggests that one way to forecast CPIH inflation would be to consider the wedge between RPI and CPIH. We note that UKRN (2018) reached a similar conclusion i.e. "ex-ante CPIH and CPI differentials will be sufficiently small that our main conclusions about the nature of historic returns will not be fundamentally changed", though the authors had also calculated that CPIH may have exceeded CPI by around 0.17% p.a. over the 1988-2005 period.[91]

Table 23 below presents historical averages of the differences between RPI and CPI inflation, and RPI and CPIH inflation, over various time frames and the difference between them. The data suggests that RPI inflation exceeds CPIH inflation by around 0.7% on average over the long run, but that this "wedge" has increased recently.

[89] We note that a range of medium-term forecasts of RPI inflation are publically available and forecast long-run RPI inflation can also be derived from financial market data such as the difference between long-term gilt and ILG yields, but the typical approach has been to start with a long-term forecast of CPI inflation and add on an estimate of the "wedge" between RPI and CPI inflation.
[90] See, for example, http://inflationmatters.com/cpi-vs-rpi/
[91] See UKRN (2018) Estimating the cost of capital for implementation of price controls by UK regulators: an update on Mason, Miles and Wright (2003), pp123-124.

Table 23: Historical averages of RPI and CPI / CPIH inflation (%)

Period to 28 February 2018	RPI	CPI	Difference	CPIH	Difference
6m	3.8%	2.9%	0.9%	2.7%	1.1%
12m	3.6%	2.7%	0.9%	2.6%	1.0%
2 year	2.8%	1.8%	1.0%	1.9%	0.9%
5 year	2.4%	1.5%	0.9%	1.6%	0.8%
10 year	2.8%	2.4%	0.4%	2.2%	0.6%
20 year	2.8%	2.0%	0.8%	2.3%	0.7%

Source: ONS, EY analysis

We also note that there are various estimates of the expected difference (or wedge) between RPI and CPI. A number of these estimates are summarised in Table 24 below.

Table 24: Independent estimates of the wedge between CPI and RPI inflation

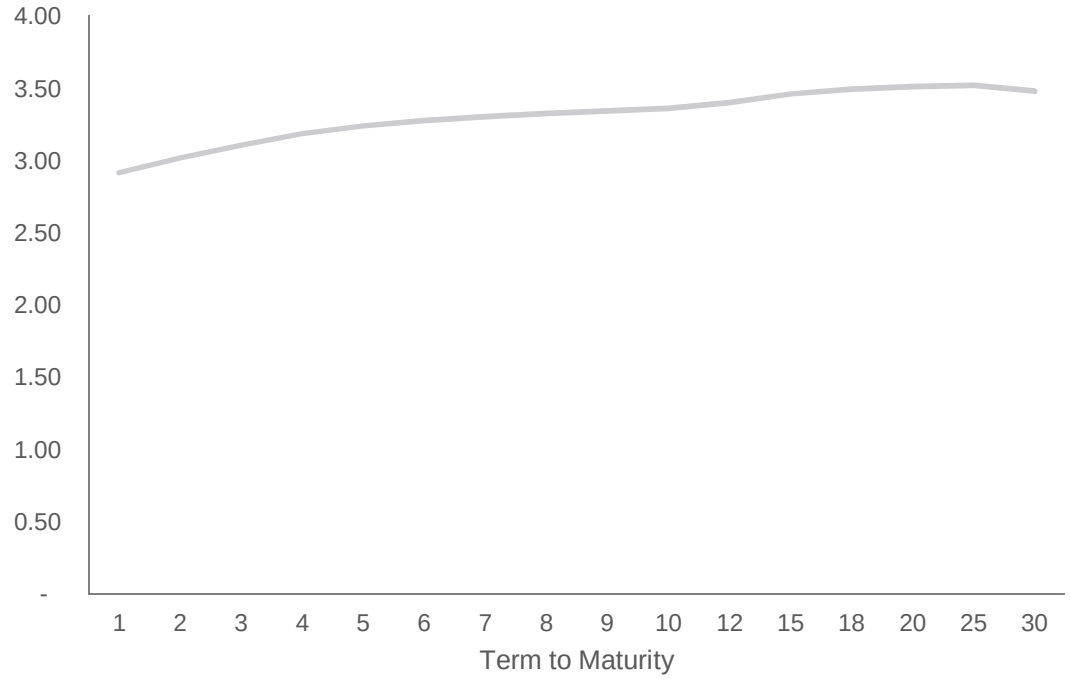
Source	Long-run RPI-CPI wedge
Moody's	1.3%
Office for Budget Responsibility	1.0%
Pension Protection Fund	1.1%
Bank of England	1.3%

Sources: Moody's (2016), UK Transition to CPI: Redefining real: adoption of CPI will transform index-linked debt market, Office for Budget Responsibility (2015), Economy and Fiscal Outlook, Pension Protection Fund (2015), Funding Strategy Review, Bank of England (2014), February Inflation Report.

These estimates suggest that the long-run wedge between RPI and CPI may be about 1.0 – 1.3% i.e. RPI exceeds CPI by about 1.0 – 1.3% on average over the long-run. If CPIH was to exceed RPI by a similar amount in future (noting CPI and CPIH inflation have been closely correlated historically), this might suggest that the wedge between RPI and CPIH will be larger in future than the historical data presented in Table 23 above suggests.

RPI inflation swaps can also provide another reference point: the swap rate indicates the expected rate of RPI inflation over the term of the swap. As Figure 31 below illustrates, the RPI inflation swap rate was around 3.5% at the end of February 2018 for medium and longer term maturities, suggesting RPI inflation was expected to be around 3.5% over this period. Assuming expected CPI and CPIH inflation of about 2.0% over this period (in line with the Bank of England's inflation target), this would imply the wedge is about 1.5%.

Figure 31: RPI inflation swap rates (%) as of 28 February 2018



Source: Bloomberg
Notes: Data shown is for 28 February 2018.

Noting that CPI and CPIH are closely correlated, we use these estimates of the wedge between RPI and CPI inflation, in combination with an assumption and that the CPI inflation rate will be close to the Bank of England's target of 2.0% on average over the AMP7 period, to estimate RPI inflation.

We use the Fisher equation [(1 + WACC) x (1 + RPI forecast)] / (1 + CPIH forecast) – 1 is to convert from real RPI-stripped WACC to nominal terms and then deflate to a CPIH-stripped real WACC.

2.7 Conclusion on the industry cost of capital

Based on the analysis described above, this section summarises our initial assessment of the cost of capital for PR19, based on currently available evidence and analysis conducted to date.

Our assessment is that the Appointee real vanilla WACC, in RPI-stripped terms, is in a range of 2.3 – 3.4. This compares to an allowed Appointee WACC of 3.74% in real, RPI-stripped, vanilla terms that Ofwat set at PR14 and Ofwat's estimate of the real RPI-stripped WACC for PR19 of 2.30%. Both of these WACC estimates are average WACCs over the AMP7 period i.e. reflecting the expected average cost of new debt, rather than an estimate of the WACC at the start of April 2020.

In real pre-tax terms, the estimated WACC is equivalent to 2.6 – 3.9% assuming a tax rate of 17% expected to prevail from 1 April 2020[92] (comparable to the 4.3% real pre-tax WACC Ofwat set at PR14, based on a 20% corporate tax rate).

Assuming RPI inflation of 3.0 – 3.3% and CPIH inflation of 2.0% over the 2020-25 period, the CPIH-stripped Appointee real vanilla WACC would be 3.3 – 4.7%.

[92] See https://www.gov.uk/government/publications/corporation-tax-to-17-in-2020/corporation-tax-to-17-in-2020 accessed on 4 April 2018.

Weighting the RPI-stripped and CPIH-stripped Appointee WACCs together on a 50/50 basis implies an overall Appointee real vanilla WACC of 2.7 – 4.0%. This weighted average WACC would increase over the 2020-25 period, all else equal, as more weight is gradually placed on the CPIH WACC as new additions to RCV will be added to the CPIH-linked RCV and multiplied by the CPI

Table 25: WACC range – real RPI inflation stripped terms

	EY estimate		Comparison ranges	
	Min	Max	PR14	Ofwat PR19 Methodology Decision
Gearing (%)	65	60	62.5	60
Cost of equity (real, post-tax, %)	**4.3**	**5.75**	**5.65**	**4.01**
Cost of debt (pre-tax, real, %)	**1.2**	**1.8**	**2.59**	**1.33**
Appointee WACC (real vanilla, %)	**2.3**	**3.4**	**3.74**	**2.40**
Retail margin adjustment (1) (%)	(0.10)	(0.10)	(0.14)	0.10
Wholesale WACC (real vanilla, %)	**2.2**	**3.3**	**3.60**	**2.30**

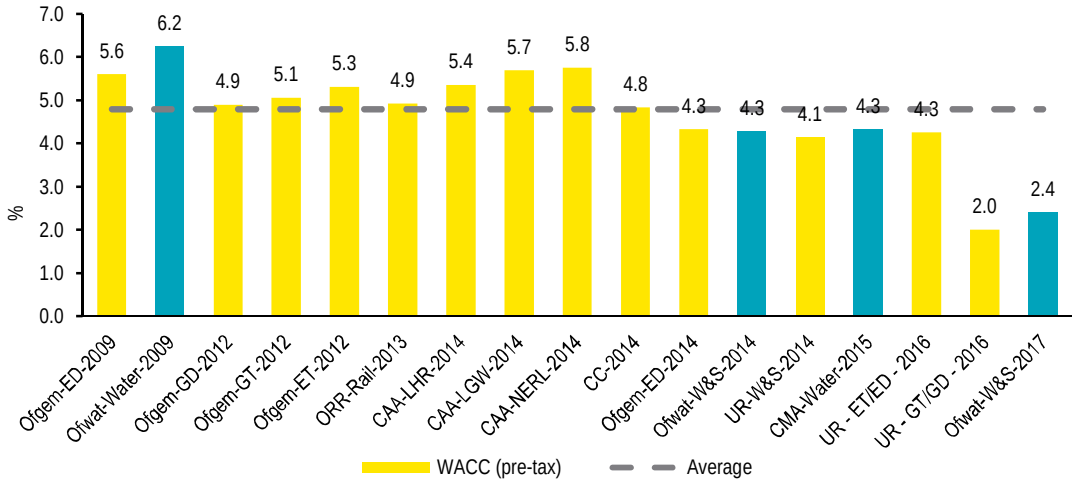
Note: (1) discussed in Section 3.

Table 26: WACC range – real CPIH inflation stripped terms

	EY estimate		Comparison ranges	
	Min	Max	PR14	Ofwat PR19 Methodology Decision
Expected RPI inflation (%)	3.0	3.3	N/A	3.0
Expected CPIH inflation (%)	2.0	2.0	N/A	2.0
Appointee WACC (real vanilla, %) (CPIH)	3.3	4.7	N/A	3.40
Wholesale WACC (real vanilla, %) (CPIH)	3.2	4.6	N/A	3.30

The estimated WACC in RPI-stripped terms is below Ofwat's PR14 Final Determination and other recent regulatory precedents, illustrated in Figure 32 below. The primary reason for this is that we have estimated the real cost of debt will be significantly lower at PR19 than in other regulatory determinations, largely reflecting the lower cost of water companies' embedded debt and the low coupons at which new debt has recently been raised by water companies. Nevertheless, our range of 2.3 – 3.4% for the Appointee WACC is higher than Ofwat's equivalent range of 2.0 – 2.8%. Moreover, Ofwat's point estimate of 2.4% is towards the bottom of our range.

Figure 32: Past regulatory decisions on cost of capital (RPI-stripped real, vanilla)



Source: UKRN, Cost of Capital Annual Update Report 2017 and various regulators publications

Selecting a point estimate in the range

The mid-point of the RPI-stripped real WACC range above is 2.85% and for the CPIH-stripped real WACC it is 4.0%.

The risks of under-estimating the WACC and over-estimating the WACC are asymmetric and it can be argued that it is better to select a point estimate above the mid–point of the range in the interests of customer welfare. However, in Bristol Water's appeal of PR14, the CMA did not adopt this argument and chose the mid-point of its range for its point estimate of WACC.[93] Consequently, our approach is to adopt the mid-point of our range as our point estimate.

Key finding: our point estimate of the water industry base WACC for the 2020-25 period is 2.85% in real RPI-stripped terms and 4.0% in real CPIH-stripped terms.

[93] See CMA (2015) Bristol Water plc, p333.

3. Residential retail margins for the 2020-25 period

3.1 Introduction to residential retail margins

At PR14, the net margin for retail services was set at 1.0%, applicable to households in England and both households and non-households (consuming below 50 Ml a year) in Wales.

Ofwat's assessment of the household retail margin was based on a combination of benchmarking against margins in other sectors and past regulatory decisions, and a cross-check using a return on capital method (involving applying the Appointee WACC to an estimate of capital employed in the retail businesses).

Ofwat's 1.0% figure was towards the lower end of the benchmark range of company submissions (0.5% – 2.0%).[94] However, Ofwat considered this to be reasonable as:[95]

- household retail activities remain a service that monopoly suppliers provide;
- the degree of risks in retailing water and wastewater are likely to be lower than other utility services, which are exposed to greater price variability; and
- the required return on retail assets will be below a normal level during the price control period because the retail fixed asset base is starting from zero.

In its PR19 methodology decision Ofwat indicated that it considered a residential retail margin of 1.0% remained appropriate for PR19.[96] Ofwat did not explain the reasoning for its decision in detail, but Ofwat's decision took into account advice it had received from its consultants about relevant comparator benchmarks using market evidence and regulatory precedent.

3.2 Evidence since PR14

Since PR14, three significant reviews of utility retail margins have been undertaken in the UK.

First, the Competition and Markets Authority conducted an inquiry into the energy market, including whether the energy suppliers were making excessive profits. The CMA considered a range of evidence about actual retail profit margins, margins in other markets (including internationally) and regulatory precedents. This comprehensive review of available evidence concluded that an EBIT margin in a competitive energy retail market of 2% was reasonable. Specifically, the CMA concluded that (emphasis added):[97]

> *The evidence from independent suppliers was difficult to interpret due to the rapid growth of these suppliers in recent years. However, it tends to suggest that* ***competitive EBIT margins in energy supply are relatively low and likely to be 3% or less*** *depending on the level of investment and the level of cost efficiency.*
>
> *The evidence from the I&C market indicates that an EBIT margin for the domestic and SME markets of around 1.9 to 2.4% is reasonable.*
>
> *The evidence from previous GB regulatory determinations indicated EBIT margins of between 0.5 and 1.5%, while that from Power NI suggested a margin of just over 2% and that from New South Wales suggested up to 4.5%.*
>
> *We consider that greatest weight should be placed on evidence from the GB energy market itself, ie on the margins earned serving I&C customers and on previous GB regulatory determinations (recognising that regulated firms may face fewer risks). On this basis, we consider that* ***an appropriate benchmark EBIT margin is around 2%****.*
>
> *We note that this figure is higher than the competitive EBIT margin implied by our ROCE analysis (of 1.25%). However, the level of the appropriate EBIT margin will*

[94] Ofwat, water companies business plan submissions.
[95] See Ofwat (2014) Setting price controls for 2015-20 – risk and reward guidance, p33.
[96] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review, p183.
[97] See CMA (2015) Energy markets inquiry – Appendix 9.13: Retail profit margins, paragraph 13 and following.

depend on the choice of operating model of an individual firm. Our ROCE analysis is based on a relatively asset-light model under which a firm pays an intermediary a trading fee, rather than holding capital for the purposes of trading collateral, and uses letters of credit rather than cash to meet regulatory collateral requirements. A firm that chose to hold capital rather than pay such fees would, other things being equal, earn a higher EBIT margin. We estimated the competitive EBIT margin implied by our ROCE analysis under the assumption that an equivalent amount of capital was held for trading and regulatory collateral purposes. This indicated a competitive EBIT margin of around 1.9%, which is broadly consistent with a 2% benchmark.

Second, in 2015/16 Ofwat reviewed whether the 2.5% margin it had assumed for non-household retail margins at PR14 remained appropriate (ahead of the non-household retail market opening in 2017). Ofwat concluded that its PR14 conclusions remained appropriate noting that the inquiry the:[98]

"Competition and Markets Authority (CMA) has carried out into the energy market also suggests that a 2.5% net margin for retail activity remains broadly appropriate. Provisional Findings from the CMA's Energy Market Investigation suggest that margins in the range of 1% to 3% provide a guide to the competitive Earnings Before Interest and Taxes (EBIT) margins"

Third, we also note that in November 2016 URGENI published their final decisions for the next Power NI Supply Price Control (which began 1st April 2017). As part of its determination, UR reviewed whether the 2.2% margin it had assumed for household retail margins remained appropriate. They concluded that 2.2% was a fair and reasonable allowance for the margin, based in part on the CMA's Energy Markets Inquiry analysis.[99]

In each of these cases the relevant retail market is open to a higher degree of competition than the residential water retail market. Further, there are differences in risk between these sectors. On the one hand, energy retailers may face greater risks from increased (wholesale) price volatility, political risks and requirements to meet environmental and social obligations. On the other hand, residential water retailers are unable to disconnect non-paying customers, increasing the risk of non-collection of monies due. It is difficult, therefore, to draw firm inferences about what these decisions mean for the residential retail margin at PR19.

These various estimates of retail margins in the utility sectors, when placed alongside the arguments that some retailers have made about the level of margins being insufficient in the non-household retail market, suggest a prima facie case for a higher residential retail net margin at PR19 could be made.

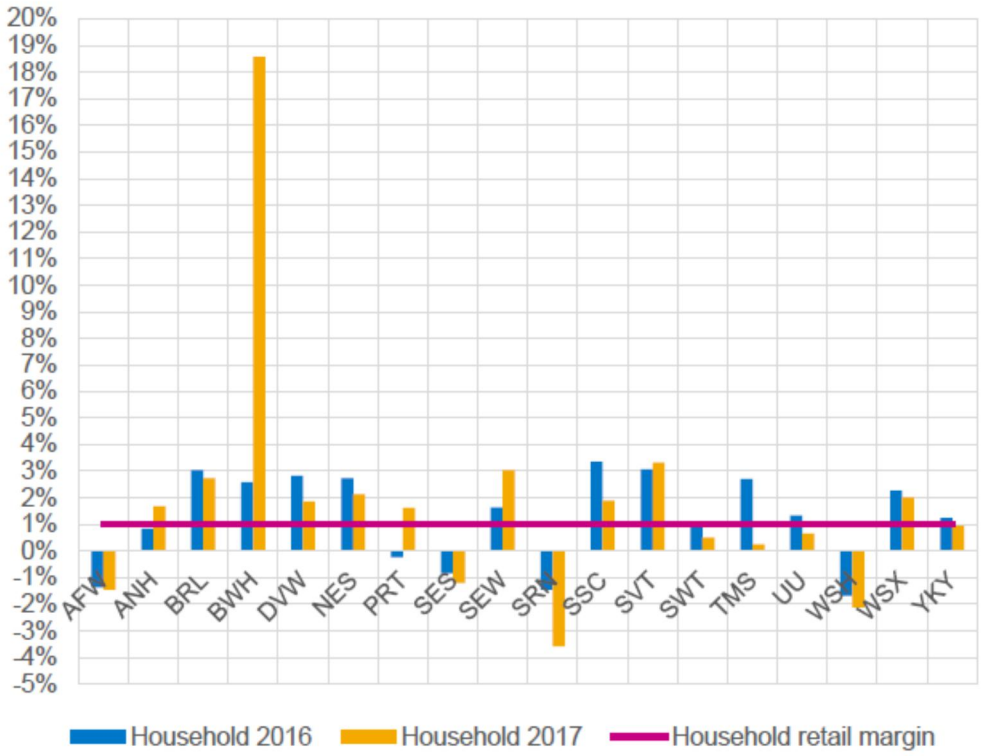
Moreover, the balance of risk seems skewed to the downside i.e. lower rates of return for residential retailers. For example, Ofwat's decision to adopt an "efficient" cost to serve rather than an "average" cost to serve might make it more likely that even a notionally efficient residential retailer would overspend their cost allowances than underspend. Residential retail competition might also be introduced during the 2020-25 period, or water companies may be expected to bear the costs of preparing to open that market to competition without corresponding increases in revenue allowances.[100] Further, macroeconomic risks, which could impact on the ability of companies to collect bills from customers, could also be argued to be higher than at PR14 due to the impact of Brexit.

As a further illustration of the possible downside skewness of expected returns from residential retail activities, we also note that water companies had residential retail margins –

[98] See Ofwat (2016) Draft statement of method and data table requirements: Review of non- household retail price controls, p22.
[99] See UREGNI (2016) Power NI Supply Price Control 2017 (SPC17): Decision Paper, p5.
[100] The risk of competition being introduced may be low given recent statements by DEFRA. For example, DEFRA issued a Draft Strategic Policy Statement for Ofwat in March 2017. Paragraphs 40 and 41 indicated that competition was unlikely to be introduced into the household retail market during the then-current parliament, though following the latest general election in June 2017. However, in the updated Strategic Policy Statement issued in September 2017, paragraph 40, there is no specific statement as to the timing of when competition might be introduced (if at all). However, the introduction of competition remains a possibility.

as illustrated in Figure 33 below - in the range of approx. -1.5% to +3.5% in 2015/16 and -3.5% to +3.0% (excluding one significant outlier) in 2016/17, according to Ofwat's 2017 Monitoring financial resilience report. This data suggests that on a customer-weighted basis, more than half the industry has not achieved the allowed margin of 1.0%, suggesting some downside skewness to returns i.e. Ofwat's revenue allowances have been more likely to be insufficient than excessive.

Figure 33: Residential retail profit margins (2015/16)



Source: Ofwat (2017) Monitoring financial resilience, p23

Another source of evidence about residential retail margins for the 2020-25 period is the cost of capital for water companies. As discussed earlier, the WACC may have decreased since PR14. Many of the market parameters that fed into that analysis would also be pertinent to an analysis of the cost of finance for a stand-alone residential retailer. It might, if nothing else had changed (e.g. no changes in risk) since PR14, suggest that residential retail margins might have decreased since PR14. It would theoretically be possible to update Ofwat's return on capital employed cross check on the residential retail margin at PR14[101] which "used a cost of capital based on the Ofwat Appointee WACC (converted into nominal pre-tax terms to use with assets measured at historic cost), multiplied it by average capital employed over the period 2015-20 and divided by industry-wide average sales to produce an equivalent average industry-wide EBIT margin (represented as an EBIT margin on sales)." However, the data required to update this analysis for PR19 is not yet available.

3.3 Conclusion on residential retail margins

The various recent determinations of allowed EBIT margins for utility retailers in competitive markets in the UK have been around 2.0 – 2.5%. In each of these cases the markets have been open to a higher degree of competition than residential water retailers and energy retailers arguably face some higher risks from volatility of wholesale costs, though they do not operate under the same constraints as residential water retailers who cannot disconnect non-paying customers. The design of Ofwat's PR19 residential retail price control may also mean residential water retailers face some asymmetry of risk.

[101] See Ofwat (2014) Setting price controls for 2015-20 – risk and reward guidance, p31.

It is difficult to quantify the differences in risk between the residential retail water sector and other utility sectors, but we consider an EBIT margin of around 1.0 – 1.5% would be a reasonable range for PR19. In the absence of a strong rationale to adopt a figure towards the top or bottom of our range, we recommend using an EBIT margin of 1.25%.

Key finding: we recommend using an EBIT margin of 1.25% in the residential retail price control.

3.4 Adjustment to the wholesale WACC to avoid double-counting

At PR14 Ofwat allocated the entire RCV to the wholesale water business. However, the RCV also included some retail assets, so an adjustment needed to be made to the Appointee WACC (as estimated in the previous chapter) to exclude the returns that were allowed on retail assets through the wholesale WACC to avoid double counting those returns (noting that in Ofwat's view the allowed EBIT margin applied to calculate allowed retail revenues provided sufficient compensation to retail investors).

The retail net margin (after tax) was separately assessed for household and non-household retail price controls, however only the household retail margin was used when Ofwat assessed the adjustment required to the Appointee WACC for the wholesale controls.[102] The calculations Ofwat undertook to calculate the adjustment are summarised in Table 27 below.

Table 27: Ofwat calculation of Appointee WACC adjustment for household retail margins at PR14

Component	Calculation	Point estimate
Vanilla WACC	A	3.74%
Retail net margin (after tax)	B	0.90%[103]
Revenue requirement (2015-20) (£m) – average	C	£10,812
RCV (2015-20) (£m) – average	D	£63,072
Retail return	**E = B * C**	£97
Return on replaced retail assets not added to RCV	F	£7
Retail return deduction from Appointee return	**G = E – F**	£90
Retail return deduction as % of Wholesale RCV	**H = G / D**	**0.14%**
Wholesale WACC	**I = A – H**	**3.60%**

Source: Ofwat (2014) Setting price controls for 2015-20: Final price control determination notice: policy chapter A7 – risk and reward, p40.

The table above shows how Ofwat used the retail margin to adjust the Appointee WACC to derive the wholesale WACC at PR14. It calculated the value of the required retail return (less the return on replaced retail assets which were not included in the legacy RCV allocated to the wholesale business) as a percentage of the wholesale RCV, thereby enabling the value of retail returns to be expressed as a percentage of the WACC applied to the RCV.

Ofwat's calculation above is a short-hand way of recognising that the RCV, while allocated 100% to wholesale, effectively comprises both a wholesale and a retail RCV and that the profits that water companies were allowed for the retail RCV (i.e. retail RCV x WACC) should not have been allowed for if they were separately already being compensated through the allowed retail margin. As a consequence, rolling forward Ofwat's approach to PR19, the adjustment for double counting should be smaller because:

[102] The non-household retail price control had a net margin of 2.5%, of which – in Ofwat's view – 1.5% related to new risks. Since these new risks needed to be compensated for, but the existing risks captured in the remaining 1.0% margin did not, Ofwat applied the 1.0% net margin (pre-tax) across the combined retail price controls: see Ofwat (2014) Setting price controls for 2015-20 – risk and reward guidance, p35.
[103] 1.0% margin net of 10% effective tax rate (average effective 2015-20 tax rate for all water companies).

- the value of retail assets included in the RCV (the 'retail RCV' in the language of the description immediately above) should be smaller as those assets will have been depreciated further since PR14; and
- the allowed WACC is likely to be lower than at PR14, meaning the return on retail assets included in the RCV will be smaller.

Ofwat essentially recognised this at PR14 when it highlighted that the size of any adjustment was likely to be smaller in future when it stated:[104]

> *"Over time, the retail business will build up its own assets and legacy retail assets in the wholesale RCV will be depreciated away, with the result that the wholesale RCV will reflect wholesale assets more accurately. As a consequence, it will be less important to deduct retail margins from Appointee WACC in future price controls."*

Building on this, in its PR19 methodology decision Ofwat indicated that the adjustment to the Appointee WACC will be lower at PR19, compared to the 0.14% adjustment due to its projected revenue and RCV growth forecasts:[105]

> *"Projecting PR14 revenue and RCV growth forwards, we estimate the appropriate retail margin adjustment is 0.1%. This estimate is subject to revision based on information received prior to our draft and final determinations"*

A range of information would be required to undertake these calculations, including the value and age of retail assets included in the legacy RCV allocated to wholesale at PR14. In the absence of this information we have not attempted to perform our own calculations to cross-check or verify Ofwat's own forecast. We recommend that this adjustment be revisited once further data becomes available. However, for the purposes of this report we use the same 0.1% adjustment recommended by Ofwat, but we note that Ofwat's calculation assumes a retail margin of 1.0% whereas we have estimated a margin of 1.25% which might suggest, all else equal, a marginally higher adjustment to the Appointee WACC when calculating the wholesale WACC.

[104] See Ofwat (2014) Setting price controls for 2015-20 – risk and reward guidance, p34
[105] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review, Figure 10.2

4. The Weighted Average Cost of Capital for the 2025-30 period

In addition to estimating the WACC over the 2020-25 (AMP7) period, UU has also asked us to estimate the WACC for the 2025-30 (AMP8) period. This will be an important input to forecasting customer bills over the whole 2020-30 period, which Ofwat requires water companies to include in their PR19 Business Plans.

To carry out this work our methodology is similar to the one we employed for estimating the AMP7 WACC. Specifically, we:

- estimate the WACC in real RPI-stripped terms before converting to real CPIH-stripped terms based on the estimated wedge between RPI and CPIH inflation;
- estimate the cost of equity using a CAPM framework;
- build up an estimate of the cost of debt based on estimates of the costs of new and embedded debt and of the proportions of new and embedded debt that will prevail over the 2025-30 period.

We have only been requested to estimate the WACC for the Appointee, not for individual price controls. Consequently, our work does not consider retail margins, the wholesale WACC or WACCs for any individual price controls.

Our assessment is based on latest available financial market and economic data. We note that a lot could (and almost certainly will) change over the next 7 years (between the time of writing and the start of the AMP8 period), but financial markets and independent forecasters will have reflected their expectations about how the economy (both national and global) and financial markets will evolve between now and 2025.

Many things could also change in the water sector between now and 2025. For example, there could be changes to the regulatory framework which affect underlying business risk (and betas), residential retail markets could be opened to competition or the industry could be re-nationalised (in full or in part). Financial markets will have taken a view on these matters, so water companies' share prices may have already factored these possibilities into account. Moreover, water companies will themselves have taken some of these possibilities into account in their choices of capital structures and financing instruments. We take this market-based information into account. However, for simplicity, we have made – with the agreement of UU – a number of assumptions to simplify our analysis (noting that there is theoretically a continuum of possible future scenarios that could be considered). These assumptions include:

- there will be no changes to the regulatory framework between PR19 and PR24;
- there will be no changes to the water sector policy framework between PR19 and PR24 e.g. we assume that there will be no re-nationalisation of the water industry and no introduction of residential retail competition;
- there will be no material changes to the credit risk profile of the water industry between PR19 and PR24, so we can continue to assume a similar credit rating for the cost of debt; and
- there will be no material changes in the capital structure of the water industry as a whole between PR19 and PR24.

We discuss each of the individual WACC parameters one by one below. We refer back to the analysis presented in Section 2 where relevant.

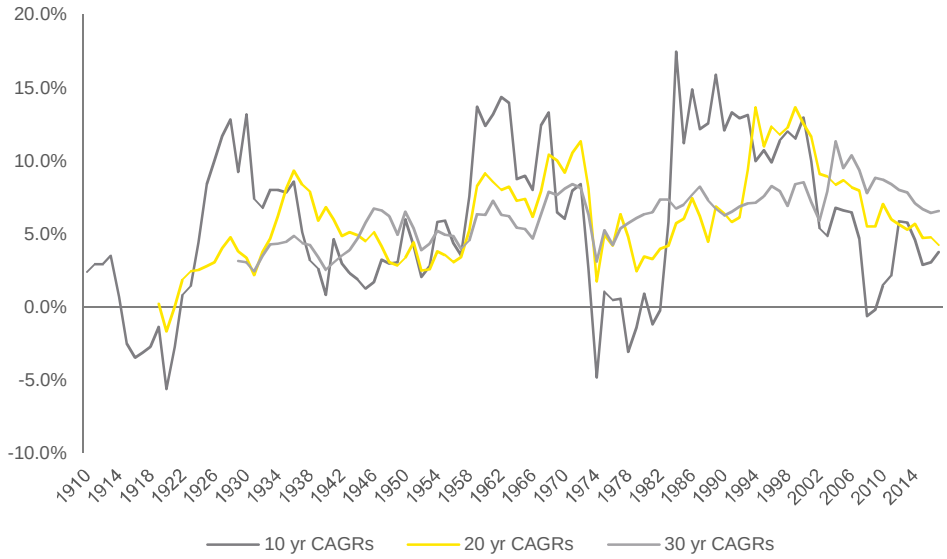
4.1 Cost of equity

4.1.1 Total market return

In Section 2 we discussed that there is a range of evidence to suggest the TMR is reasonably stable over the long term, whereas the ERP is more volatile, and that it might therefore be more appropriate to estimate the cost of equity in a CAPM framework by first estimating the TMR and then deducing an estimate of the risk-free rate to calculate the ERP. In support of

this proposition we noted that this was a common approach by UK economic regulators and had been supported by a number of academic studies commissioned by UK economic regulators, including a recent one on behalf of the UK Regulators Network. To reinforce the point we also presented analysis of long-run average returns over various historical periods (reproduced in Figure 34 below).

Figure 34: Rolling averages of historical UK total market returns (real)



Source: EY analysis of Dimson, Marsh and Staunton (2018) data

Combining the evidence considered in Section 2 we concluded on a range for the TMR of 5.0 – 6.5% in real, RPI-stripped, terms.

This estimate of the TMR was based on long-run historical data, regulatory precedent and academic literature. While outturn equity market returns over the 2020-25 period could increase or decrease historical averages, as a short period in a long time series, the impact is likely to be modest. In any case, deviations from the long run average over the short and medium term are common (see Figure 34 above), so would not necessarily be any cause for revisions to our assumptions. Consequently, we adopt the same range for the TMR for the 2025-30 period i.e. 5.0 – 6.5% in real, RPI-stripped, terms.

4.1.2 Risk free rate

In Section 2 we presented analysis of long and short run historical averages of yields on index-linked gilts and of nominal bond yields deflated by expected inflation. We presented these average yields at various maturities, ranging from 5 years up to 30 years. We also discussed the uncertainty around the outlook for interest rates, but that some increase in interest rates (and gilt yields) was expected over the 2020-25 period. We also considered how economic regulators in the UK have typically approached this issue.

Combining that information together we adopted an RPI-stripped, real, risk free rate of 0.0 – 0.5% for PR19.

Looking further ahead to the 2025-30 period, our estimate of the risk-free rate that would prevail over that period can be updated to take into account expected movements in interest rates over the 2020-25 period. The 2020-25 period estimate described above is an average over the period, so interest rates might be expected to be higher by the end of the period and they might be expected to increase further over the 2025-30 period.

To investigate this issue we have examined forward curve data derived from gilts and ILG yields. To obtain an indication of how much government bond yields might increase we have taken a similar approach to Ofwat at PR14 and compared yields on nominal gilts over various maturities. We note:

- comparing the 5 year and 15 year nominal gilt yields (1.08% and 1.86%) indicates yields between 1 March 2023 (close to the middle of AMP7) and 28 February 2033 are expected to be around 2.26% per annum. In other words, the 10 year forward gilt rate on 1 March 2023 is about 2.26%;
- comparing the 10 year and 20 year nominal gilt yields (1.57% and 1.98%) indicates yields between 1 March 2028 (close to the middle of AMP8) and 28 February 2038 are expected to be around 2.39% per annum. In other words, the 10 year forward gilt rate on 1 March 2028 is about 2.39%; and
- comparing the implied 10 year forward gilt yield in the middle of AMP8 (2.39%) to the 10 year forward gilt yield in the middle of AMP7 (2.26%), suggests gilt yields are expected to increase by about 10 basis points between the middle of AMP7 and the middle of AMP8.

Assuming that long-term expected inflation remains stable between AMP7 and AMP8, the above forward gilt yields suggests only a very modest change in the real risk-free rate between AMP7 and AMP8. Such an assumption would be consistent with interest rates remaining at historically low levels throughout most of the 2020s i.e. with a "lower for longer" scenario outlined by Ofwat in its "early view" of the WACC for PR19 (which it also presented in its earlier PR19 methodology consultation). We disagreed with Ofwat's presumption that the UK economy is in a "lower for longer" scenario in a previous report for UU[106] and we continue to view the risks of interest rates turning out higher than forecast by the market to be skewed to the upside i.e. it is more likely interest rates will be higher than expected than that interest rates will be lower than expected. We discussed some of these uncertainties in more detail in Section 2.2.2.

In Section 2.2.2 we also discussed that the real risk-free rate might be expected to gradually trend back towards long-term real GDP growth of about 2.0%. This would be consistent with the UK economy "normalising" over the coming decade or so after a prolonged period of slower economic growth and low interest rates that have prevailed since the global financial crisis. We note that independent medium term real UK GDP growth rate forecasts have been, on average, around 1.5 – 2.0% over the past year or so (see Table 12 earlier).

As we also noted earlier, historical market returns data presented in Figure 3 showed that there have been previous periods where rates of return decreased (e.g. during World War I and II and the oil price shocks of the 1970s), but eventually rates of return increased and long term trailing averages reverted back towards their mean. Indeed, in each of the three episodes mentioned, returns reverted back to typical levels within a period shorter than the period between 2018 and the middle of AMP8. While each of these historical episodes is of course different to the current period of low interest rates, historical data suggests that interest rates and returns are likely to normalise at some point over the next decade.

Combining the above information, we conclude that it is reasonable to assume that real interest rates would start to rise back towards "normal" levels (judged by historical standards) over the 2025-30 period. Noting that these real interest rates would be starting from low levels (based on our forecasts for AMP7), we judge that an appropriate real RPI-stripped risk-free rate for AMP8 would be around 1.0 – 1.5%. This would be consistent with real interest rates rising to around the 2.0% level by the end of the AMP8 period, consistent with long term trend real GDP growth.

Key finding: We estimate the real RPI-stripped risk-free rate for the AMP8 period to be about 1.0 - 1.5%.

4.1.3 Equity risk premium

As noted above, when estimating the WACC for PR19 we first estimated the TMR and then deducted off an estimate of the risk-free rate to arrive at our estimate of the ERP. We cross-checked this estimated ERP against regulatory precedent and evidence from a DGM. We concluded that an ERP in a range of 5.0 – 6.0% was appropriate.

[106] See EY (2017) The cost of equity at PR19: A report for United Utilities Water Limited, August.

We consider that the same approach remains appropriate for estimating the ERP for the 2025-30 period. Updating our estimate of the ERP for the 2025-30 period to take account of the increase in risk-free rate that we anticipate over the period, and retaining our assumption of a stable TMR in a range of 5.0 – 6.5%, we estimate the ERP for the 2025-30 period to be about 4.0 – 5.0%.

We note that this range would be broadly consistent with the long run historical returns data presented in Section 2.2.3 earlier. The upper end of this range would be consistent with regulatory precedent and survey data also discussed in that section.

Key finding: We estimate the ERP for the AMP8 period to be in a range of 4.0 – 5.0%.

4.1.4 Beta

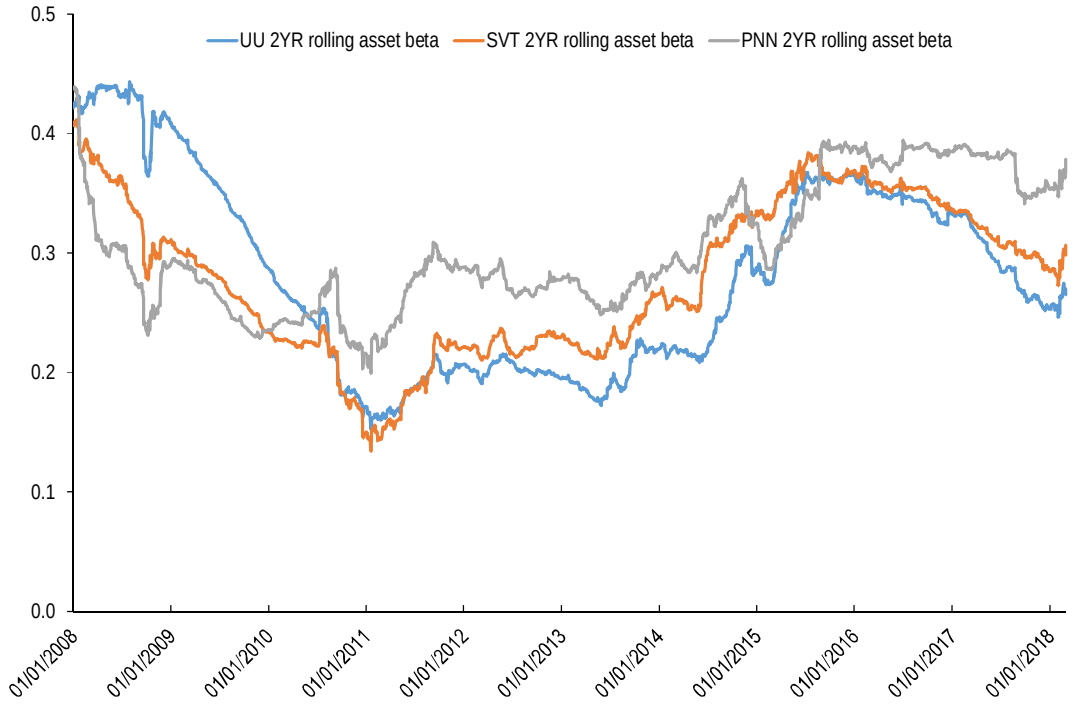
As we noted earlier, we have assumed no changes to the regulatory or policy landscape around the English and Welsh water sector between PR19 and PR24, so we assume that there would be no changes in systematic risk arising from those sources.

Looking further into the future might, however, suggest placing less weight on estimates of beta based on long run historical data. This is because older historical data might b e a worse approximation of the future, if we assume that there have been some changes over time (leading up to today when we are undertaking our analysis). We note, however, that a recent report for the UK Regulators Network suggested estimating betas using the longest run historical data available because all of this data provided useful information on beta (and more data made the estimates more robust).

To check the stability of beta estimates over time we have calculated asset betas over the past ten years (since the start of 2008). We used the same methodology to calculate these betas as in Section 2.2.4. The results of this analysis are shown in Figure 35 below. The analysis suggests that asset betas for the listed water companies have fluctuated over time, but have been broadly in a range of around 0.2 – 0.4 over the period. While the fluctuations in asset betas tend to suggest that the asset betas could be higher or lower by PR24, that the asset betas have not deviated significantly above or below this suggests that an appropriate asset beta for PR24 is unlikely to be significantly different to the assumption we have made for PR19 (based on the information available to us currently and noting all the assumptions we made previously about no changes to the regulatory and policy landscape for the water sector between PR19 and PR24).

We also note that regulatory precedent – across a range of sectors in the UK - has demonstrated a degree of stickiness over time i.e. beta estimates have generally not tended to change very much from price control to price control.

Figure 35: Rolling water company asset betas estimated using 2 years of daily data



Source: EY analysis of Bloomberg data up to 28 February 2018

Combining all of the above we continue to base our estimates of beta on the same analysis presented in Section 2. Accordingly, our estimate of the asset beta for the 2025-30 period is the same as for the 2020-25 period i.e. 0.30 – 0.35.

Key finding: We estimate the asset beta for the AMP8 period to be in a range of 0.30 – 0.40. We note that A figure towards the lower end of this range would be more consistent with regulatory precedent and be aligned with our estimate for PR19, so we use a range of 0.30 – 0.35.

4.1.5 Cost of equity conclusion

Combining the analysis presented above, Table 28 below summarises our estimate of the cost of equity for the 2025-30 period. In combination, these estimates for the CAPM parameters imply a real, RPI-stripped, post-tax cost of equity in a range of 4.43 – 5.88% at PR24. This estimate for PR24 is slightly higher than the estimate for PR19, reflecting the higher risk-free rate assumed (although this is offset to a degree by the lower ERP).

Table 28: EY estimates of the cost of equity (real, RPI-stripped terms, post-tax)

	AMP8		AMP7	
	Min	Max	Min	Max
Total market return (%)	5.0	6.5	5.0	6.5
Risk-free rate (%)	1.0	1.5	0.0	0.5
Equity risk premium (%)	4.0	5.0	5.0	6.0
Debt beta	0.0	0.0	0.0	0.0
Asset beta	0.30	0.35	0.30	0.35
Equity beta	0.86	0.88	0.86	0.88
Gearing (%)	65	60	65	60
Cost of equity (real, post-tax, %)	**4.43**	**5.88**	**4.3**	**5.75**

4.2 Cost of debt

As with our estimate of the cost of debt for AMP7, to estimate the cost of debt for AMP8 we separately analyse the cost of existing and new debt. We then return to the proportions of debt which we estimate will be new and existing over the AMP8 period.

4.2.1 The cost of existing debt

We have estimated the RPI-stripped real cost of existing debt to be 1.5 – 2.0% at PR19. We also estimated the RPI-stripped real cost of new debt at PR19 to average 0.0 – 0.5% over the 2020-25 period, but to be about -0.5% to 0.0% at the start of 2020. If we assume that the cost of new debt would increase linearly over the 2020-25 period, then the RPI-stripped real cost of new debt in each year would be as follows:

- 2020/21: -0.50% to 0.00%
- 2021/22: -0.25% to +0.25%
- 2022/23: 0.00% to +0.50%
- 2023/24: +0.25% to +0.75%
- 2024/25: +0.50% to +1.00%

We assumed a 75/25 embedded/new split at PR19, which implies that the amount of debt which will have been raised over the AMP7 period will be equal to about 50% of the amount of debt that was outstanding at the start of the AMP7 period. It does not mean that 50% of the debt outstanding at the start of April 2020 has matured since some of the debt that is raised over the AMP7 period will be new debt (rather than replacement debt).

Because we do not have detailed information on planned totex and debt raising available for the years between now and 2025 we have to make some simplifying assumptions to work out the cost of embedded debt at the start of April 2025 that is consistent with our other assumptions and estimates. Specifically, we assume:

- No additional debt (as opposed to replacement debt) is raised over the remaining years of AMP6, so the stock of embedded debt summarised in Table 30 below is the full amount of outstanding embedded debt we need to consider; and
- All of the debt that is expected to mature before 2020 is replaced with debt that does not mature until after 2025.

If, as the data shown in Table 15 in Section 2 implies, 16.6% of the debt outstanding at the start of April 2020 would mature over the 2020-25 period then the amount of additional debt raised over the 2020-25 period will be about 33% of the amount of debt outstanding at the start of 2020.[107]

[107] A worked example illustrates this point: if total debt outstanding at 31 March 2020 is £1bn and 16.6% of it is replaced, then total debt at 31 March 2025 needs to be about £1.333bn in order for £500mn of the total debt (50% of the original £1bn on 31 March 2020) to have been raised over the 2020-25 period. In this case, approximately £333m would be additional debt and £166m would be replacement debt. Approximately £834m of the original £1bn that was outstanding on 31 March 2020 will still be outstanding on 31 March 2025. This £834m would be about

This implies that the debt portfolio on 31 March 2025 would comprise about 62.55% debt that had been raised pre-2020 and 37.45% debt which had been raised over the 2020-25 period. If we assume that this 50% of April 2020 debt would be raised uniformly over the 2020-25 period, then about 7.5% of the 31 March 2025 portfolio would have been raised each year of AMP7.

Our analysis of water companies' currently (i.e. as of 28 February 2018) bonds outstanding, indicates that the average coupon on the pre-2020 debt which won't mature until after 2025 (the 62.5% tranche of 31 March 2025 debt) is about 2.0%.[108]

Combining the analysis above, as Table 29 below shows, indicates a weighted average RPI-stripped real cost of embedded debt on 31 March 2025 of about 1.25 – 1.44%.

Table 29: Calculation of the real RPI-stripped cost of embedded debt on 31 March 2025

	As % of debt outstanding on 31 March 2025	RPI stripped real cost of embedded debt on 31 March 2025
Debt raised pre 2020	62.55%	2.0%
Debt raised during 2020/21	7.5%	-0.50% to 0.00%
Debt raised during 2021/22	7.5%	-0.25% to +0.25%
Debt raised during 2022/23	7.5%	0.00% to +0.50%
Debt raised during 2023/24	7.5%	+0.25% to +0.75%
Debt raised during 2024/25	7.5%	+0.50% to +1.00%
Total / weighted average	100%	1.25% to 1.44%

Source: EY analysis of Bloomberg data up to 28 February 2018.

Key finding: We estimate an RPI-stripped real cost of existing debt of 1.25 – 1.44% for PR24.

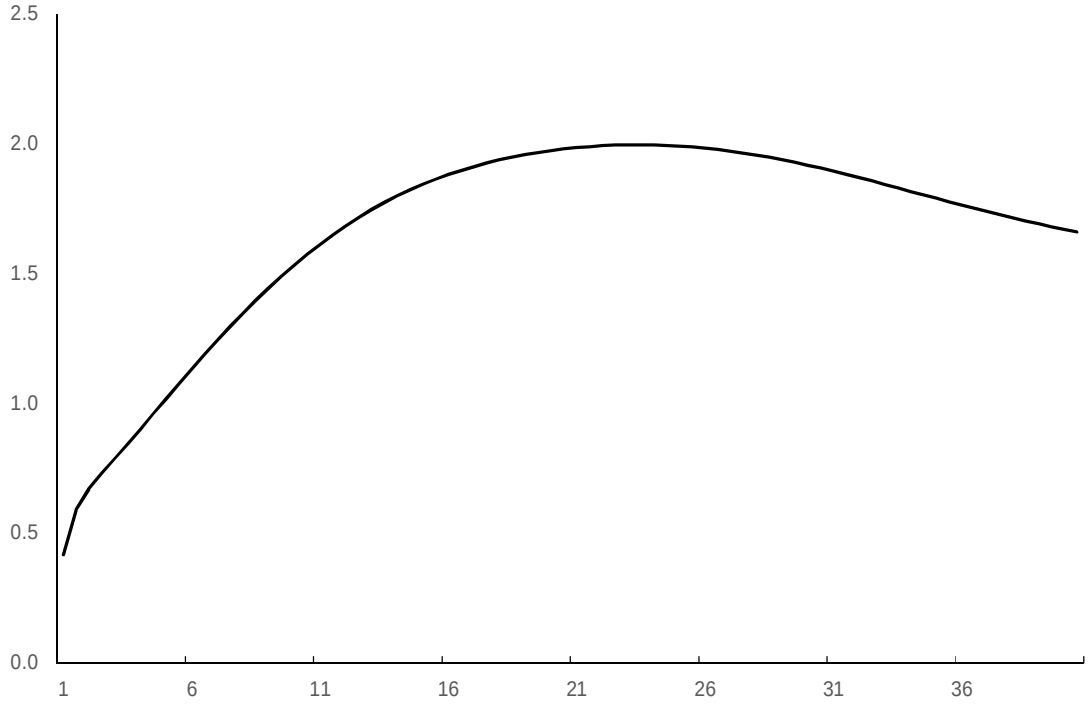
4.2.2 The cost of new debt

The analysis of the cost of debt raised over the 2020-25 period implies that the cost of new debt would be around 0.875% by 31 March 2025 i.e. at the start of AMP8.
Our analysis of gilt yield curve data implies that 10 year government bond yields would be essentially unchanged between 28 February 2025 (approximately the start of AMP8) and 31 August 2027 (approximately the mid point of AMP8). The 10 year forward rate on 28 February 2025 implied by the nominal gilt yield curve on 28 February 2018 is 2.37%, while the 10 year forward rate on 31 August 2027 implied by the nominal gilt yield curve on 28 February 2018 is 2.39%. These results suggest that the gilt yield curve flattens out, as Figure 36 below illustrates. In other words, yields are not expected to rise (or fall) over AMP8 according to current gilt yield data.

62.55% of the £1.333bn of debt that would be outstanding on 31 March 2025, with the remaining 37.45% having been raised over the 2020-25 period.

[108] We calculate that the weighted average coupon on nominal embedded debt will be 4.97% and the weighted average coupon on index-linked embedded debt will be 2.02%. Converting the nominal cost of debt to real RPI-stripped terms using expected long-term RPI inflation of around 3.0% implies a real cost of debt of about 1.91%. Combining the 1.91% and the 2.02%, we assume a real RPI-stripped cost of embedded debt of 2.0%.

Figure 36: Nominal gilt yield curve on 28 February 2018



Source: EY analysis of Bank of England data.

If we assumed that the corporate yield curve is similarly shaped over the AMP8 period and that debt spreads would remain stable over AMP8, this would imply an average cost of new debt for water companies over AMP8 of about 0.875% i.e. the cost of new debt we estimate will apply at the end of the AMP7 period.

However, as we have noted earlier, we feel it is more appropriate to assume that yields will start to return to more normal levels at some point over the next decade so that the RPI-stripped real risk free rate over the AMP8 period will be around 1.0 – 1.5%.

If we add an estimate of the debt spread to this estimate of the real risk-free rate for the AMP8 period, then the cost of new debt would be around 2.0 – 2.5% in real RPI-stripped terms on average over the period.[109]

To cross check the reasonableness of this estimate, if the cost of new debt at the start of AMP8 is around the 0.875% mark stated above, then for the cost of new debt to average about 2.0 – 2.5% over the period, the cost of new debt would need to rise steadily over the AMP8 period to somewhere around 3.0 – 3.5% by 31 March 2030 i.e. the end of the AMP8 period. A real cost of debt of around 3.0 – 3.5% is similar to the levels achieved back around the turn of the millennium, as Figure 19 showed earlier. We therefore adopt an RPI-stripped real cost of debt of around 2.0 – 2.5% for PR24.

Key finding: We estimate an RPI-stripped real cost of new debt of 2.0 – 2.5% for PR24.

4.2.3 Proportion of new and existing debt

For our analysis of the proportions of new and existing debt to use in our calculation of the AMP7 cost of debt we analysed the portfolio of water companies' outstanding bonds to assess what proportions would mature prior to 2020, over the 2020-25 and the 2025+ periods. However, because we did not have any projections of totex and/or capex programmes for AMP7 we ultimately used this analysis as a cross-check on adopting a 75/25

[109] As we noted in Section 2.3.4 debt spreads implied by iBoxx A and BBB rated 10+ and 15+ non-financial corporate bond indices have averaged about 100-140 basis points over the last five years but have been about 80-100 basis points more recently.

embedded/new split on the basis that this was the assumption used by Ofwat at PR09 and PR14. We note that Ofwat has proposed a 70/30 split for PR19.[110]

We could adopt the same approach for AMP8 i.e. adopt a 75/25 embedded/new split on the basis of regulatory precedent. To test if this is reasonable or not, we perform a cross-check below.

Table 30 below expands our earlier analysis of water companies' bond debt maturity profile to consider the proportions of pre-2020 debt which are maturing over the 2025-30 and 2030+ periods.

Table 30: Proportions of debt maturing over various time frames

	Proportion maturing pre 2020	Proportion maturing 2020-2025	Proportion maturing 2025 - 2030	Proportion maturing after 2030
Bond debt	5.4%	18.5%	22.4%	53.6%

Note: Based on bonds denominated in GBP and with fixed coupons and bullet maturities. The principal outstanding on inflation linked bonds has been estimated by grossing up the amount originally issued for outturn RPI inflation since the data of issuance.
Source: Bloomberg, EY analysis

We made some simplifying assumptions in Section 4.2.1 to facilitate our analysis of the cost of existing debt. Those assumptions were:

- No additional debt (as opposed to replacement debt) is raised over the remaining years of AMP6, so the stock of embedded debt summarised in Table 30 above is the full amount of outstanding embedded debt we need to consider; and
- All of the debt that is expected to mature before 2020 is replaced with debt that does not mature until after 2025.

As part of that analysis we also calculated that the amount of debt outstanding at 31 March 2025 would have to be about 33% higher than at 31 March 2020 to warrant the 75/25 split of embedded/new debt assumed for PR19.

We adopt those same assumptions as part of our cross-check on the proportions of embedded and new debt to assume at PR24. To complete our cross-check of the proportions of new and existing debt to assume at PR24, we need to estimate or make assumptions about:

- How much of the debt raised 2020-25 would mature during 2025-30 (and how much would mature after 2030); and
- How much additional debt would need to be raised during AMP8 e.g. to fund new capex.

Some of the debt raised over the 2020-25 period would mature during AMP8 if the debt raised had a similar mixture of tenors to debt raised by water companies in the past. Our analysis of the bonds issued since PR14 presented in Table 19 and Table 20 earlier indicates that about 1/3 of nominal bonds would have tenors short enough to mature during the 2025-30 period, but none of the index-linked bonds. Noting this, and that the closer a bond is issued to 2025, the less likely it is to mature over the 2025-30 period, we assume about 25% of the bonds issued over the 2020-25 period would mature during 2025-30.

If 22% of 2018 debt would mature during 2025-30 and 25% of the debt raised over 2020-25 would mature during 2025-30, this implies that in order for a 75/25 embedded/new split to be appropriate at PR24 the amount of additional debt raised over the 2025-30 period would have to be equal to around 33% of the debt outstanding on 31 March 2025. While this is the same percentage increase in debt outstanding over the 2020-25 period as implicitly assumed in our estimate of the PR19 cost of debt, it is not the same amount in £m terms: it actually implies an acceleration in the capex programme from 2020-25 to 2025-30. While we do not have any

[110] See Ofwat (2017) Delivering Water 2020: Our methodology for the 2019 price review – Appendix 12: Aligning risk and return, December, p17.

data on the likely capex programmes over either 2020-25 or 2025-30, it is not immediately obvious to us why there would be a significant increase across the industry (noting that this would imply a corresponding increase in RCV, not just a replacement of existing assets reaching the end of their lives).

If, instead, we assume that the same amount of additional debt would have to be raised over the 2025-30 period as over the 2020-25 period, then this would imply around 40% of the debt outstanding by 31 March 2030 would have been raised over the 2025-30 period (i.e. combining new and replacement debt). This is more consistent with an 80/20 embedded/new split for PR24 than a 75/25 split.

Key finding: we assume an 80/20 embedded/new split of debt for PR24.

4.2.4 Debt issuance and liquidity management costs

In Section 2 we discussed debt issuance and liquidity management costs. We reviewed regulatory precedent on these costs and we estimated these costs based on publically available information and calculations of the likely cost of carrying cash balances and liquidity facilities.

There is no obvious reason to assume that debt issuance costs will be higher or lower in future. While we note that changes in financial markets, and particularly the outcome of the negotiations around 'passporting' in the context of Brexit could affect the degree of competition between banks, there is no obvious reason to anticipate that there would be more or less competitive tension going forward and that therefore the cost of issuing debt should be materially different in 2025-30 than 2020-25.

We note, however, that the cost of managing liquidity does change over time since it is linked, in part, to the difference between the cost of debt and the rate of interest which can be earned on short term deposits. Recognising this, and noting that our analysis above forecasts some change in the cost of debt between the 2020-25 and 2025-30 periods, we have considered whether our analysis of liquidity management costs needs to be updated. We note, however, that the margins between government yields and corporate bond yields have been assumed to remain broadly stable, and while this does not necessarily imply that the difference between the cost of new debt and the interest rate on deposits would be unchanged, assuming this to be the case would be consistent with our broader approach to estimating the cost of capital (which has assumed interest rates of various kinds are moving broadly in step). That being the case, it would only make sense to update our estimate of liquidity management costs if the cost of credit facilities (commitment fees) was expected to increase or if water companies were likely to maintain more or less liquidity in future (relative to their aggregate stock of net debt). As we noted earlier, we do not have access to good information on commitment fees, so we consider it prudent to assume no change to those costs. We also see no reason at this stage to anticipate that water companies would change their policies on maintaining liquidity.

Combining all of the above, we consider it reasonable to adopt the same assumptions about debt issuance and liquidity management costs for PR24 as we did for PR19.

Key finding: We add 0.1 – 0.2% to the cost of debt to compensate for transaction and liquidity management costs.

4.2.5 Cost of debt conclusion

Table 22 below summarises the key conclusions from our analysis above.

In combination, these factors imply a real, RPI-stripped, pre-tax cost of debt in a range of 1.6 – 1.95%, inclusive of transaction costs over the 2025-30 period.

This estimate is at the upper end of the range we estimated for PR19, but is not higher. The reason that the two estimated ranges for the cost of debt (one at PR19 and the other at PR24) overlap is that while on the one hand the cost of new debt increases from AMP7 to AMP8, the cost of embedded debt continues to fall (as water companies are able to raise

cheaper than average debt over the AMP7 period) and the weight which is attached to the new cost of debt is reduced for AMP8.

Table 31: EY estimate of the cost of debt for AMP8 (real, pre-tax)

	AMP8		AMP7	
	Min	Max	Min	Max
Cost of existing debt (real, pre-tax, %)	1.25	1.44	1.5	2.0
Cost of new debt (real, pre-tax, %)	2.5	3.0	0.0	0.5
Existing/new split	80/20	80/20	75/25	75/25
Transaction costs (%)	0.1	0.2	0.1	0.2
Cost of debt (real, pre tax, %)	1.60	1.95	1.2	1.8

4.3 Gearing

In Section 2 we presented analysis of water companies' actual gearing and how gearing levels had changed over time. We noted that in the last few years' industry average gearing had been broadly in a range of 60 – 65% in recent years. We also noted that gearing in this range is broadly consistent with an investment grade credit rating and with a wide range of UK regulatory precedents.

Industry gearing might be expected to respond to changes in the regulatory framework (e.g. introduction of more competition) or to changes in the financial markets. However, we have assumed for the purposes of this work that there won't be any changes to the regulatory framework between PR19 and PR24. Our analysis above has also shown that financial markets and independent economists are, on average, not expecting any fundamental changes in financial markets over this period. While historical data tends to suggest that significant unexpected events ("shocks") take place from time to time it is by definition difficult to predict when these may occur or what the impact might be. So while it is entirely possible that the financial markets' central case expectations will be wrong, given this is the best information we have available we do not, at this time, see any reason to assume a different range for water industry gearing at PR24.

Key finding: We have therefore assumed a range of 60 – 65% in our analysis.

4.4 Forecasts of RPI / CPIH inflation

In Section 2 we presented analysis of the historical difference between RPI and CPIH inflation (which we also showed was closely correlated with CPI inflation) and various forecasts of the long run 'wedge' between the RPI and CPI measures of inflation. These estimates, reproduced in Table 32 below, suggest that the long-run wedge between RPI and CPI may be about 1.0 – 1.3%. Combining those pieces of information we concluded that an appropriate estimate of the difference between RPI and CPIH inflation was about 1.0 – 1.3% per annum. Adding that estimate of the wedge between RPI and CPIH to the Bank of England's CPI inflation target, we assumed RPI inflation of 3.0 – 3.3% for the 2020-25 period.

Table 32: Independent estimates of the wedge between CPI and RPI inflation

Source	Long-run RPI-CPI wedge
Moody's	1.3%
Office for Budget Responsibility	1.0%
Pension Protection Fund	1.1%
Bank of England	1.3%

Sources: Moody's (2016), UK Transition to CPI: Redefining real: adoption of CPI will transform index-linked debt market, Office for Budget Responsibility (2015), Economy and Fiscal Outlook, Pension Protection Fund (2015), Funding Strategy Review, Bank of England (2014), February Inflation Report.

Looking further ahead to the 2025-30 period, the question which falls for consideration is whether there is any reason to expect the wedge between RPI and CPIH to be different over this period than over the 2020-25 period. In this respect we note that the methodology we adopted to forecasting the RPI/CPIH wedge for the 2020-25 period was based on long run assumptions, so there is no obvious reason to assume anything different for the 2025-30 period unless we expect there to be some fundamental changes to either of these indices during the 2020-25 period (and presumably towards the end of that period otherwise we should have factored them into our assessment of the wedge over the 2020-25 period).

We note that the RPI inflation swap curve for 28 February 2018 presented in Figure 31 indicated that RPI inflation is expected to remain fairly stable over the medium term, albeit a little bit higher in the 2025-30 period than the 2020-25 period. This evidence does not imply that inflation should be expected to be materially different over the 2025-30 period from the 2020-25 period.

We also note that a comparison of gilt yields and ILG yields on 28 February 2018 suggests RPI inflation is expected to average around 2.9% p.a. over the following five years (2018-23), but around 3.2% p.a. over the following ten years (2018-28). This data implies some acceleration of RPI inflation to around 3.5% p.a. over the 2023-28 period. While this is slightly above the 3.0 – 3.3% range assumed above, it is no so far different that we feel it warrants any change to our inflation assumptions.

Moreover, at this time we are not aware of any reason to expect any changes to the way these inflation indices are measured that would fundamentally affect the wedge between them, so we have assumed the same wedge for the 2025-30 period as for the 2020-25 period.

Key finding: We assume CPIH inflation of 2.0% and RPI inflation of 3.0 – 3.3% over the 2025-30 period.

4.5 Conclusion on the cost of capital for the 2025-30 period

Based on the analysis described above, this section summarises our initial assessment of the cost of capital for PR24, based on currently available evidence and analysis conducted to date.

Our assessment is that the Appointee real vanilla WACC, in RPI-stripped terms, is in a range of 2.6 – 3.5%. This compares to our estimated Appointee WACC of 2.3 - 3.4% in real, RPI-stripped, vanilla terms for PR19.

Assuming RPI inflation of 3.0 – 3.3% and CPIH inflation of 2.0% over the 2025-30 period, the CPIH-stripped Appointee real vanilla WACC would be 3.6 – 4.8%.

Weighting the RPI-stripped and CPIH-stripped Appointee WACCs together on a 25/75 (RPI/CPIH)[111] basis implies an overall Appointee real vanilla WACC of 3.2 – 4.2%. This weighted average WACC would be lower at the start of the 2025-30 period, and higher by the end of the period, all else equal, as more weight is gradually placed on the CPIH WACC as new additions to RCV will be added to the CPIH-linked RCV and multiplied by the CPI**Table 33: EY estimated WACC ranges – real RPI inflation stripped terms**

[111] We do not have enough information about industry expenditures plans over AMP7 and AMP8 to estimate the RPI and CPIH stripped proportions of the RCV for AMP8. However, knowing that the RPI/CPIH split will start at 50/50 in 2020 and the CPIH stripped portion will grow over time as all new totex after 31 March 2020 is added to the CPIH-stripped RCV, we consider that a 25/75 split may be a reasonable approximation.

	AMP8		AMP7	
	Min	Max	Min	Max
Gearing (%)	65	60	65	60
Cost of equity (real, post-tax, %)	**4.4**	**5.9**	**4.3**	**5.75**
Cost of debt (real, pre-tax, %)	**1.6**	**1.95**	**1.2**	**1.8**
Appointee WACC (real, vanilla, %)	**2.6**	**3.5**	**2.3**	**3.4**

Table 34: EY estimated WACC ranges – real CPIH inflation stripped terms

	AMP8		AMP7	
	Min	Max	Min	Max
Expected RPI inflation (%)	3.0	3.3	3.0	3.3
Expected CPIH inflation (%)	2.0	2.0	2.0	2.0
Appointee WACC (real, vanilla, %) (CPIH)	3.6	4.8	3.3	4.7

The estimated WACC range is relatively little changed between AMP7 and AMP8 because:

- we consider the expected medium and long term TMR is broadly stable over time, meaning that the increase in risk-free rate we estimate between PR19 and PR24 only has a moderate impact on the cost of equity; and
- we estimate that water companies will continue to be able to raise relatively low cost new debt over the 2020-25 period, such that the embedded cost of debt may be lower by PR24 than at PR19, offsetting to a degree the higher cost of new debt expected to prevail over the 2025-30 period (compared to the 2020-25 period).

Selecting a point estimate in the range

As we did when determining the point estimate for our AMP7 WACC, we adopt the mid-point of our estimated AMP8 WACC range as our point estimate. The mid-point of the RPI-stripped real WACC range above is 3.1% and for the CPIH-stripped real WACC it is 4.2%.

Key finding: our point estimate of the water industry base WACC for the 2025-30 period is 3.1% in real RPI-stripped terms and 4.2% in real CPIH-stripped terms.

5. Testing the acceptability of the risk & reward balance at PR19

Testing whether risk and reward are appropriately balanced could involve testing the acceptability of the plan to a variety of stakeholders including equity investors, debt investors, and customers. In this section of the report we consider the appropriate way to test acceptability to debt and equity investors and how to align risk and reward if they are not balanced.

5.1 Testing the acceptability of the risk & reward balance to equity investors

At PR14 Ofwat used RoRE analysis as a key measure of the acceptability of the price controls to equity investors. It also considered a number of equity financial ratios, such as dividend ratios. We consider that both of these tools remain appropriate for PR19. Below we discuss the approaches to implementing these tools.

5.1.1 RoRE analysis

As we noted earlier, Ofwat has proposed to use RoRE analysis at PR19 to inform its assessment of the acceptability of the risk and reward balance to equity investors. In its PR19 methodology decision, Ofwat has provided a formula for the RORE[112] which is:

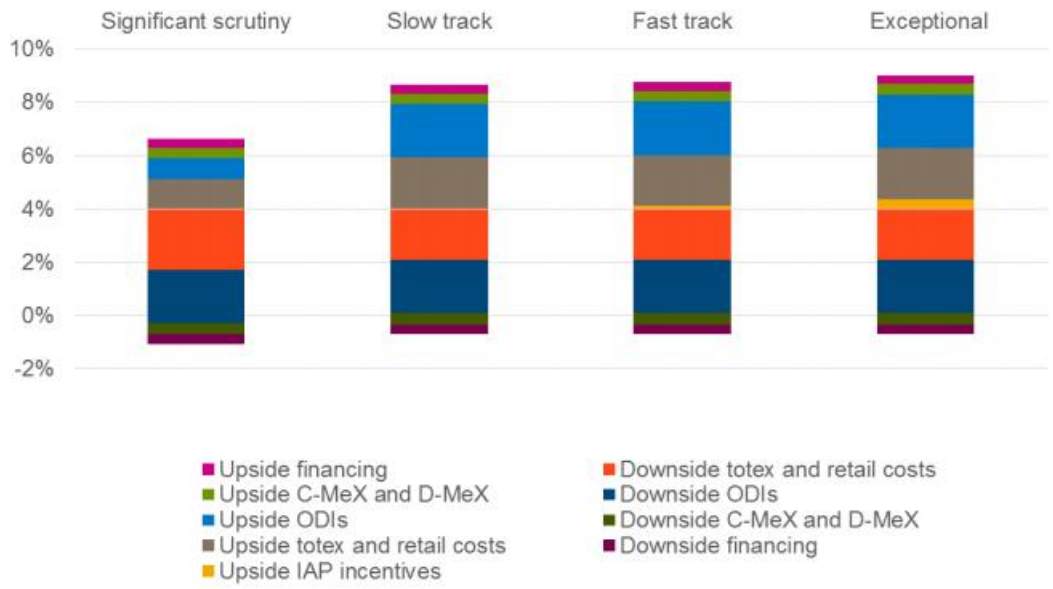
$$RoRE = \frac{EBIT - tax - (cost\ of\ debt * net\ debt)}{equity\ component\ of\ the\ RCV}$$

In its PR19 methodology, Ofwat has illustrated four RoRE ranges which it proposes companies would be able to achieve depending on which business plan "category" the company is in, as shown in Figure 37 below.[113] The key contributors to the RoRE ranges are totex cost sharing incentives, ODIs and CMeX/DMeX.

[112] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review p198

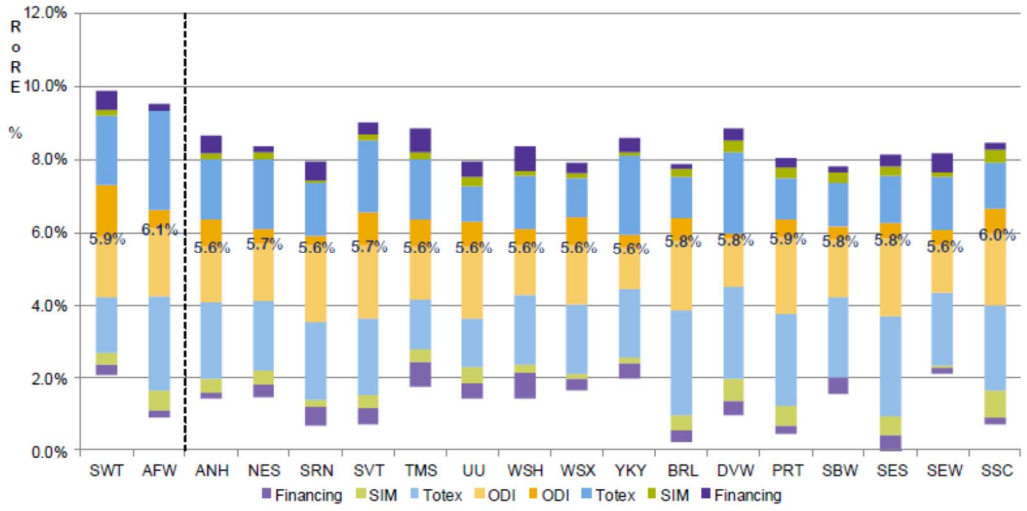
[113] Ofwat has proposed companies would be allocated to one of four categories based on an assessment of their business plans. The four categories, from those Ofwat assesses as the best to those Ofwat assesses as the worst, are "exceptional", "fast track", "slow track" and "significant scrutiny". Further details of Ofwat's proposed approach to assessing business plans can be found at Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review, p233.

Figure 37: Ofwat's illustrative RoRE ranges for different business plan categories at PR19[114]



These proposed ranges are more symmetrical than those adopted at PR14, where the RoRE ranges were skewed to the downside and varied somewhat across companies, as illustrated below. Ofwat indicated that these RoRE ranges excluded the premium on margins for non-household retail, which it assessed was worth an extra "0.08% – 0.16% for WaSCs and 0.12% – 0.24% for WoCs" on top of base returns.[115]

Figure 38: Ofwat PR14 Final Determination RoRE ranges



Source: Ofwat (2014) Setting price controls for 2015-20 : Final price control determination notice: policy chapter A7 – risk and reward, p13

The changes to the RoRE ranges proposed by Ofwat appear to reflect its desire to combine a reduced allowed cost of equity with greater opportunities for the best performing companies to achieve higher returns through better performance.

Noting that Ofwat has provided guidance on the RoRE ranges it would like companies to adopt in its PR19 methodology, the key question that falls for consideration in this report is whether those ranges are appropriate and, if not, what would be a more appropriate RoRE range to assume. We consider this issue below.

[114] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review, Figure 10.1.

Are the RORE ranges Ofwat has proposed for PR19 appropriate?

To test whether Ofwat's proposed RoRE ranges are deliverable in practice we have considered whether a notionally efficient company (NEC) could reasonably be expected to be capable of achieving the assumed out/underperformance of Ofwat's cost efficiency and service standards targets required to achieve the proposed scale of RoRE rewards and penalties.

We have discussed this issue in more detail in a separate report for UU on Balancing Risk and Reward at PR19,[116] prior to Ofwat finalising its methodology. We have updated the findings of our work (i.e. our analysis of the levels of performance that a NEC would be assumed to achieve, the potential for outperformance and the rewards for outperformance) to take into account Ofwat's PR19 methodology decision in Table 35, summarising for each of the core components of RoRE upside and downside. Table 35 also considers the overall deliverability of the package of rewards i.e. whether a NEC could reasonably be assumed to be capable of outperforming across all these areas simultaneously.

[116] See EY (2017) Balancing risk & reward at PR19: A report for United Utilities Water Limited.

Table 35: Summary of our assessment of the deliverability of Ofwat's proposed RoRE ranges

	Performance of NEC consistent with Ofwat proposals[117]	Ofwat assumed contribution to RoRE	Our assessment
Totex	Upper quartile	10% out/under-performance equates to +/- 2% of RoRE	Unclear if 10% outperformance could be achieved by NEC given Ofwat has indicated it intends for totex allowances to be very challenging to meet. Based on Ofwat's "cost sharing spreadsheet model"[118], a 10% totex outperformance translates to 1.6% of RoRE upside for the NEC, whilst a 10% underperformance translates to a 1.6% RoRE downside.
ODIs / PCs	Forecast upper quartile in each year on common PCs and "stretching" performance on other PCs	+/-1% to +/-3% of RoRE	Given that the NEC will face upper quartile or stretching PCs, have to retain most of any PR14 PCs it is currently underperforming and that water companies only met around 70% of PCs in 2016/17, it seems unlikely that the NEC would be able to significantly outperform against its PCs over the 2020-25 period.
CMeX / DMeX	Middle-ranking performer	+/- 0.5% of RoRE	NEC would need to be upper quartile within the water sector and the cross-economy UK Customer Satisfaction Index to achieve the top end of Ofwat's rewards. This appears unlikely given according to Ofwat no water company appeared in the top 50 organisations in the July 2017 UKCSI.[119] We also note the available upside from CMeX performance only appears to be worth 0.35% of RoRE based on PR14 data.[120]
Total	--	+/- 4.5% of RoRE	The RoRE ranges which Ofwat present (as shown in Figure 37 above) for the different business plan assessment categories presents the potential RoRE ranges which are not weighted according to the likelihood of actual performance. Historical performance data for UK water companies and energy networks suggests companies are not typically leading performers across all the areas which would be required to achieve the full RoRE upside assumed by Ofwat. Moreover, some of the rewards Ofwat assumes would be available for outperformance may be smaller than assumed. Based on the assessment above, it appears that the likelihood of the NEC outperforming will be less than the likelihood of it underperforming, and that the potential scale of outperformance will be lower than the potential scale of underperformance, and as such the NEC will face a RoRE range that is negatively skewed.

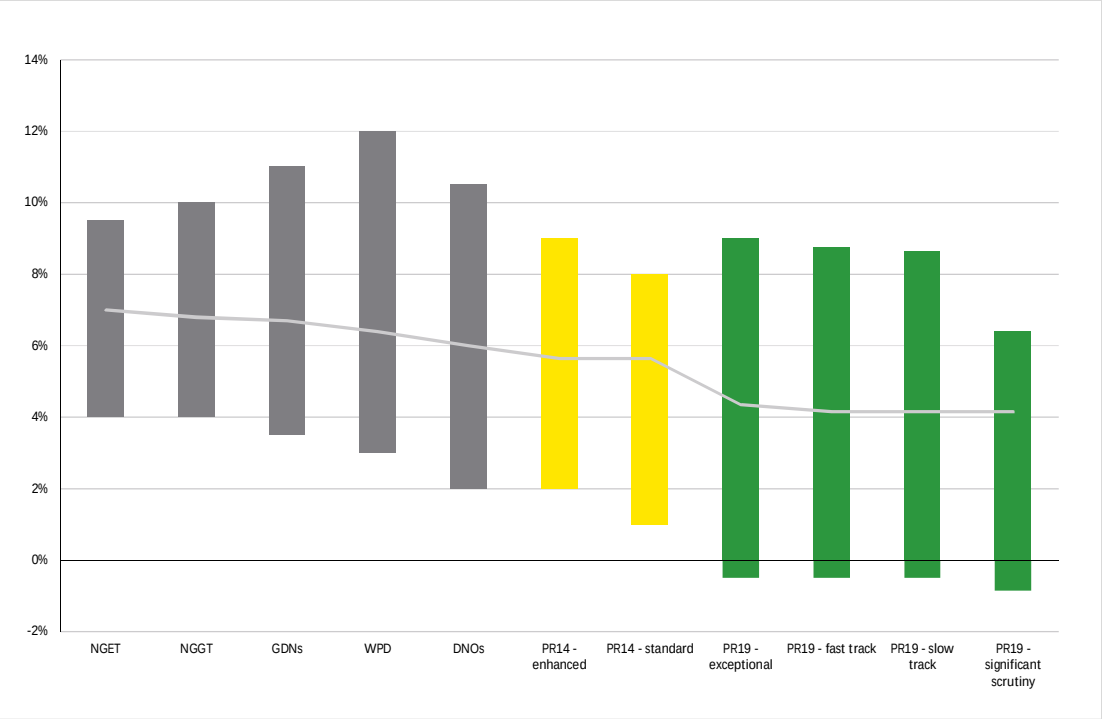
Based on the above, our analysis indicates that the RoRE ranges which a NEC would face are likely to be skewed to the downside, rather than the symmetrical shape Ofwat assumes.

[117] The NEC is also assumed to have financial performance in line with Ofwat's assumptions i.e. a cost of existing debt equal to Ofwat's allowed cost of existing debt, a cost of new debt equal to Ofwat's cost of debt index in each year and a capital structure in line with Ofwat's assumptions. For the purposes of this report, noting that Ofwat's illustrative RoRE ranges include only very small contributions from financial out/underperformance, we assume that the NEC will not out/underperform these financial assumptions.

[118] Calculated using a "cost sharing spreadsheet" Ofwat published with its PR19 methodology consultation. While Ofwat published a similar spreadsheet alongside its PR19 methodology decision, the indicative RoRE calculation was not incorporated into this version of the spreadsheet. We note, however, that the cost sharing rates for the NEC (which is assumed to have business plan totex equal to Ofwat's totex baseline) remained the same between the

It is also helpful to consider Ofwat's proposed RoRE ranges from a top-down point of view. In this regard, we note that Ofgem has also used RoRE analysis at many of its recent price control determinations for gas and electricity networks and as an ex-post comparative monitoring tool. At its most recent major price control decision, RIIO-ED1, Ofgem's package of rewards, penalties and incentives was designed such that each DNO could earn a return on equity in a range of roughly 2 – 10.5% (at 65% gearing). This range was wider than at most of its past RIIO determinations and more symmetrical – the downside on the RoRE range extended somewhat lower than the cost of debt at the time (though Ofgem's cost of debt index has continued to fall subsequently). These various RoRE ranges are illustrated in Figure 39 below.[121]

Figure 39: Approximate Return on Regulatory Equity (RoRE) ranges from recent Ofgem price control determinations (grey), PR14 (yellow) and those illustrated by Ofwat for PR19 (green)



Source: EY analysis of Ofgem and Ofwat publications.

Noting all of the above, we believe that the RoRE range should be symmetrical and Ofwat's proposed ranges are acceptable provided that they are actually achievable for a NEC. If in fact, as our analysis suggests, the ranges are not achievable in practice for a NEC – e.g. even an efficient company could not reasonably expect to achieve the top end of the range of outperformance or that it would meet Ofwat's totex targets and PCs in a central case scenario – then water companies will need to consider adjustments to other elements of the risk and reward package.

One potential solution to this issue could be to revisit the calibration of cost efficiency targets, cost sharing incentives, PCs, ODIs and CMeX/DMeX (i.e. the key regulatory levers which can influence risk). Adjusting how challenging the targets in each of these areas is, or the scale of rewards and penalties available for out/underperformance, could increase or decrease the amount of RoRE upside and downside available.

methodology consultation and methodology decision versions of the spreadsheet. We have therefore used the cost sharing spreadsheet published alongside the PR19 methodology consultation, but we have updated the assumed gearing percentage from 62.5% to 60%, in line with Ofwat's final methodology.

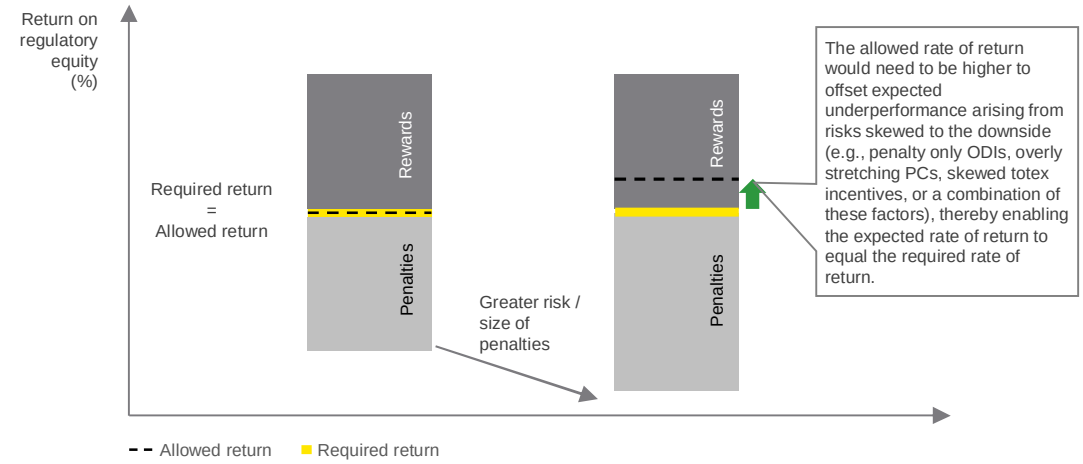
[119] See Ofwat (2017) Delivering Water 2020: Our methodology for the 2019 price review – Appendix 3: customer measure of experience (C-MeX) and developer services measure of experience (D-MeX), pp6-7.

[120] Since these calculations are based on PR14 data the results could be different if applied to PR19 data. However, if the relative scale of residential retail revenue and regulatory equity remain the same, the results presented would be applicable.

[121] The ranges are shown based on the notional gearing assumptions made by the regulators.

Another potential solution could be to adjust the allowed cost of equity to restore the balance between investors' required rate of return on equity and the expected rate of return i.e. to ensure that expected RoRE (not the range of RoRE but the central case estimate) is equal to the cost of equity (which should be equal to the allowed return on equity for a NEC with an appropriately balanced RoRE range). As Ofwat has previously recognised, investors would require a higher allowed cost of equity in order to expect a rate of return equal to their required rate of return: '[i]f investors were asked to invest in companies with a regulatory system that only allowed for penalties, or downside risk, customers would pay for this through a higher cost of capital'[122]. This is illustrated below in Figure 40.

Figure 40: Impact of skewing the RoRE range on the required and allowed rates of return



Source: EY

5.2 Testing the financeability of debt at PR19

Under Section 2 of the Water Industry Act 1991 Ofwat has a number of statutory duties which govern how it carries out its work as the economic regulator of the water sector. These duties include to secure that water companies can (in particular through securing reasonable returns on their capital) finance the proper carrying out of their statutory functions.[123] The interpretation of this duty – the financing duty – has been the subject of much debate over the years. Ofwat has typically interpreted the financing duty as a duty to "ensure that an efficient company can finance its functions".[124] Water companies have argued that the duty does not include a reference to "efficient" and more weight should be attached to the company's actual financing and performance when evaluating the financing duty.

This report considers the appropriate approach to financeability and financial resilience at PR19 along a number of dimensions:

- whether to conduct financeability tests on an actual or notional balance sheet;
- whether to conduct financeability tests on the Appointee or individual price controls;
- defining the notional capital structure to use in financeability tests;
- defining an appropriate target credit rating;
- aligning the financeability tests with the views of credit ratings agencies;
- assessing whether the tests have been passed or not;
- solving financeability problems;
- testing the financeability of equity;
- the role of, and approach to, testing financial resilience; and
- the interactions between the risk and reward balance, financeability and financial resilience.

[122] See Ofwat (2016) A consultation on the outcomes framework for PR19, November, pp6-7.
[123] See Ofwat website http://www.ofwat.gov.uk/about-us/our-duties/, accessed on 04 April 2018.
[124] See, for example, Ofwat (2016) Monitoring financial resilience, p11.

5.2.1 Testing on an actual or notional balance sheet

At PR14, Ofwat requested companies to undertake financeability tests on both a notional and an actual balance sheet basis. Companies also had to provide assurance that they were financeable.

Ultimately, Ofwat based its financeability tests on a notional balance sheet basis.[125] Ofwat did not publish any detailed discussion of the tests on the actual balance sheet, but presented forecast financial ratios for each company on the notional balance sheet basis. The CMA has also consistently confirmed the testing of financeability on a notional balance sheet basis.[126]

Ofwat has proposed to adopt a similar approach at PR19.[127]

Noting the above, we consider that financeability tests should be conducted on both a notional and an actual balance sheet basis.

5.2.2 Testing the Appointee or individual price controls

Ofwat's approach at PR14, also adopted by the CMA during Bristol Water's appeal, was to conduct financeability tests at the Appointee level, rather than for individual price controls.

For PR19 Ofwat has proposed to undertake financeability tests at the Appointee level and to conduct "headroom checks" for each of the individual price controls.[128] Ofwat provides limited details about its intended approach to these "checks" but does state "while we consider that each of the wholesale controls should be able to support financial ratios at a level equivalent to an investment grade credit rating, we would not necessarily expect each control to have the same level of financial headroom". This tends to suggest that Ofwat is intending to conduct the financeability "headroom checks" for each of the wholesale price controls using the same set of credit rating metrics and thresholds as for the Appointee.[129]

While we acknowledge that evaluating the financeability of separate price controls might be a theoretically worthwhile exercise, there are practical difficulties with undertaking financeability testing on a price control by price control basis. For example, the credit ratings agencies have not published methodologies tailored specifically to stand-alone residential water retail, water resources, water network plus, sewerage network plus and bioresources businesses. Some of these business units might be covered by existing ratings methodologies, but bioresources and water resources businesses might be sufficiently different from existing water businesses to warrant a bespoke ratings methodology. Consequently, well defined and established financial ratio tests and thresholds do not currently exist for all of the separate price controls.

Noting the above, it does not seem proportionate to us to try and undertake detailed financeability testing of each price control. We agree with Ofwat's proposal to undertake some basic "headroom checks" provided they are undertaken at a sufficiently high level and are not used to justify changes in allowed revenues for either individual price controls or at the Appointee level. The tests would need to be more robust if they were to be used for that purpose.

In the absence of any detailed guidance from the credit ratings agencies relevant to the specific individual price controls, but noting that each of the four wholesale price controls is an RCV based price control (with some proportion of wholesale RCV allocated to it) we suggest that the best available financial ratios to use in the headroom checks are the same ones as used for the Appointee (discussed in Section 5.2.5 below).

[125] See Ofwat (2014) Setting price controls for 2015-20: Final price control determination notice: policy chapter A8 – financeability and affordability, p17 where Ofwat says "we assessed financeability on a notional basis for an efficient company". We note, for example, Ofwat disregarded a representation from UU that the Draft Determinations were unfinanceable on the actual balance sheet: see Ofwat (2014) Setting price controls for 2015-20: Final price control determination notice: company-specific appendix – United Utilities, p76. This reinforces the conclusion that Ofwat disregarded the tests on an actual balance sheet basis.
[126] See, for example: CMA (2015) Bristol Water plc: final determination, p351. See also Competition Commission (2010) Bristol Water plc: Final Report, para 10.10.
[127] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review, p190.
[128] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review, p191.
[129] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review, p191.

5.2.3 Defining the notional capital structure to use in financeability tests

If a notional balance sheet basis is adopted, then that notional balance sheet needs to be defined. Ofwat's prior approaches have defined the notional balance sheet along a number of dimensions:

- gearing;
- dividends; and
- index-linked debt.

At PR14,[130] Ofwat adopted a gearing assumption of 62.5% - consistent with its WACC assumption – and assumed dividends 4% of regulatory equity in 2015/16 that would then grow at 1.65% per annum (which under a Dividend Growth Model implies a cost of equity of 5.65%, consistent with its WACC determination). Ofwat also assumed that 33% of total debt was index-linked i.e. this assumption applied to both existing and new debt.

Ofwat has not yet consulted on all these details of its approach for PR19, though we note that in its PR19 methodology Ofwat proposes to adopt gearing of 60% at PR19.[131] We discuss the merits of this assumption elsewhere in this report, but for the purposes of financeability testing on the notional balance sheet, we would propose that UU adopts a gearing assumption consistent with the WACC calculation.

The dividend assumption will need to be considered further taking into account the conclusions on the cost of equity and financeability testing e.g. to calibrate dividends with an appropriate level of retained earnings to finance future capex and meet credit ratios.

The proportion of industry debt that is index-linked is just under 50%.[132] Water companies have issued some index-linked debt since PR14, around 7.5% of total issuance over the period.[133] The index-linked debt which has been raised since PR14 has been about 45% RPI-linked and 55% CPI linked.[134] On this basis, noting the significant difference between the proportion of new and existing debt which is index-linked, it may be appropriate to make different assumptions about the proportions of new and existing debt which are index-linked in the notional capital structure. A similar approach was taken at PR09. An assumption that around 50% of existing debt is RPI-inflation index-linked, and around 10% of new debt (rounding up from the 7.5% observed since PR14) is RPI-inflation or CPI-inflation linked, could be reasonable for PR19 (based on currently available information).[135]

We note that Ofwat indicates it will assume 33% of debt on the notional balance sheet is index-linked in its financeability tests for PR19.[136] Ofwat does not appear to propose to assume different proportions for new and embedded debt at PR19. Our assumption of 50% of embedded notional debt being index-linked and 10% of new debt, combined with our assumption that 75% of debt is embedded and 25% is new, implies that about 40% of debt overall would be index-linked. If Ofwat's 70/30 embedded/new split is used with our assumptions about the proportion of embedded and new debt which is index-linked, this

[130] See Ofwat (2014) Information Notice: 2014 price review – Ofwat's approach to assessing financeability.
[131] See Ofwat (2017) Delivering Water 2020: Our methodology for the 2019 price review - Appendix 12: Aligning risk and return, p20.
[132] Moody's calculated that around 50% of the debt issued by companies it rates is currently linked to RPI inflation, either directly or via index-linked swaps: see Moody's (2016) "UK Transition to CPI: Redefining real: adoption of CPI will transform index-linked debt market, raise risk for regulated sectors", 13 January, p13. We note that Ofwat has reported 46% of WaSCs' debt and 66% of WoCs' debt was index-linked in 2016: see Ofwat (2017) Monitoring financial resilience, p12. Ofwat's November 2017 Monitoring financial resilience (p18) quotes very similar figures.
[133] EY analysis of Bloomberg data. All bonds issued by water companies included. Bonds issued in foreign currencies converted to GBP using exchange rate on day of issue.
[134] EY analysis of Bloomberg data. Only GBP, bullet, non-callable bonds have been included in this analysis: see Table 20 (excluding the Western Power Distribution bond).
[135] We have considered if it would be appropriate to specify particular percentages of debt which are RPI-inflation linked and which are CPIH inflation linked, but this is difficult to do on the basis of the information currently available and risks spurious accuracy. To the extent that a greater proportion of future index-linked debt raised by water companies may be CPI-linked, it may be appropriate to simply assume a more conservative amount of RPI-inflation linked debt in the notional capital structure.
[136] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review: Appendix 12 – Aligning risk and return, p84.

would imply about 38% of debt overall would be index-linked. Noting that Ofwat has decided to assume 33% of debt is index-linked (rather than a higher figure) on the basis that it is "a prudent assumption for the testing of financeability"[137] and that our estimates are only slightly higher, we consider it reasonable for companies to use Ofwat's assumption of 33% index-linked notional debt for the purposes of conducting financeability tests.

In making this assessment, we are conscious that debt markets and issuance will need to continue to be monitored to take account of any new developments. There are also reasons to consider that index-linked debt issuance may be a smaller proportion of issuance in future, for example, due to changes to pension rules, Basel III / Solvency II and the transition from RPI inflation to CPIH inflation. On the other hand, inflation volatility might prompt an increase in demand for inflation protected bonds, or as the transition from RPI to CPIH inflation progresses a market for CPI-linked bonds may emerge.

5.2.4 Defining an appropriate target credit rating

In order to perform financeability tests, it will be necessary to define which credit rating it is that is being targeted e.g. investment grade, A3, Baa1 etc.

Ofwat has not proposed a target credit rating in its PR19 methodology, and instead companies should provide "evidence about the credit rating targeted in their plan and the level of each ratio they consider appropriate"[138]. This would include information on the level of financial headroom, which Ofwat explicitly states it would not set a target for as it would limit Board ownership of business plans.[139]

With respect to the different price controls Ofwat states that it considers that the different wholesale price controls should be able to support financial ratios at a level equivalent to an investment grade credit rating, though each control may have different levels of financial headroom.[140]

Economic regulators have typically targeted an investment grade credit rating in the past, though the exact definition of this has varied from "comfortable investment grade" to specific ratings e.g. A3, Baa1 etc. At PR14, Ofwat was not precise about which credit rating it was targeting. However, the CMA previously targeted a Baa1 rating at Bristol Water's appeal of PR14[141] and an investment grade credit rating at Bristol Water's appeal of PR09.[142] The above regulatory precedent suggests that a target credit rating should be at least investment grade and probably in the A/A2 to BBB/Baa2 range.

There may be a difference in the cost of capital at different credit ratings, so we would expect water companies to have broadly targeted a credit rating consistent with an optimal capital structure. In this respect, we note that at the end of 2016/17, all the rated water companies had a credit rating of BBB+, Baa1 or Baa2, except Welsh Water which had an A- / A3 rating.[143]

Moreover, we note that our analysis of historical iBoxx bond yield indices (see Table 17 above) for A and BBB categories indicated that there was a roughly 20 – 30 basis points difference in the cost of debt for an A rated company (i.e. A+, A or A-) and a company with a BBB rating (i.e. BBB+, BBB or BBB-). This suggests that all else equal a company with a weaker credit rating would have a higher cost of capital. However, there is also likely to be a difference in the gearing of water companies at the credit ratings (comparing on a like for like basis companies with traditional corporate finance structures rather than whole business securitisations or other highly leveraged capital structures). The financial ratios used by

[137] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review: Appendix 12 – Aligning risk and return, p84.
[138] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review, p198.
[139] See Ofwat (2017) Delivering Water 2020: Consulting on our methodology for the 2019 price review, p227.
[140] See Ofwat (2017) Delivering water 2020: Our final methodology for the 2019 price review, p191.
[141] The CMA did not explicitly state which credit rating it targets in Bristol Water's appeal of PR14. However, the CMA used the threshold levels proposed by Bristol Water and those thresholds were stated to be consistent with a Baa1 rating by Bristol Water. See, for example, Table 11.3 of CMA (2015) Bristol Water plc: final determination.
[142] See Competition Commission (2010) Bristol Water plc: Final Report, para 10.19
[143] See Ofwat (2017) Monitoring financial resilience, p7. UU has informed us that these ratings are corporate credit ratings, rather than the ratings of the underlying debt (which are not necessarily the same).

Moody's to assess credit ratings summarised in Table 38 below provide an indication of the potential differences in gearing. Companies with higher gearing may have a higher cost of debt, but they also have substituted more relatively low cost debt for high cost equity. Very high leverage may also transfer some additional systematic risk to debt investors, such that the debt beta may increase from the zero we have assumed in our analysis to say around 0.10. All of these moving parts make it difficult to identify a single "optimal capital structure" and some simple calculations reinforces this point: combining the above assumptions implies a cost of capital for A, A-, BBB+ and BBB categories in a narrow range of about 2.5 – 2.8%[144] i.e. there is very little to choose between these different ratings, a result which bears out the different ratings that the water companies have selected in practice.

There are other considerations around the choice of capital structure and target credit rating. Continued access to finance during periods of financial market turmoil may point towards targeting a rating well within the envelope we discussed above: the experience during the global financial crisis was that utilities with stronger credit ratings were able to continue to access capital markets (albeit at higher cost) while other corporates with weaker credit ratings were not.[145]

Combining all of the above, we consider that an appropriate target credit rating would be A- or BBB+.

5.2.5 Aligning the financeability tests with the views of credit ratings agencies

Ofwat has proposed a set of measures to use for testing the financeability of debt at PR19.[146] Ofwat did not, however, define the thresholds it intends to use at PR19 in its methodology.[147]

Table 36: Ofwat's proposed definitions of financial ratios for PR19

Ratio	Ofwat definition
Gearing	Net debt / RCV
Interest cover	Funds from operations (pre interest) / Cash interest
Adjusted cash interest cover ratio (ACICR)	(Funds from operations (pre interest) – RCV run off) / (Cash interest)
Funds from operations / net debt	Funds from operations / Net debt
Retained cash flow / debt	(Funds from operations (post interest) – dividends paid) / Net debt

Source: Ofwat (2017) Delivering Water 2020 : Our final methodology for the 2019 price review, Table 11.1, December.

The ratios Ofwat has proposed are the same as at PR14.[148] The ratios proposed by Ofwat are similar to, but not precisely the same as those used by credit ratings agencies.

[144] This analysis has assumed: (1) the total market return, risk-free rate, equity risk premium and asset beta are at the middle of the ranges shown in our earlier analysis; (2) the cost of debt of an A rated company equals the low end of our range, the cost of debt of a BBB rated company the top end of our range and the cost of debt of A- and BBB+ rated companies are linearly interpolated between these points; (3) the gearing of companies at A, A-, BBB+ and BBB are the mid-points of the ranges shown in Table 38 (but Moody's does not give the lower bound for an A range so we have assumed the mid-point is 50%); (4) debt beta is zero for an A or A- rated company, consistent with our assumption of a zero debt beta for a company with gearing in our estimated range of 60 – 65%, but the debt beta for a BBB+ rated company is 0.05 and for a BBB rated company 0.10. This analysis assumes companies have a traditional corporate finance structure and does not take into account the impact of whole business securitisations and other highly covenanted structures.

[145] See, for example, Hern, Haug, Legg and Robinson (2009) Cost of capital for PR09: A final report for Water UKp66, which showed that BBB rated corporates had much more limited access to bond markets during the global financial crisis of 2007-08.

[146] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review, Table 11.1.

[147] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review, Table 11.1.

[148] See Ofwat (2014) Information notice: 2014 price review – Ofwat's approach to assessing financeability, back page for a definition of the ratios used at PR14. "Interest cover" at PR19 was called "Cash interest cover" at PR14; "FFO (pre interest)" at PR19 was called "FFO + interest paid" at PR14; "RCV run off" at PR19 was called "RCV depreciation" at PR14; "FFO (post interest)" at PR19 was called "FFO" at PR14.

The CMA, during Bristol Water's appeal of PR14, did not use the same set of ratios as Ofwat. Rather, the CMA adjusted some of Ofwat's definitions of the financial ratios to align with the definitions used by the credit rating agencies. Specifically, the CMA stated "FFO/Net Debt has been modified to include the indexation component of index-linked loans in FFO, and based on year end net debt. Net Debt / EBITDA has been added to Ofwat's model using the EBITDA figure and the year-end net debt."[149] These adjustments meant that the estimated financial ratios were weaker than those Ofwat had itself calculated.

Nevertheless, we note that Ofwat has continued to adopt a different definition of FFO / Debt and RCF / Capex ratios since PR14.[150] Consistent with this, and anticipating companies may propose different definitions, Ofwat has proposed that companies can propose additional financial ratios at PR19 if they wish to.[151]

Noting all of the above, and particularly in light of the CMA's decision it would seem appropriate for water companies to test financeability using the credit ratio definitions adopted by Moody's and S&P in addition to the specific ratios and definitions that Ofwat has proposed.

Since Ofwat has not defined them, the appropriate set of thresholds to use in the tests at PR19 also needs to be defined.

PR14 does not provide any useful guidance on this topic as at PR14 Ofwat also did not define the thresholds it used in its financial ratio tests.[152]

Moody's has previously published guidance applicable to regulated water utilities, summarised below, but this is applicable globally and does not take into account the economic regulatory framework in England and Wales.

Table 37: Moody's Credit Rating methodology thresholds for assessing water companies - global

	Aaa	Aa	A	Baa
AICR	>=8x	4.5-8x	2.5-4.5x	1.5-2.5x
(OR) FFO interest coverage	*>=10x*	*7-10x*	*4.5-7x*	*2.5-4.5x*
Net Debt/RAB	<25%	25-40%	40-55%	55-70%
FFO/Net Debt	>=40%	25-40%	15-25%	10-15%
RCF/Net Debt	>=30%	20-30%	10-20%	6-10%

Source: Moody's Rating Methodology for Regulated Water Utilities (December 2015). AICR = Adjusted Interest Coverage Ratio; FFO = Funds From Operations; RAB = Regulatory Asset Base; RCF = Retained Cash Flow.

Moody's has recently (May 2018) published updated guidance on the tests and thresholds it intends to use for English and Welsh water companies going forward. These tests and thresholds are summarised in Table 38**Error! Reference source not found.** below.

[149] See CMA (2015) Bristol Water plc: final determination, para 11.43.
[150] See Ofwat (2017) Monitoring financial resilience, p17 where Ofwat presents FFO / Debt and RCF / Capex ratios for the industry and notes "Each credit rating agency has their own calculation of these ratios which may differ slightly from the calculations here." Ofwat did not include detailed definitions of the financial ratios it proposes to use at PR19 in its PR19 methodology decision document.
[151] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review, p199.
[152] The Methodology Decision, p143, names some ratios and defines them, but does not talk about thresholds. It says that Ofwat will review company business plans before deciding what an appropriate level for the tests is (p144). See Ofwat (2013) Setting price controls for 2015-20 – final methodology and expectations for companies' business plans. Ofwat (2014) Setting price controls for 2015-20 – risk and reward guidance also did not talk about tests or thresholds. Similarly, in Ofwat (2014) Setting price controls for 2015-20: Draft price control determination notice: technical appendix A7 – financeability and affordability, p7, Ofwat simply talk about ratios not thresholds. And in Ofwat (2014) Setting price controls for 2015-20: Final price control determination notice: policy chapter A8 – financeability and affordability, p30, Ofwat again only discussed the ratios, not the thresholds.

Table 38: Moody's UK water ratios and thresholds (2018)

Rating	Net Debt/RCV	Adjusted Interest Cover Ratio
A2	< 55%	>2.0x
A3	> 55% < 65%	>1.7x < 2.0x
Baa1	> 65% < 72%	>1.5x < 1.7x
Baa2	> 72% < 80%	>1.3x < 1.5x

Source: "Regulated Water Utilities – UK: Regulator's proposals undermine the stability and predictability of the regulatory regime", 22 May 2018.

These updated tests are more stringent than those Moody's has used in the past, reflecting Moody's decision to downgrade its assessment of the UK water sector regulatory environment following Ofwat's recent "putting the sector back in balance" consultation which proposed a number of changes that were in Moody's view "a response to public and political pressure, but [which] undermine the track record of stable and predictable regulation".

The previous ratio tests which Moody's applies are summarised in Table 39**Error! Reference source not found.** below.

Table 39: Moody's UK water ratios and thresholds (2013)

Rating	Net Debt/RCV	Adjusted Interest Cover Ratio
A1	> 40% < 50%	>2.5x < 3.5x
A2	> 50% < 60%	>1.8x < 2.5x
A3	> 60% < 68%	>1.6x < 1.8x
Baa1	> 68% < 75%	>1.4x < 1.6x
Baa2	> 75% < 85%	>1.2x < 1.4x

Source: "UK Water Sector: Speed of Money Cannot Address Potential Financeability Concerns", 16 May 2013.

Moody's have applied these past ratio thresholds to UU. For example, in February 2015 and again in September 2015 Moody's commented "UU's current rating reflects Moody's expectation that the ratio of Net Debt to RCV would remain broadly in the range of 60 – 65% with an Adjusted Interest Cover ratio of at least 1.6 - 1.8x. This is in line with our published ratio guidance for other UK regulated water utility groups rated at the same level, such as Severn Trent Water or Wessex Water."[153] Similarly, in November 2014 Moody's stated "there would be upward ratings pressure if group consolidated Net Debt to RCV appeared likely to remain consistently below 60% with Adjusted Interest Cover consistently above 1.8x. Negative pressure on the ratings could derive from weak operational performance and/or changes in dividend policy or capital structure that would result in a deterioration of the group's financial profile, particularly Net Debt to RCV consistently above the high-60's in percentage terms and Adjusted Interest Cover permanently below 1.6x."[154]

We infer from the way that Moody's has applied its previous ratio guidance to UU, that it will likely apply the updated 2018 ratio guidance to UU in the same way i.e. the tests it would expect UU to meet to achieve a particular credit rating would be the same as those stated in Table 38.

S&P have previously stated[155] that for "the U.K. water sector, we use the "low volatility" table, which allows for higher leverage due to the relatively stable and predictable revenues of regulated utilities" and that "in the U.K. water sector, some companies are listed and some have implemented whole-business securitisations (WBS). The listed companies that we rate generally have "significant" financial risk profiles. At that level, we expect their core ratio of

[153] See Moody's (2015) "Credit Opinion: United Utilities plc", 3 February and Moody's (2015) "Credit Opinion: United Utilities plc", 15 September.
[154] See Moody's (2014) "Rating Action: Moody's assigns a P(A3) rating to United Utilities Water Finance PLC, stable outlook", 14 November.
[155] See S&P (2014) "Credit FAQ: For UK Water Utilities, Challenging Cost of Capital Guidance May Bring Rating Stress", February.

FFO-to-debt to be at least 9%. The more highly geared WBS generally have guidelines indicating at least 6% FFO-to-debt."

The "low volatility" table is extracted below and the commentary above indicates that the "significant" and "aggressive" rows would be the most appropriate ones to consider for UK water companies. For a listed company like UU, the "significant" row is most relevant.

Table 40: S&P ratios and thresholds for UK water companies

Cash Flow / Leverage Analysis Ratios - Low Volatility							
	Core ratios		Supplementary coverage ratios		Supplementary payback ratios		
	FFO / debt (%)	Debt / EBITDA (x)	FFO / cash interest (x)	EBITDA / interest (x)	CFO / debt (%)	FOCF / debt (%)	DCF / debt (%)
Minimal	35+	Less than 2	More than 8	More than 13	More than 20	20+	11+
Modest	23-35	2-3	5-8	7-13	20-30	10-20	7-11
Intermediate	13-23	3-4	3-5	4-7	12-20	4-10	3-7
Significant	9-13	4-5	2-3	2.5-4	8-12	0-4	0-3
Aggressive	6-9	5-6	1.5-2	1.5-2.5	5-8	(10)-0	(20)-0
Highly leveraged	Less than 6	Greater than 6	Less than 1.5	Less than 1.5	Less than 5	Less than (10)	Less than (20)

Source: S&P (2014) "Credit FAQ: For UK Water Utilities, Challenging Cost of Capital Guidance May Bring Rating Stress", February.

We note that the CMA also had regard to the same S&P ratios and thresholds during Bristol Water's appeal of PR14. For example, Bristol Water submitted (see Table 11.2 of the CMA determination) that the thresholds it needed to meet in order to maintain a Baa1 rating were:[156]

- S&P
  - FFO / Net Debt > 9%
  - Net Debt / EBITDA < 6%
- Moody's
  - AICR > 1.4x
  - Net Debt / RCV < 75%

S&P has also previously discussed that UU's credit rating could be positively upgraded from BBB+ if it can achieve FFO to debt of above 11%[157] and S&P's assessment that it expected UU to maintain FFO to debt above 11% over the period to 31 March 2020 was a key factor in its recent decision to upgrade UU to A-.[158]

Fitch has previously indicated that:[159]

- it would upgrade UU's credit rating if gearing was consistently below 63% and PMICR was consistently above 1.8x; and
- it would downgrade UU's credit rating if gearing was consistently above 68% and PMICR was consistently below 1.5x.

The CMA considered these ratios and whether any particular company specific set of ratios should be used. The CMA noted that S&P uses a 10% target for Bristol Water, but that this took into account some company-specific factors and the ratio test would be 9% in the absence of those. The CMA ultimately used the target of 9% for the FFO / Net Debt ratio.[160]

[156] NB it isn't clear in the CMA determination that the ratios Bristol Water stated it needed to meet were consistent with a Baa1 rating, but this is stated in Bristol Water (2015) Statement of Claim, para 2299:
[157] See S&P (2016) "United Utilities Water Ltd", 22 December and S&P (2015) "UK Based United Utilities Water Outlook Revised to Positive; BBB+ Ratings Affirmed", 8 September.
[158] See S&P (2017) "UK Based United Utilities Water Upgraded to 'A-'; Outlook Stable", 25 July.
[159] See Fitch (2016) "Fitch Affirms United Utilities Water Senior Unsecured Credit Rating at A-", 26 April.
[160] See CMA (2015) Bristol Water plc: final determination, para 11.32.

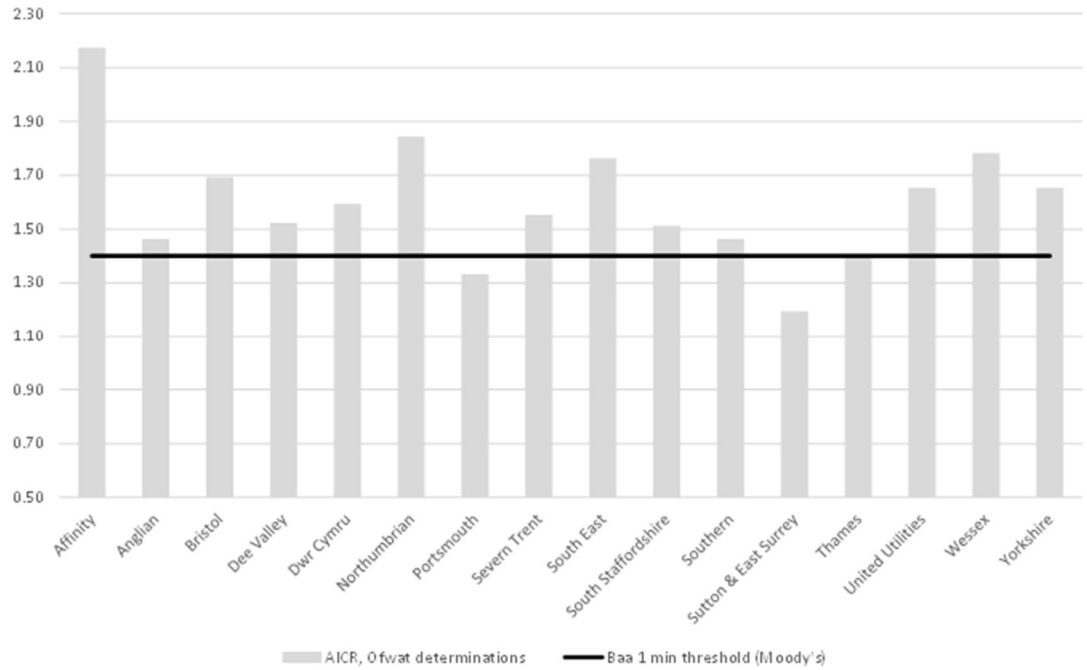
The guidance from S&P above does not explicitly state what the appropriate thresholds would be for different credit ratings e.g. A-, BBB+ etc, though as discussed above, some inferences can be drawn from ratings decisions and commentary.

Noting all of the above, we recommend that UU assesses whether its PR19 business plan is financeable by testing if the projected financial ratios, using both Ofwat and credit ratings agency definitions, meet the minimum thresholds specified by the credit ratings agencies for the credit rating which UU decides to target (which we have discussed above).

5.2.6 Assessing whether the tests have been passed or not

At PR14, Ofwat did not require water companies to meet all of the financial ratio tests in all of the years of the period. For example, Ofwat's own projections of some financial ratios failed to meet the minimum thresholds, as illustrated below.

Figure 41: Adjusted Interest Coverage Ratio: Ofwat PR14 projections compared to financeability test thresholds



Source: EY analysis of Ofwat (2014) Setting price controls for 2015-20: Final price control determination notice: policy chapter A8 – financeability and affordability, p31 and Moody's publications

At Bristol Water's appeal of PR14, the CMA discussed how much weight to place on the financeability tests and stated "the calculation of ratios forms part of a broader assessment to assign credit ratings and these ratios are not applied mechanistically. We note that a set of modelling assumptions that produced inferior ratios compared with the targets in one or more years might not indicate a concern in relation to financeability."[161] This suggests that the CMA did not consider it essential that the ratio thresholds be satisfied in every year. Reinforcing this point, the CMA considered it acceptable that Bristol Water did not meet the FFO/Net Debt test in all five years of the period i.e. it was acceptable to the CMA that BW failed that test in the final year of the period – see para 11.63. The CMA also did not place much weight on the Net Debt / EBITDA tests, preferring to place little weight on this particular ratio as Ofwat and other economic regulators had not had regard to it in the past. On this basis, the CMA was content that BW failed this test in 3 out of 5 years – see para 11.65.

In its PR19 methodology decision Ofwat has stated:[162]

[161] See CMA (2015) Bristol Water plc: final determination, para 11.35.
[162] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review, p197.

> "We will consider the average of each metric over the price control and we will look at trends over the price control period, rather than focusing on individual metrics in a single year. We will exercise our judgement in looking at the suite of financial metrics as part of our assessment of financeability and will look at the entire suite of metrics over the entire control period, rather than focusing on a single metric or a single reporting period.
>
> We would not consider that a poor cashflow metric in a single year necessarily raises financeability issues, however, we may have concerns if there were poor metrics in multiple years or if there was a significant decline in cash flow metrics across the period."

As the statements by credit ratings agencies in Section 5.2.5 indicate, the ratings agencies also tend to look at financial ratios over a period of time rather than adjusting ratings each time a financial ratio deviates outside of its guidance range. Judgement also plays a significant role in the credit ratings agencies' assessment of credit risk.

Noting all of the above, it does not seem necessary to us for a water company's price control to forecast that it will meet every financial ratio in every year of the period, but a degree of judgement will have to be exercised in forming a view on whether the tests have been met or not.

5.2.7 Solving financeability problems

Theoretically, there are a range of tools available to companies and/or regulators to solve financeability problems, such as shortening asset lives, reducing dividends, equity injections or cutting back on the capex programme. In its PR19 methodology, Ofwat identify three mechanisms for addressing financeability issues at PR19:[163]

- use of PAYG/RCV run-off levers – the PAYG and RCV run-off levers can be used to move revenue between control periods on an NPV-neutral basis;
- restriction of dividends – the use of dividend restrictions may be justified where the company has a large investment programme and the company is seeking to mitigate the effects on credit ratios; and
- equity injection – an equity injection may be appropriate where a company has a particularly large investment programme relative to its RCV and needs to maintain notional gearing.

These solutions are similar to those which Ofwat considered at PR14, where they assumed that companies could solve financeability problems through adjustments to PAYG ratios and asset life assumptions to accelerate revenues into AMP6 in NPV neutral terms. The CMA's assessment of Bristol Water's PR14 appeal also used changes to PAYG ratios to solve financeability problems. The CMA was not explicit about limitations on the use of PAYG ratios, but did note:[164]

> *"Moving revenue between regulatory periods (eg via PAYG changes) may be NPV neutral. However, if the amounts are excessive then this would be detrimental for both the company's long-term financial position (as recognised by the credit rating agencies) and for customers (as inter-generational differences could result in current customers paying more than their fair share)."*

The use of PAYG ratios at PR19 may be more complicated because of the transition from RPI inflation to CPIH inflation, the effect of which (assuming CPIH is expected to be lower than RPI) would be to increase bills and accelerate revenues in the short-term (but have the opposite effect in the long term).

We also note that Ofwat has reiterated its position that companies can use adjustments to dividend payments and/or equity injections to manage financeability issues, but these steps

[163] See Ofwat (2017) Delivering Water 2020: Our final methodology for the 2019 price review, Table 11.2.
[164] See CMA (2015) Bristol Water plc, para 11.14.

will most directly impact on gearing ratios and only have a limited impact on interest coverage ratios.

Noting the CMA's position on these issues, if UU identifies a financeability issue in its PR19 business plan, it will need to consider whether changes to PAYG ratios and RCV run-off rates could resolves those problems. We would suggest that restriction of dividends (on the notional balance sheet) and equity injections should only be considered if the financeability problems cannot be resolved using PAYG ratios or changes to RCV run-off rates. Judgement will have to be exercised to work out the limitations on the use of PAYG ratios or RCV run-off rates, for example taking into account if these tools could lead to undesirable complications over the medium and longer term if accelerating revenue into AMP7 would cause a decrease in revenue, and associated financeability challenges, over AMP8 (or later years) or if accelerating revenue into AMP7 would lead to undue volatility of customer bills over time.

6. Appendix A: Past UK regulated utility M&A transactions

Table 41: Acquisition premium/discount compared to RCV

Date of acquisition	Asset	Premium to RCV
Dec-95	Mid Kent Water	13.3%
Dec-95	Northumbrian Water	22.5%
May-96	Southern Water	52.0%
Jan-97	Hartlepool	24.0%
Jan-99	Wessex	65.4%
Jan-99	York Water Works	46.4%
Dec-99	Cambridge	60.4%
Oct-00	Dwr Cymru	-7.1%
Oct-00	Thames Water	17.6%
Mar-01	Mid Kent Water	-9.0%
Apr-04	Cambridge Water	16.9%
Sep-04	NGT: LDZs	14.0%
Oct-04	South Staffordshire	25.0%
Feb-05	Mid Kent Water	24.0%
Apr-05	East Surrey	30.0%
May-06	Bristol Water	32.0%
May-06	BAA	25.0%
Oct-06	AWG	22.0%
Oct-06	South East	22.5%
Oct-06	Thames	23.4%
Nov-06	Viridian	45.0%
Oct-07	Southern	30.6%
Oct-07	South Staffordshire	26.1%
Nov-07	Kelda	30.0%
Nov-09	Southern Water	23.0%
Mar-10	Southern Water	25.0%
Jul-10	EDF Energy	27.0%
Dec-10	South East Water	25.0%
Mar-11	Eon networks (PPL)	28.0%
Jul-11	Northumbrian Water	30.0%
Aug-11	Thames Water	24.0%
Aug-11	Cambridge Water	16.0%
Oct-11	Bristol Water	20.0%
Oct-11	Bristol Water (20% stake)	17.0%

Date of acquisition	Asset	Premium to RCV
Jun-12	Veolia	30.0%
Jun-12	Cambridge Water	0.3%
Jul-12	Wales and West Utilities	25.0%
Feb-13	Sutton & East Surrey	46.0%
May-13	South Staffordshire	68.0%
Jun-13	SVT	32.0%
Sep-13	Bristol Water	8.1%
Sep-13	Sutton & East Surrey	39.0%
Apr-14	Kelda Group	18.0%
Apr-15	Veolia Environment	30.0%
Apr-15	Bournemouth Water	30.0%
May-16	Southern Water Services	43.0%
Oct-16	Sutton & East Surrey	48.0%
Nov-16	Dee Valley	56.0%
Dec-16	Bournemouth Water	30.0%
Dec-16	Bristol Water	15.0%
Mar-17	National Grid	50.0%
Mar-17	Scotia Gas	45.0%
Mar-17	Thames Water	32.0%
Apr-17	Affinity Water	39.0%
Dec-17	Thames Water	29.0%
Dec-17	Anglian Water	39.0%

Source: Macquarie Research, EY analysis

7. Appendix B: RPI-stripped real WACC parameters and estimates re-stated in nominal terms

As we noted in the main text of the report we do not agree with Ofwat's decision to estimate the WACC in nominal terms. It is also not necessary to estimate a nominal WACC to estimate a real WACC, so we have not estimated a nominal WACC as part of our work. UU has, however, requested that we provide nominal values for all of our WACC parameter estimates so that it can complete Ofwat's PR19 Business Plan tables.

Accordingly, in this Appendix we have converted each relevant WACC parameter into nominal terms to enable UU to complete those tables. Because we do not estimate a nominal WACC these values should not be regarded as such: they are simply the real WACC and parameter estimates converted into nominal terms using expected RPI inflation for the price control period.

The RPI inflation rate which has been used in these calculations is 3.15% in both AMP7 and AMP8 i.e. the mid-point of the range stated in Table 34. The values have been converted from real to nominal terms using the Fisher equation.

Table 42: EY WACC parameters restated in nominal terms (converted using expected RPI inflation for the corresponding price control period) (%)

	AMP8		AMP7	
	Min	**Max**	**Min**	**Max**
Total market return (%)	8.31	9.85	8.31	9.85
Risk-free rate (%)	4.18	4.70	3.15	3.67
Equity risk premium (%)	4.13	5.16	5.16	6.19
Debt beta	0.0	0.0	0.0	0.0
Asset beta	0.30	0.35	0.30	0.35
Equity beta	0.86	0.88	0.86	0.88
Gearing (%)	65	60	65	60
Cost of equity (post-tax)	**7.72**	**9.21**	**7.57**	**9.08**
Cost of existing debt (%)	4.4	4.6	4.7	5.2
Cost of new debt (%)	5.7	6.2	3.2	3.7
Existing/new split (%)	80/20	80/20	75/25	75/25
Transaction costs (%)	0.1	0.2	0.1	0.2
Cost of debt (pre tax)	**4.80**	**5.16**	**4.41**	**5.03**
Appointee WACC (vanilla)	**5. 82**	**6.78**	**5.52**	**6.65**

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