A review of Ofwat's proposed approach to total market returns

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KPMG LLP

Contents

Key messages

- PwC has forecast total market returns (TMR) for PR19; 2020-2025 and estimated a nominal TMR of 8.0-8.5%, based on analysis of current market data. This equates to 5.1% to 5.5% real.[1]
- The proposed TMR is a significant reduction from UK regulatory precedent of 6.1%-7.3%,[2] based on 100years+ of data.
- The approaches used to estimate TMR have important shortfalls, which serve to understate TMR. The key issues include:
  - i. The Dividend Discount Model estimates a geometric average, which fails to compensate investors for volatility in TMR over time. CMA precedent and analysis in the widely used Dimson Marsh and Staunton (DMS) publication suggests a volatility adjustment of +75 to +150bps.
  - ii. The analysis of market to asset ratios (MARs) fails to account for RCV growth and non-regulated revenue. Adjusting for this increases TMR by +100 to +130bp.
  - iii. The survey evidence is not reliable as it was not specified whether respondents should provide TMR in real or nominal terms.
- The premise of PwC's reduction in TMR is that low interest rates have reduced returns on equities and that this low interest rate environment will continue until 2025 - "lower for longer". There are three key issues with this:
  - i. The evidence base for lower for longer is at best mixed, with recent statements by the Bank of England and market data indicating that rates are likely to rise.
  - ii. There is evidence (including in PwC's own analysis) of a negative correlation between interest rates and returns on equities, such that low interest rates do not result in reduced equity returns.
  - iii. The average TMR in recent years is statistically indistinguishable from the long-run TMR.
- Relying on short-term estimates would introduce substantial financial risk to the firms and investors on the basis of assumptions which cannot be relied upon.
- TMR for regulatory settlements should be based on long-run averages, in line with regulatory precedent. Long-run data on real TMR suggests a range of 6.25% to 7.3%.
- Sole reliance on short-term market data, whilst not advisable, should at least involve a correction for the shortcomings in PwC's analysis, which results in a real TMR of approximately 6.5%.

[1] Using RPI inflation of 2.8%
[2] Between 2013 and 2017

1 Executive summary

In July 2017, Ofwat published a document 'Delivering Water 2020: Consulting on our methodology for the 2019 price review' consulting on its methodology for the 2019 price review (the "PR19 Consultation") for the water and wastewater monopoly service providers in England and Wales. This document outlines the approach and estimates that Ofwat is considering adopting with respect to the allowed cost of equity for PR19.

The PR19 consultation is important to examine closely because it signals a possible fundamental change to the approach that Ofwat as well as other regulators have previously employed with respect to estimating a key component of the cost of equity: the total market return ('TMR'). Specifically, Ofwat refers to the use of 'a market based cost of equity, placing less weight on long-run historical average equity returns', and in fact places no weight on their estimates of actual, outturn historical returns. Under the revised approach, Ofwat refers to a cost of equity range of 3.8% to 4.5% on a real RPI basis[3], compared to 5.65% at PR14.[4]

To support its proposed estimates, Ofwat has commissioned a report from its advisors, PwC, to consider the implications of what it describes as a 'lower for longer' interest rate era on the cost of equity for PR19. PwC estimates a nominal cost of equity range of 6.7% to 7.4%[5], based on a nominal TMR of 8.0% to 8.5%[6], significantly below long-term market estimates of 10.3%.[7] Ofwat's own estimates for TMR in PR09 were 6.75% in real terms[8] compared to their current estimate of 5.1%-5.5% TMR (real). This again marks a significant shift from their previous determinations of TMR.

Ofwat appears exclusively to rely on PwC analysis and PwC's estimates of TMR, which in turn, are mainly based upon analysis using the dividend discount model ('DDM'), with additional evidence from market to asset ratios ('MARs') and investor surveys. The estimates appear to place no weight on historical outturn equity returns, achieved by investors over the long-run or take account of the limitations and uncertainties associated with these estimates. They also do not appear to take into account other important market evidence such as negative correlation between interest rates and market risk premia.

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[3] PwC (2017), 'Refining the balance of incentives', p100.
[4] Ofwat (2014), 'Setting price controls for 2015-20 Final price control determination notice: policy chapter A7 – risk and reward', p41
[5] PwC (2017), 'Refining the balance of incentives', p100.
[6] PwC (2017), 'Refining the balance of incentives', p92.
[7] Dimson, Marsh, Staunton (2017), 'Credit Suisse Global Investment Returns Yearbook. 7.3% real, uplifted for 2.8% RPI inflation for comparability.
[8] Ofwat (2014), 'Setting price controls for 2015-20 Final price control determination notice: policy chapter A7- risk and reward', p41.

Table 1: Summary of PwC's Analysis

Source	Estimate of nominal TMR	Equivalent real TMR, using RPI of 2.8%
DDM (spot)	8.30%	5.40%
DDM (5-yr average)	8.80%	5.80%
Market Asset Ratio analysis	7.6%-8.1%	4.7% - 5.2%
Investor surveys	8.10%	5.20%
Proposed range	8.0%-8.5%	5.1%- 5.5%

Source: PwC (2017), Balance of Incentives, Appendix C and KPMG deflation analysis

1.1 Scope of this report

Anglian Water, Affinity Water and Northumbrian Water have jointly commissioned KPMG LLP to independently review the PwC analysis of TMR (and its constituent components ERP and RFR), and consider how Ofwat has reflected this analysis in its consultation and could reflect it in its PR19 determination. In undertaking this review, KPMG primarily examined Appendices A-C of PwC's report along with Section 10.6 and Appendix 13 of Ofwat's consultation.

The subject of this report is the components of the cost of equity that relate to the overall market, and not the water sector specifically. At the same time, the overall cost of equity may be influenced by sector-specific developments such as the introduction of competition in some elements of the value chain, changes to the regulatory framework concerning performance and corresponding financial exposure, as well as efficiency challenges.

The scope of this review is to:

- Assess the robustness of the evidence and analysis provided by PwC, which Ofwat has indicated it is minded to rely upon;
- Provide insight into and outline some implications of the level of uncertainty associated with forecasting investor expectations of TMR;
- Provide commentary on the analysis and evidence that Ofwat might consider as it seeks to strike an appropriate balance between maintaining low tariffs for customers whilst ensuring that the price control settlement is financeable and provides appropriate incentives for investment; and
- Discuss what can be concluded from the evidence presented.

The purpose of this report is not to defend one particular approach or a particular level for the cost of equity, but to assess the robustness, importance and usefulness of differing approaches towards estimating the TMR for the purposes of a five year charge control.

1.2 The context of Ofwat's announcement is important

TMR is inherently difficult to estimate because it represents market investors' expectations of future returns; it is not therefore directly observable or measurable. This

difficulty in estimating TMR is exacerbated at present due to significant distortions in financial markets in general as a result of the recent monetary policy, lasting consequences of the financial crisis and uncertainty associated with Brexit, among other factors.

The implication of these factors is that the UK market is arguably not currently in a state of economic equilibrium. This is reflected in exceptionally low interest rates implying from some data a negative real return on UK gilts, a highly unusual circumstance. These abnormal market conditions raise questions around whether some of these unusual market parameters could be directly translated into implications for the allowed cost of capital for regulated utilities and how they should be reflected in the determination. It is fitting, therefore, to ask the question and consider the potential consequences of the current economic environment on the setting of the regulated cost of capital, as Ofwat has done by commissioning the PwC report. The UK regulators Network (UKRN) has also recognised the need to review the current approach – and will be commissioning an academic review of the approach to setting the regulated cost of capital in the near future.[9]

The results of the PwC report – being a real TMR of 5.1% to 5.5% – could have significant implications for financeability and cash flows of the regulated firms, allocation of capital by investors, perception of the UK utilities sector, and potentially for consumers and should, therefore, be reviewed in close detail.

The significance of Ofwat's announcement that it may adopt such a significant reduction in TMR estimate is best illustrated with reference to the context in which it has been made.

Prior to 2014, estimates of the TMR had almost universally been based on the long-term (100+ years) averages of historical equity returns, of around 7% real[10], following the recommendations of a report by Smithers & Co that was commissioned by the UK economic regulators and the OFT in 2003 as well as wider empirical research in corporate finance.[11] It was widely agreed that the best estimate of TMR for charge control purposes was to use long-run achieved returns by investors. This agreement on the approach contributed to regulatory stability and predictability. [12]

The determination of Northern Ireland Electricity's ('NIE') price control appeal by the Competition and Markets Authority (CMA) in 2014 was seen as a significant reduction from this consensus, resulting in a reduction to the TMR of about 50 bps to 6.5%.[13]

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[9] Section 4.8 of the UKRN's Strategy and Forward Work Programme for 2017/18, dated 14 June 2017.
[10] Dimson, Marsh, Staunton (2017), 'Credit Suisse Global Investment Returns Yearbook.
[11] Wright, S., Mason, R. and Miles, D. (2003), 'A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K'.
[12] For example, Ofgem stated in paragraph 1.41 of its 2014 decision on the methodology for assessing equity market returns that 'We note that maintaining regulatory stability is important to reassure investors in the [energy] sector. In our Strategy decision, we stated that our range for the cost of equity was 6.0 to 7.2 per cent. We consider that there are strong advantages in terms of regulatory consistency in keeping within this range'.
[13] Competition Commission (2014), Northern Ireland Electricity Limited price determination- final determination.

Ofwat is now effectively consulting on a complete transition away from the approach that was previously adopted based on robust long-term estimates in favour of full reliance on a relatively new and untested approach ignoring historical returns; this new approach yields a real TMR of 5.1%-5.5% according to PwC and Ofwat.

This is a *further* reduction of between 100bp and 140bp from the CMA figure of 6.5%, and up to 200bp (2%) from the starting position a few years ago. This cumulative change is more than 50% of the overall cost of capital.

1.3 The analysis of DDM underestimates TMR and has limited predictive power

PwC relies primarily on one approach to estimate the TMR—the DDM; the rest is effectively supporting evidence. This approach does not take into account traditional, historical measures of TMR and, in effect, places all weight on one estimation method. This is problematic when the approach in question suffers from considerable uncertainty and potential biases: a more prudent approach when confronted with such uncertainty might be to rely on several approaches, which would reduce the extent to which the final result is influenced by a single set of estimates prone to biases.

PwC's DDM findings are highly sensitive to various inputs, including whether spot rates or trailing averages are used, the estimation window for the assessment, and the dividend growth rate assumption. PwC's own sensitivities on the dividend growth forecasts show a range of as much as 350bps[14]—equal to nearly the entire value of the overall real rate of return set by Ofwat at the time of PR14.

PwC's DDM calculates a geometric average return. It does not therefore compensate investors for volatility of within year TMR, due to changes in the market price. Academic studies such as DMS (2017) and precedent from the CMA support an adjustment to move towards the arithmetic average, based on an estimate of expected volatility. A volatility adjustment of 75bp[15] (CMA) to 150bp (DMS) is therefore required[16], resulting in an outturn nominal TMR of 9.6%-10.3%, using PwC's 5 year average and 9.1%-9.8% using PwC's spot-rate DDM.

PwC's TMR range of 8.0%-8.5% is in line with its spot rate TMR estimate arising from its DDM approach. Empirical analysis and academic studies referred to in this report show that spot rate DDMs have poor predictive power over five year periods. It therefore appears inappropriate to place weight on a spot-rate TMR alone, for charge control purposes.

These observations highlight the inherent uncertainty with using DDM to forecast TMR, introduced by the need to forecast dividend growth. Some reliance can be placed on DDM, possibly reflecting some reduction in the TMR, but it needs to be a DDM that

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[14] See PwC (2017) 'Refining the balance of incentives', p83.
[15] Competition Commission (2014), Northern Ireland Electricity Limited price determination- final determination, Appendix A13(2)-4.
[16] DMS, 2017, Table 11 p34 show that their alternative decomposition approach would estimate a forward looking geometric TMR of 5.45% (4.59% geometric mean yield plus 0.86% real growth). To this, DMS suggest adding an uplift of 1.5% to arrive at the equivalent of an arithmetic return – p 37."

covers at least five periods. Further, the DDM should be uplifted to account for volatility in TMR before it can be used in a charge control setting.

1.4 The analysis of market to asset ratios ('MARs') underestimates TMR

PwC infers the TMR based on MARs implied by secondary market equity prices for two listed water companies. The analysis controls for the potential impact of expected outperformance, which is appropriate.[17]

However, PwC's analysis omits the impact of regulatory capital value (RCV) growth and non-regulated services on the listed water/wastewater companies' valuations. Assuming a constant real RCV and including non-regulated services results in a nominal TMR estimate of 8.7% to 9.4%, which is a real TMR of 5.7% to 6.4% (adjusted for RPI inflation of 2.8%).

The following additional observations can be made with respect to PwC's analysis and reliance upon MARs:

- MARs for the listed water companies exhibits considerable volatility, and has been below one in at least one year in each of the last three AMPs.[18]
- TMR is an economy-wide variable, and PwC's sample is unlikely to be representative of the broader economy.
- The sample can also be a biased representation of the water industry, since the listed water companies are considerably larger than the average company in the sector.
- The stock prices are likely to be influenced by limited liquidity, in the absence of which the MAR would be higher and the estimated TMR lower than currently estimated.

Collectively, these factors illustrate the uncertainty associated with inferring market wide TMR from an analysis of the MARs of two companies in the water sector.

1.5 The investor surveys referred to by PwC are unlikely to be a usable datapoint in the current context

Survey data is rarely used to set the level of the TMR in the context of setting price controls. This is in part because the nature of the responses is potentially sensitive to the framing of the question, and the bases of the responses are not transparent. In the current context, these issues are equally evident.

The survey data quoted does not appear to distinguish between real and nominal returns in the questions it poses to respondents, which suggests that at least a proportion of respondents could have replied with estimates of the real risk free rate and ERP.[19] This

[17] Whilst adjusting for expected outperformance is needed, the level of outperformance expected and therefore the size of the adjustment is necessarily judgmental.
[18] Credit Suisse (2016), 'Revisiting the equity risk', 21st July.
[19] See Fernandez et al. (2017).

would understate the nominal TMR, and imply that this information cannot be seen as useful information with which to validate the findings from the DDM.

The survey data might be, at the same time, useful for highlighting trends in the TMR. Comparing the 2017 survey to its 2015 counterpart actually suggests that the TMR is increasing rather than decreasing. The survey also highlights the wide range of views on the appropriate TMR, which further reinforces the lack of robustness associated with forward-looking assumptions.

1.6 Ofwat and PwC have not specified what approach will be used to deflate the nominal TMR

PwC and Ofwat have not been clear on the proposed approach to deflating the nominal TMR estimates. It is important to use an inflation estimate that is consistent with the underlying approach to estimating TMR.

Ofwat might want to consider this and propose a transparent and well-justified methodology to deflate the nominal TMR estimates, which can be consulted upon.

1.7 Forecasts of the risk-free rate have little or no predictive power with respect to TMR

PwC has introduced the concept of 'lower for longer' to describe the expectation that interest rates will remain low for several years. PwC explicitly suggests that the expectation of low future interest rates implies low future equity returns: '*current market interest rate conditions in the UK, and as a consequence returns, are expected to diverge from long-run historical averages for an extended period of time*'.[20] This suggestion stands at odds with academic literature and empirical evidence quoted by PwC.

It also contradicts PwC's own findings that the impact of low recent interest rates has been offset by increases in the equity risk premium ('ERP').

More generally, bond yields might be less stable than equity returns.[21] Indeed the evidence on 'lower for longer' has shifted in the eight months since PwC did its analyses. For example, BoE Governor Mark Carney, in the most recent press conference discussing the Bank's latest Inflation Report (August 2017) indicated that despite markets having increased its expectations of a rate rise, its current expectations are still "insufficient". This illustrates both the volatility of interest rates but also the risk of relying on short term estimates of interest rates for the purposes of a five year charge control.

It follows that the assumption that low forecast interest rates imply low equity returns is not supported by robust evidence. This in turn undermines a key justification for moving to such a significantly lower TMR, especially in one large step that follows on previous reductions.

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[20] PwC (2017), 'Refining the balance of incentives', p4.
[21] Smithers & Wright (2014), 'The Cost of Equity Capital for Regulated Companies: A Review for Ofgem', p13.

1.8 PwC's analysis implies substantially negative risk free rates

The lower bound of PwC's range for the real risk free rate (RFR) is unprecedented historically at negative 1.3%.[22] The current real returns on UK gilts, which form the basis of PwC's estimate, are due to highly unusual macroeconomic conditions, created, *inter alia*, by the BoE's quantitative easing policy. Little weight should be attached to these values as a proxy for the long-term real return required by investors in risk free assets.

For Ofwat to embed this negative RFR in its regulated cost of capital, it would need to be confident that the large distortion in UK gilt markets will remain for the long-term i.e. that a negative RFR represents an actual position of equilibrium for the UK economy that will persist. It is hard to see how one can be confident in this assumption.

Adopting a negative RFR, even implicitly, would constitute a major departure from past regulatory determinations of the real RFR. Indeed, this was recognised by other regulators. For example, in Ofcom's publication on the upcoming wholesale local access (WLA) charge control it suggested that it would not, as a matter of principle, include a negative RFR in the regulated cost of equity, despite the current data on UK gilt yields.[23]

1.9 Short-term trends in outturn equity returns do not provide robust evidence of lower return expectations

The premise of PwC's report is that there has been a shift in investor's expectations for returns on UK equities. There is some cursory market evidence that shows returns in the current period have been lower than the long-run past so that some reduction from the long-term trend might be justified.[24] However, short-term deviations in TMR should be contextualised in the high volatility of TMR over time and documented mean reversion. For example, real TMR in 2016 was positive 15.2%. This volatility in TMR makes it difficult to conclude robustly that there has been a permanent shift in TMR. In fact, the average return over any sub-period over the last 20 years is statistically indistinguishable from long-run historical average returns since 1900.[25]

Therefore there appears to be insufficient evidence to justify large changes in total market returns. In part, the lack of robust evidence for such a large reduction in TMR is due to the volatility in TMR over time, which renders statistically robust results of a shift in TMR unlikely. However, the TMR estimate is a fundamental input to the regulatory settlement. It has significant implications for financeability and incentives to invest. There is a risk of making a large reduction in TMR (over and above the recent reduction in TMR since the CMA's NIE case) on the basis of weak evidence.

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[22] We use the nominal lower bound RFR stated by PwC of 1.5% and deflate this using RPI of 2.8%.
[23] Ofcom (2017), Wholesale Local Access Consultation, A16.21.
[24] If one simply takes average TMR data over time, 2008-2016 shows average real TMR of 4.7% compared to the long-run average of 7.3%.
[25] We show this by undertaking statistical tests to determine if there has in fact been a shift in achieved returns by using DMS long-run historical data (see section 9).

1.10 A more appropriate TMR estimate for PR19 requires reliance on long-run data

TMR is inherently an unknown parameter, because its forward-looking estimation is trying to predict what investors' expectations of returns will be in the future.

There are three main methods which can be adopted in order to estimate TMR.

I. Long-run historical achieved returns i.e. the sole approach used by UK regulators prior to the CMA NIE case
II. Long-run ex ante returns – where the DDM is applied each year over the long-run past.
III. A current market estimate – based on the DDM applied to today's market, MARs and surveys i.e. the approach adopted by PwC.

There are a number of judgments to be made when deciding which approach to take, in order to estimate TMR, none of which are unambiguously supported by the evidence. Ofwat's task is therefore difficult – in that it must strike the right balance, based on in some cases conflicting evidence. This judgement also means there is uncertainty involved in forecasting TMR out to 2025.

In relying on PwC's current market (or spot rate) TMR estimate, Ofwat would need to be comfortable that there has been a very large, permanent reduction in TMR. However, there is no statistically robust evidence to support this. Relying on short-term estimates would introduce substantial financial risk to the firms and investors on the basis of assumptions which cannot be relied upon.

The judgment and uncertainty in estimating TMR should also be contextualised in the asymmetric risks of setting cost of equity too low and too high. It is widely acknowledged that the result of setting the cost of equity slightly higher i.e. a small increase in customer bills are less consequential than setting the cost of equity too low i.e. financeability issues and suboptimal investment.

The balance of evidence suggests that there is a strong case for TMR for regulatory settlements to be estimated primarily based on long-run averages. The long-run averages embed lessons learnt from the past and provide some protection against apparent volatility in TMR, which is perhaps the only feature of TMR that can be confidently forecast to 2025. Relying on long-run evidence also contributes to the stability and predictability of the regulatory regime, which is vital for maintaining investor confidence in the sector. This was recognised by Ofwat in PR14 when despite the short term market evidence showing substantially higher TMR, Ofwat relied on the long-run average data and set a TMR of 7.4%.

Long-run data on TMR suggests a range of real TMR of 6.25% to 7.3%.

1.11 Whilst the evidence does not support use of a spot rate TMR, at a minimum, errors in the analysis should be corrected

There appears to be no sufficient evidence to place significant weight on a spot estimate of TMR, as supported by analysis in this report and indeed PwC's own position in PR14

(where it dismissed a spot rate DDM based on its unreliability) [26]. However, should Ofwat's view change between PR14 and PR19 and weight be placed on the spot estimate, at the very minimum, the necessary adjustments and errors identified in this report should be corrected.

Table 2: Errors in PwC's spot rate DDM that should be corrected

	PwC spot rate DDM	PwC 5-year average DDM		MARs TMR
PwC estimate, nominal	8.30%	8.80%	PwC estimate, nominal	7.6% – 8.1%
Uplift to move away from geometric average	+75bp-+150bp	+75bp-+150bp	Uplift for RCV growth a	+100bp
			Uplift for non-regulated revenue	+30bp
Corrected estimate	9.1%-9.8%	9.6%-10.3%	Corrected estimate	8.6% – 9.4%

Source: PwC (2017), Balance of Incentives, Appendix C and KPMG deflation analysis

Table 2 shows that correcting PwC's estimate supports a range of nominal TMR of 8.6% to 10.3%, with a mid-point of 9.5%, which is approximately 6.5% in real terms.

[26] PwC (2014), 'Updated Evidence on the WACC for PR14: a report prepared for Ofwat', p29.

2 Scope and objectives

Anglian Water, Affinity Water and Northumbrian Water have commissioned KPMG LLP to independently review and comment on the PwC analysis of the cost of equity and TMR, and how Ofwat has reflected this analysis in its consultation.

In undertaking this review, we primarily examined Appendices A-C of PwC's report along with Section 10.6 and Appendix 13 of Ofwat's consultation.

The focus of the report is on the components of the cost of equity that relate to the broader market (i.e., TMR and its components; RFR and ERP) and not the water sector specifically. At the same time, the cost of equity may have been influenced by sector-specific developments such as the introduction of competition in some elements of the value chain.

In undertaking this review, it is acknowledged that there has been a general reduction in interest rates in recent years, and that this is likely to affect the short-term cost of capital. The focus of this review is therefore not to advocate for a particular level for the cost of equity, but to assess the robustness of differing approaches towards estimating the TMR for the purposes of a five-year charge control.

The focus of this review is to:

- Assess the robustness of the evidence and analysis provided by PwC, which Ofwat has indicated it is minded to rely upon;
- Provide insight into and outline some implications of the level of uncertainty associated with forecasting investor expectations of TMR;
- Provide commentary on the analysis and evidence that Ofwat might consider as it seeks to strike an appropriate balance between maintaining low tariffs for customers whilst ensuring that the price control settlement is financeable and provides appropriate incentives for investment; and
- Discuss what can be concluded from the evidence presented.

The purpose of this report is not, therefore, to defend a particular approach or a particular level for the cost of equity, but to assess the robustness of differing approaches towards estimating the TMR for the purposes of a five year charge control.

The remainder of the report is structured as follows:

- Section 4 summarises PwC's approach to estimating TMR, and briefly comments on the overall approach adopted.
- Section 5 examines PwC's TMR estimates based on the DDM. It identifies some important shortfalls in PwC's TMR estimate and suggests amendments, based on empirical analysis.
- Section 6 examines PwC's TMR estimates based on market-asset-ratios ('MARs') and survey evidence. It identifies some important limitations in PwC's TMR estimate and suggests amendments, based on empirical analysis.

- Section 7 considers Ofwat and PwC's approach to inflation. It highlights the need to use the appropriate inflation figure for each method used in order to estimate TMR.
- Section 8 reviews PwC's evidence on lower for longer and the low risk free rate assumed by PwC. It analyses recent market data on the outlook for UK interest rates and sets out what Ofwat needs to assume, in order to rely on low interest rates prevailing out to 2025.
- Section 9 discusses the relevance of low interest rates for estimating TMR, given the negative correlation between ERP and RFR. It sets out the evidence for the negative correlation and the implications this has on drawing inferences on TMR from reducing RFR.
- Section 10 analyses whether recent historical data provides support for a permanent shift in TMR. It does so by performing statistical tests on TMR achieved in recent periods compared to the long-run past.
- Section 11 sets out the long-term data available for estimating TMR and the benefits of relying on long-term data.
- Section 12 sets out the implications of the evidence considered for how TMR should be estimated for PR19. It sets out the assumptions and benefits behind the various approaches that can be adopted and the TMRs estimated via each approach, before concluding on the appropriate approach to adopt.

3 Context of Ofwat's consultation

This section provides further detail in respect of the context of Ofwat's July consultation paper.

Ofwat's proposed approach represents a significant change from regulatory precedent. To date regulators have placed weight on historical data and long-run ex-ante estimates of TMR, with recent decisions by UK regulators using a TMR of c.6.5%. This is largely a result of the CMA's NIE case (2014) where a TMR of 6.5% was relied upon. Ofwat's reliance on a real TMR range of 5.1%-5.5% is therefore a reduction of 100-140bp from recent UK regulatory settlements.

This reduction in the allowed return comes at a time of economic and political uncertainty – such as the UK's decision to leave the EU, loss of confidence in the pound and the upward sloping yield curve. This economic uncertainty increases the risk for investors in UK infrastructure.

3.1 Ofwat's PR19 consultation

On 11 July 2017, Ofwat published 'Delivering Water 2020: consultation on PR19 methodology' (the 'PR19 Consultation').

This document sets out a broad range of issues for discussion around how the PR19 price control determination should be implemented.

The issues discussed include Ofwat's preliminary view of the methodology it will employ to determine the cost of capital, as well as initial proposals for the range of values it will adopt. Issues relating to the cost of equity are discussed in Section 10 of the main document, and in further detail in Appendix 13.

Ofwat has signalled that the allowed returns will be significantly lower in PR19. [27] It has highlighted that a significant driver of lower allowed returns is its view that the TMR for PR19 will be lower than in prior periods. This is driven by Ofwat's view that "there are compelling reasons why the interest rate environment is expected to remain low by historical standards through 2020-25."[28]

A prominent assertion made in various places throughout the Ofwat consultation is that low expected interest rates imply low TMR in future years. Ofwat cites analysis by Barclays[29] and Credit Suisse[30] in support of its position.

Ofwat also indicates that it considers that the risk free rate should be considerably lower for PR19 than for PR14, and possibly even negative throughout the period.[31]

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[27] Ofwat (2017), 'Delivering Water 2020: consultation on PR19 methodology', p20.
[28] Ofwat (2017), 'Delivering Water 2020: consultation on PR19 methodology', Appendix 13, p8.
[29] Barclays (2017), 'Equity gilt study'
[30] Credit Suisse (2017), 'Global investment returns yearbook 2017 – slide summary deck', slide 11.
[31] Ofwat (2017), 'Delivering Water 2020: consultation on PR19 methodology', Appendix 13, p93.

Ofwat concludes that the evidence it has reviewed to date is indicative of a cost of equity range of 3.8% to 4.5% on a real RPI basis, compared to 5.65% at PR14.[32] This cost of equity range is based on a real TMR of 5.1% to 5.5% (based on 2.8% RPI).

In arriving at its proposals, Ofwat has relied extensively on a report and accompanying analyses prepared by PwC: 'Refining the balance of incentives for PR19' (the 'PwC Report').

3.2 Ofwat's proposals represent a significant move away from regulatory precedent

The significance of Ofwat's announcement is best illustrated with reference to the context in which it has been made.

Prior to 2014, estimates of the TMR had almost universally been based on long-term (since 1900) averages of historical equity returns, following the recommendations of a report by Smithers & Co that was commissioned by the UK economic regulators and the OFT in 2003. [33] It was widely agreed that the best estimate of TMR for charge control purposes was to use long-run achieved returns by investors. The consensus prevailed for a considerable period of time, despite significant variations in outturn equity returns. The determined TMRs did not vary considerably during this period, and the variations were, without exception, considerably smaller than the change that is currently being proposed by Ofwat. This is consistent with the evidence presented in Section 10 on outturn equity returns, which illustrates the difficulties in demonstrating any 'new' level of TMR based on historical data.

This agreement on the approach contributed to regulatory stability and predictability.[34] Such stability has prevailed so far in UK regulation. Table 3 below shows that recent UK decisions on TMR have been broadly consistent and not below 6.20% real.

Table 3: Regulatory Precedent for TMR

Date	Oct-13	Feb-14	Mar-14	Jun-14	Dec-14	Dec-14	Feb-15
Regulator	ORR	CAA	CC	Ofcom	Ofwat	UR	Ofcom
TMR	6.75%	6.25%	6.50%	6.30%	6.75%	6.50%	6.30%

Date	Oct-15	Apr-16	Sep-16	Nov-16	Mar-17	Jun-17
Regulator	CMA	Ofcom	UR	Ofgem	Ofcom	UR
TMR	6.50%	6.30%	6.25%	7.30%	6.20%	6.50%

[32] Ofwat (2014), 'Setting price controls for 2015-20 Final price control determination notice: policy chapter A7 – risk and reward', p41.
[33] Wright, S., Mason, R. and Miles, D. (2003), 'A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K'.
[34] Smithers & Wright (2014), 'The Cost of Equity Capital for Regulated Companies: A Review for Ofgem', p13.

The use of historical outturn equity returns as a basis for estimating TMR was not due to lack of consideration of alternative approaches. UK regulators considered the use of forward-looking approaches such as DDM, but placed limited weight on such approaches on each occasion. An important motivation for the rejection of forward-looking models such as DDM was the perceived methodological weaknesses associated with these approaches. Mainly, it was not predicated on an assumption of mean-reversion in TMR as suggested by PwC. [35]

In PR09, Ofwat estimated the range for the TMR exclusively based on historical outturn returns; the choice of a point estimate towards the top of this range was motivated by a concern regarding 'general economic conditions, and not by Ofwat's estimate of forward-looking returns. In fact, Ofwat stated that:

'*A key difficulty with the DGM [equivalent to DDM] is the need to make an estimate of the future dividends expected by investors. Europe Economics' view was that we should be particularly cautious about placing weight on DGM estimates calculated during a period of financial turmoil because analysts' forecasts of the absolute amount of future dividends are likely to be biased upwards when share prices are falling. In addition, Europe Economics advised that DGM projections which relied on proxies for analysts' forecasts may not accurately reflect investors' expectations of long-run dividend growth for a particular company. Therefore, we have not placed particular weight on a DGM-derived cost of equity in our final determinations*.'[36]

This stands in significant contrast to its current position, where a 100bp-140bp reduction in TMR is being proposed, in light of a DDM analysis. Ofwat states that, 'in the 2009 price review, we increased the allowed equity return to allow for the expected impact of the global financial crisis.'[37] In fact, the TMR implied by Ofwat's PR09 determination (7.4%) was only 40bps above the level proposed by Smithers & Co[38], and did not represent a significant departure from precedent determinations. The 7.4% TMR is significantly below the spot estimates of TMR in 2008 which, according to PwC, were between approximately 11% and 12%,[39] which equates to a real TMR of 8.0% to 9.0% (using RPI inflation of 2.8%).

The determination of NIE's price control appeal by the CMA in 2014 was seen as a major departure from the consensus of relying solely on long-run historical achieved returns, despite resulting in a reduction to the TMR of only 50 bps.[40] The determination triggered a full consultation by Ofgem purely on the subject of the appropriate basis for estimating TMR[41]. NIE itself strongly emphasised the departure of the CMA's approach from that adopted in prior regulatory determinations[42]. It is particularly significant that the CMA

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[35] PwC (2017), 'Refining the balance of incentives', p77.
[36] Ofwat (2009), 'Future water and sewerage charges 2010-15: final determinations', pp129-130.
[37] Ofwat (2017), 'Delivering Water 2020: consultation on PR19 methodology', p207.
[38] Wright, S., Mason, R. and Miles, D. (2003), 'A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K'.
[39] PwC (2017), 'Refining the balance of incentives', p82; we read off TMR estimates in Figure 25.
[40] Competition Commission (2014), Northern Ireland Electricity Limited price determination- final determination.
[41] See Ofgem (2013), 'Decision on our methodology for assessing the equity market return for the purpose of setting RIIO-ED1 price controls', February.
[42] Northern Ireland Electricity Limited (2013), 'Response to the Competition Commission's Provisional Determination', November, pp80-81.

continued to place significant weight on historical estimates – the 'innovation' in the CMA's approach was to place non-zero weight on an alternative approach.[43]

The preceding observations highlight that methodological changes to the estimation of the TMR – however minor – have been thoroughly considered, evidenced, and accompanied by extensive debate and deliberation. These changes have been cautious by comparison with the step-change implied by Ofwat's consultation, which effectively proposes a complete transition away from the approach that was previously adopted in favour of full reliance on a relatively new and untested approach.

Ofwat's proposal to significantly reduce TMR and therefore cost of equity, introduces volatility in returns to an industry which is generally stable. This clearly has significant ramifications for customers and companies, and must be approached with caution and due consideration to ensure that the correct solution is agreed.

3.3 Aspects of the current economic climate could drive higher required returns

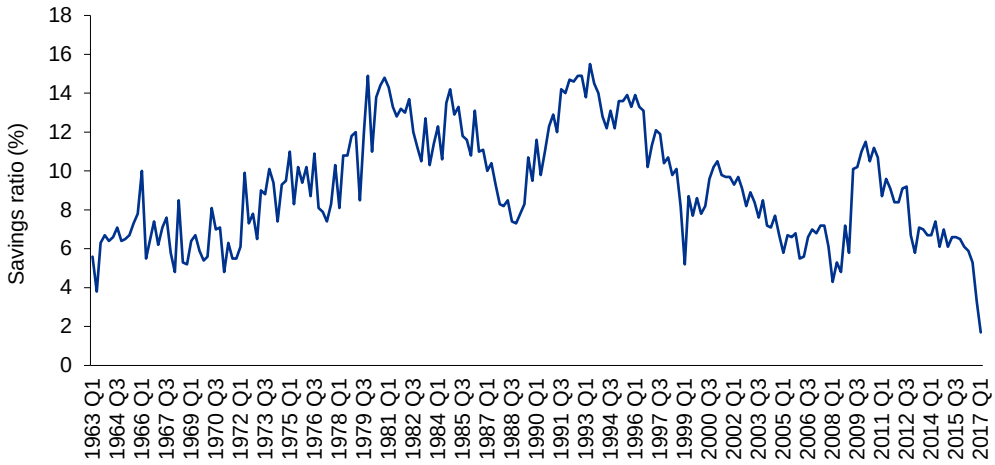
In addition to the regulatory context within which Ofwat's consultation has taken place, it is useful to briefly reflect on the broader economic backdrop. In Appendix 13 of its consultation, Ofwat sets out '*a range of factors affecting the UK economy that are likely to constrain prospects for growth in equity returns over the short to medium term*'[44].

Ofwat highlights the monetary policy outlook as one reason to consider that interest rates will remain low for the foreseeable future. Evidence is presented in Section 8 of this report to suggest that may be changing.

Ofwat also highlights a higher propensity to save as another factor driving low rates. Whilst there is some evidence that interest rates will remain low, there is significant evidence to the contrary. The latest statistical release by the Office for National Statistics in June, indicates that savings rates are at historic lows:

[43] Specifically related to using the DDM over the long-run.
[44] Ofwat (2017), 'Delivering Water 2020: consultation on PR19 methodology; Appendix 13: Aligning risk and return', p7.

Figure 1: UK savings ratio



Source: ONS

There are also additional economic factors that have not been included in Ofwat's assessment and may have the effect of increasing interest rates and/or required returns. Such factors could include:

- Currently elevated levels of inflation in the UK – the Bank of England suggests that import-price-driven inflation is likely to persist for the foreseeable future, and that, '*some tightening of monetary policy would be required to achieve a sustainable return of inflation to the target. Specifically, if the economy follows a path broadly consistent with the August central projection, then monetary policy could need to be tightened by a somewhat greater extent over the forecast period than the path implied by the yield curve underlying the August projections*'. [45]

- Emergence of the Eurozone and non-EU UK from a low growth period – various sources have highlighted a recovery in the GDP growth outlook for Eurozone and non-UK EU countries. [46] This is significant because the UK competes in a global market for access to capital. To the extent that alternative infrastructure investments become available in countries similar to the UK, this could reduce the demand for UK assets, and increase their required returns.

These observations are indicative of a more mixed outlook for both interest rates and TMR than Ofwat suggests. Given that Ofwat and PwC's conclusion with respect to TMR relies heavily on the premise that interest rates will remain low to 2025, this mixed evidence base is important. Setting cost of equity estimates for charge control purposes based on mixed or weak evidence risks adopting a position that is incorrect *ex post*. If PwC and Ofwat's assumption of lower for longer is incorrect, investors in UK water

[45] Bank of England (2017), 'Inflation report', August, p ii.
[46] See, for example, ECB (2017), 'Eurosystem staff macroeconomic projections for the euro area', June.

companies would be exposed to substantial financeability challenges and would not face appropriate incentives to invest.

4 PwC's approach to estimating TMR

This section summarises the approach taken by Ofwat's advisors, PwC, to estimate TMR for PR19.

At a high-level, PwC has estimated TMR with reference to current market forecasts and disregarded historical data. This is a novel approach, in the context of setting TMR for regulatory charge controls. PwC's rationale for a change in approach is that the current low interest rate environment is a) reducing returns on equities and b) going to remain until 2025.

PwC's analysis builds on the work of the CMA in applying the DDM model. The DDM provides useful insights into investors forward looking expectations and is an important tool to apply when examining TMR. However, the CMA used a long-run DDM model to inform their views on TMR, whereas PwC use short-term estimates.

4.1 PwC's overall approach

To support its proposed approach, Ofwat has commissioned a report from its advisors, PwC, to consider the implications of what it describes as a '*lower for longer*' interest rate era on the cost of equity for PR19. PwC estimates a nominal cost of equity range of **6.7% to 7.4%**[47], based on a nominal TMR of **8.0% to 8.5%**.[48]

PwC's estimates of the TMR in the current market are largely based upon analysis using the dividend discount model ('DDM'), with other supporting evidence from market to asset ratios ('MARs') and investor surveys. The estimates appear to place no weight on historical outturn equity returns. PwC estimates TMR on a nominal basis.

Table 4: PwC's estimates of TMR

Source	Estimate of nominal TMR (%)	Equivalent real TMR, using RPI of 2.8%
DDM (spot)	8.3%	5.4%
DDM (5-yr average)	8.8%	5.8%
Market Asset Ratio analysis	7.6%-8.1%	4.7% – 5.2%
Investor surveys	8.1%	5.2%
Proposed range	**8.0%-8.5%**	**5.1%- 5.5%**

Source: PwC (2017), 'Refining the balance of incentives'

[47] PwC (2017), 'Refining the balance of incentives', p100.
[48] PwC (2017), 'Refining the balance of incentives', p92.

PwC does not propose a particular range for the real TMR or cost of equity, but does consider the effect of deflating its nominal TMR estimates on these variables using various approaches. The resulting values roughly correspond to the real cost of equity range cited by Ofwat.

4.2 Evidence of 'lower for longer' cited by PwC

PwC defines the concept of 'lower for longer' as '*The prospect of major central banks keeping the cost of borrowing low via their short-term interest rate decisions for a prolonged period of time*'.[49] PwC has put forward two main observations that it considers are indicative of a lower for longer environment:

- OBR outlook on base rate – PwC highlights that OBR expectations of base rate increases have subsided between 2013 and 2016; and
- Gilt yields – PwC notes that both nominal and index-linked Gilt yields have fallen in recent years.

PwC asserts that a lower for longer environment implies an expectation of lower TMR compared with long-term historical outturn returns.[50] PwC concludes that '*current low long-term interest rates are likely to persist for the foreseeable future*' and that '*Low interest rates are also likely to underpin low returns across all other asset classes*'.[51] While this may be true across some asset classes, there generally is a corresponding negative correlation between interest rates and equity returns as discussed in section 8.2.

PwC justifies its move away from a long-run approach to estimating TMR on the basis of the lower for longer era. PwC therefore adopts a number of methods to estimate a current TMR and does not place weight on long-run data.

4.3 PwC's estimate of TMR based on the DDM

PwC has developed a monthly DDM to estimate TMR.[52] This compares forecast dividends for the FTSE-All Share over a period of five years, together with a terminal value assumption, with the current value of the All-Share index.

The current (year 0) dividend level is estimated based on:

- A dividend yield assumption – PwC does not explicitly state the source of its dividend yield assumption, but it is presumably based on the most recent annual dividend yield for the FTSE-All Share to December 2016; and
- A buy-back yield assumption – this is based on the value of actual buy-backs on the FTSE All-Share since 2000.

PwC assume that dividends grow by consensus forecasts of near-term GDP growth.[53] A forecast horizon of five years is used in calculating TMR. The terminal value after five

[49] PwC (2017), 'Refining the balance of incentives', p70.
[50] PwC (2017), 'Refining the balance of incentives', p77.
[51] PwC (2017), 'Refining the balance of incentives', p74.
[52] We acknowledge that PwC has used a monthly rather than an annual DDM, which provides a more robust estimate given the richness and granularity of the data.
[53] PwC (2017), 'Refining the balance of incentives', p102.

years is estimated based on the Gordon Growth equation assuming that dividends grow in perpetuity at the same rate as long-term GDP forecasts for the UK.

PwC then estimates the constant annual discount rate that equates the discounted value of the forecast dividends to the current value of the All-Share index. PwC assumes that this discount rate represents an appropriate TMR for a regulatory charge control.

PwC presents the estimated TMR from its DDM approach applied in a rolling five-year window from 2000 to 2016, concluding that there is a downward trend. It estimates a 5-year average (2012 to 2016) nominal TMR of 8.8% and a spot estimate as at December 2016 of 8.3%.[54] Surprisingly, PwC does not use historical data to cross-check their DDM analysis, which is highly unusual given that this is the standard approach used by regulatory and competition authorities before informing their views on market returns. While there is merit in using an ex-ante approach such as the DDM, it is equally essential to cross-check these estimates to actual returns achieved by the market over the same time period. This in essence provides evidence regarding the extent to which actual returns support the outputs estimated from using the DDM.

4.4 PwC's estimate of TMR based on MARs

PwC examines the MARs for regulated companies, based on two sources of evidence:

- data from private transactions; and
- observed values from stock market data for two listed water companies – Severn Trent and United Utilities (SVT and UU)

PwC notes that MARs for regulated companies have been consistently above one, but that '*in the absence of adequate assumptions regarding outperformance of regulatory allowances embedded in these private transactions we cannot disentangle the individual impact of [cost and financing outperformance]*'[55], and hence do not use the data on private transactions to estimate the TMR. This seems sensible, particularly given that other factors – such as control premiums – are likely to apply in the context of private transactions, and would need to be controlled for.

PwC estimates TMR on analysis of MARs inferred from stock prices for SVT and UU. The MARs are calculated on a rolling basis, comparing RCV values with the companies' enterprise value[56].

PwC controls for the expected outperformance in respect of service incentive mechanism (SIM), output delivery incentive (ODI) and financing by deducting the nominal value of outperformance assumed in analyst reports from the enterprise value.[57]

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[54] PwC (2017), 'Refining the balance of incentives', p82.
[55] PwC (2017), 'Refining the balance of incentives', p84.
[56] PwC does not disclose how it estimates the value of the companies' net debt, but it appears from the values depicted that it has used book values. This appears to be a sensible assumption for the purposes of the current analysis.
[57] See PwC (2017), 'Refining the balance of incentives', p85.

The report states that the next step is to estimate the discount rate required to reach an RCV premium of zero. The nature of the cashflows being discounted are not explicitly stated, but appear to be the real allowed return on the indexed RCV.

PwC concludes from its analysis of MARs that a nominal TMR of 7.6% to 8.1% is appropriate.[58]

4.5 PwC's estimate of TMR based on survey data

PwC estimates TMR based on the findings of two surveys:

- The first is by Fernandez et al (2017), which collected information on the cost of equity applied by practitioners, investors and academics in the UK;
- The second is by Horizon Actuarial Services who survey 35 investment advisors regarding its views of the cost of equity in the US.

Based on the surveys considered, PwC concluded that a nominal TMR of 8.1% is appropriate.[59]

4.6 Other evidence considered by PwC

PwC also calculates the multiple of the ERP relative to the corporate bonds spreads over time to inform its analysis of TMR. However, it did not find a consistent spread that could be of use for inferring TMR and therefore concludes that this data is likely to be unreliable.[60]

This seems to be a reasonable conclusion, and PwC does not comment on this approach further.

4.7 PwC's approach to deflating nominal TMR

PwC's analysis and final range of 8.0-8.5% is all presented in nominal terms.

PwC does present real cost of equity figures within appendix C of its report. To deflate its nominal cost of equity, PwC uses 5-yr forecasts of RPI-X and CPI as at year end 2016 to deflate nominal TMR estimates across all of its approaches.

The forecast for CPI is based on the longer-term inflation target of 2%. The forecast for RPI-X is based on the CPI target together with the historical average wedge between CPI and RPI-X of 0.8%, yielding a total RPI-X assumption of 2.8%.[61] PwC therefore assumes that the appropriate inflation estimate is a spot forecast of long-term inflation.

[58] PwC (2017), 'Refining the balance of incentives', p86.
[59] PwC (2017), 'Refining the balance of incentives', p89.
[60] See PwC (2017), 'Refining the balance of incentives', p89.
[61] PwC (2017), 'Refining the balance of incentives', pp97-98.

5 Review of PwC's estimate of TMR based on the DDM

This section provides a detailed examination of PwC's DDM and comments on the use of this model to estimate the TMR. The DDM model can provide insight into TMR and PwC's analysis is useful in that it builds upon the work done by the CMA in the 2014 NIE case.

This section does not focus on minor issues with PwC's approach and interpretation of the results. Rather it highlights specific fundamental issues that affect the extent to which Ofwat can rely on the outturn TMR estimates as they stand.

This section demonstrates that PwC's DDM analysis has three fundamental weaknesses:

- First, DDM ultimately relies on assumptions around dividend forecasts into perpetuity, which introduces significant judgment to the analysis. PwC's own sensitives on dividend forecasts show a range of 350bp.
- Second, PwC assumes a constant discount rate over time in applying the DDM. The resulting TMR therefore fails to capture the return required for volatility in within year TMR. This should be corrected if any weight is to be placed on the DDM. The evidence shows that an uplift of 75bp[62]-150bp[63] to the TMR is appropriate, to account for volatility.
- Third, a spot-rate DDM has limited predictive power over periods of five to 10 years.

PwC's DDM outturn should be corrected for a volatility uplift before they can be used. Given the limited evidence supporting the reliability of TMR's derived from a spot rate DDM, the uplift for volatility should be applied to the five-year average DDM estimate as a basis for estimating TMR. Doing so would result in a nominal TMR of 9.6% to 10.3%.[64]

5.1 The results of DDM are sensitive to the dividend growth assumption and time period

PwC's assumption that dividends will grow at the same rate as nominal GDP is a strong supposition.[65] The relationship between dividends and GDP has historically been highly imperfect, and there is no robust means to test whether this assumption truly reflects investors' expectations.

The importance of this assumption can be demonstrated by examining the impact of small deviations of the dividend growth assumption.

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[62] Competition Commission (2014), Northern Ireland Electricity Limited price determination- final determination, Appendix A13(2)-4.
[63] Dimson, Marsh, Staunton, 'Credit Suisse Global Investment Returns Yearbook' (2017), Table 11 p34.
[64] PwC's 5 year trailing average of 8.8% plus a 75bp to 150bp uplift for volatility.
[65] PwC (2017), 'Refining the balance of incentives', p102.

Figure 26 of PwC's report presents the results of its sensitivity analysis, but little commentary is provided in respect of the implications of these sensitivities for the robustness of the analysis. Importantly, PwC's own sensitivities show a range of approximately 350bps, with a top end of c.11.1% nominal TMR.[66] This means, that according to PwC's own sensitivities, reasonable changes in the dividend forecasts could result in an implied real TMR of 8.1%, which would increase the real cost of equity by over two percentage points.[67] This suggests that reasonable deviations from PwC's assumptions can eliminate the difference between the historical outturn approach and PwC's DDM approach.

Further, each 10bps increase in the assumed growth rate, well within the margin of error on consensus forecasts of GDP growth, results in an increase in outturn TMR of around 10bp.

Table 5: Sensitivity of PwC's DDM TMR estimates to dividend growth assumption

Growth rate	**4.1%**	**4.2%**	**4.3%**	**4.4%**
TMR (Spot DDM)	8.26%	8.35%	8.43%	8.52%
TMR (5-yr average DDM)	8.79%	8.86%	8.90%	8.97%

Source: KPMG Analysis

The DDM results are also volatile over time. PwC's analysis indicates that nominal TMR changed by 420bp over the eight-year period between 2008 and 2016.[68] This variation is more than some of the estimates around the allowed real cost of equity itself and therefore highly significant.[69] This change in the TMR implied by PwC has happened in the same length of time over which PwC is projecting forward its outturn TMR estimate.

The instability of PwC's DDM estimates means that there is a large confidence interval for the monthly DDM outputs, ranging from 8.1% to 9.5%, as illustrated in the Table overleaf:

[66] PwC (2017) 'Refining the balance of incentives', p83.
[67] Assuming real RFR of 0.5%, beta of 0.8 and PwC real RFR of 5.4% (8.25% reduced by 2.8% RPI inflation). Increase in cost of equity = ((0.8*(8.1%-0.5%))+0.5%) - ((0.8*(5.4%-0.5%))+0.5%) = 2.16%.
[68] We infer this from Figure 25, PwC (2017), 'Refining the balance of incentives', p82.
[69] See PwC (2017) 'Refining the balance of incentives', p99.

Table 6: Confidence intervals around PwC's 5 year average DDM

5 year avg. TMR	8.8%
Std. Deviation	0.4%
95% Lower bound	8.1%
95% Upper bound	9.5%

Source: KPMG Analysis

These observations suggest that the DDM lacks precision as an estimator of TMR, and could result in significant changes in the cost of equity at different intervals.

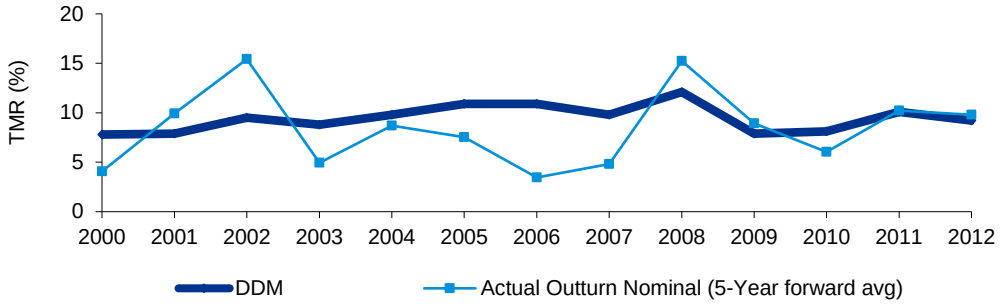
5.2 Spot rate DDMs exhibit weak predictive power

A corollary of the instability of the DDM is that its ability to predict outturn equity returns is poor. The ability to predict outturn equity returns is a useful diagnostic tool, and poor predictive power suggests that the model suffers from significant shortcomings.

5.2.1 Empirical analysis shows PwC's DDM model has limited predictive power

To illustrate the poor predictive power of the DDM, the chart below compares the DDM TMR predictions with the outturn returns in the five-year period following the estimate.

Figure 2: Predictive Power of DDM Expected Returns vs Actual Outturns (Nominal)



Source: KPMG Analysis

Figure 2 above shows that there are significant prediction errors in each year of the period.

The predictive power of each method available for estimating TMR is poor and therefore this issue is not unique to the DDM method. This is in large part because outturn TMR is

volatile over time. The issue of poor predictive power therefore highlights the need to consider data from the other methods of estimating TMR, such as long-run averages.

5.2.2 The academic literature confirms that TMR estimates based on spot DDMs exhibit limited predictive power

PwC refers to two academic papers in support of the predictive power of its DDM approach:

- Damodaran (2016), 'Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2016 Edition'; and
- Chin and Polk (2015), 'A forecast evaluation of expected equity return measures', Working Paper No.520, BoE.

Damodaran's study tested the predictive power of short run *ex ante*, long-run *ex ante* and long-run *ex post* estimates of ERP and found that for estimating ERP for 5 years and 10 years, the previous 5 years of *ex ante* returns had the best predictive power.[70] The paper further concluded that the current (i.e. spot rate) implied premium had poor predictive power for 5 year and 10 year forecast periods.[71] This is in stark contrast to what PwC has done, implicitly relying on its spot rate ex-ante forecast to determine TMR over the next eight years, as opposed to its five year average.

The paper by Chin and Polk tested the predictive power of the DDM over short time periods – 3 months through to 3 years. The DDM was only shown to have statistically significant predictive power for returns 3 months ahead when looking at in-sample predictions. Unfortunately, the paper does not examine longer-term (>5 years) horizons and therefore does not provide relevant evidence for predictive power of DDM over the long term. As PwC intends on using their DDM analysis to set market returns over the long-run (up to 2025) this is not therefore compelling evidence that a short-term DDM approach is appropriate for setting an *ex ante* cost of equity for a six year charge control.[72]

The evidence from Damodaran and Chin and Polk does not therefore support reliance on spot estimates of TMR to set TMR for PR19. The findings in both papers are consistent with the analysis of the predictive power of PwC's DDM detailed in section 5.2.1 above.

PwC acknowledges that trailing averages of DDM TMR estimates are superior in their predictive power: '*we caution against relying on any particular spot estimate given the inherent volatility of these approaches*'[73]. PwC then appears to disregard this observation in favour of a spot rate DDM: PwC's 5 year average TMR of 8.8% is outside its proposed range of 8.0% to 8.5% and PwC's spot rate TMR of 8.3% lies close to the midpoint. This is justified on the basis that, 'the spot rate has the advantage of containing the most up to

[70] Damodaran (2016), 'Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2016 Edition'; p118.
[71] Ibid.
[72] Chin and Polk (2015), 'A forecast evaluation of expected equity return measures', Working Paper No.250, BoE, p19.
[73] PwC (2017), 'Refining the balance of incentives', p81. .

date market information'.[74] This does not appear compelling if the spot rate estimate lacks predictive power, based on the papers cited by PwC itself.

Overall, it appears clear from the evidence above that – if any weight is to be placed on DDM estimates – spot rate DDM estimates should be disregarded in favour of trailing averages.

5.3 PwC's assumption of a constant annual discount rate leads to a downward bias in the TMR

Where data on annual returns is obtained over more than one year, there is a choice as to what method to use, in order to derive the required rate of return; the arithmetic mean or geometric mean. The arithmetic mean takes the simple average of annual returns, which involves summing the returns and dividing by the number of periods. The geometric mean, on the other hand, works out the effective annual compound growth rate each period i.e. it works out the consistent annual return that can be applied to the initial share price to arrive at the final share price.[75] The arithmetic average is alternatively known as the single period simple return.

Mathematically, the geometric mean is lower than the arithmetic mean, with the gap widening as the volatility in the underlying data increases. For example, the 2017 data from Dimson Marsh and Staunton (DMS) on long-run achieved returns suggests an arithmetic average real TMR of 7.3% and geometric average real TMR of 5.5% for the UK.[76]

The choice between an arithmetic or geometric average depends on the expected volatility of future returns[77] (both dividend yield and price growth) and the expected investment holding period. However, it also depends on the model used to set the required rate of return.

A DDM analysis assumes a constant discount rate over time i.e. a geometric average.[78] PwC does not discuss its approach to averaging the returns in the sample period used, save for a brief mention in footnote 134 in relation to data it presented on long-run ex post returns:

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[74] Ibid.
[75] The formula for the geometric mean is take the *nth* root of the final value to the starting value.
[76] Dimson, Marsh, Staunton, 'Credit Suisse Global Investment Returns Yearbook', p212.
[77] More specifically whether future volatility will be the same as volatility in the sample and also whether returns are serially uncorrelated i.e. returns in t+1 are not in some way predictable given returns at in t.
[78] Fama and French (2002), 'The Equity Premium', p657. Unfortunately, the PwC approach does not calculate a DDM discount rate in a fashion that is capable of a "clean" interpretation as they employ a multi-stage model which assumes a constant short term growth rate followed by a perpetual long term growth rate. The authors then calculate a simple average of these estimates over a restricted number of periods. By construction, the resulting estimates are closer in nature to a geometric expected rate of return than an arithmetic one. Also by construction, there is very little volatility in the assumed long term growth rate. It is clear, therefore, that the resultant estimate will be well below the equivalent of an arithmetic average discount rate which all parties would appear to accept is the required benchmark figure.

"The equity returns presented here are on an arithmetic average basis, consistent with the view of Smithers & Co (2003) that this was the most suitable basis for expected returns. Averages from geometric returns are lower than their arithmetic counterparts, for example, the long-run Barclays geometric average for real equity returns is 5.0%, while the equivalent for the DMS dataset is 5.4%. The CMA in their determination for NIE also noted that "The simplest approach is to calculate the arithmetic average of historical returns… Since annual returns have been highly variable this approach requires looking at a long run of historical data."[79]

It is perhaps implicit in PwC's presentation of arithmetic means of historical returns data and the quote above, that it agrees with Smithers and Co. that the geometric mean is inappropriate. However, in applying the DDM, PwC has failed to recognise that it has calculated a geometric average rate of return.

Furthermore, volatility in returns can be decomposed into volatility in dividend growth and volatility in equity price growth.[80] Under the dividend yield approach, the mean return only takes account of the volatility in dividend yield, through the dividend growth input assumption.[81] However, investors expect volatility in both dividend yield and share price. The simple annual DDM approach, therefore, understates expected returns by failing to recognise that the volatility of price growth has historically been far greater than the volatility of dividend growth. Fama and French (2002) propose a "bias adjustment" to deal with this issue which involves increasing the DDM estimate by half the difference in the variances between the two growth rates. This "bias adjustment" corrects the DDM estimate to the equivalent of a simple one period discount rate, or arithmetic average equivalent discount rate.

This issue has been explicitly recognised by regulators in the past. In the 2014 NIE case, the CMA undertook the DDM approach to estimate returns on an ex ante bases. The CMA noted that an arithmetic mean would be appropriate where the holding period under consideration was close to one-year, and a geometric mean would be appropriate for an indefinite holding period. The CMA suggested that the holding period for utilities would generally imply an estimate somewhere between the two means. It indicated that a geometric mean plus an uplift of approximately 75bps could be appropriate.[82]

DMS also address the issue of uplifting a geometric average for volatility in returns. Table 11 of the 2017 publication shows a forward looking geometric TMR of 5.45% real (similar to the PwC real TMR range). To this, DMS suggest adding an uplift of 1.5% to arrive at the equivalent of an arithmetic return of 6.95%[83].

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[79] PwC (2017), 'Refining the balance of incentives', footnote 134.
[80] Fama and French (2002), 'The Equity Premium'.
[81] Assuming an arithmetic average of dividend/earnings growth data has been used for the dividend growth input assumption.
[82] Competition Commission (2014), Northern Ireland Electricity Limited price determination- final determination, Appendix A13(2)-4. The CMA stated that the volatility in price growth, not factored into the 'raw' DDM estimate, accounted for approximately half of the difference between the DDM estimate and the long-run historical returns, which was 1.5 percentage points.
[83] Vivian, 2007, Table 3, Panel C are UK specific and include buybacks. Vivian suggests an even larger uplift when reproducing the F&F bias adjustment, including buyback data.

To summarise, a large uplift is needed to the outturn TMR from applying the DDM model, to account for volatility in TMR over time. This is supported by empirical literature and regulatory precedent.

Applying an uplift based on a range of 75bps (CMA) and 150bp (DMS) to PwC's geometric mean results in a nominal TMR of 9.05%-9.8%, based on the spot DDM and 9.55%-10.30%, based on the five-year average DDM.

5.4 Summary and implications

The results of PwC's DDM approach are volatile and susceptible to small changes in the period and input assumptions, particularly dividend growth. The sensitivity of the DDM to these assumptions results in a wide range of implied TMRs – 350bp according to PwC's own analysis. A wide range on TMR results in more risk with picking a point estimate. If Ofwat chooses to rely on spot rate DDM estimates it should recognise that there is a high probability of mis-forecasting.

PwC appears to place most weight on its spot rate TMR implied from the DDM in January 2017 of 8.3% (which lies in the middle of its TMR range of 8.0%-8.5%). Spot rate TMRs derived from applying the DDM to a single period, have limited predictive power for forecast periods of 5 years.

Further, the DDM approach assumes a constant discount rate into perpetuity. It therefore fails to compensate investors for changes in TMR over time due to volatility in price. In line with the findings of the CMA in its determination of NIE's price control appeal and the latest DMS publication, an uplift of between 75bp and 150bp is appropriate to account for volatility in the discount rate and therefore TMR over time.

Given the limited evidence supporting the reliability of TMR's derived from a spot rate DDM, it is not advisable to rely on the outturn spot rate TMR.

If Ofwat chooses to rely on the DDM, then PwC's five year average TMR adjusted for the volatility uplift is preferable to the spot estimate. Taking PwC's five year TMR and increasing it by 75bp to 150bp results in a nominal TMR of 9.6% to 10.3%.[84]

[84] PwC's 5 year trailing average of 8.8% plus a 75bp to 150bp uplift for volatility.

6 Review of PwC's MARs and survey evidence

PwC uses its analysis of MARs and survey evidence to corroborate its TMR range of 8.0% to 8.5%.

There is a downward bias in both PwC's MARs and survey evidence. In particular, the MARs analysis fails to account for RCV growth and the survey question is unclear as to whether estimates were required in real or nominal terms.

The MARs and survey evidence cannot therefore be used to support PwC's TMR range. These issues with MARs and survey evidence are not new, hence previous regulatory precedent has been to place little weight on the outturn TMRs from these approaches.

6.1.1 PwC's MARs do not account for RCV growth and non-regulated revenue, which understates TMR

Market asset ratios across a representative set of firms/transactions can in general provide useful information regarding expected equity returns. However, market asset ratios for a single sector is less useful for estimating the generic parameters: by their nature, these variables reflect economy-wide conditions, and assessing these with reference to only two companies over a short period of time may not yield a robust estimate.

PwC's analysis of MARs for the listed water companies omits important drivers of observed valuations, and hence underestimates the implied cost of equity and TMR:

- First, PwC's analysis does not control for RCV growth, and implicitly assumes a constant nominal RCV in perpetuity; and
- Second, the MARs used to estimate an implied cost of equity do not control for non-regulated activities, which are dismissed as being 'very small'.

Impact of RCV growth on outturn TMR

The growth in network utility companies' regulated asset bases are an important value driver for investors. An expectation of future growth in asset values can drive valuations in excess of the regulated asset value, without any divergence of required returns from allowed returns.

The relationship between MARs, required returns and asset growth expectations can be summarised by rearranging the terms of the dividend growth model:

$$P_0 = \frac{E_1(1-b)}{(r-g)}$$

Where P_0 is the present value of equity, E_1 is the forecast earnings in period 1, b is the payout ratio, r is the equity discount rate and g is the expected annual earnings growth. For any given allowed return and in the absence of outperformance, the growth of earnings is precisely equal to the growth rate of the RCV. E_1 can be expressed as $RoE.B_0$, where RoE is the return on equity and B_0 is the current book value of equity.

Dividing through by B_0 gives:

$$\frac{P_0}{B_0} = \frac{RoE * (1 - b)}{(r - g)}$$

g can be expressed as b.RoE, such that b = g/RoE. Substituting this into formula 2 above gives:

$$r = \frac{RoE - g}{P_0/B_0} + g$$

In PR14, Ofwat forecast that the real RCV growth for SVT Water Limited would be 8.7%[85] over AMP5 and 1.9% for UU[86]. Given the ongoing need to ensure the provision of safe and reliable water and wastewater services to a growing UK population, it seems plausible that asset values could continue to grow in real terms at a steady pace for the foreseeable future. At a minimum, it is reasonable to expect that the real value of the companies' asset bases will be preserved in real terms (i.e., the nominal value of the asset bases will grow with inflation).

The following table illustrates the impact of assuming a 2.8% (PwC's forecast RPI) perpetual growth in RCV in place of PwC's assumption of a constant nominal RCV.

Table 7: Impact of introducing RCV growth on outturn TMR estimates

	SVT		UU	
	0% nominal RCV growth	**2.8% nominal RCV growth**	**0% nominal RCV growth**	**2.8% nominal RCV growth**
Adjusted Market-to-RCV ratio	1.12		1.10	
PR14 nominal allowed return	6.64%			
Implied nominal required return	5.9%	6.2%	6.0%	6.3%
Implied nominal cost of equity	6.7%	7.5%	6.8%	7.5%
Implied EMRP*	4.6%-6.4%	5.5%-7.3%	4.8%-6.6%	5.6%-7.5%
Implied nominal TMR	7.6%-7.9%	8.7%-9.1%	7.8%-8.1%	8.6%-9.0%

*based on PwC estimates for the risk free rate and equity beta; Source: KPMG Analysis

Table 7 above illustrates that the inclusion of a conservative assumption of ongoing RCV growth results in an increase in nominal TMR of approximately 1 percentage point.

[85] Ofwat (2014), 'Final price control determination notice: company-specific appendix – SVT Water', Table A6.8.
[86] Ofwat (2014), 'Final price control determination notice: company-specific appendix – UU', Table A6.8.

Impact of non-regulated revenue adjustment on outturn TMR

The TMR estimate implied by the observed MARs is increased further, once the proportion of enterprise value that is attributable to non-regulated activities is excluded. Based on the 2017 statutory financial statements for SVT Water, these activities account for 3% of capital employed. Similar figures are not reported for UU, and hence are not considered here. However, UU continues to benefit from non-regulated revenues streams for example its WaterPlus JV with SVT.

The Table below re-presents the estimates from the previous Table with a deduction of 3% from the observed MAR for SVT, for non-regulated activities.

Table 8: Impact of excluding non-regulated revenue on outturn TMR estimates

	SVT	
	0% nominal RCV growth	**2.8% nominal RCV growth**
Adjusted Market-to-RCV ratio	1.12	
Adjusted Market-to-RCV ratio excl non-reg	1.09	
PR14 nominal allowed return	6.64%	
Implied nominal required return	6.1%	6.3%
Implied nominal cost of equity	**7.2%**	**7.8%**
Implied EMRP	5.2%-7.1%	6.0%-7.9%
Implied TMR	**8.2%-8.6%**	**9.0%-9.4%**

Source: KPMG Analysis[87]

Table 8 shows that excluding non-regulated revenue further increases the nominal TMR estimate by 30bp from 8.7%-9.1% to 9.0%-9.4%.

6.1.2 MARs data are not a reliable source of evidence for estimating TMR

The following additional observations can be made with respect to PwC's analysis and reliance upon MARs:

- MARs for the listed water companies exhibits considerable volatility, and has been negative in at least one year in each of the last three AMPs.[88]
- TMR is an economy-wide variable, and PwC's sample is unlikely to be representative of the broader economy.

[87] Adjusted MAR ratio takes into account non-regulated component for SVT and is fed through the calculations (6.64%/1.09).
[88] Credit Suisse (2016), 'Revisiting the equity risk', 21st July.

- The sample is also a biased representation of the water industry, since the listed water companies are considerably larger than the average company in the sector.
- The stock prices are likely to be influenced by limited liquidity, in the absence of which the MAR would be higher and the estimated TMR lower than currently estimated.

Collectively, these factors illustrate the uncertainty associated with inferring market wide TMR from an analysis of the MARs of two companies in the water sector.

6.1.3 The investor survey evidence is not reliable

Survey data have been used by UK regulators on a number of occasions as cross-checks on other estimates of TMR. They are rarely used to set the level of the TMR in and of themselves. This is in part because the nature of the responses is sensitive to the framing of the question, and the bases of the responses are not transparent.

The survey data relied upon by PwC suffers from these biases. The survey does not specify the time period over which respondents are being asked to provide the TMR and ERP – it merely asks for the TMR being used in 2017. The phrasing of the question does not permit the respondent to understand whether a prospective or retrospective TMR is required.

Critically, it is not clear from the phrasing of the survey questionnaire whether respondents were required to give their estimates in real or nominal terms. To the extent that a proportion (even if a minority) of respondents submitted estimates of real TMRs, this would serve to understate the nominal TMR derived from the survey.

Survey data can provide a useful basis for understanding trends in a particular variable, to the extent that the same question is posed to the same respondents repeatedly over a period of time. In that respect, the survey data is insightful: it points to increasing TMRs, not decreasing/constant as PwC suggests (e.g. 2015 survey points to 7.2%[89] nominal TMR, compared with 8.1%[90] in 2017).

A further insight that can be drawn from the survey data is the dispersion of responses to the questionnaire, which range from 5.8% to 10.3%, with a standard deviation of 1.1%[91]. The large range of responses reinforces the lack of robustness of any forward-looking forecasts of TMR.

6.2 Summary and implications

PwC's TMR estimate derived from MARs, fails to adjust for RCV growth and non-regulated activities in the SVT data point. Adjusting for a conservative RCV growth of 2.8% and removing non-regulated activities from the SVT data point, results in a nominal TMR estimate of approximately 8.7-9.4%.

[89] Fernandez, P., Pershin, V., and Acin, I. (2017), 'Discount Rate (Risk-Free Rate and Market Risk Premium) used for 41 countries in 2017: a survey', p7.
[90] PwC (2017), 'Refining the balance of incentives', p89.
[91] Fernandez, P., Pershin, V., and Acin, I. (2017), 'Discount Rate (Risk-Free Rate and Market Risk Premium) used for 41 countries in 2017: a survey', p6.

The survey data referred to by PwC is likely to have a downward bias, as the questionnaire did not state whether returns should be nominal or real.

The other evidence presented by PwC in support of its DDM estimate, cannot therefore be relied upon to support a nominal TMR of 8.0% to 8.5%.

7 Deflating nominal TMR estimates

This section sets out some considerations with respect to the appropriate basis for deflating nominal TMR estimates derived from particular sources, and their implications for PwC's analysis.

We set this out here as it is unclear from the PwC report, what approach will be used to deflate TMR. However, it is important to have a robust approach for converting a nominal TMR estimate into real TMR in regulated utilities, given the approach of allowing a real return on an indexed RCV.

7.1 Determining the appropriate approach to deflating nominal TMR

The real return implied by a particular nominal TMR estimate will depend on the method that was used to estimate TMR in the first place. This is considered for three groups of estimation approaches below:

Approach based on forward-looking assumptions

If the nominal cashflows assumed under a DDM reflects investors' actual expectations, the real expected returns can be estimated by deducting a forward looking estimate of inflation. In effect this assumes that investors will price in consensus forecasts of inflation into their nominal return expectations.

However, the assumption that investors will embed an up to date forward looking inflation estimate in their TMR expectations cannot be independently and robustly tested.

Approach based on trailing averages of models based on forward-looking assumptions

Where the estimated nominal TMR is based on trailing averages of models based on forward-looking assumptions, the real expected returns will depend on investors' inflation expectations at each point in time.

For short periods of time (e.g., the five-year averages considered by PwC for its DDM), data exists with respect to historical inflation forecasts that can be used for this purpose.

Approach based on historic outturn returns

Where the TMR has been estimated based on historical outturn equity returns, the underlying hypothesis is that expected returns will be the same in the future as they have been in the past. If inflation expectations are different in the future to what has prevailed historically, it is relevant to consider whether investors expect the same *nominal* return or the same *real* return as prevailed historically.

In theory it is correct to assume that investors will expect the same real return to prevail. This implies that the nominal expected return on equities is expected to be higher during

periods of higher forecast inflation. [92] The appropriate approach to deflating nominal TMRs based on historic outturn equity returns is therefore to deflate these figures based on historic outturn inflation.

A further consideration is the historic relationship between real TMR and inflation – and in particular whether real TMR has historically been higher during inflationary periods.

To the extent that real TMR is correlated with inflation, this could result in a biased estimate of real TMR if:

- historical averages for nominal outturn returns are deflated by average outturn inflation; and
- inflation is expected to be different in future periods than in the past and one is using a real TMR from historical data.

The bias would serve to understate TMR, if inflation is higher than has previously been the case and there has been a positive correlation between real TMR and inflation historically.

7.2 Implications for PwC's analysis

PwC has used forward-looking consensus forecasts for inflation as at year end 2016 to deflate each of its estimates of nominal TMR.

This approach appears to be internally consistent for the spot DDM and MARs analyses, notwithstanding the aforementioned drawbacks of these approaches.

The five-year trailing average DDM estimate should be based on inflation expectations at each period, rather than the forecast at year end 2016 as has been applied by PwC. The Table overleaf compares the DDM-implied TMRs for each quarter of the five-year averaging period used by PwC with the corresponding period CPI forecasts. The implied inflation level is slightly (7 bps)[93] smaller than under PwC's approach. This would serve to increase the real TMR by 7bp.

The appropriate inflation estimate used to deflate the Fernandez (2017) investor survey data is not straightforward. The survey did not specify whether respondents should provide real and nominal return expectations, which suggests that application of consensus forecasts to the entire sample could lead to a downward bias. In addition, the time period for the forecasts and whether these were intended to be retrospective or prospective was not specified, so it is not clear whether historical outturn inflation or forward-looking consensus estimates should be used.

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[92] Note: the question of whether expected nominal returns are sensitive to expected inflation is separate to the question of the impact of *unexpected* inflation on nominal returns. There is some evidence to suggest that unexpected inflation has a negative effect on nominal returns in the short run, and is neutral with respect to nominal returns in the long run (see for example, UBS (2012), 'Measuring Inflation Exposure and Managing Inflation Risk through Infrastructure Investments).

[93] PwC's CPI inflation is 2.0%, whereas the five year average is 1.93%.

Table 9: Comparison of DDM-implied nominal TMRs with corresponding period inflation forecasts

	5-year CPI forecast	TMR (nominal)	TMR (real, CPI)	TMR (real, RPI-X)
2016 Nov	2.33%	8.25%	5.79%	4.97%
2016 Aug	2.01%	8.21%	6.08%	5.25%
2016 May	1.75%	8.43%	6.56%	5.73%
2016 Feb	1.66%	8.55%	6.78%	5.94%
2015 Nov	1.64%	8.63%	6.88%	6.04%
2015 Aug	1.65%	8.56%	6.80%	5.97%
2015 May	1.64%	8.31%	6.56%	5.72%
2015 Feb	1.54%	8.27%	6.62%	5.79%
2014 Nov	1.72%	8.87%	7.03%	6.19%
2014 Aug	1.88%	8.81%	6.80%	5.97%
2014 May	1.89%	8.83%	6.81%	5.98%
2014 Feb	1.92%	8.88%	6.83%	6.00%
2013 Nov	2.02%	9.19%	7.03%	6.19%
2013 Aug	2.17%	9.29%	6.97%	6.14%
2013 May	2.22%	9.30%	6.92%	6.09%
2013 Feb	2.37%	9.24%	6.71%	5.89%
2012 Nov	2.10%	9.08%	6.84%	6.01%
2012 Aug	1.95%	9.14%	7.06%	6.22%
2012 May	2.14%	9.15%	6.87%	6.04%
2012 Feb	2.03%	8.84%	6.68%	5.85%
5-year average	**1.93%**	**8.79%**	**6.73%**	**5.90%**

Source: Bank of England, KPMG analysis.

7.3 Summary and implications

PwC and Ofwat have not been clear on the proposed approach to deflating the nominal TMR estimates. However, it is important to use an inflation estimate that is consistent with the underlying approach to estimating TMR.

Ofwat and PwC should propose a methodology to deflate the nominal TMR estimates, addressing the concerns in this section, which can be consulted upon.

8 The evidence base for 'lower for longer' and a negative risk free rate is mixed

PwC uses a 'lower for longer' assumption to support its use of short term data in determining total market returns. PwC's 'lower for longer' notion of TMR relies on a short to medium term view of the market and is based on the assumption that the current low interest rate environment will prevail until the end of PR19. PwC's proposed TMR range is based on an extrapolation of today's low interest rate environment over the next eight years, assuming no changes in the macro economy.

Recent evidence on interest rate projections show signs that bank rates over the short to medium term are expected to rise and as a result PwC's assumption of 'lower for longer' is not currently supported by market expectations.[94]

PwC's estimate implicitly assumes a negative real RFR of -1.3%.[95] This is an unprecedented reduction in the RFR when compared to previous charge controls. It is unlikely that a negative RFR is representative of the long-term return on safe assets in the UK.

8.1 Recent evidence shows that 'lower for longer' is not an assumption which PwC and Ofwat can be confident in

Ofwat's position on the likely path of the UK macro economy is based on an incomplete assessment of the U.K. macro-economy across the upcoming charge control period. By extrapolating the current low rate environment across to 2025, PwC's analysis fails to account for the changing macroeconomic conditions in the U.K, since its decision to leave the European Union (E.U) (June 2016).

Changes in key economic variables closely monitored by the Bank of England, have altered the market's view on the trajectory of monetary policy. This has reduced the likelihood of a 'lower for longer' economic environment that Ofwat has assumed when calculating total market returns in the U.K. This shift in the evidence base for 'lower for longer' in the eight months alone since the completion of PwC's analyses further illustrates the risks with using current market data to forecast TMR.

Indeed, interest rates have remained at low levels over the last decade. However, as shown in the chart below, expectations of interest rate rises have started to emerge. The Office of Budget Responsibility's (OBR) latest view on interest rates (March 2017) highlights the expected path of monetary policy, showing a significant shift in rates since its previous publication in November 2016, which was relied upon by PwC. This is a reflection of the changing macroeconomic environment in the U.K.

From the below OBR projections, it is clear that bank rates have seen an upward shift as expectations of a rate rise have increased over the first half of 2017. According to the

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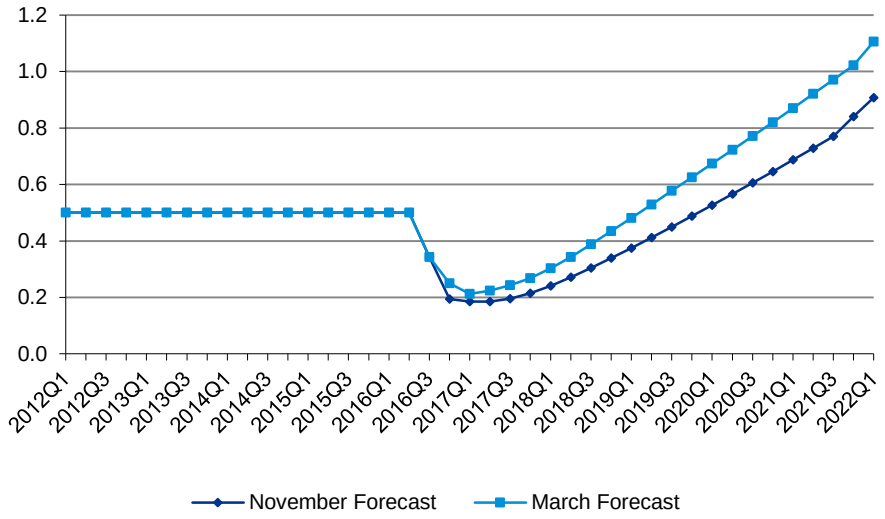
[94] See, for example, recent OBR forecasts, consensus forecasts, overnight index swaps/yields and Bank of England interest rate projections.
[95] We deflate PwC's lower bound risk-free rate (nominal) by 2.8% (RPI) forecast assumption.

OBR, bank rates could see the first rate rise in the U.K since the onset of the crisis towards the start of 2019, nearly three quarters ahead of its previous forecast in November, 2016.

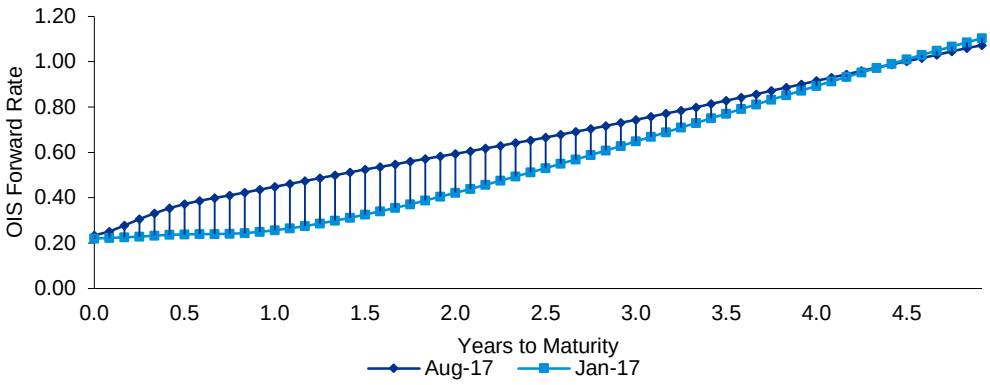
Figure 3: OBR Base Rate Forecasts (%)



Source: Office of Budget Responsibility (March 2017)

Additionally, when looking at instantaneous overnight index swaps (OIS), which is a commonly used measure from the Bank of England to understand markets' view on the likely future interest rate path, the implied interest rate paths from January 2017 to August 201 7 show a marked change in market expectations for a rate rise in the short term (see figure 4 below).

Figure 4: UK Instantaneous OIS Forward Curve (January 2017 vs August 2017) - 5 Years



Source: Bank of England

The OIS forward curves above illustrate how volatile short term interest rates could be, given changes in the perceived trajectory of the U.K economy. While it is difficult to predict the actual path of future interest rates across a charge control period, eight years in advance, in light of changing dynamics in the U.K economy, it would be more prudent to take a longer term view when estimating the cost of equity for the water industry.

In addition to the evidence outlined above, there are a number of other factors that have signalled a shift in expectations for lower rates. These are outlined below.

- Ofwat's position that interest rates will remain at the same level is based on expectations that economic activity will continue in its current state, meaning the prospects of the U.K will remain bleak up to 2025. However, growth has remained at or above trend and is forecast to do so over the next three years.[96] Additionally, rising inflation and expectations of rising inflation have moved up the time scale of interest rate rises as the Bank of England faces increasing pressure to tighten monetary policy in the midst of above-target inflation.
- Public appearances from members of the Bank of England's monetary policy committee, including Mark Carney (Governor) and Andy Haldane (Chief Economist) have suggested that interest rates may rise in the short term rather than the long term. Governor Mark Carney, in his most recent press conference discussing the Bank's latest Inflation Report (August 2017) indicated that despite markets having increased its expectations of a rate rise its current expectations are "insufficient"- indicating a steeper tightening of interest rates. Andy Haldane also discussed in depth the risks of tightening interest rates too late, suggesting that a rate rise towards the end of the year is probable.[97]
- The natural rate of interest is somewhere between 1.5% and 2%[98]-well above the current bank rate of 0.25% (six times higher than its current rate). The natural rate of interest is the level of real interest rates which sustains growth around the economy's potential growth rate with inflation around target. This further enforces the notion that real interest rates are dampened by other central bank policies.

Overall, PwC's analysis effectively fails to address the current pressure on the Bank of England to raise interest rates, which would put an end to the 'lower for longer' era as a result of exogenous factors in the macro economy. The evidence presented above casts doubt on PwC's position that the 'lower for longer' era will continue for the duration of the charge control period.

As such, a long-run assessment can provide a more robust estimate. This avoids any ambiguity in determining future market returns based on arbitrary time periods, which introduces sampling bias. To superimpose the lower rate environment into a 'lower for longer' scenario would be to dismiss the current signs of monetary tightening over the horizon and market expectations that interest rates will rise, pushing up yields and subsequently the risk-free rate.

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[96] Forbes, Kristin (2017), 'Failure to launch', speech given on the 22 June 2017.
[97] Haldane, Andy (2017), 'Work, Wages and Monetary Policy', speech given on 21 June 2017.
[98] Forbes, Kristin (2017), 'Failure to launch', speech given on the 22 June 2017.

8.2 The negative risk free rate implied by PwC's analysis is unprecedented

The implication of PwC's TMR range is an implied negative risk free rate of -1.3% in real terms, when deflating PwC's lower bound RFR of 1.5% with the average consensus RPI forecasts for 2020-2025. Assuming such a risk-free rate is unprecedented and is major departure from regulatory precedent.

Other regulatory decisions relating to a real RFR are outline in the table below.

Table 10: Regulatory Precedent for real risk-free rate

Regulator	Publication Date	Real Risk-free Rate
Ofcom, LLCC	2016	1.0%
UR, GD17-PNGL	2016	1.25%
Ofgem, Electricity	2016	2.0%
CMA, Bristol Water	2015	1.3%
CER, Water	2016	2.0%
UREGNI, Water (PC15)	2016	1.5%
Ofcom, WLA	2017	0.5%-1.0%

Ofcom, the telecommunications regulator in the U.K in its latest charge control for the wholesale local access market (2017) cites that considerable caution should be given in interpreting market yields for gilts, especially when estimating a forward-looking real RFR appropriate for the duration of a charge control period. The regulator states that "it would be inappropriate to simply adopt the current low rates on index-linked gilts without considering the reasons why they could be depressed".[99] In fact, Ofcom concludes that it does "not consider that the real RFR is actually zero or negative (even if financial market proxies such as yields on index-linked gilts are negative").[100]

Looking beyond Ofcom's latest consultation relating to setting the RFR, other regulators have also concluded similarly. Regulatory precedent for the RFR is between 1% and 2% in real terms (see table above), broadly in line with investor expectations over the long-run.

Negative returns in real terms on UK Gilts are a result of a number of market distortions, including:

[99] Ofcom (2017), Wholesale Local Access Consultation, A16.21.
[100] Ibid, A16.24.

- Increased demand for safe assets: investors have increased demand for safe 'risk-free' assets, driving up prices and bringing down yields.
- Quantitative Easing: the Bank of England embarked on a large 'Asset Purchase Facility' programme in an attempt to stimulate the economy by buying up to £435 billion in assets. Its effect has seen a material reduction in yields.[101]

In assuming a negative risk free rate out to 2025, PwC is effectively assuming that the current central bank policy and heightened demand for safe assets will continue for the next eight years. Whilst this is possible, it is evidently not probable. To base a regulated return on such an assumption is not advisable.

The International Fisher Effect (which says that real rates of interest should be identical across countries where free movement of capital exists) supports the hypothesis that the UK real returns are due to significant market distortions. Recent evidence on US TIPS[102] shows current yields of 0.18% at 5 years, 0.41% at 10 years, 0.71% at 20 years and 0.92% at 30 years.[103] The negative UK real returns on certain securities are therefore materially different to US real returns on risk free assets. This further supports the hypothesis that the negative real returns on certain UK securities is unlikely to represent an equilibrium state for the UK economy.

Based on the reasons above, Ofwat and PwC cannot be confident that the current market distortions will continue over the long-term.

8.3 Summary and implications

It is clear from the evidence provided above that the evidence for 'lower for longer' is mixed. Over the last eight months alone, market expectations for an interest rate rise have increased materially. This substantial shift in market expectations in the eight months since PwC did its analysis highlights the risks with placing weight on current market conditions for a five year forecast.

Additionally, PwC's low end RFR of -1.3% real is unprecedented. The negative real returns on UK gilts are due to large market distortions, which Ofwat and PwC cannot be confident will continue throughout PR19.

[101] Joyce et. al (2011), 'The Financial Market Impact of Quantitative Easing in the United Kingdom'.
[102] Conceptually equivalent to UK index-linked gilts.
[103] https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=realyield. Data extracted on 28 August 2017.

9 The negative correlation between RFR and ERP brings into question the relevance of the low interest rate environment for estimating TMR

PwC assumes that low interest rates translate into a low TMR. This is at odds with a wealth of academic evidence and PwC's own analysis that there is a negative correlation between the RFR and ERP.

9.1 There is a negative correlation between RFR and ERP, which serves to offset the impact of low interest rates on TMR

PwC's focus on 'lower for longer' is based on the premise that the current period of ultra-low interest rates is likely to underpin low returns across all other asset classes.[104]

However, the evidence does not support the assumption that low interest rates results in low returns on equities. Rather there is a negative correlation between RFR and ERP. ERP is not observable from market data, whilst RFR is (albeit with some uncertainty as to the appropriate security to use). Given the negative correlation between ERP and RFR, where there is evidence that the RFR is decreasing, the logical conclusion is that ERP is increasing.

There is evidence to support the negative correlation between RFR and ERP, such that decreases in RFR are offset by increases in ERP.

First, a speech given by Martin Taylor, External Member of the Financial Policy Committee, BoE in May 2015 set out clearly that the low interest rate environment had been accompanied by a an increase in the ERP. This is based on BoE analysis of earnings[105] and the RFR over time.[106] Taylor stated:

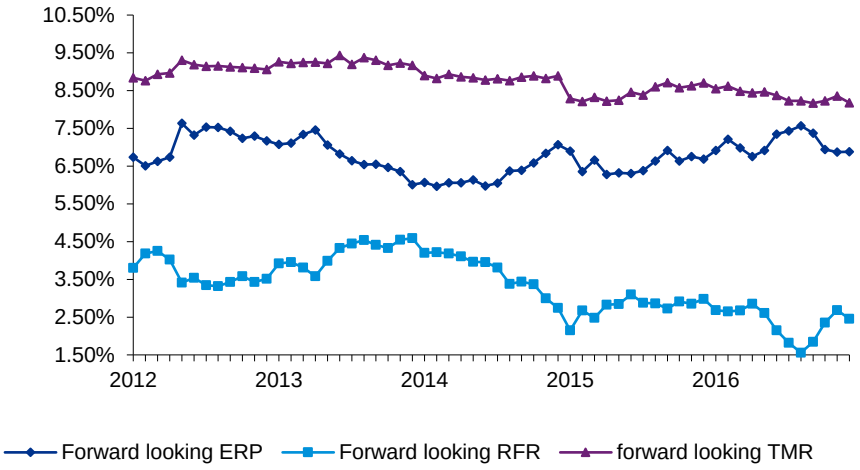
"the post-crisis fall in interest rates has not been accompanied by anything like the same reduction, it appears, in the cost of equity..this rise in the ERP has been working vigorously against the fall in the RFR."[107]

Second, PwC's own analysis, where it presents evidence of a negative correlation between the RFR and ERP, implied from its DDM analysis. This correlation has a gradient of between -0.76 and -0.88, depending on the time period used.[108]

[104] PwC (2017), 'Refining the balance of incentives', p74.
[105] Calculated as the reciprocal of the P/E ratio
[106] Martin Taylor (2016), Bank of England, Banking in the Tundra, 25 May 2016.
[107] Ibid.
[108] PwC (2017), 'Refining the balance of incentives', p78 (footnote 144).

Replicating PwC's analysis of spot rate DDMs, deducting a spot rate RFR and comparing this ERP with 10-year yield curves over the same period illustrates this negative correlation diagrammatically. Figure 5 illustrates the results.

Figure 5: DDM derived TMR and ERP, compared with RFR over time



Source: PwC Analysis, KPMG Analysis, Bank of England

Figure 5 shows a clear negative correlation between the ERP and the RFR. It follows that, using PwC's DDM approach (which has a number of shortfalls detailed in section 5.1 above) reductions in the RFR do not have a substantial impact on TMR.

Third, there is academic evidence supporting the negative correlation:

I. As noted by PwC, Barro (2006) finds that during times of disaster, such as world wars, low risk free rates and high equity risk premiums result.

II. Smither's & Co. (2003) evidence that TMR is more stable than its constituent parameters (RFR and RFR), which requires one to assume a degree of negative correlation.[109]

The negative correlation is consistent with financial theory. In times of financial instability, investors increase demand for risk-free assets reducing the RFR. There is also a correspondingly higher risk of investing in equities thus, the ERP is higher.

The evidence on negative correlation, including PwC's own analysis is in contradiction with PwC's position that low interest rates will translate into a low TMR.[110] Rather, the

[109] Wright, S., Mason, R. and Miles, D. (2003), 'A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K'.
[110] PwC (2017), 'Refining the balance of incentives', p74.

evidence suggests that low interest rates will be largely offset by an increase in the ERP, such that TMR is not substantially affected by low interest rates.

The conclusion that the current low interest rate environment should not translate into a lower TMR and therefore cost of equity is echoed by Smithers & Co. in their latest (2014) report for Ofgem, where it states:

"We conclude that there is no plausible case for any further downward adjustment in the assumed market cost of equity based on recent movements in risk-free rates (or indeed any other "recent market evidence")"[111]

9.2 Summary and implications

The negative correlation between RFR and ERP has buffered the effect of the RFR reduction on TMR. If one assumes a negative correlation between RFR and ERP, as PwC does, then the low interest rate environment should not drastically reduce TMR.

[111] Smithers & Wright (2014), 'The Cost of Equity Capital for Regulated Companies: A Review for Ofgem', p2.

10 Historical achieved returns do not show a statistically significant shift in TMR

Evidence on historical achieved TMR over time shows that it is highly volatile. It is therefore difficult to draw robust conclusions on structural breaks in TMR. PwC's assumption that there has been a long term reduction in TMR is therefore difficult, if not impossible, to evidence.

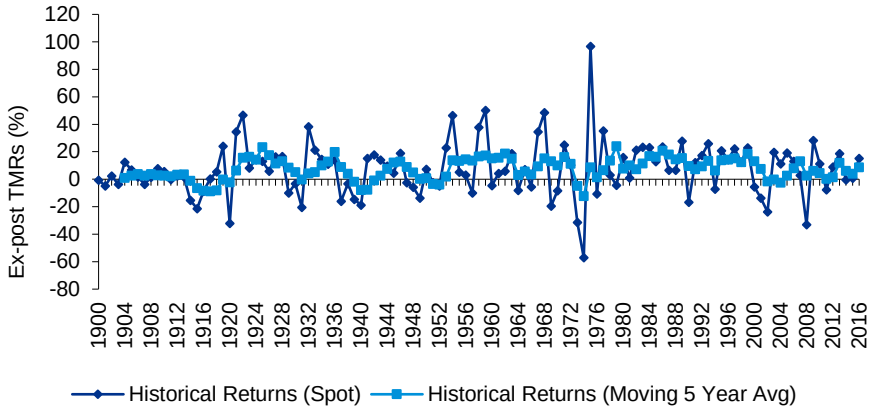
Analysis using historical returns shows that there is no statistical evidence to prove that short term returns are different from long-run historical estimates. It follows that relying on a TMR estimate that is below the historical average, on the basis of a new era of lower returns, is not supported by the evidence.

10.1 Historical TMR is highly volatile over time

Dimson Marsh and Staunton (DMS) contains evidence of TMR over the long-run going back to 1900. It is one of the most widely used sources by regulators and practitioners when assessing achieved market returns. DMS reports historical achieved returns (ex-post data) by incorporating both price growth and dividend yields achieved by investors.

Drawing on the substantial database that DMS provides, it is clear that achieved returns have been highly volatile (see figures 6 and 7 below) with real returns across the period being on average (arithmetic) 7.3% and the standard deviation being 19.6% from 1900 to 2016.[112] This exemplifies the volatility of returns across a number of business cycles over 100 years of data.

Figure 6: Historical TMRs

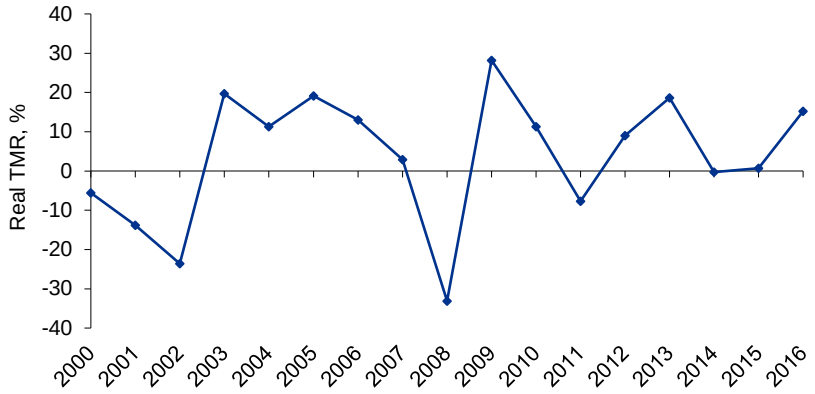


Source: KPMG Analysis

[112] Dimson, Marsh, Staunton (2017), 'Credit Suisse Global Investment Returns Yearbook'.

Similar to above, real TMR from 2000 to 2016 is presented below, the subset of years PwC focuses on (PwC places particular emphasis over the last five years 2012-2016).

Figure 7: Real TMR, 2000 - 2016



Source: KPMG Analysis

The figures above show the large volatility in annual ex post returns over time. Looking at the most recent year of data, TMR in 2016 was +15.2% real.

Further evidence to outline how volatile actual historical returns are since 2000, can be found in Table 11 below. Looking at different variations in time periods over the last 10 years the average TMR ranges from 4.5% to 9.4%, with the standard deviation ranging from 8.45% to 17.82%.

Table 11: Volatility in achieved TMR over time

Statistic	2006-2016	2007-2016	2008-2016	2009-2016	2010-2016	2011-2016	2012-2016	2013-2016	2014-2016
MIN	-33.1	-33.1	-33.1	-7.7	-7.7	-7.7	-0.3	-0.3	-0.3
Average	5.3	4.5	4.7	9.4	6.7	5.9	8.6	8.6	5.2
MAX	28.2	28.2	28.2	28.2	18.6	18.6	18.6	18.6	15.2
Standard Deviation	16.16	16.81	17.82	11.57	9.42	10.08	8.45	9.75	8.67

Source DMS, KPMG Analysis

The volatility in returns in ex post data also illustrates that over the long-run past there have been short periods of both high ex post TMR and low ex post TMR.[113] However, in using long-run ex-post data, one has the advantage of reducing any sampling bias

[113] Clearly, achieved TMR is not necessarily equivalent to expected TMR. Rather, achieved TMR includes an element of surprise or shocks, such that ex post TMR is equivalent to expected TMR +/- unexpected returns, which will be above or below expected TMR. However, in using a long-run period, it can be assumed that on average unexpected returns cancel out, such that the long-run achieved returns are a good proxy for expected returns.

(through the selection of an arbitrary time period for analysis) and understanding how actual historical ex-post returns have evolved over a number of economic cycles.

10.2 TMR now is not statistically different to the long-run TMR

PwC's analysis assumes that there is a structural shift in TMR over the last 10 years. PwC uses this to justify moving away from regulatory precedent of relying upon long run historical data to estimate TMR, to using current market forecasts to extrapolate what the market could look like over PR19.

Comparison of the TMR over several time periods with the long-run of 100+ years (i.e. the entirety of the DMS database) provides insights into the evidence for a structural shift in TMR. By employing an 'equivalence of means' test, one can determine if there is in fact a statistical difference in real TMRs across various periods when compared to the long run.[114] The results can be found in Table 12 below.

Table 12: Statistical difference between recent achieved TMR's and achieved TMRs over the long-run

Period	P-Value of statistical difference from the long run (anything under 0.1 shows a minimum level of statistical significance)
1970+	0.52
1990+	0.93
2000+	0.43
2006+	0.72
2012+	0.88

Source: KPMG analysis.

There is no statistical difference between shorter time periods and the long-run historical real TMR, contrary to the assumption by PwC that this is the case.

10.3 Summary and implications

Analysis of long run historical data on achieved returns from DMS, shows that a substantial amount of volatility exists (as exhibited in the standard deviation of the TMRs). This suggests that it is important to use a long-run view in order to mitigate any issues relating to sampling bias (selection of a shorter time period).

PwC also fails to evidence the rationale for a structural break between the long-run and short run. Looking at historical data on real TMRs it is evident that there is no statistical

[114] We run a t-test on the mean of the long-run historical real TMR and compare it to a specific period of TMR.

difference between the short-run and the long run TMR. Therefore, there is no robust evidence that there has been a structural shift in TMR.

11 Use of long-term data to estimate TMR

The most commonly adopted approach used to determine TMR is to use data on long-run TMR achieved in the past. The assumption being that what was achieved in the past is a good proxy for future expectations of returns. This can be referred to as the long-run ex-post approach.

There is a long time period of data available on TMR over time, extending back to 1900 (as discussed above). This long-run of data embeds the lessons of the past and allows for stability and predictability in the regulatory regime. For this reason, use of long-run data has been the method of choice by regulators to date.

11.1 Long-run ex post returns

11.1.1 Long-run ex-post returns show a real TMR of 7.3%

The most widely used source of long-run ex-post data is the DMS database. DMS collates historical achieved returns to equity holders (both dividend yield and capital appreciation) from 1900 to date. For the UK, the arithmetic average of the real returns since 1900 is 7.3%.[115]

It is evident that the long-run ex post returns are a proxy for future expected returns because the achieved returns can be split into an expected return and unexpected return. Smithers & Co.,[116] explain this concept using the following equation:

$$Realised\ return = Expected\ retrun\ \pm\ "surpirse"$$

The rationale for assuming that long-run ex post returns are a good proxy for a forward looking TMR is that over the long-run, the surprises cancel out, such that the realised return is equivalent to the expected return.

The benefits of this long-run approach to estimating TMR, cannot be underestimated. TMR is inherently an unknown parameter as it is a forward looking estimate of investors' expectations. The long-run ex post approach is the only method available for estimating TMR that is based on hard evidence and not affected by assumptions and forecasts. Unless there is compelling evidence that investor behaviour and volatility in equity returns have permanently changed then long-run ex post TMR estimates cannot be dismissed. This position is consistent with the conclusions of DMS in the 2017 Yearbook, where they state:

"For practical purposes, it is hard to beat extrapolation from the longest history available when the forecast is being made."[117]

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[115] Dimson, Marsh, Staunton (2017), 'Credit Suisse Global Investment Returns Yearbook', Table 72.
[116] Smithers & Wright (2014), 'The Cost of Equity Capital for Regulated Companies: A Review for Ofgem.
[117] Dimson, Marsh, Staunton (2017), 'Credit Suisse Global Investment Returns Yearbook', p41.

11.1.2 Long-run data shows high volatility in equity returns

Evidently, in using long run ex post TMR estimates, one has to assume conditions going forwards will be the same as the long run past. This may not be an unreasonable assumption as the long-run historical data does support a trend of short term deviations from the long-run TMR followed by mean reversion.[118]

However, during the 117 year period over which DMS collects TMR data there have been two world wars and an arguably unprecedented surge in returns during the 1990s.[119] These events and investor's response to such events introduces a large degree of volatility in the long-run returns, which serves to increase TMR.[120]

As pointed out by Smithers (2003), there is an important distinction between acknowledging that there is a large degree of volatility in the past and assuming that the future will be different from the past. The latter assumption is not one which a regulator can be entirely confident in. This is supported by analysis of TMR over time in section 10.2 above, which shows no statistically robust reduction in TMR in recent periods, compared with the long-run past.

11.1.3 The benefits of using long-run ex post returns have resulted in it being a key point of reference for regulatory decisions to date

The long-run ex post data is what investors actually received in the past. It is therefore achieved data and is not affected by assumptions or forecasts. This advantage separates the long-run ex post approach apart from approaches that rely on the DDM.

The benefits of using long-run ex post returns have resulted in it being a key point of reference for regulatory decisions to date. Prior to the CMA's 2014 Northern Ireland Electricity case (NIE), regulators recognised the advantages of the long-run ex post approach. Indeed, decisions generally adopted the DMS long-run ex post returns figure to set TMR, which resulted in TMR estimates of approximately 7.0% real.[121]

11.2 Long run ex-ante returns are a better proxy for setting TMR than spot rate TMRs

As well as data on achieved returns, long-run data can be obtained by applying the DDM each year in the long-run past, using the market price and dividend forecasts at the relevant date to work out the implied TMR. This can be referred to as the long-run ex ante approach to estimating TMR.

The long-run ex ante approach benefits from directly estimating investor's expectations of returns over the long-run past. In addition, as pointed out by PwC, the DDM applied over

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[118] Dimson, Marsh, Staunton (2017), 'Credit Suisse Global Investment Returns Yearbook', p41.
[119] Wright, S., Mason, R. and Miles, D. (2003), 'A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K'.
[120] The volatility in TMR over the long-run has been a topic of much debate. Empirical analysis has shown that the volatility in historical returns data is more volatile than the observed volatility in consumption and dividend growth. There is a body of literature on this so-called "excess volatility" and investor irrationality as a possible explanation for this. See for example, Shiller 2003. From efficient markets theory to behavioural finance.
[121] See for example the CMA's (initial) final decision on Bristol Water 2010 where 7.0% TMR was used.

a number of years has been shown to have relatively good predictive power over 5 to 10 year forecast periods.[122]

In the CMA's decision on the 2014 NIE case, the CMA placed substantial weight on the long-run DDM analysis (i.e. long-run ex ante TMR) model. The CMA justified the use of a long-run ex-ante approach as it provided a "reliable indication of the ERP".[123] The CMA estimated a TMR of 6.25% based on the long-run DDM.[124]

Whilst the CMA acknowledged the benefit in using a forward looking approach to setting TMR it did also highlight its main flaw - estimating long term expectations of dividends. This adds considerable uncertainty and judgement to the TMR estimate, which is not present in the long-run ex post data.

11.3 Summary and implications

The long-run ex post data is what investors actually received in the past. It is achieved data and therefore has the benefit of not being affected by assumptions or forecasts. This is a key advantage of the long-run ex post approach over approaches that rely on the DDM or other forecast-based TMR estimates.

The long-run ex ante approach has the benefit of estimating TMR expectations directly, as opposed to assuming that surprise over and under performance of equity investments cancel out. However, the long-run DDM is still susceptible to the assumptions made around dividend forecasts

The long-run data points to a real TMR between 6.25% and 7.3%, significantly above PwC's estimate of 5.1% to 5.5%.

[122] Note, as discussed in section 5.2.2 of this report, PwC mis-interpreted this evidence to justify reliance on a spot estimate.
[123] Competition Commission (2014), 'Northern Ireland Electricity Limited price determination- final determination', Appendix 13 paragraph 8. CMA DDM is 5.5% geometric average with 75bp uplift for volatility (given that half the difference between the DDM 5.5% and ex post returns of 7% is due to volatility).
[124] Ibid, 13.147

12 Implications for how TMR should be estimated for the purposes of setting the cost of equity for AMP7

This section sets out some recommendations for Ofwat to consider, with respect to the estimation of TMR in the context of PR19, in light of the evidence considered in this report.

Section 12.1 summarises the principal sources of evidence available to Ofwat as a basis for estimating TMR;

Section 12.2 sets out a 'first best' recommendation for how Ofwat should proceed; and

Section 12.3 sets out minimum adjustments that should be made to PwC's analysis in the event that Ofwat chooses to place weight on spot estimates of TMR.

12.1 Summary of the evidence base for each approach

There are effectively three approaches one can use to estimate TMR:

- Long-run ex-post data;
- Long-run ex ante data; and
- Current market forecasts i.e. spot rates.

Each approach comes with its own merits and assumptions. Table 13 below summarises the inherent assumptions, benefits and real TMR estimates arising from each approach.

Table 13: The three main approaches to estimating TMR

Approach	Assumptions	Benefits
Long-run ex post	■ Past achieved returns are a good proxy for future expectations of returns ■ There has not been a permanent shift in volatility in equity markets ■ There has not been a permanent shift in investor behaviour	■ Based on hard evidence and not affected by assumptions and forecasts ■ Stability and predictability for customers and investors
Long-run ex ante	■ Dividend forecasts can be made with any degree of accuracy ■ Dividend forecasts can be made with any degree of accuracy	■ Directly estimates investor's forward looking expectations ■ Has been shown to have good predictive power ■ Directly estimates investor's forward looking expectations
Spot estimate	■ A spot rate TMR estimate is appropriate for forecasting five years' of TMR ■ There has been a permanent shift in TMR (whether due to a reduction in the volatility of equity markets and/or investor risk aversion) such that long-run data is no longer relevant.	■ Reduced risk of overcompensating investors and overcharging customers, where there has been a permanent reduction in TMR.

Source DMS, KPMG Analysis

12.2 A more appropriate TMR estimate for PR19 requires reliance on long-run data

Table 13 above shows that there are a number of judgments to be made when deciding which approach to take, in order to estimate TMR, none of which are unambiguously supported by the evidence. This judgement means there is uncertainty involved in forecasting TMR out to 2025.

However, forecasts of TMR using current market information are evidently inappropriate for forecasting TMR for regulatory charge controls. First, a spot-rate TMR, as adopted by PwC, has no robust predictive power for periods five years ahead. Second, estimating TMR from one point in time would serve to embed short-run expectations of returns in a long-run cost of equity. The latter point exposes the regulated firms to changes in the cost of equity during the charge control period.

A focus on short-term TMR is further complicated by the substantial volatility in TMR over time. This substantial volatility not only makes it difficult to estimate TMR over a period of time but also close to impossible to robustly conclude that there has been a permanent shift in TMR in recent years.

In relying on PwC's spot rate TMR estimate, Ofwat would need to be comfortable that there has been a permanent reduction in TMR. However, there is not statistically robust evidence of this. Relying on short-term estimates would therefore introduce substantial financial risk to the firms, on the basis of assumptions, which Ofwat cannot be confident in.

In part, the lack of evidence for a reduction in TMR is due to the volatility in TMR over time, which renders statistically robust results of a shift in TMR unlikely. However, the TMR estimate is a fundamental input to the regulatory settlement. It has significant implication for financeability and incentives to invest. It is, therefore, not advisable to make a large reduction in TMR (over and above the recent reduction in TMR since the CMA's NIE case) on the basis of weak evidence.

The judgment and uncertainty in estimating TMR should be contextualised in the asymmetric risks of setting cost of equity too low and too high. It is widely acknowledged that the result of setting the cost of equity slightly higher i.e. a small increase in customer bills are less consequential than setting the cost of equity too low i.e. financeability issues and reduced investment. Given this asymmetric risk, regulators in the past have erred on the side of caution and used a TMR estimate based on long-run data.

The balance of evidence suggests that TMR for regulatory settlements should be estimated based on long-run averages. The long-run averages embed lessons learnt from the past and provide some protection against volatility in TMR, which is perhaps the only feature of TMR that can be confidently forecast to 2025. Relying on long-run evidence also contributes to the stability and predictability of the regulatory regime, which is vital for maintaining investor confidence in the sector.

Finally, whilst Ofwat has indicated that it will use CPI to deflate nominal returns, it has not set out clearly the methodology that it will use to adjust for inflation when moving from nominal to real TMR estimates. It is important that this issue is addressed as the approach will have a material impact on the regulated returns.

12.3 Whilst the evidence does not support use of a spot rate TMR, at a minimum, shortcomings in PwC's analysis should be corrected

There is not sufficient evidence to place weight on a spot estimate of TMR, as supported by analysis in this report and indeed Ofwat's own position in PR14. However, should Ofwat's view change between PR14 (where it dismissed an approach to estimating TMR, based on current market forecasts) and PR19 and weight be placed on the spot estimate, the shortcomings identified in this report should be corrected.

Table 14: Shortcomings in PwC's spot rate DDM that should be corrected

	PwC spot rate DDM	PwC 5-year average DDM		MARs TMR
PwC estimate, nominal	8.3%	8.8%	PwC estimate, nominal	7.6% – 8.1%
Uplift to move away from geometric average	+75bp- +150bp	+75bp- +150bp	Uplift for RCV growth a	+100bp
			Uplift for non-regulated revenue	+30bp
Corrected estimate	9.1%-9.8%	9.6%-10.3%	Corrected estimate	8.6% – 9.4%

Table 14 shows that correcting PwC's estimate supports a range of nominal TMR of 8.6% to 10.3%, with a mid-point of 9.5%, which is approximately 6.5% real.

12.4 Summary and implications

The evidence base associated with the different approaches to estimating TMR supports an approach of placing weight on both the long-run ex post and long-run ex ante methods. The real TMR range from these two methods is 6.25% to 7.3%.

Should Ofwat not be persuaded by the evidence and continue to rely on PwC's current TMR estimate, it should ensure that, at a minimum, it corrects the estimate for the errors identified in this report.

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