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Further evidence on the TMR

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Executive Summary

NERA Economic Consulting (NERA) has been commissioned by the Energy Networks Association (ENA) to provide further evidence on the determination of the total market return (TMR) at RIIO-2. This short paper addresses two issues that arose at a RIIO-2 regulatory finance workshop attended by Ofgem, ENA and their respective advisers in early October 2018 around the alleged decline in the TMR, and the effect of corrections to CEPA's DGM TMR.

There is no market evidence to show that the TMR has declined in the recent past

UK regulators and their respective advisers have asserted that the TMR has fallen in the recent past which has been used to justify a decline in the allowed cost of equity at RIIO-2, and the apparent decline in returns was discussed at the ENA-Ofgem workshop.

We show that there is no market evidence to support a decline in either realised or expected returns, and indeed recent market evidence is consistent with a broadly constant TMR over time. Examining historical realised returns for major equity markets, we show that there is an upward trend in returns in three of the five major equity markets (US, Germany, Japan) and there is no discernible tend in either of the other two (UK or France). Similarly, we show that evidence from forward looking DGM models – including Bank of England, Bloomberg and PwC – shows no discernible trend in the DGM estimates over the recent past, despite their varying methodologies and implied absolute levels of the TMR.

The Ofgem-ENA workshop also discussed whether fund managers' required returns have fallen, as asserted by UK regulators and their advisers. Our review of one of the most comprehensive surveys (Fernandez, and as cited by PwC) shows that investors' expected returns have increased over the sample period (2013 to 2018). We also show that survey evidence should not be used to inform the TMR at RIIO-2 given concerns over the framing of the question, and that regulators should principally draw on (stable) long-run realised returns.

Once we correct for errors, CEPA's DGM model supports a forward-looking TMR of 6.5 to 7.1 per cent (real RPI)

CEPA's DGM based TMR provides an estimate of between 4.85 to 5.45 per cent (real RPI). In previous reports, we have shown that the CEPA's DGM is low because it disregards analyst dividend forecasts over the short-term, and its failure to recognise that 70 per cent of earnings for UK companies are derived overseas. Instead, CEPA mistakenly uses UK GDP measure as a proxy measure for long run dividend growth. CEPA's practice contrasts sharply with the Bank of England who use both analyst forecasts and then global GDP growth, which provides a TMR estimate of 7 to 8 per cent.

We show that the current academic literature does not support the existence of an optimism bias in UK, and that historically the optimism bias related to US markets prior to institutional reforms that would have addressed potential sources of bias. Overall, we show that adopting global GDP growth increases CEPA's DGM TMR by around 120 bps, and the use of analyst forecasts increases the estimate by a further 50 bps, providing a corrected CEPA DGM of between 6.5 to 7.1 per cent (real RPI).

1. Introduction

NERA Economic Consulting (NERA) has been commissioned by the Energy Networks Association (ENA) to provide further evidence on the determination of the total market return (TMR) at RIIO-2. This short paper addresses two issues that arose at a RIIO-2 regulatory finance workshop attended by Ofgem, ENA and their respective advisers in early October 2018. These are:

- **Evidence on the change in TMR over time**. We present evidence to show that there is no market evidence to show that the TMR has declined over recent time. Indeed, recent market evidence supports the mainstream view that TMR is broadly constant. (Section 2)
- **Correcting CEPA's DGM based TMR**. We show that correcting for errors in CEPA's DGM increases its mid-point TMR estimate from 5.15 to 6.8 per cent (real, RPI), and the overall range to 6.5 to 7.1 per cent (from CEPA's 4.85 to 5.45 per cent). (Section 3)

2. Recent Market Evidence Shows Constant TMR

UK economic regulators and their advisers have asserted that there is market evidence that demonstrates a decline in TMR over the recent past.[1] Ofwat has also provided evidence that supposedly shows that the TMR is lower in a low interest rate environment.[2] These issues were discussed at the Ofgem-ENA RIIO-2 regulatory finance workshop held in October. We show that these assertions are incorrect, and indeed that market evidence supports the broad constancy of the TMR over time. Specifically, we show that:

- Historical realised returns from equity markets demonstrate no decline in the recent past (section 2.1)
- Forward looking discount growth models (DGM) provide broadly constant TMR estimates over recent time periods (section 2.2)
- Survey evidence on required returns is constant over the past few years (section 2.3)

We conclude that there is no objective basis to set a lower TMR at RIIO-2 based on trends in either realised or measures of expected market returns.

We also show that Ofwat's assertion that returns are lower in a lower interest rate environment errs in its citation of DMS data (section 2.4).

2.1. Historical realised returns from major equity markets shows there is no trend decline

If UK regulators and their advisers are correct that investors *expected* returns have fallen in the recent past, for example, given the low interest rate environment, we may expect to observe a decline in *realised* returns.

We have analysed the realised equity returns in the five largest global equity markets: France, Germany, Japan, UK, and USA[3]. We calculate real realised returns as a rolling 20-year and 30-year average noting that we can only make inferences around expected returns from market data over relatively long-time period (i.e. minimum 20 to 30-year period).[4] Figure 2.1 shows a trend increase in the historical returns in three of the five largest markets, US, Germany and Japan, while realised returns in France and in the UK do not display any discernible trend. Moreover, in all countries the realised return over the recent period is not statistically different from the long-run average return.[5] In conclusion, realised returns data do not support a trend decline in the TMR over the recent period.

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1 PwC (December 2017), Updated analysis on cost of equity for PR19, p.10; KPMG (2017), A review of Ofwat's proposed approach to total market returns, p.5. [NERA to provide specific citations by Ofgem/CEPA]

2 PwC (June 2017), Refining the balance of incentives for PR19, Appendix B.

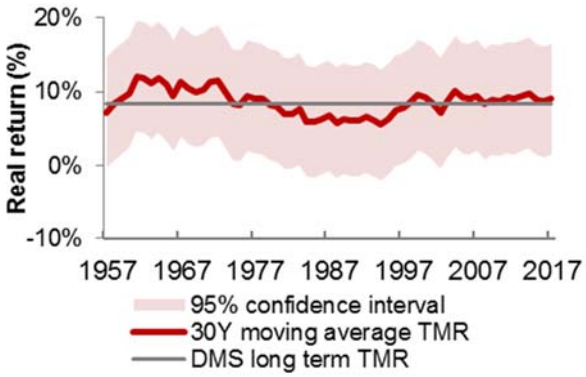
3 DMS (February 2017), Global Investment Returns Yearbook – Slide Deck, slide 3.

4 We have calculated 30-year moving average returns for US, Germany, and the UK. Our results for France and Japan are based on 20-year moving average returns, given the shorter available historical series.

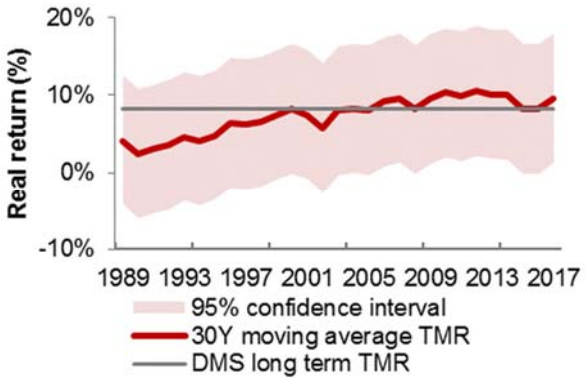
5 We have calculated the 95% confidence interval shown in Figure 2.1 using the standard deviation of the long-run mean. For all the countries considered, recent returns are close to the long-run average TMR and within the 95% confidence interval.

Figure 2.1: Major global equity markets show no discernible decline in realised returns over the recent period

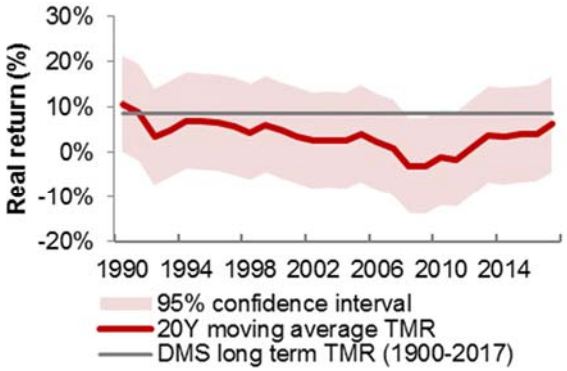
a. US equity market returns



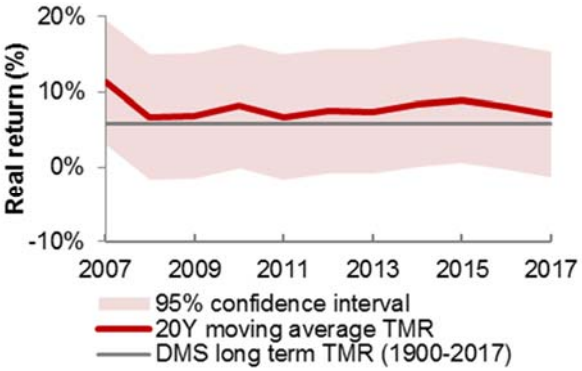
b. Germany equity market returns



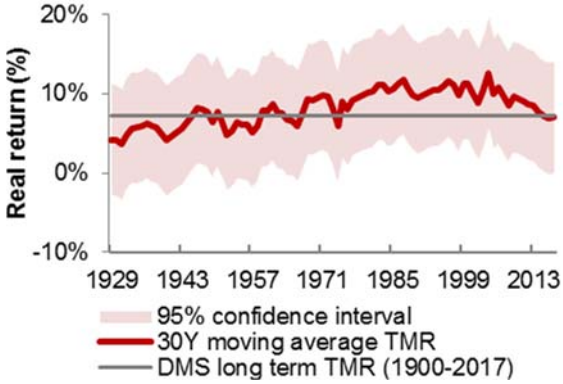
c. Japan equity market returns



d. France equity market returns



e. UK equity market returns



Source: NERA analysis based on data from Bloomberg, OECD, US Bureau of Labour Statistics and DMS (February 2018), Credit Suisse Global Investment Returns Yearbook 2018

2.2. Forward-looking DGM Estimates of the TMR Do Not Support a Reduction in Investors Expected Returns

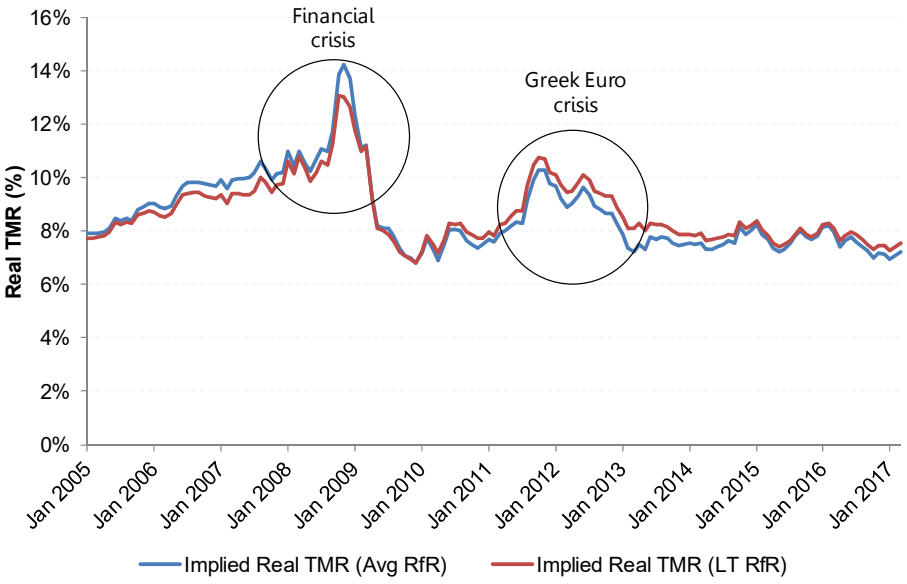
The DGM solves for a discount rate which equates the present value of future expected dividends to the current stock price. If applied to the entire market index (e.g. FTSE All Share), the discount rate implied by the DGM reflects the expected return on the whole market (i.e. the TMR). At previous reviews, the CMA as well as other regulators used evidence from the DGM as a cross-check on the TMR estimated from long-run historical data.[6]

We have drawn on DGM models published by the Bank of England, Bloomberg, and PwC, Ofwat's PR18 advisers, to consider the *trend* in investors expected returns over the most recent period. Although we have concerns with the use of DGM to inform the absolute value of TMR given the sensitivity of the results to the dividend growth assumption, we can draw on the trend in DGM estimates to assess UK regulators' assertion that market evidence supports a decline in market returns. We show that none of the published DGM models shows a trend decline over the period of their analysis, despite differences in methodology and the implied DGM level.

2.2.1. BoE's DGM shows that TMR has been relatively stable over time

Figure 2.2 below shows estimates of the TMR from the Bank of England. The Bank of England estimates the TMR for the FTSE All Share index, using equity analyst estimates of short-term dividend growth and a long-run dividend growth assumption based on long-run GDP growth estimates for the different regions from which FTSE All Share companies derive their earnings.

Figure 2.2: Bank of England DGM shows Stable TMR, Other Than Higher during GFC and Greek Euro Crisis



[6] See e.g. Ofwat (January 2014), Setting price controls for 2015-20 - risk and reward guidance, section A1.4 or CMA (March 2014), NIE Limited price determination, para 13.137.

Note: The Bank of England estimates the DGM using a time varying risk-free rate for all maturities (where available) and a long-run risk-free rate assumption. We calculate a TMR as the sum of the Bank of England's reported ERP and an i) average of the real risk-free rate for all available maturities and 2) the real risk-free rate at the longest maturity available.
Source: NERA analysis of Bank of England (2017), An improved model for understanding equity prices, Quarterly Bulletin 2017Q2, p.94 and Bank of England yield curve data.

As can be seen from Figure 2.2, the TMR estimate from the DGM has been relatively stable over time, apart from the global financial crisis period as well as the Greek euro crisis period where the TMR increased. The relative stability of the TMR supports the theory that the recent reductions in the risk-free rate have been offset by increases in the ERP resulting in a stable TMR over time. Depending on the averaging period, the forward-looking estimates of the real TMR based on the Bank of England's DGM lie in a range between 7 and 8 per cent.[7]

2.2.2. PwC's DGM model does not show a decline in the implied TMR

PwC argues that a low risk-free rate environment implies a reduction in market returns (referred to as "lower for longer").[8] PwC concludes that long-term historical data is inappropriate for estimating the TMR in the current market environment, as historical data fails to include a comparable period of ultra-low interest rates. Instead, PwC recommends drawing on "current" approaches to estimate TMR, such as the application of dividend discount model (DDM) or DGM.[9]

However, PwC's DGM TMR estimate does not show a decline over the period for which it is applied from 2000, as shown in Figure 2.3. Rather it shows an increase prior to and during the GFC, and a broadly constant TMR otherwise.[10] PwC's own DGM model therefore contradicts its assertion that market returns are lower in today's environment. [11]

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7 For a more detailed explanation, see NERA (August 2018), Cost of Capital for PR19, Section 2.3.2.

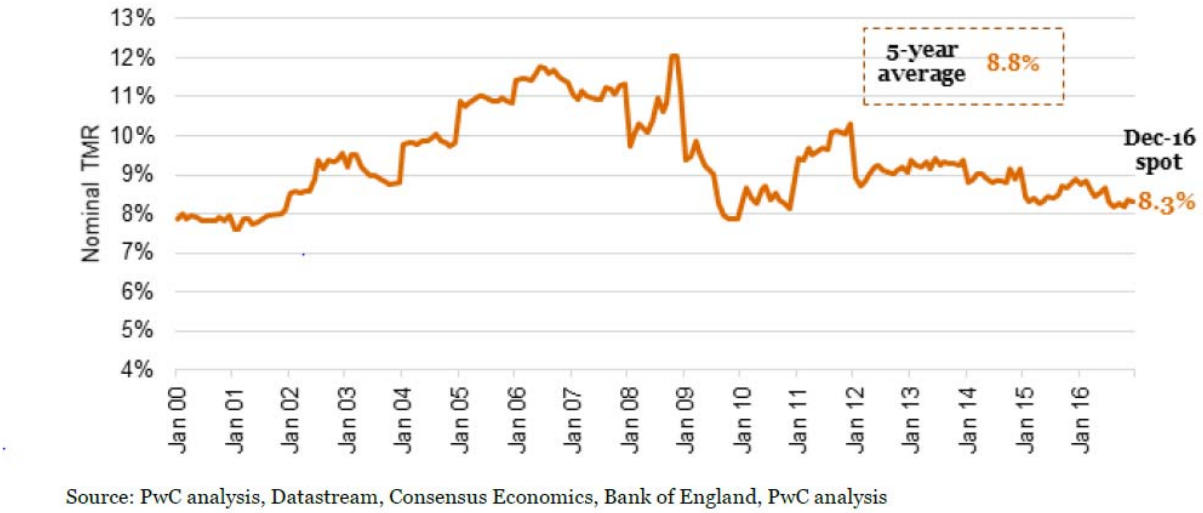
8 PwC (December 2017), Updated analysis on cost of equity for PR19, p.7.

9 PwC (June 2017), Refining the balance of incentives for PR19, Appendix B, p.70-80.

10 We have also deflated PwC's nominal estimates with the 10y UK implied inflation spot curve downloaded from the Bank of England's website, and we show that the general picture does not change when PwC's DGM TMR is presented in real terms. Bank of England's website, https://www.bankofengland.co.uk/statistics/yield-curves, Government liability curve (inflation): archive data. Accessed on 26 October 2018.

11 Setting trends aside, PwC estimate an absolute DGM of around 8.5 per cent in nominal terms, although we consider that this estimate is flawed because of unreasonably low dividend growth assumptions, as we have explained in separate reports. See, for example. NERA (3 November 2017), Total Market Return for Determining the Cost of Equity at RIIO-2, p.8-9; NERA (October 2017), A review of PwC's approach to setting cost of equity in a "lower for longer" era, p.14-16.

Figure 2.3: PwC's DGM TMR Does Not Show a Declining Trend



Source: NERA analysis of PwC and Bank of England data

2.2.3. Bloomberg's DGM Does Not Show a Decrease in Real Market Returns

Figure 2.4 shows Bloomberg implied real market return.[12] As with Bank of England and PwC, the implied real market return for the UK has been relatively stable over the calculation period, albeit we only have access to Bloomberg's DGM over a relatively short period since 2010.

[12] We have calculated the real TMR by deflating Bloomberg's nominal TMR estimates with the 10-year breakeven inflation provided by the Bank of England

Figure 2.4: Bloomberg's UK Real Market Return Calculated Using the DDM Does Not Show a Declining Trend

Source: NERA analysis of Bloomberg and Bank of England data

2.3. There is no Evidence to Show Fund Managers' Required Returns Have Declined

We have also reviewed recently published evidence on fund managers expected returns, and we have found no evidence to support a decline in expected returns. We also find that survey evidence is unreliable to inform the absolute level of investors' expected returns given concerns over the framing of the question.

2.3.1. Survey evidence cited in PwC's report does show a reduction in required equity returns Since 2013

UK regulators and their advisers have also cited survey evidence as a potential reason to set a lower TMR.[13] For example, in its report to Ofwat for PR19, PwC relies on the surveys carried out annually by Fernandez.[14] Professor Fernandez et al. publish an annual study containing the statistics about the ERP used by the investor community in over 40 countries to calculate the required return on equity, and survey evidence on the TMR is available for 39 countries for the years 2013, 2015, 2017, and 2018.

Reviewing the survey evidence, we find no systematic decline in the required returns over the wide sample. Indeed, our analysis of Fernandez data shows that the average TMR has increased from 10.7 per cent to 11.3 per cent from 2013 to 2018. Therefore, the survey evidence cited by PwC does not support a decrease in TMR.

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[13] For example, while relying primarily on forward-looking measures to calculate the TMR, PwC considers investor survey as a supplementary source of information. PwC (December 2017), Updated analysis on cost of equity for PR19, p.4.

[14] Source of the most recent issue of the paper: Fernandez, P., Pershin, V., and Acin, I.F. (April 2018), Market Risk Premium and Risk-Free Rate used for 59 countries in 2018: a survey

Figure 2.5: Survey Evidence from Fernandez Does Not Show a Trend Decline in TMR[15]

Source: NERA analysis of Fernandez data.

2.3.2. Change in HICL discount rate likely to reflect change in asset allocation

In its PR19 methodology[16], Ofwat presented time-series evidence on the discount rate for HICL Infrastructure Company, as evidence of a recent decline in investors' expected returns.

We have considered the change in portfolio allocation by HICL over time to understand its effect on the discount rate. Our analysis shows that the change in HICL portfolio is equally likely to explain the decline in required returns. Our review of the portfolio of assets held by HICL demonstrates that only two of the noted "ten largest investments" held in 2013 are in HICL's portfolio as of March 2018. In addition, the geographic location of the asset has greatly varied, for example, with asset allocation to North America declining from 10 per cent of the asset portfolio in March 2018 to only 2 per cent in January 2013.[17]

The material changes in the HICL portfolio means that we cannot draw any reliable conclusions on the change in investors' expected returns, as this needs to be undertaken on a risk-adjusted basis.

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15 It is unclear to us whether the respondents are asked for their views on the TMR level in nominal or in real terms, which highlights an issue with survey evidence. See Fernandez, P., Pershin, V., and Acin, I.F. (April 2018), Market Risk Premium and Risk-Free Rate used for 59 countries in 2018: a survey, p.11.

16 Ofwat (December 2017), Delivering Water 2020: Our methodology for the 2019 price review – Appendix 12: Aligning risk and return

17 HICL Infrastructure (January 2013), Quarterly Factsheet – January 2013; HICL Infrastructure (May 2018), Annual Results Presentation: Year to 31 March 2018.

2.3.3. Survey evidence is unreliable, as confirmed by the CMA

More generally, regulators should not rely on survey evidence to estimate the TMR, given issues around respondents' understanding of the question being asked. The response to the survey is highly sensitive to the framing of the question and whether the required returns are intended to be nominal or real. For similar reasons, the CMA criticised the use of survey evidence of in its 2014 NIE determination, where it noted:

> *"[…] the results of such surveys tend to depend on the identity and outlook of the respondents and how they interpret the questions being asked. Some surveys do not clarify the time frame over which the parameters are to be estimated (the long-term equilibrium ERP or a shorter-term estimate); whether an arithmetic or geometric averaging approach should be used; or whether the ERP is over bonds or bills or some other instrument."*[18]

2.4. DMS Data Does Not Provide Evidence of Low TMR in Today's low RFR Environment

In its December 2017 methodology document, Ofwat argues that interest rates over PR19 are expected to remain low compared to historical standards and that this low interest rate environment will lead to low equity returns as a result. To support this statement, Ofwat presents data from DMS which allegedly shows a positive relationship between real interest rates and real equity returns from cross-country data (i.e. the lower the interest rate, the lower the equity return and vice versa).[19] The DMS evidence has also been cited by CEPA[20], and its relevance was raised at the Ofgem-ENA regulatory finance October workshop.

Ofwat mistakenly interprets the DMS evidence as a positive relationship between low real bond returns and low equity returns, despite a clear statement from DMS that the relationship arises due to the relatively greater effect of high inflation on bond returns than equity. As DMS recognise, *"historically, the bulk of the low real rates occurred **in inflationary periods**, in contrast to today's low-inflation environment"*.[21] Thus, the apparent positive relationship between real interest rates and equity returns presented by Ofwat (and cited by CEPA) from cross-country data is in fact driven by a negative relationship between both variables and inflation. As DMS show, historically bond and equity returns have shown a negative relationship with inflation, with bond returns particularly affected compared to equities, as shown in Figure 2.6.

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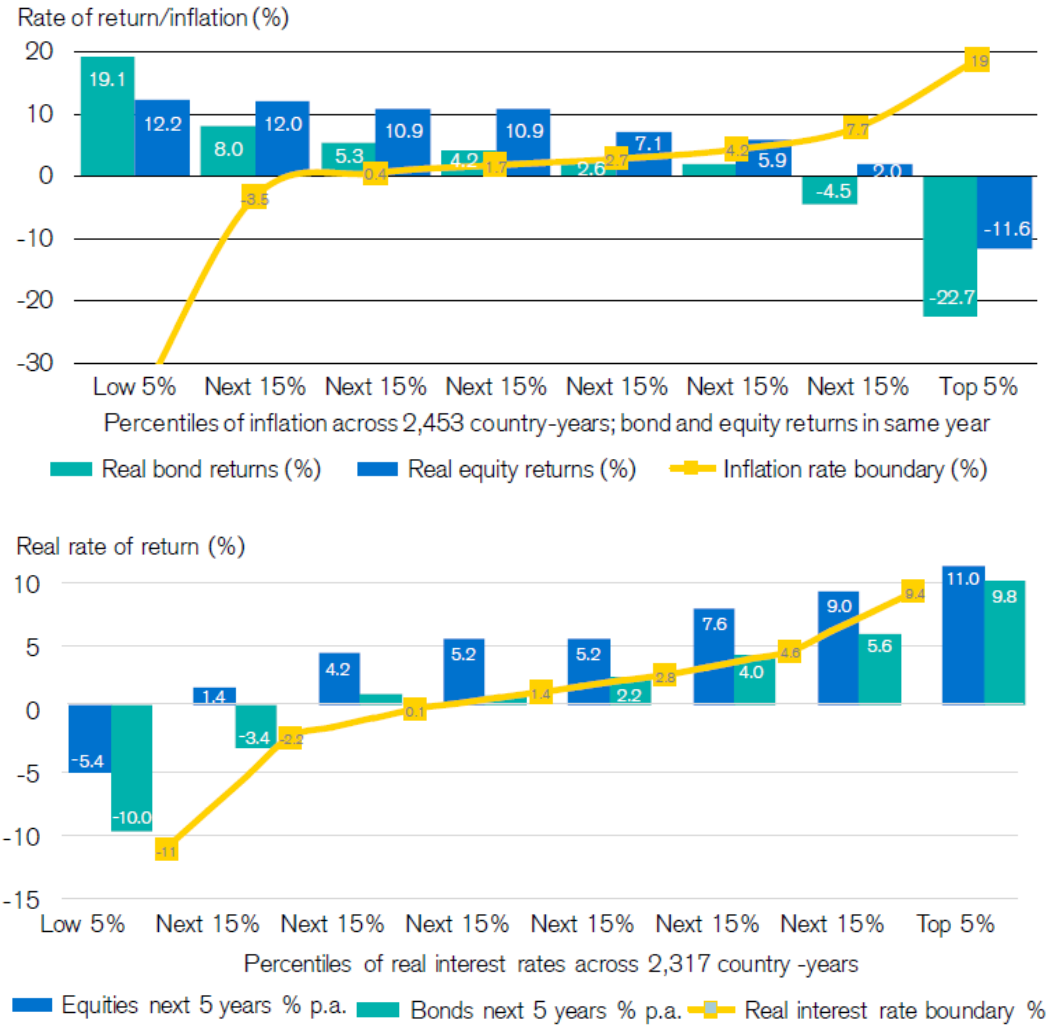
[18] CMA (March 2014), Northern Ireland Electricity price determination, Final Determination, para. 13.156, p.13-31 and para 13.32.

[19] Ofwat (December 2017), Delivering Water 2020: Our methodology for the 2019 price review Appendix 12: Aligning risk and return., section 5.4.1.

[20] CEPA (July 2018), Review of cost of capital ranges for new assets for Ofgem's network division, p.15.

[21] DMS (February 2018), Credit Suisse Global Investment Returns Yearbook 2018, p.20.

Figure 2.6: Bond returns react more negatively to high inflation compared to equities (LHS), giving rise to apparent "positive" relationship between low real bond returns and low equity returns (RHS)



Source: DMS (February 2018), Global Investment Returns Yearbook 2017 – Slide Deck, p.11 and 14.

However, the relationship between bonds and equity returns in high inflation periods is not relevant for the assessment of the implications of the current low risk-free rate environment on equity returns, as the low risk-free rate is not driven by high inflation but is a result of loose monetary policy.

2.5. Conclusions: Current Market Evidence Shows Constant TMR

As we have explained in this Chapter, evidence from realised returns from the world's major stock markets, evidence from forward-looking DGM TMR estimates, and survey evidence, do not provide any evidence of a recent decline in the TMR, and indeed support the widely-accepted theory that the TMR is broadly constant over time, as we have explained in previous

reports.[22] We conclude that there is no objective basis to set a lower TMR at RIIO-2 based on trends in either realised or measures of expected market returns.

[22] See, for example. NERA (3 November 2017), Total Market Return for Determining the Cost of Equity at RIIO-2, p.8-9; NERA (October 2017), A review of PwC's approach to setting cost of equity in a "lower for longer" era, p.14-16; NERA (August 2018), Cost of Capital for PR19

3. Correcting CEPA's Forward Looking DGM

CEPA presents forward looking estimates on the TMR, drawing on its own DGM as well as PwC's DGM analysis for Ofwat for the upcoming PR19 review. CEPA's DGM estimates provide a range for the TMR of 4.85 and 5.45 per cent (real, RPI-deflated), based on CEPA's multi period model.[23]

In this Chapter, we show that correcting for these issues in CEPA's DGM provides a TMR of 6.5 to 7.1 per cent (real RPI).

3.1. CEPA's DGM TMR Below Bank of England, Due to Implausibly Low Assumptions on Dividend Growth

CEPA's (and PwC's) DGM evidence is substantially below independent estimates of the TMR from the Bank of England's DGM, which the CMA relied on in its 2014 NIE determination. As discussed in Section 2.2.1, independent estimates of the TMR from the Bank of England support a range of around 7 to 8 per cent (real, RPI-deflated).

CEPA's (and PwC's) DGM is understated due to implausibly low assumptions around dividend growth rates, a key determinant of the implied TMR. CEPA assume that FTSE dividends grow in line with short-term and long-term nominal growth in UK GDP, but provide no basis for the assumption that UK GDP forecast growth rates are a good proxy for investors' expectations of dividend growth rates. As we have set out in previous reports, this assumption is incorrect:[24]

- First, FTSE All-Share companies derive over 70 per cent of their earnings from outside of the UK, which have higher forecasts of GDP growth than assumed by CEPA for the UK.[25]

- Second, short-term UK GDP forecast growth rates are somewhat depressed (e.g. due to Brexit) and are substantially lower than independent analyst forecasts of dividend growth rates for FTSE stocks, which are used by the Bank of England as a basis of forecasting short-term dividend growth in its DGM.[26]

As a result of understating dividend forecasts for both the short-term and the long-term relative to the independent estimates by the Bank of England, CEPA's and PwC's DGM substantially understate the TMR.[27]

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[23] Real values calculated based on information in CEPA (July 2018), Review of cost of capital ranges for Ofgem's RIIO-2 for onshore networks division, Table 6.6, deflated using inflation of 3 per cent.

[24] See, for example. NERA (3 November 2017), Total Market Return for Determining the Cost of Equity at RIIO-2, p.8-9; NERA (October 2017), A review of PwC's approach to setting cost of equity in a "lower for longer" era, p.14-16.

[25] For example, the weighted average long-run GDP growth rate for the different regions from which FTSE companies derive their earnings as of October 2016 is around 5.9% (nominal), while the UK long-run GDP growth rate assumed by CEPA is 4.5 per cent (nominal). Source: Bank of England (2017), An improved model for understanding equity prices, Quarterly Bulletin 2017Q2, p.91, Chart 7; CEPA (July 2018), Review of cost of capital ranges for new assets for Ofgem's network division, p. 95.

[26] Bank of England (2017), An improved model for understanding equity prices, Quarterly Bulletin 2017Q2, p.90, Chart 3.

[27] The DGM estimates a discount rate which equates the forecast dividends to the current value of the FTSE all share index, which is observable. If dividend forecasts are understated, the DGM will "compensate" for this by producing a lower discount rate (i.e. TMR) to equate the lower dividend forecasts to the same observed value of the market index.

Table 3.1: CEPA's and PwC's nominal dividend growth assumptions are understated compared to Bank of England (October 2016 assumptions)

	Bank of England	CEPA	PWC
Short-term dividend growth (nominal)	Around 8% (analyst forecasts)	Around 3.6% (UK GDP growth)	3.7% (UK GDP growth)
Long-term dividend growth (nominal)	Around 6% (weighted average GDP growth for countries from which FTSE companies derive earnings)	4.5% (UK GDP growth)	4.0% (UK GDP growth)

Note: Reflects forecasts for October 2016 DGM results.
Source: Bank of England (2017), An improved model for understanding equity prices, Quarterly Bulletin 2017Q2, p.90-91, Chart 3 and 7, (approximate values based on BoE summary charts) ; CEPA (July 2018), Review of cost of capital ranges for new assets for Ofgem's network division, Annex F – Overview of CEPA DGM, p.115-117.

3.1.1. There is No Evidence to Support Analyst Bias, as it has Been Recently Mitigated by Regulatory Reforms

As explained above, CEPA's DGM relies on UK GDP growth estimate as the basis for its dividend growth assumptions as it considers analyst estimates to be subject to optimism bias.[28] CEPA cites evidence from Ofwat which in turn cites CMA evidence that analyst forecasts are subject to optimism bias. The CMA evidence itself is based on a paper published in 1990 drawing on evidence from the US.[29]

Our analysis of more recent literature on optimism bias suggests that any evidence of historical optimism bias is no longer relevant to today. Much of the historical literature on optimism bias focussed on US companies and their earnings growth forecasts during a time before the so-called "Global Settlement" between the SEC and Wall Street investment banks in 2003. As reported in Sudarsanam (2011), the settlement involved ten leading investment banks agreeing to reform analyst pay structures and to rely more on external analyst input in order to mitigate bias in analyst forecasts.

As a consequence of reform, the post-2003 US literature suggests that any bias has been substantively addressed. For example, Ashton et al. (2011) find that the bias in the long-run dividend growth rate due to analyst optimism is insignificant when a US dataset running up to 2006 is used.[30] The academic literature based on non-US market data also questions the existence of optimism bias. For example, for the UK, Ryan and Taffler (2006) find that the ratio of sell and buy recommendations is less distorted than in the US. Galanti and Vaubourg (2017) find that optimism bias significantly reduced after the implementation of Commission

[28] CEPA (February 2018), Review of cost of capital ranges for Ofgem's RIIO-2 for onshore networks, p.115.

[29] Ofwat (December 2017), Delivering Water 2020: Our methodology for the 2019 price review – Appendix 12: Aligning risk and return, p.48-49.

[30] Ashton, D.; Gregory, A. & Wang, P. (2011): Analysts' Optimism in Earnings Forecasts and Biases in Estimates of Implied Cost of Equity Capital and Long-run Growth Rate, University of Bristol Working Paper.

Sharing Agreements (CSA), which unbundle brokerage and investment research fees, drawing on evidence from France.[31]

Based on our survey of these more recent studies, there is no evidence that optimism bias in the UK is as prevalent as it may have been in the US in the past.

3.2. Correcting for CEPA's Errors, We Derive a Real TMR of 6.5 to 7.1 per cent (real RPI)

We have corrected CEPA's DGM TMR for the two issues identified above, namely:

- We use the weighted average GDP growth for countries from which FTSE companies derive earnings as the measure of long-term dividend growth, consistent with the Bank of England.
- As a second step, we use analyst forecasts for the short-term period, given the absence of any up-to-date evidence on optimism bias.

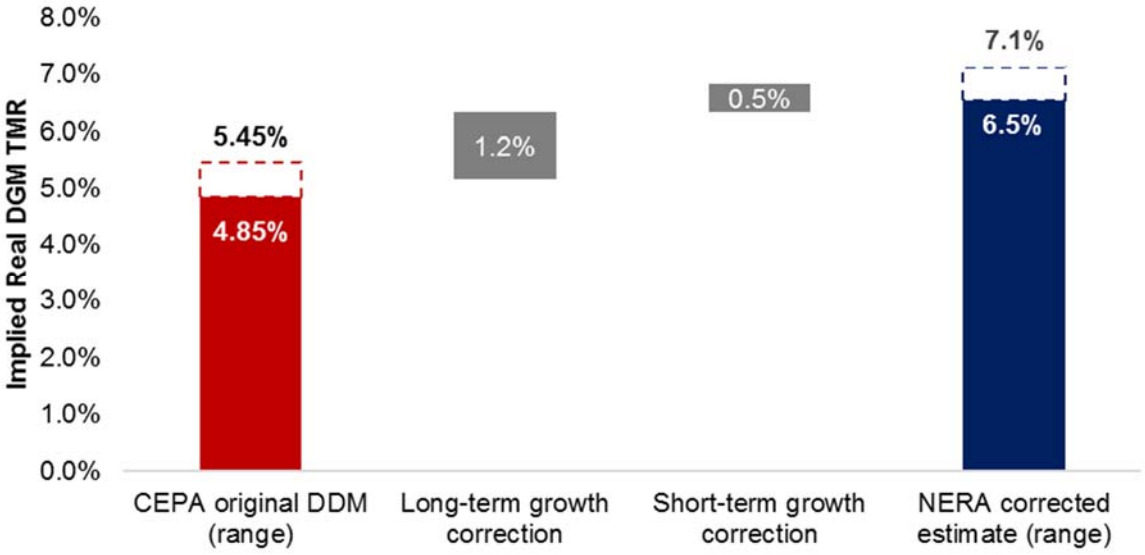
Otherwise, we retain CEPA's assumptions, notably around the starting point total equity yield measured as the sum of the dividend yield and the share buyback

Figure 3.1 shows that the correction of CEPA's dividend growth assumptions implies a real forward-looking TMR of around 6.8 per cent (mid-point), and a range of 6.5 to 7.1 per cent. The most material change relates to the correction for the use of weighted average GDP growth for countries from which FTSE companies derive earnings, which increases CEPA's DGM TMR by around 120 bps, with the use of analyst forecasts increasing CEPA's estimate by around 50 bps.[32] The relative magnitude of these effects is explained by the relative short period for which analyst forecasts are available relative to the DGM modelling period.

[31] Galanti, S., and Vaubourgm A.G. (May 2017), Optimism bias in financial analysts' earnings forecasts: Do commission sharing agreement rules reduce conflicts of interest?

[32] We have replicated CEPA's DGM TMR based on spot market and 2-year historical evidence, which forms its estimate in the range of 4.85 to 5.45 per cent. Based on this model, we estimate the impact of using global GDP as the long-run growth forecast of around 120 bps, and the impact of using analyst forecasts over the short-term of around 50 bps.

Figure 3.1: Correcting CEPA's DGM for Use of Global GDP Increases TMR by 120 bps, and Further 50 bps if Use Analyst Forecasts



Source: NERA analysis of CEPA's Bank of England's data.

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