

UKRN guidance for regulators on the methodology for setting the cost of capital

## Contents

Executive Summary .....	3
Introduction .....	6
Scope of the guidance.....	7
Overall framework for estimating allowed returns.....	10
CAPM cost of equity .....	12
Risk free rate: current approach.....	12
Risk-free rate: guidance .....	14
TMR/ERP: current approach .....	16
TMR/ERP: guidance .....	19
Equity Beta: current approach.....	21
Equity beta: guidance .....	22
Deriving a CAPM cost of equity range and point estimate.....	25
Cross-checks to the CAPM cost of equity .....	26
Cross-checks: current approach .....	26
Cross-checks: guidance.....	27
Cost of debt and notional gearing .....	31
Cost of debt.....	31
Notional gearing .....	33
Annexes.....	34
1. Building blocks approach to setting price controls.....	34
2. BEIS Economic Regulation paper Terms of Reference.....	34
3. Risk-free rate time series.....	36

## Executive Summary

In most sectors subject to economic regulation, regulators rely on price controls as a tool to protect the interests of consumers. Where regulators set price controls with reference to expected efficient costs of delivering the service, the allowed return on capital is an important component of the price for that service – particularly where there is a significant quantum of regulated capital assets. This is why companies, investors and consumer bodies take a strong interest in how the allowed return is derived. The allowed return in revenue terms is calculated as the percentage rate of return multiplied by the value of the asset base for the regulated service in question.

The provision of debt and equity finance is crucial to the successful operation and delivery of investment in the regulated sectors. Ensuring the allowed rate of return appropriately reflects the market risks taken by investors, given the underlying regulatory framework in each sector, is vital for promoting the long-term interests of consumers by encouraging investment and innovation, whilst protecting consumers from excessive prices. Regulators which use a 'building blocks' approach to set cost-based price controls in their sectors: The Water Services Regulation Authority (Ofwat), Office for Gas and Electricity Markets (Ofgem), Office of Communications (Ofcom), the Civil Aviation Authority (CAA), and the Utility Regulator for Northern Ireland (UREGNI) typically set the allowed rate of return by reference to a weighted average cost of capital (WACC).<sup>1</sup> These regulators start from a position of significant alignment in the overall framework and methodologies used to estimate the WACC,<sup>2</sup> but ultimately final decisions are taken independently, in light of each individual regulator's duties.

The Government has asked Ofwat, Ofgem and Ofcom ('the Named Regulators') to work together, through the UKRN, to identify areas where there is already significant alignment in cost of capital methodologies and areas where further alignment could be achieved.<sup>3</sup> Greater transparency and consistency in decisions should reduce the uncertainty associated with the final price control outcome and should allow for easier cross-sector comparisons. Estimating the WACC involves judgement where there are different possible approaches to estimate many of the cost of capital parameters. In some cases, differences between methodological approaches applied will be due to sector specific issues. Where this is not the case, aligning around a reasonable methodology for market parameters where practicable would reduce the need to continue revisiting theoretical debates where there is not a clear benefit of doing so. This in turn would allow companies and regulators to focus on the effective running of their respective sectors and allow all parties to focus on delivering best outcomes for customers. In addition, greater alignment should improve the predictability of regulatory decisions and may reduce the risk of investing in UK infrastructure, benefitting consumers by lowering costs and supporting sustainable investment.

The Named Regulators have been joined by the Civil Aviation Authority (CAA), Office of Rail and Road (ORR) and the Utility Regulator of Northern Ireland (UREGNI), to form a taskforce to put forward a set of recommendations which reflect the outcome of this joint work. Following a request from BEIS, the Competition and Markets Authority (CMA), as the appeal body for the majority of regulated utilities in the United Kingdom, has participated as an observer with respect to the development of this guidance. In addition, the taskforce has considered peer review comments provided by John Earwaker<sup>4</sup> and Craig Lonie<sup>5</sup> in the development of this guidance.<sup>6</sup> Finally, the taskforce has

---

<sup>1</sup> In some sectors, cost-based price controls apply to the entire value chain (e.g. water), whereas in others they may only be used for a relatively small sub-set of wholesale services (e.g. telecoms).

<sup>2</sup> [Cost of Capital – Annual Update Report, July 2022.](#)

<sup>3</sup> [BEIS: Economic regulation policy paper](#), p.20. See Annex 2 for the terms of reference from BEIS.

<sup>4</sup> John is a director at consultancy First Economics, specialising in regulatory economics, regulatory finance, and periodic reviews.

<sup>5</sup> Craig is a specialist partner at consultancy Flint Global and has three decades of experience in utility infrastructure, communications and media sectors, particularly around financial matters.

<sup>6</sup> The views expressed in this report should not be interpreted as necessarily reflecting the views of the external peer reviewers.

considered the submissions of 13 respondents to our draft guidance consultation.<sup>7</sup> The taskforce is grateful for the input of all contributors.

The primary focus of this guidance is on the common parameters for the cost of equity and the overall framework for choosing a point estimate for the allowed return on equity, due to these areas having the greatest commonality across regulators. The proposals in this document bring together and consolidate existing methodologies, recognising the importance of both consistency across sectors as well as across time and recognising the benefits brought about by aligning regulatory approaches to investors and customers. In formulating proposals, the taskforce has considered responses to the draft guidance consultation carefully, and a summary table explaining how we have addressed responses is published alongside this guidance. The taskforce considers that future iterations of this guidance should likewise involve consultation, giving stakeholders an adequate opportunity to contribute their perspective.

This guidance is not binding and each regulator will continue to make decisions in accordance with its own statutory duties. Nothing in this guidance overrides relevant legislation or the principle of regulatory independence. However, the expectation is that the Named Regulators<sup>8</sup> together with ORR and UREGNI would commit to having regard to the recommendations in this guidance in their future price control decisions where this is permitted by their statutory duties and to deviate only where they consider there are good reasons to depart from these recommendations. We recognise that the development and publication of this document is at a time when some regulators from the wider taskforce have been in the process of making draft or final price control decisions. The approach to making those decisions has been subject to appropriate consultation and careful consideration and we therefore do not expect the recommendations in this guidance to be adopted for those decisions. Nothing in this document should be taken as suggesting that any regulator should change its approach to such decisions.<sup>9</sup> The CMA has confirmed its expectation that the independent groups of decision-makers which it convenes to make decisions on regulatory appeals will have due regard to the guidance, alongside the other evidence and submissions received, and taking into account the relevant standard of review and legal grounds in a particular appeal.

Following consultation on the draft guidance, the recommendations for application in future cost of capital decisions are set out below.

**Recommendation 1 - Notional company:** Regulators should continue to estimate the allowed rate of return in price controls based on the weighted average cost of capital for a notionally financed firm within their sector.

**Recommendation 2 – CAPM:** Since the cost of equity is not directly observable, it must be estimated using a widely accepted method. Regulators should continue to use the capital asset pricing model (CAPM) as their primary approach for estimating the cost of equity.

**Recommendation 3 – Risk-free rate:** To estimate the real risk-free rate (RFR) within the CAPM, regulators should use recent yields on the index-linked gilts, with a maturity which matches the assumed investment horizon for their sector.

**Recommendation 4 – Equity risk premium:** Regulators should estimate the equity risk premium (ERP) within the CAPM as the difference between total market return (TMR) and the risk-free rate (RFR). We recommend that the TMR should be primarily based on historical ex post and historical ex ante evidence.

**Recommendation 5 – Equity beta:** Regulators should estimate equity beta for the notional company using comparable listed companies and standard regression techniques (i.e. ordinary least squares (OLS)). Where the listed comparator

<sup>7</sup> Anglian Water, British Telecom, Citizens Advice, CCWater, The Energy Networks Association, The Global Infrastructure Investor Association, National Grid, The Office of Rail and Road, Southern Gas Networks, South West Water, Thames Water, United Utilities, WaterUK.

<sup>8</sup> i.e. Ofwat, Ofgem and Ofcom.

<sup>9</sup> This includes the CAA, which will review its approach to the cost of capital and how to best have regard to the positions set out in this document after the end of the H7 and NR23 reviews.

has different gearing to the notional company, regulators should continue to de-lever and re-lever the raw equity beta.

**Recommendation 6 – CAPM point estimate:** The RFR, TMR and (re-levered) equity beta assumptions should be combined using the CAPM to produce a cost of equity range. The mid-point of the range should be used as the central estimate for the CAPM cost of equity.

**Recommendation 7 – Cross-checks:** Cross checks may be used to sense check the CAPM derived point estimate. However regulators should only deviate from the mid-point of the CAPM cost of equity range if there are strong reasons to do so.

**Recommendation 8 – Cost of debt:** Regulators should estimate an allowance for an efficient company under the notional financial structure, with actual debt costs suitably benchmarked against other market evidence.

**Recommendation 9 – Gearing:** The notional gearing assumption should reflect the regulator's assessment of the balance of risks facing the regulated company, a wide range of benchmarks on gearing levels, and overall regulatory policy objectives - not just the gearing level of the actual company (or companies) in question.

The value of a common methodology is its transparency and predictability. Nevertheless, we recognise that changes to market conditions, finance theory, statutory frameworks regulators operate under, and the type of assets being regulated, could constitute a case for revising regulatory practice. For these reasons, the UKRN taskforce agrees that the recommendations on a common methodology are subject to a periodic review by the regulators.

## Introduction

Economic regulators use price controls to protect consumers from excessive prices and to incentivise companies to invest, innovate, deliver cost efficiencies, and provide a decent quality of service. In effect, regulators are trying to recreate incentives which are prevalent in competitive markets.

Price controls can take different forms, but in the majority of regulated sectors they are set with reference to the expected efficient costs of delivering the service over the control period, including an appropriate allowance for remunerating the providers of equity and debt capital.

Ensuring regulated companies have a reasonable expectation of earning returns which compensate capital providers for the risk of investing in these businesses is an important aspect of setting price controls. The "allowed return" is applied to the value of the regulated asset base (or capital employed) to calculate a revenue requirement within the building blocks of a price control (see Annex 1). The allowed return is typically estimated by reference to the weighted average cost of capital (WACC) for the relevant regulated activity. The WACC is an important part of overall revenue allowances and bills – particularly in sectors where the regulated asset base is large in financial value.<sup>10</sup>

The approach of most regulators is to allocate risk to those parties which are best placed to manage it. Companies maintain significant discretion over their own financing and capital structure arrangements, but they also bear the risks of their decisions in these areas in the context of the price control and the wider regulatory framework.

The allowed return is typically the base return for a 'notional' company with a particular financial capital structure, as opposed to allowances corresponding to company-specific financing costs. The actual return that companies achieve will depend on their actual capital structure and their performance during the control period, including in areas such as cost efficiency or service delivery, where incentive payments may drive revenue adjustments. These incentives are designed to align the interests of companies and investors with those of customers, with regulators typically aiming to attach financial incentives to the behaviour and outcomes most valued by customers.

The overall methodology used to estimate the allowed rate of return is broadly similar across all major price controls. Through the UKRN Cost of Capital working group (including through the publication of the annual Cost of Capital report) significant alignment has already been achieved.<sup>11</sup>

The Government's 2022 Economic Regulation Policy Paper set out the expectation that regulators should work towards greater consistency, and towards a common methodology, where appropriate for the WACC in setting price controls. It stated that alignment would encourage greater confidence in the price control for consumers, businesses and investors.<sup>12</sup> Regulators involved in setting the main price controls recognise the value of further alignment in the approaches and ultimately the common parameter values used in each sector. Ofwat, Ofgem and Ofcom (the 'Named Regulators' in the paper), have worked in tandem with the CAA, ORR, and UREGNI, in a UKRN taskforce to produce this guidance and anticipate further collaboration on these issues going forward. Following a request from BEIS, the Competition and Markets Authority (CMA), as the appeal body of the majority of regulated utilities in the United Kingdom, has participated as an observer with respect to the development of this guidance. In addition, the taskforce

---

<sup>10</sup> For example, the allowed return accounts for around a fifth of regulated water and energy network revenues.

<sup>11</sup> See [UKRN, 'Cost of Capital – Annual Update Report', July 2022.](#)

<sup>12</sup> Department for Business, Energy and Industrial Strategy (BEIS), [Economic Regulation Policy Paper](#), January 2022.

has considered peer review comments provided by John Earwaker<sup>13</sup> and Craig Lonie<sup>14</sup> in the development of this guidance.<sup>15</sup>

The true cost of capital for any service or line of business is unknown, and there are many analytical judgements to be made in deriving a reasonable estimate. Well-informed academics and practitioners can often disagree on the best approach to take. However, we consider that there is value from further alignment on some aspects of the methodology used to estimate the allowed rate of return. Greater alignment would provide a greater degree of predictability for investors, potentially reducing the risk premium associated with investing in UK infrastructure, to the long-term benefit of consumers. Further, greater alignment would reduce the burden on regulators, appeal bodies and other stakeholders by not revisiting certain methodological debates for every price control decision, unless there is a good reason to do so.

This guidance document largely seeks to bring together and consolidate existing methodologies, rather than re-open theoretical debates, recognising the importance of consistency across sectors but also across time. We intend that this common methodology would be updated periodically to confirm agreement on the material amongst the regulators and to capture any additional insights that may stem from evolving circumstances.

The allowed return is one of many aspects of the regulatory framework which influences the relative attractiveness of a given sector to investors and which ensures that consumers get value for money. Long-term protection of investments from the use of a Regulated Asset Base (RAB), inflation indexation, a stable and predictable framework for remunerating expenditure, the use of reconciliation mechanisms to drive incentives and provide risk protection, competitive tendering for large scale projects, greater pricing freedom in the presence of stronger competitive pressure – are some examples of the other features of the regulatory framework which would also have a significant bearing on investment incentives.

Within this context, a more tightly-defined methodology for the allowed rate of return, while supportive of greater predictability in the regulatory regime and potentially increasing the attractiveness of UK regulated infrastructure as an asset class, will not be the only aspect which influences investment decisions.

## Scope of the guidance

We intend that this guidance would be applicable where regulators explicitly set cost-based price controls using the 'building blocks' approach referenced earlier (and described in Annex 1). In some sectors, in particular in telecoms, regulators also use other approaches to cap prices, such as anchor pricing<sup>16</sup> or safeguard caps, where the prices do not necessarily follow the projected path of efficient costs (including capital costs), and therefore, this guidance would not directly influence prices. There will also be other instances where regulators require an estimate of a cost of capital or a discount rate (e.g. to appraise investments or to settle disputes), or are seeking to secure financing for novel or bespoke investment projects, and these cases are also not covered by this guidance.

The recommendations in the guidance reflect an aim by regulators to find defensible and evidence-based common approaches to cost of capital estimation which improve the predictability of regulatory decisions. While acknowledging the views of past CMA panels as important considerations in informing this guidance, regulators were not convinced that this guidance should be based solely on the approach taken by any one CMA panel. Overall, regulators agree with

---

<sup>13</sup> John is a director at consultancy First Economics, specialising in regulatory economics, regulatory finance, and periodic reviews.

<sup>14</sup> Craig is a specialist partner at consultancy Flint Global and has three decades of experience in utility infrastructure, communications and media sectors, particularly around financial matters.

<sup>15</sup> The views expressed in this report should not be interpreted as necessarily reflecting the views of the external peer reviewers.

<sup>16</sup> Anchor pricing refers to setting a regulated price cap on a basic "anchor" product (e.g. wholesale access to a basic broadband connection) with pricing flexibility on other products (e.g. wholesale access to higher speed broadband connections).

the conclusions of the RIIO-2 CMA panel that the PR19 redetermination does not set down the unquestionable methodological best practice that must automatically be applied in future regulatory determinations.<sup>17</sup> In particular, there was a consensus within the taskforce in favour of guidance that did not derive from an approach focused on a particular sector, and which could incorporate emerging evidence.

This guidance is not binding and each regulator will continue to make decisions in accordance with its own statutory duties. Nothing in this guidance overrides relevant legislation or the principles of regulatory independence. However, the expectation is that the Named Regulators<sup>18</sup> together with ORR and UREGNI would commit to having regard to the recommendations in this guidance in their future price control decisions where this is permitted by their statutory duties and to deviate only where they consider there are good reasons to depart from these recommendations. We recognise that the development and publication of this document is at a time when some regulators from the wider taskforce have been in the process of making draft or final price control decisions. The approach to making those decisions has been subject to appropriate consultation and careful consideration and we therefore do not expect the recommendations in this guidance to be adopted for those decisions. Nothing in this document should be taken as suggesting that any regulator should change its approach to such decisions.<sup>19</sup> The CMA has confirmed its expectation that the independent groups of decision-makers which it convenes to make decisions on regulatory appeals will have due regard to the guidance, alongside the other evidence and submissions received, and taking into account the relevant standard of review and legal grounds in a particular appeal. The CMA has noted that, in the context of an appeal, the relevant regulator may wish to explain how it has applied the guidance agreed by the UKRN, or, if it has departed from that guidance, to explain its reasons for doing so.

The focus of this guidance is on parameters relevant to the cost of equity part of the allowed return, given that there is greater scope for cross-sector alignment and given that the cost of equity is typically subject to greater uncertainty than the cost of debt.

We have treated the following policy choices as out of scope for a common methodology since they require only internal consistency in their treatment and we do not see much value in consistency between regulators in these areas:

- **Tax** – The expression of the allowed return in pre-tax or "vanilla" terms depends on the price control modelling choices made by each regulator.<sup>20</sup> We do not consider that guidance or a common methodology is required in this area.
- **Real or nominal returns** – The choice of whether to express the allowed return as a real rate or a nominal rate remains with each regulator and is largely dependent on the approach in previous reviews in the sector. All sector regulators need not apply one or other approach, however regulators should adopt internally consistent approaches. Nevertheless, the move to measuring inflation in CPI(H) rather than RPI terms does raise some complications in how we measure and estimate returns. We do, therefore, discuss issues around converting between RPI, CPI(H), and nominal values in further sections.

The value of a common methodology is its transparency and predictability. Nevertheless, we recognise that material changes to market conditions, finance theory, statutory frameworks regulators operate under, and the type of assets

<sup>17</sup> CMA, 'RIIO-2 Final Determination, Volume 2A: Joined Grounds: Cost of equity', p.46, para. 5.120

<sup>18</sup> i.e. Ofwat, Ofgem and Ofcom.

<sup>19</sup> This includes the CAA, which will review its approach to the cost of capital and how to best have regard to the positions set out in this document after the end of the H7 and NR23 reviews.

<sup>20</sup> For example, when a regulator models the tax position of the regulated entity, the appropriate allowed return is net of any tax allowance – which is often referred to as the "vanilla" WACC. Alternatively, price controls can be set without explicitly modelling the tax position of the regulated entity. In this case, the allowed return used to set the price control needs to be on a pre-tax basis to allow sufficient funding to compensate equity investors (whose returns would be net of corporation tax). The concepts of vanilla and pre-tax WACC are explained further in the next section.



being regulated, could constitute a case for revising regulatory practice. For this reason, the UKRN taskforce agrees that the guidance should be kept under review and updated as necessary. The taskforce considers that there is likely to be limited benefit in constraining such updates to a review timetable that is predetermined at this point in time. For these reasons, the regulators expect the guidance set out in this document to be subject to a periodic review by the UKRN taskforce, with future reviews subject to consultation.

## Overall framework for estimating allowed returns

The allowed rate of return is typically estimated by reference to the weighted average cost of capital (WACC) for the relevant regulated activity. Investments are typically funded by both debt and equity, so the WACC represents an average of the costs of debt and equity, weighted by their relative share of the total market value:

$$WACC = (gearing) \times K_d + (1 - gearing) \times K_e$$

Where:

$K_d$  is the cost of debt,

$K_e$  is the cost of equity, and

*gearing* is the amount of debt financing as a proportion of the combined debt and equity value of the firm.

The cost of debt is measured in pre-tax terms (since interest payments are deductible from profits when calculating liability for corporate taxation), whereas equity returns are measured in post-tax terms (since equity investors receive any profits net of the payment of corporation tax). The WACC in the formula above is therefore a vanilla WACC – in that the cost of equity is not uplifted for the corporate tax wedge between debt and equity (i.e. by  $1 / (1-t)$ ).

Regulators typically place most weight on the Capital Asset Pricing Model (CAPM) to estimate the cost of equity. Under the CAPM the cost of equity ( $K_e$ ) is a function of the risk-free rate (RFR,  $R_f$ ), the expected return on the equity market above the risk-free rate, i.e. the equity risk premium (ERP), and the systematic risk of the relevant activity, i.e. equity beta ( $\beta_e$ ).

$$K_e = R_f + (R_m - R_f) \times \beta_e$$

Where:

$R_f$  is the risk-free rate (RFR)

$R_m$  is the Total Market Return (TMR)

$(R_m - R_f)$  is the Equity Risk Premium (ERP)

$\beta_e$  is the equity beta.

A range of alternative models to the CAPM exist, however these alternatives have not seriously challenged the dominance of the CAPM as the workhorse model within economic regulation in the UK.

The CAPM remains in use by a wide cross-section of financial practitioners and benefits from requiring only three inputs, the data for which can be transparently derived with relative ease. A UKRN-commissioned report in 2018 recommended that regulators should continue to use the CAPM to estimate the cost of equity, which remains the recommendation that we follow in this guidance.<sup>21</sup>

The cost of debt ( $K_d$ ) is typically estimated with reference to observed market yields on corporate bonds, either issued directly by the regulated entities or by entities with similar credit risk. Most regulated sectors make an allowance for historically incurred debt costs as well as expected costs of new debt expected to be issued during the control period.

<sup>21</sup> Burns, P., Mason, R., Pickford, D., Wright, S., '[Estimating the cost of capital for implementation of price controls by UK Regulators](#)', March 2018, pp.16-22 and appendices A and B. The report recommended that the CAPM is used to calculate both the cost of debt and the cost of equity. However, regulatory determinations typically take account the fact that some debt is embedded in a company's structure through the period of the price control.

It is commonplace in sectors with several companies for regulators to set a single allowance either benchmarked to an average of companies' actual debt costs or to a general bond index.

To assign weights to the costs of equity and debt, regulators typically assume a notional capital structure for their sector or regulated company, drawing on evidence on actual debt structures in their sectors, previous regulatory determinations, policy objectives, and other market benchmarks.

We set out two recommendations on the overall framework.

**Recommendation 1):** *Regulators should continue to estimate the allowed rate of return in price controls based on the weighted average cost of capital for a notionally financed firm within their sector.*

**Recommendation 2):** *Since the cost of equity is not directly observable, it must be estimated using a widely accepted method. Regulators should continue to use the capital asset pricing model (CAPM) as their primary approach for estimating the cost of equity.*

## CAPM cost of equity

While the CAPM is a relatively simple model, judgement is required because there are different approaches to derive the model inputs and a degree of parameter uncertainty. This section discusses key estimation issues and the scope for greater harmonisation.

### Risk free rate: current approach

The risk-free rate (RFR) is an economy-wide figure which does not vary depending on the sector being considered. It is the required return on a riskless asset in the CAPM. Such an asset does not exist in practice, but textbooks, practitioners and regulators have tended to use the rates on inflation-linked government issued debt as a proxy for the real RFR. More recently, there has been a debate as to whether real government bonds provide the best proxy for the RFR in the CAPM, and whether there may be a rationale for placing some weight on alternative debt instruments.

### *Choice of benchmark:*

Most regulators have in recent years used yields on index-linked gilts of 10 to 20 years maturity as the closest available market proxy of a risk-free instrument, having no inflation risk and very low default risk and liquidity risk. All recent regulatory determinations have placed weight on index-linked gilts. In the aftermath of the Global Financial Crisis (GFC), it was commonplace in regulatory decisions to set the RFR considerably above prevailing spot rates. This reflected a degree of regulatory caution when estimating allowed returns in a newly-depressed interest rate environment. As interest rates have remained low, in more recent decisions, the allowed RFR has moved closer to spot yields on index-linked gilts. Figure 5 in Annex 3 shows the history of regulatory decisions on the RFR against the yields on index-linked gilts.

In proceedings related to recent regulatory decisions, some regulated companies and their consultants have argued that index-linked gilt yields underestimate the true risk-free rate due to the presence of a 'convenience yield'. This is often described as a yield discount that investors are willing to accept due to the convenient attributes of government bonds (e.g. money-like safety and liquidity characteristics). Proponents of the convenience yield concept have tended to argue that an estimate of its value should be added to the base RPI-linked yield before its use as an input to the CAPM,<sup>22</sup> or that regulators should use an average of the RPI-linked gilt yield and the yield of an AAA-rated corporate bond index.

In the CMA's redetermination following the appeals of the PR19 decision by four water companies the panel also considered recent yields on index-linked gilts as a suitable proxy for the RFR. However, the panel concluded that there was some theoretical and empirical support for the argument that index-linked gilts could underestimate the true RFR in the CAPM, and that yields on AAA-rated non-government bonds were also a suitable input in the RFR estimation.<sup>23</sup> In the RIIO-2 appeal,<sup>24</sup> the CMA found that Ofgem was not wrong in using index-linked gilts as the main basis for the RFR, and furthermore that it was not wrong in its use of 20 year Sterling Overnight Index Average (SONIA) swaps as a cross-check.<sup>25</sup> Recent appeal submissions have also highlighted other potential RFR proxies as inputs into the estimation process or appropriate cross-checks of ILG-based estimates, such as nominal gilts.

<sup>22</sup> For instance, Oxera's consultation response argues for an adjustment of 50-100 basis points.

<sup>23</sup> On the basis that government bonds might be trading at a premium to low-risk non-government bonds; and that the market RFR for borrowing and lending might be different. ['PR19 Redeterminations: Final report'](#), paragraphs 9.263-9.264.

<sup>24</sup> In which the CMA was not required to do a full redetermination but had to decide whether the appellants had shown that Ofgem's decision was "wrong"

<sup>25</sup> [CMA RIIO2 Final determination](#): Volume 2A: Joined Grounds: Cost of equity, 28 October 2021, paragraphs 5.146-5.149.

## Inflation issues

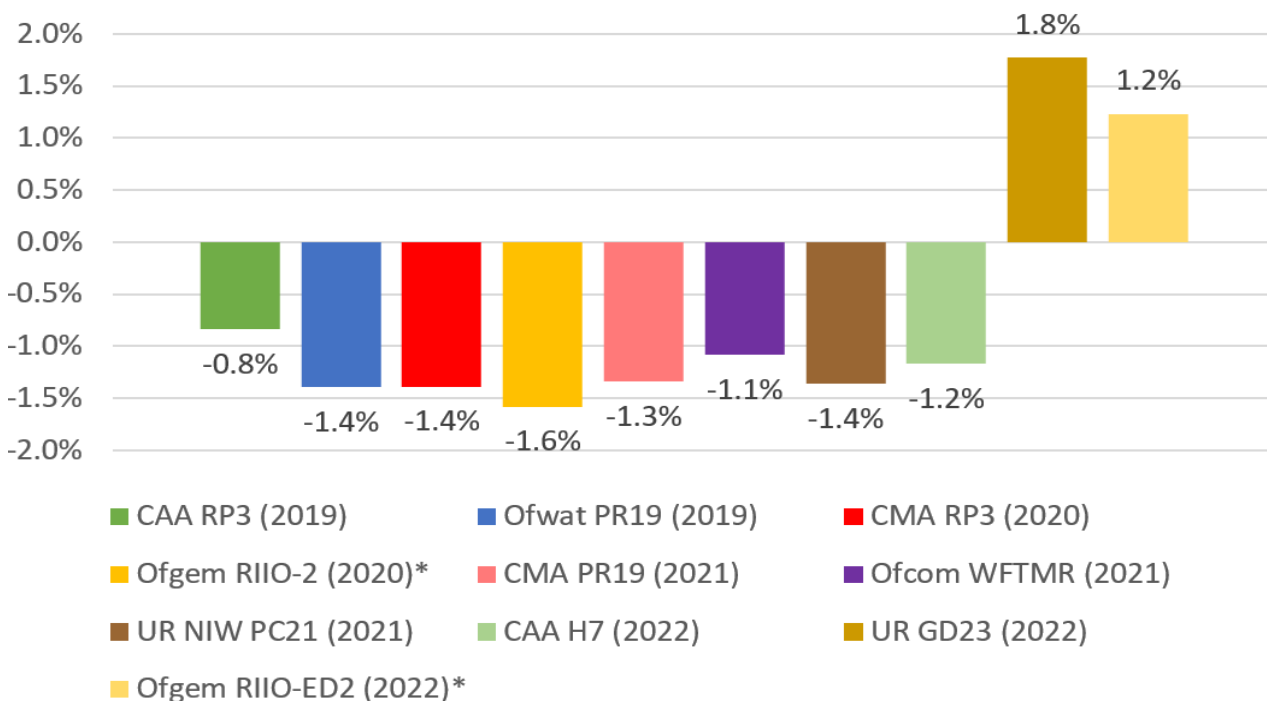
The transition of several regulators to the use of CPI(H)-based rates of return has meant that index-linked yields need to be converted from an RPI to a CPI(H) basis. Sector regulators and the CMA have typically relied on externally-anchored inflation assumptions,<sup>26</sup> or inflation forecasts from official sources like the OBR, rather than forecasting inflation themselves. Ofcom estimates the cost of capital in nominal terms and typically uses OBR long-run RPI forecasts to convert index-linked yields into nominal values.

## Addressing the risk of forecast error

Recent regulatory determinations have addressed the potential for forecast error in different ways. Ofgem has adopted indexation for the RFR for RIIO-2, reducing the importance of making an accurate ex-ante forecast. Other regulators (for instance Ofwat at PR19) have used market-implied interest rate changes from yield curves to uplift prevailing rates at the time of final determinations. This latter approach has however been challenged on the grounds that rates uplifted in this way have not in recent years been a better predictor of future rates than spot rates.<sup>27</sup>

Figure 1 summarises the most recent set of RFR decisions.

Figure 1: Risk-free rate in recent regulatory decisions (CPI(H)-real)



Source: Cost of Capital – Annual Update Report, July 2022. Tables 2 and 3. Ofgem RIIO-ED 2 and UREGNI GD23 final determinations. Note: Where determinations have been set in RPI terms without an explicit forecast of the RPI-CPI(H) wedge, a 90 basis points RPI-CPI(H) wedge has been applied to convert to CPI(H) basis. Asterisks denote an indexed risk-free rate, for which an illustrative estimate has been provided using spot gilt yields uplifted using forward rates.

<sup>26</sup> For instance, the Bank of England's 2.0% CPI inflation target.

<sup>27</sup> The CMA's redetermination of PR19 concluded that forward rates do not offer a better assessment of future spot rates than current spot rates, and did not include this uplift. Source: CMA, ['PR19 Redeterminations: Final report'](#) Paras 9.228 – 9.234

Risk-free rate: guidance

*Choice of benchmark:*

Regulators note that index-linked gilts (ILGs) have many characteristics that qualify them as a good proxy for the true risk-free rate, due to a combination of inflation protection, low default risk and low liquidity risk that is not typically found to the same extent in other proxies. The commonly-cited alternatives – nominal gilts, SONIA swap rates and AAA-rated non-government bonds – all contain risk premia that would not feature in the true risk-free rate and so should be adjusted for. However, judgement is required in calibrating the appropriate adjustment for each risk premium, with a higher number of adjustments increasing the scope for estimation error.

For example, there are currently relatively few corporate AAA-rated issues available to serve as constituents in AAA-rated corporate bond indices, and AAA-rated corporate bond indices may also feature instruments that have tenors significantly longer than the usual 10-20 year CAPM investment horizon common to regulatory determinations. A weighting to very illiquid or long-tenor instruments may make the headline index yield less relevant as an RFR proxy for the notional company at the regulators' chosen investment horizon.<sup>28</sup> This scenario was addressed in the RIIO-2 CMA panel's final determination, where the panel noted evidence from Ofgem that stripping out instruments with irrelevantly long tenors reduced the pool of bonds in the reference AAA-rated index to a single usable instrument. Once adjusted for estimated liquidity and interest risk premia, this remaining instrument had a yield that was almost identical to that of the comparable ILG yield. As a result, the CMA noted that 'there is little practical impact from including the most relevant AAA bond data into the [RFR] estimation process'.<sup>29</sup>

Regulators should use long-dated index-linked gilts at the assumed investment horizon in their sector as their risk-free proxy. Consistent with recent precedent, maturities of 10 to 20 years are likely to be suitable for most sectors. Recent yields (going back no more than a year from the analysis cut-off point) should be reasonable to inform the RFR. The weight a regulator places on the sample of recent yields (for example 1, 6 or 12 months) in determining a RFR point estimate or range will be influenced by the methodological approach adopted in its calculation of the RFR (for example a range for the RFR may not need to be derived if the RFR is indexed annually).

While noting arguments for a convenience yield in gilts, this is not a well-established topic in economic regulation, and the taskforce notes that in academic literature there are no empirical estimates of the convenience yield in index-linked gilts at the 10-20 year CAPM investment horizon used by most regulators.<sup>30</sup> Given divergence in approaches across regulators, this guidance does not therefore propose alignment to a particular stance; however regulators should clearly set out their assessment of the evidence base in making their decisions. Regulators identify this as an area that may benefit from further work to consider the necessity of adjustments to index-linked gilt yields at the 10-20 year horizon.

Despite the drawbacks of non-ILG RFR proxies, regulators agree that nearly any risk-free proxy stripped of accurately-measured risk premia should give a value close to the 'true' risk-free rate. In principle this suggests that evidence from these proxies could provide a useful sense check in times of ILG market volatility or to help define the range within which the point estimate for the risk-free rate should be drawn.

<sup>28</sup> Specifically, as at 28/06/2022 the CMA's PR19 redetermination synthetic index (the simple average of the GBP non-gilt AAA-rated 10-15 and 10+ indices) contained three bonds of 49.1, 49.3 and 95.7 years to maturity, respectively; far outside the indicative investment horizon of 10-20 years.

<sup>29</sup> [CMA RIIO2 Final determination](#): Volume 2A: Joined Grounds: Cost of equity, paragraphs 5.101-103.

<sup>30</sup> Regulators were only able to identify one academic paper with estimates of the convenience yield in a UK context, with estimates confined to nominal bonds up to a horizon of only 2 years. See Diamond & Van Tassel (2021), '[Risk-Free Rates and Convenience Yields Around the World](#)'

### *Inflation issues*

Regulators should continue to adjust the RPI yields into CPI(H) or nominal yields, if required by their price control methodology. Using inflation swaps or long-run inflation forecasts or assumptions from official sources such as the OBR to estimate the long-run RPI or the long-run RPI-CPI(H) wedge are recognised as acceptable approaches by the regulators. During periods of atypically high or low inflation, regulators should however consider carefully whether using long-run assumptions is appropriate for the next price control period.

The UK Statistics Authority has consulted on future changes to the calculation of RPI with the intention of bringing the methods and data of CPIH into the RPI measure and has confirmed its intention to implement the change in February 2030.<sup>31</sup> The implication of the reform is that RPI will align with CPIH from 2030. The reform is still some years away and there is uncertainty around how the market is pricing this reform into RPI-linked gilts, and most official forecasts of RPI and CPIH typically do not extend beyond the next 5 years. Until there is more clarity around the reform, we consider that regulators will need to exercise judgement in deciding how to adjust available RPI and CPIH forecasts for the expected convergence in RPI and CPIH from 2030.

### *Addressing the risk of forecast error*

Regulators recognise a number of appropriate measures which can reduce forecast error in setting a RFR. These include:

- Choosing the length of trailing average (of up to 1 year) which is calculated to provide the most appropriate estimate of the risk-free rate over the ensuing control period.
- Indexation of the risk-free rate proxy.

There is some debate about the predictive power of using forward rates to forecast future risk-free yields, as there is evidence that using forward rates leads to upwardly-biased estimates of the risk-free rate.<sup>32</sup> As a result, regulators agree that the two approaches above are likely to be preferable in terms of limiting forecast error. However, the decision on whether to index the RFR component of the cost of equity should remain with each regulator, given the interactions with the other elements of the price control methodology.

### *Recommendation*

**Recommendation 3)** *To estimate the real risk-free rate (RFR) within the CAPM, regulators should use recent yields on index-linked gilts, with a maturity which matches the assumed investment horizon for their sector.*

---

<sup>31</sup> <https://uksa.statisticsauthority.gov.uk/correspondence/response-from-the-chair-to-the-chancellor-of-the-exchequer-rpi-consultation-response/>

<sup>32</sup> CMA, '[PR19 redeterminations: Final report](#)', March 2021, pp. 788-789

## TMR/ERP: current approach

The Total Market Return (TMR)<sup>33</sup> measures the return expected by the marginal investor from holding a diversified portfolio of securities. Regulators have tended to use a broad index of equities as a proxy for the market of investible securities; for instance, the UK FTSE-All Share.

The Equity Risk Premium(ERP)<sup>34</sup> is the difference in expected return between the TMR and the RFR. It denotes the additional compensation that investors require from being invested in the market compared to the risk-free asset. It is an important input to the CAPM as the ERP is multiplied by the beta of the company in question to give a risk premium specific to that company.

Consistent with the recommendations of the 2018 UKRN Cost of Capital study,<sup>35</sup> as well as earlier reports by the same authors,<sup>36</sup> there is a long-standing practice in UK regulation to assume that the TMR is a more stable component of the cost of equity than the ERP. In part, this approach is informed by long-run empirical evidence which suggests that equity returns are more stable over time than the ERP.<sup>37</sup> Hence regulators have typically focused on estimating the TMR directly, often relying on long-run historical data (as explained below). The ERP is then calculated as the difference between the estimated TMR and the RFR.

An alternative approach is to assume that the ERP remains broadly stable over time. This latter approach is used by international regulators, for instance, in continental Europe and Australia.<sup>38</sup> The methodology used for estimating the ERP needs to be considered jointly with the methodology used for the RFR, to understand the overall impact on the TMR.

The TMR estimate is typically derived from one or more of the following three approaches:

- **'Historical ex-post' approaches** use observed historical equity returns as a benchmark for investors' current expectations for the TMR;
- **'Historical ex-ante' approaches** also use observed historical returns to infer the expected TMR but adjust them for historical factors which are unlikely to be repeated; and
- **'Forward-looking' approaches** use more recent market data, such as current market valuations, and / or surveys of market practitioners to infer the expected rate of return on the market index.

All regulators place weight on historical ex-post approaches and many of them on historical ex-ante methods. Some regulators have also considered forward-looking evidence in their most recent decisions.

With significant weight placed on TMR estimates derived from the historical ex post approach, the application of UK regulatory practice typically results in relatively stable cost of equity allowances over time. While we have generally seen the assumed levels of the TMR (and subsequently) the allowed cost of equity decline in most sectors following the 2007/08 Financial Crisis, the assumed TMR has not declined one-for-one with the RFR, consistent with the

<sup>33</sup> Sometimes referred to as the EMR (Expected Market Return).

<sup>34</sup> Sometimes referred to as the MRP (Market Risk Premium).

<sup>35</sup> S. Wright et. al. '[Estimating the cost of capital for implementation of price controls by UK Regulators](#)', 2018

<sup>36</sup> Smithers and Co Ltd '[A Study into certain aspects of the cost of capital for regulated utilities in the UK](#)', 2003

<sup>37</sup> See e.g. Wright and Smithers '[The Cost of Equity Capital for Regulated Companies: A Review for Ofgem](#)', 2014 pp. 13-16

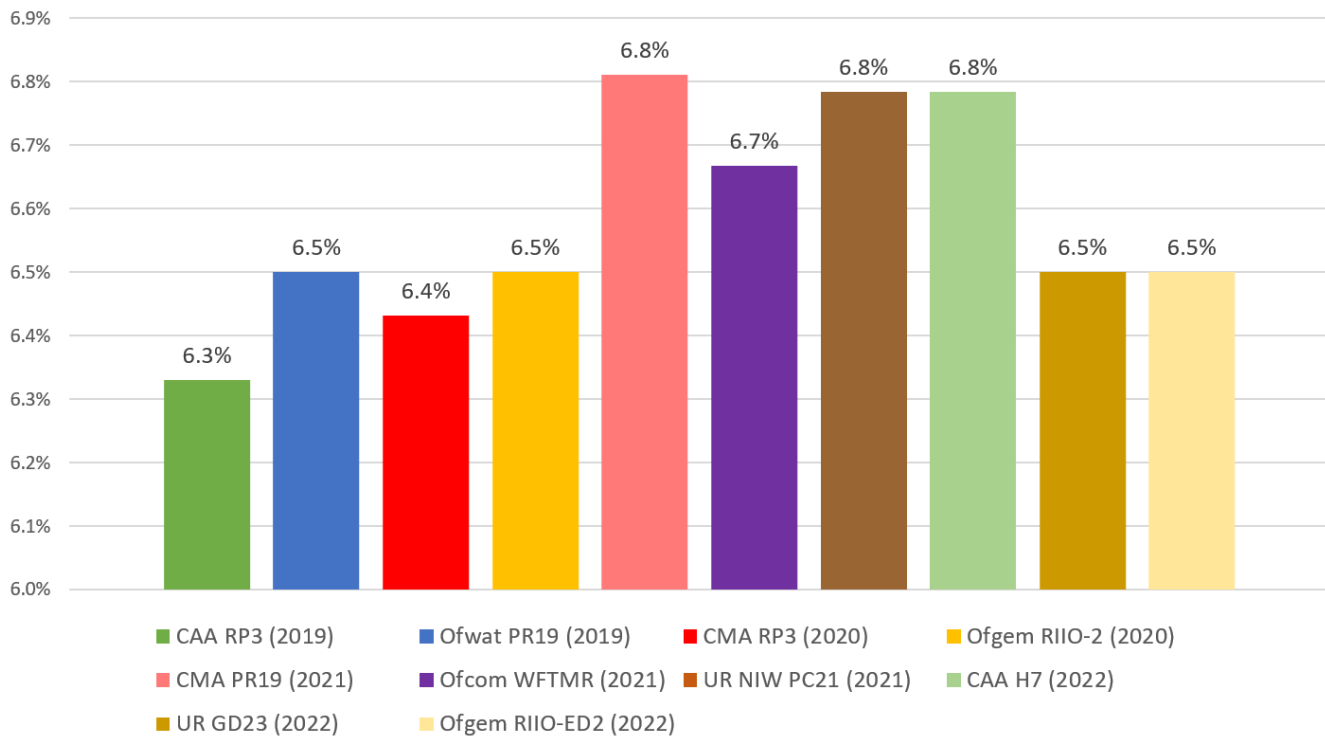
<sup>38</sup> See for example, BEREC guidance for the calculation of the cost of capital for legacy infrastructure in telecoms, [BEREC Report on WACC parameter calculations according to the European Commission's WACC notice of 6th November 2019](#), updated June 2021; and IPART, New South Wales, [Review of our WACC method](#), February 2018.



assumption of greater stability in the equity returns compared to government bond returns. Conversely, in an environment of increasing interest rates, the allowed cost of equity would not rise as quickly as the RFR under current UK regulatory practice.

Figure 2 below shows the real CPI(H) values for the TMR in recent regulatory decisions – which lie in the range of 6.3% to 6.8%. The implied ERPs are in the range of 7.2% to 8.2%; significantly above the long-run historical UK ERP of 4.9%.<sup>39</sup>

Figure 2: Total Market Return in recent regulatory decisions (CPI(H)-real)



Source: Cost of Capital – Annual Update Report, July 2022. Tables 2 and 3, and Ofgem RIIO-ED 2 and UREGNI GD23 final determinations. Note: Where determinations have been set in RPI terms without an explicit forecast of the RPI-CPI(H) wedge, a 90 basis points RPI-CPI(H) wedge has been applied to convert to CPI(H) basis.

### Historical ex post approach: key issues

Historical ex post evidence is a key source of evidence for the TMR. The Credit Suisse Global Investment Returns Yearbook (“DMS Yearbook”) provides the data on annual returns from 1900 to the most recent year.<sup>40</sup> The data is available both in nominal and real format, although there has been recent debate in regulatory proceedings about how best to deflate historical nominal returns.

Historical inflation data for adjusting nominal returns to real returns is incomplete, with regulators needing to use composite series which chain together previous consumer price indices.

For the period 1900-1947, there are two main inflation measures available, the Consumption Expenditure Deflator (CED) and the Cost of Living Index (COLI). Regulators have focussed on the CED as the most reliable source of inflation data for 1900-1947, because the Office for National Statistics has stated its preference for using the implied deflator,

<sup>39</sup> Source: Dimson et. al 'Credit Suisse Global Investment Returns Yearbook,' 2022, the figure refers to the UK ERP (whole-period arithmetic mean).

<sup>40</sup>Dimson et. al 'Credit Suisse Global Investment Returns Yearbook,' 2022.

due to COLI's relatively limited coverage in terms of products and population, and concerns about the quality of weights.<sup>41</sup>

From 1949 onwards, there are also two choices: RPI and CPI, and there are potential issues with both measures. It used to be common practice to deflate returns using RPI, given it is available over the full time period, and that it used to be the main measure of inflation until the 1990s. However, it is now well-established that RPI is a flawed, upwardly-biased and inconsistent measure of inflation over the full measurement period. In particular, there has been a pronounced increase in the 'formula effect' – an artefact of the RPI averaging formula which is a source of upwards bias to RPI inflation – which makes post-2010 RPI values difficult to compare to historical series. In 2013, the ONS declassified the UK RPI index as a national statistic. More recently, the UKSA has urged both public and private sectors to stop using RPI as a measure of inflation.<sup>42</sup>

As a result, regulators have been increasingly using CPI to deflate historical nominal returns. However, this is also not without challenges as actual CPI data is only available since 1988. For the period 1948-1988 various modelled series are available, such as the Bank of England Millennial Dataset and the ONS back-cast series, but these are imperfect estimates of CPI, as they have out of necessity drawn on a more limited range of data than is used to calculate latter-day CPI. More recently, the ONS has also published a back-cast series for CPIH.<sup>43</sup> CPIH is the preferred measure of inflation by the ONS going forward and one which is being used by some regulators as the basis for estimating real returns.

In the CMA's PR19 redetermination, the panel gave some weight to RPI-deflated returns (albeit adjusting for the post-2010 increase in RPI formula effect).<sup>44</sup> However, in the RII02 appeals, the CMA found Ofgem not wrong in relying on CPI-deflated returns alone.

Another key issue with historical ex post evidence is how to average historical returns (which are available at an annual frequency). Regulators have tended to rely on a variety of approaches, often combined to triangulate a plausible range. There is generally agreement that the expected return from such past data is the arithmetic average return, because the expected return of a probability distribution is the arithmetic mean. However, this does not mean that the arithmetic average of 1-year returns is the most appropriate estimator. The 1-year arithmetic average would be appropriate for short investment horizons (e.g. 1 year). However, for longer investment horizons, an arithmetic average of 1-year returns will be an upwardly-biased estimator of expected returns, due to some evidence of negative serial correlation in returns over time.<sup>45</sup>

There are broadly two approaches to estimating the arithmetic average of historical returns. given the assumptions above. One is to take an arithmetic average over holding periods aligned with the CAPM investment horizon (usually 10-20 years). This approach takes into account the lower volatility of returns over longer holding periods. The averages can be calculated for overlapping and non-overlapping periods.

The other approach is to take a whole-period geometric average and then adjust it for the impact of arithmetic averaging (i.e. accounting for the volatility of returns).<sup>46</sup> UK regulators have in recent years tended to interpret this as

---

<sup>41</sup> ['PR19 Redeterminations: Final report'](#), paragraph 9.294

<sup>42</sup> <https://uksa.statisticsauthority.gov.uk/news/uk-statistics-authority-statement-on-the-future-of-the-rpi/>

<sup>43</sup> See: ONS, ['Consumer price inflation, historical estimates, UK 1950 to 1988 – methodology'](#), May 18 2022

<sup>44</sup> ONS's 2010 changes to how clothing and footwear are accounted for in inflation statistics led to a step-change increase in the level of the 'formula effect'. The CMA's redetermination of the PR19 price controls subtracted a 30bps estimate of this increase from historical RPI-real averages for this reason.

<sup>45</sup> See CMA, ['PR19 redeterminations final report'](#) March 2021, pp.813-819

<sup>46</sup> This approach uses the result that the approximate difference between the arithmetic and geometric means for a lognormally distributed series is half the variance of log returns.

requiring an adjustment of between 1% and 2% to the geometric whole period average, with the lower end of this range more appropriate for longer forecast horizons.<sup>47</sup>

Both approaches have been considered by the CMA in recent decisions. While the approach of adjusting the geometric average has been subject to challenge in the PR19 appeal, due to disputes over the appropriate size of uplift,<sup>48</sup> in RII02 the CMA found Ofgem 'not wrong' in adopting this approach.<sup>49</sup>

#### *Historical ex ante evidence: key issues*

The historical ex ante approach also relies on historical data but considers how it needs to be adjusted to better reflect forward-looking expectations of investors. For instance, the authors of the Credit Suisse Global Investment Returns Yearbook decompose the historical equity risk premium into a contribution from factors unlikely to be repeated in future, which can then be used to infer an expected TMR adjusted for these factors. Similar to the historical ex post approach, there are some issues around appropriately deflating any historical data. The other issue is producing an estimate that is consistent with the chosen investment horizon in the presence of serial correlation in annual returns.

#### *Forward-looking evidence: key issues*

Forward-looking evidence usually refers to recent estimates of the expected market return implied by dividend discount models, professional forecasts and/or surveys of market practitioners. Dividend discount models can be applied to current market prices to infer the investors' required rates of return, but these estimates are heavily influenced by the choice of input assumptions, such as the expected long-run growth rate of dividends, which are difficult to verify. Estimates from surveys are liable to be subjective, volatile and reflect how the survey questions are framed.

The CMA did not place significant weight on forward-looking approaches in its PR19 redetermination, due to estimates lying within a wide range and being to a large extent driven by assumptions which were difficult to verify. However, for its RII0-2 appeals, the CMA panel recognised the value of such approaches as cross-checks in providing some insight into market expectations of returns in the relatively near term, and argued that they supported the hypothesis that investors expected returns lower than they have been, historically.<sup>50</sup>

### TMR/ERP: guidance

There is significant alignment amongst regulators in the overall approach to the TMR/ERP, namely that in recent determinations UK regulators assume greater stability in the TMR and therefore estimate it directly from historical equity returns data. In the interests of maintaining consistency across sectors and also across time, continuing with this approach remains preferable. This approach does not imply that regulators should simply pick the same fixed value for the TMR in each decision for all time, but that the TMR would be relatively less variable than the underlying RFR. This would support greater stability in the cost of equity allowances over time. This policy choice seems appropriate in the wider context of the aspiration for greater predictability and transparency in the regulators' methodologies for estimating the allowed rate of return, and one that is fair to investors and customers over time.

However, it is important to recognise that depending on the macroeconomic environment, this largely 'through-the-cycle' approach could either overstate or understate returns required by investors in a specific price determination. In the low interest rate environment following the 2008 Financial Crisis, such an approach likely overestimated the TMR

<sup>47</sup> This reflects the tendency of returns measured over longer holding periods to have lower volatility. See Wright et al. '[Estimating the cost of capital for implementation of price controls by UK regulators](#)', March 2018, Annex E.

<sup>48</sup> CMA, '[Ofwat price determinations, final report](#)', March 2021, paras 9.335 to 9.338

<sup>49</sup> [CMA RII02 Final determination](#): Volume 2A: Joined Grounds: Cost of equity, paragraphs 5.255 to 5.258

<sup>50</sup> [CMA RII02 Final determination](#): Volume 2A: Joined Grounds: Cost of equity, 28 October 2021, paragraph 5.286

expected by the market. This is in part because there is empirical evidence of a positive relationship between real interest rates and real returns on equity, for example, as shown in the DMS Yearbook.<sup>51</sup>

The potential for this methodology to produce upwardly-biased estimates of the TMR is recognised by regulators, the CMA<sup>52</sup> and the authors of the 2018 UKRN Report.<sup>53</sup> This bias is likely to persist for as long as interest rates remain low compared to long-run historical averages.

#### *Historical ex post evidence*

To estimate the TMR, it is appropriate to place weight on historical ex post evidence, as it remains one of the more objective pieces of evidence for use in regulatory determinations.

Traditionally, regulators have used long-term equity return data from sources such as the DMS Yearbook as the source of historical equity returns. Although in theoretical terms the taskforce agrees that regulators should adopt an approach that draws on average returns across all assets and not only equities, there are significant practical obstacles to the introduction of such an approach, as referenced in past regulatory determinations.<sup>54,55</sup> Regulators should therefore continue with the established practice of using historical equity return data.

With respect to inflation, we recognise that any measure of inflation is likely to have imperfections over such a long horizon. There have been various changes in how inflation is measured over time, and any back-cast series could be subject to statistical revision in the future. However, given the established methodological problems with RPI discussed earlier and the proposed alignment of RPI with CPIH from 2030, anchoring TMR estimates around real CPI(H)-deflated historical returns, where possible, is likely to be a more transparent and implementable approach for regulators to take in future. If RPI is used to deflate returns, additional adjustments would be required (such as for the change in the formula effect over time).

Irrespective of the historical inflation measure chosen, regulators agree that for the period of 1900-1947 (which predates RPI, CPI and CPIH), the Consumption Expenditure Deflator (CED) should be preferred to the Cost of Living Index (COLI), on account of its more realistic treatment of weights applied to consumed goods.<sup>56</sup> For the period 1947-1988, regulators consider that relying on backcast CPI or CPIH data is likely to be preferable to using RPI data (including RPI data with formula effect adjustment).<sup>57</sup> From 1988 onwards, sufficient data exists to directly produce reasonable estimates of CPI and CPIH.

To estimate the arithmetic average of historical returns, consistent with the chosen investment horizon, regulators could use both of the approaches described earlier. The first approach is to take an arithmetic average of historical returns over the corresponding holding periods (which could include both overlapping and non-overlapping periods). Using overlapping periods has the advantage of more data points when compared to non-overlapping periods, but the individual data points will exhibit serial correlation. Using non-overlapping periods avoids the issue of serial correlation but typically leads to estimates that are volatile year-on-year due to small sample sizes. The second approach is to uplift whole-period geometric average to reflect volatility in returns. We consider that both approaches are acceptable, while recognising that there remains a role for judgement in interpreting the data and deriving a range for the historical ex post evidence.

---

<sup>51</sup> The authors conclude that “when real interest rates are low, expected future risky-asset returns are also lower”. Source: Dimson et. al 'Credit Suisse Global Investment Returns Yearbook,' 2022, p.69

<sup>52</sup> CMA, ['Ofwat price determinations, final report'](#), March 2021, paragraphs 9.387-9.388 and 9.1314.

<sup>53</sup> [CMA RIIO2 Final determination: Volume 2A: Joined Grounds: Cost of equity](#), 28 October 2021, paragraph 5.283(b)

<sup>54</sup> CMA, ['Ofwat price determinations, final report'](#), March 2021, p.800, para 9.283

<sup>55</sup> CMA, [Final determination: Volume 2A: Joined Grounds: Cost of equity \(publishing.service.gov.uk\)](#), October 2021, p. 71, para.5.202

<sup>56</sup> See O'Donoghue et al. 'Consumer Price Inflation since 1750', ONS Economic Trends, March 2004

<sup>57</sup> See: ONS, ['Consumer price inflation, historical estimates, UK 1950 to 1988 – methodology'](#), May 18 2022

## Historical ex ante evidence

We propose that regulators should place weight on historical ex-ante evidence. Since there is evidence that historical returns were not expected by investors (a phenomenon referred to as the 'Equity Premium Puzzle'), using achieved returns as a guide to future return expectations may be unreliable.<sup>58</sup> Dimson, Marsh & Staunton note that using the historical risk premium of equities as a guide to future return expectations is liable to be misleading if it is non-stationary.<sup>59</sup> The authors decompose the historical return to provide insights into the contribution of a) luck, and b) repricing resulting from changes in the underlying risk premium.<sup>60</sup> They argue that the 'ex-ante' forward-looking equity risk premium is liable to be much lower than historical estimates using long-run averages.<sup>61</sup>

## Producing a range for the TMR

Combining the lowest "low" estimate and highest "high" estimate from the historical ex post and historical ex ante evidence is likely to result in a wide range for the TMR (at least 100 basis points wide). Regulators could identify a narrower range from this evidence to achieve greater alignment and predictability in regulatory decisions over time. For example, the area of overlap for the ranges provides a more tightly focussed range which may be more useful, assuming the historical ex-ante and ex-post ranges overlap. Alternatively, regulators could look to derive a range based on the top end of the ex-ante range and the bottom end of the ex-post range or a range based on the mid-points of the two ranges (assuming it is possible to construct a range from both sources of evidence).

We consider that this is an area where regulators would need to continue to exercise their judgement, depending on the latest available evidence.

## Recommendation

**Recommendation 4)** *Regulators should estimate the equity risk premium (ERP) within the CAPM as the difference between the total market return (TMR) and the risk-free rate (RFR). We recommend that the TMR should be primarily based on historical ex post and historical ex ante evidence.*

## Equity beta: current approach

The final component of the cost of equity in the CAPM is the equity beta, which is the firm- or sector-specific parameter in the CAPM. For given values of the common parameters for the cost of equity (i.e. RFR and TMR), it is the choice of equity beta that would be the main driver of differences in the allowed returns on equity between sectors.

Equity beta is a measure of the sensitivity of a stock's return to 'systematic', or market-wide risks, measured relative to the aggregate systematic risk exposure of the market portfolio of equities. By definition, the market portfolio has an equity beta of 1. Individual stocks with an equity beta less than 1 are less sensitive to the market and investors require lower returns on such stocks than on the overall market (i.e. the overall cost of equity is less than the TMR). The converse is true for stocks with equity betas above 1.

Like the TMR, the equity beta component of the cost of equity is not directly observable but must be estimated, usually using historical data. The most common technique to estimate equity betas is regression analysis of past returns on the listed stock(s) of interest and the market index.

<sup>58</sup> See e.g. Mehra, R. "The equity premium puzzle: A review." *Foundations and Trends in Finance* 2.1 (2007): 1-81.

<sup>59</sup> Dimson et al, ['The worldwide equity premium: A smaller puzzle'](#), 2006, Chapter 11 of R Mehra (ed), 'Handbook of the Equity Risk Premium', Elsevier 2008, pp. 467-514.

<sup>60</sup> The authors note that a significant part of the excess return to equity is due to capital gain triggered by past repricings that were triggered by a *reduction* in the risk premium.

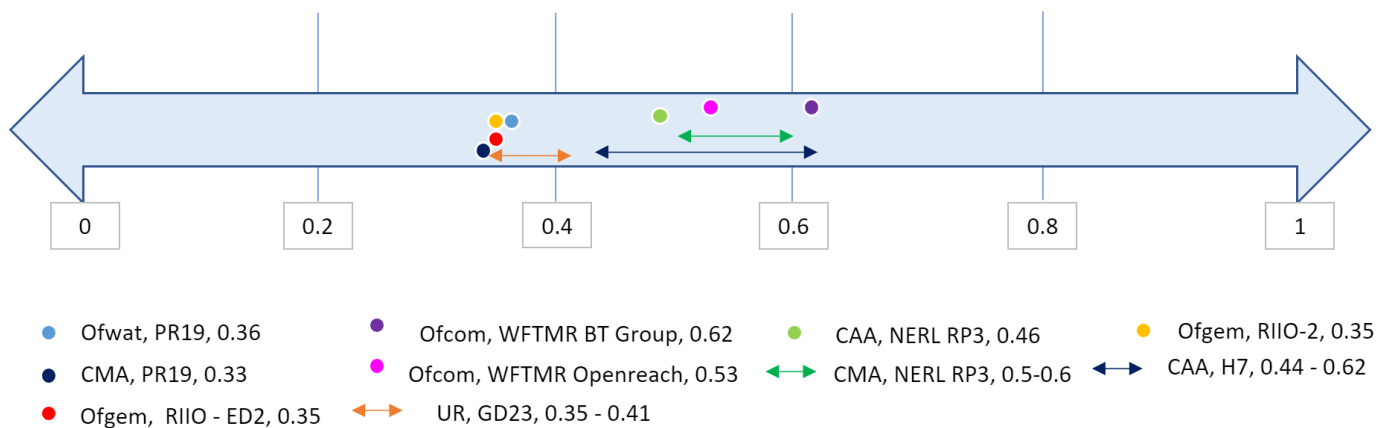
<sup>61</sup> Credit Suisse Global Investment Returns Yearbook 2022, page 62.

All regulators follow broadly similar steps in estimating the equity beta:

- First, identify listed companies which could form suitable comparators for the regulated activities for which price controls are being set. In some sectors, this is more straightforward than in others, but, in practice, there are very few pure-play listed benchmarks.<sup>62</sup>
- Second, estimate raw equity betas for these comparators through regression analysis, typically using a range of estimation periods (e.g. 2-year, 5-year and sometimes longer estimation windows) and a range of returns data (e.g. daily, weekly or monthly).
- Third, de-lever raw equity betas using the Harris-Pringle approach.<sup>63</sup> This requires an estimate of gearing and a debt beta. This produces an asset beta – a measure of operating risk, not affected by the financial capital structure choices of each comparator.
- Fourth, re-lever the asset beta using the regulator’s assumptions for the notional gearing and debt beta for the relevant notional company.

Figure 3 shows recent regulatory decisions on the asset beta.

Figure 3: Asset betas from recent regulatory decisions<sup>64</sup>



Source: UKRN analysis of regulatory publications

## Equity beta: guidance

### Estimating raw equity betas

Regulators should estimate "raw" equity betas using comparable listed companies. Appropriate comparable companies are those that either individually or in aggregate have similar exposure to systematic risk as the notional company for whom the regulator is estimating a return. Significant regulatory judgement will need to be applied where pure play comparators from the sector in question cannot be identified. This could involve, for instance, adjusting the beta from a pure play company in a different sector to reflect the relative business risk between the sectors or adjusting a sector beta to reflect project risk. Currently, the suite of UK companies which are likely to be

<sup>62</sup> In some circumstances there may be no suitable comparators in which case the regulator may need to estimate an appropriate beta by benchmarking or inferencing from other beta estimates or precedents.

<sup>63</sup> The Harris Pringle formula is:  $\beta_a = \beta_e \cdot (1 - g) + \beta_d \cdot g$ , where  $\beta_a$  is the asset beta,  $\beta_e$  is the raw equity beta of the listed comparator,  $\beta_d$  is the debt beta, and  $g$  is gearing, as defined by debt/(debt+equity).

<sup>64</sup> UREGNI did not calculate an asset beta in its recent decision PC21 for NI Water.

most relevant in the markets of interest are Severn Trent, United Utilities, National Grid, BT Group and, going forward, Pennon.<sup>65</sup>

Despite the periodic suggestion that regulators could use betas estimated against a World index as an input to their implementation of the CAPM, we note that this is in practice beset with difficulties, such as identifying the appropriate World Index and proxy for the World risk-free rate, and controlling for exchange rate effects. Regulators consider that the more pragmatic and implementable approach remains, where possible, estimating betas from the markets in which the regulated companies operate and from which the estimates of the risk-free rate and total market return are derived. However, where there are no (or limited) relevant beta data points in the relevant market, regulators may choose to consider extending the dataset to other markets to consider relevant estimates of beta.

In estimating betas, there is a trade-off between relevance and reliability. Recent data may be more relevant to market expectations of future risk than historical data, but the longer the sample of observations used, the more reliable (statistically robust) estimates will be, and the less heavily influenced by atypical and transient events which may not be representative of the ensuing control period.<sup>66</sup>

Considering a range of lengths of estimation window (for example, 2 year, 5 year and 10 year) should be sufficient to balance the dual objectives of minimising unrepresentative noise from small samples of data and recent data relevant to a forecast. The use of historical data to set beta offers an approach that is transparent and which can be replicated. It allows beta changes to be reflected over time in the calculations subject to a timing lag, the result being that these changes are fairly reflected in customer bills and investor returns over time. Further, relying on standard regression techniques such as ordinary least squares (OLS) is also likely to be sufficient in most cases. The use of daily data should be reasonable for the types of stocks generally considered (as they tend to be highly traded liquid stocks) rather than weekly or monthly data in regressions, as these significantly increase the analytical work involved<sup>67</sup> but without necessarily producing more reliable results. Finally, the market index based on the most diversified local index in the relevant currency for the relevant country/economic area is preferable.<sup>68</sup>

Betas can change over time reflecting macroeconomic factors whose impacts may vary between sectors because of the form of the control, changes in the composition of the market portfolio and changes in regulation. For instance, share prices of airports have been affected quite differently to the share prices of water companies by the COVID-19 pandemic. One reason for this is that airports are exposed to volume risk, whereas water companies benefit from a control on total revenue with reconciliations for revenue under- or over-recovery. In addition, availability of relevant data over a long enough period may constrain the length of estimation window which can be used in some sectors. The role of the regulator therefore lies in using their judgement to interpret which specification of beta (i.e. estimation window, rolling average, frequency) is liable to be most relevant to the specific circumstances of their sector and listed comparator(s). For these reasons a 'one-size-fits-all' approach for regulators is unlikely to be appropriate, and regulators must be free to exercise their judgement in a manner best suiting the prevailing circumstances.

<sup>65</sup> Even these listed comparators are not entirely pure play regulated monopolists. Severn Trent and United Utilities are close to pure play for England and Wales water and sewerage companies, as is Pennon following its disposal of Viridor which completed on 8 July 2020, but National Grid has international assets and operates in some competitive market segments. BT Group similarly operates in a range of market segments only some of which are subject to economic regulation.

<sup>66</sup> The impact of the Covid-19 pandemic is an example of this.

<sup>67</sup> Specifically, weekly or monthly estimates are affected by the 'reference day bias' in which betas of the same frequency and estimation window can be different because of the day picked.

<sup>68</sup> For UK stocks, this would be the FTSE All Share. For European stocks, this would be an index which covered most European stocks traded in euros, e.g. the STOXX 600 or the FTSE All World Europe (ex UK).

## Estimating the unlevered beta

Betas are typically unlevered to allow for more precise comparisons of risk across firms with different levels of gearing. This approach of unlevering beta remains valid going forward, in particular, if notional gearing differs from observed gearing.

However, gearing itself needs to be estimated, and there is some uncertainty around the market value of gearing. Traditionally, gearing is defined as the ratio of book value of debt to the enterprise value. For practical reasons using book values of debt is likely to be reasonable, although, if appropriate, market values of debt could also be considered.

Other considerations which regulators may wish to consider when determining the asset beta are the characteristics of the services which are in scope for the price control, such as:

- Systematic demand risk: services in sectors that exhibit more demand risk (greater income elasticity of demand) may be expected to have higher asset betas while services that have less demand risk (i.e. services that are 'necessities') may have lower asset betas; and
- Operating leverage: services in sectors that have greater operating leverage (i.e. require significant upfront investments or have a higher proportion of fixed costs) may be more exposed to systematic risk and thus have higher asset betas. However, this effect may be more relevant to new projects rather than ongoing investment in existing projects, and depend also on the form of regulation or other regulatory protections in place which could serve to reduce exposure to systematic risk than might otherwise be the case.

## Estimating the debt beta

Debt betas are required to convert the unlevered equity beta to an asset beta, which is the measure of business risk with the effect of financial gearing removed. There are several approaches which can be used to estimate the debt beta.

The debt beta itself is only important in so far as it aims to ensure that the re-levered notional equity beta is reasonable, given the assumptions on the unlevered operating risk of the notional company and the assumed notional level of gearing.

The CAPM and the Harris-Pringle formula for de-levering and re-levering used by regulators typically relies on standard corporate finance theory ('Modigliani-Miller Theorem')<sup>69</sup> that the cost of capital is invariant to gearing changes (absent frictions such as tax). It is important to note that this applies to a pure forward-looking cost of capital, rather than to the overall allowed rate of return applied to regulated assets in price controls, which will tend to include an allowance for embedded debt costs. In a pure forward-looking and CAPM-consistent WACC, the cost of debt reflects (a) the cost of new debt only; and (b) a debt premium (over the risk-free rate) which is entirely explained by the risk inherent in the debt beta.<sup>70</sup>

In 2019, the UKRN published a report commissioned from CEPA on relevant considerations for setting debt beta. This set out four approaches which could be used to derive estimates (i.e. Direct, Indirect, Structural, Decompositional).<sup>71</sup> This report argued that no single approach should be either discounted entirely or relied on exclusively – and that the weight placed on each approach should vary based on the regulatory context and specific details of the estimation exercise. We consider that this report remains of ongoing relevance to estimators choosing a point estimate for debt beta. This guidance does not prescribe the use of a particular methodology for estimating the debt beta at this stage.

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

<sup>70</sup> Other premia inherent in the debt premium are likely to include default risk (since the promised yield is greater than the expected yield) and a liquidity risk premium.

<sup>71</sup> CEPA, '[Considerations for UK regulators setting the value for debt beta](#)', report for UKRN, Dec 2019



## Estimating a notional equity beta range

Based on the considerations above regulators should clearly state their equity beta range, at the notional gearing level, and should state the underlying debt beta and asset beta assumptions consistent with this range.

### *Recommendation*

**Recommendation 5:** *Regulators should estimate equity beta for the notional company using comparable listed companies and standard regression techniques (i.e. ordinary least squares (OLS)). Where the listed comparator has different gearing to the notional company, regulators should continue to de-lever and re-lever the raw equity beta.*

## Deriving a CAPM cost of equity range and point estimate

The CAPM parameters are forecasts which are subject to uncertainty. It is appropriate to reflect this uncertainty in the CAPM's output in the form of a CAPM cost of equity range, obtained using low and high case estimates for the RFR, TMR and beta. We propose that the starting assumption should be that the distribution of values in this range is broadly symmetric, and that the mid-point of range would therefore represent a suitable point estimate for the CAPM cost of equity (which would then feed into the allowed rate of return for the relevant price control, before considering cross-checks). While this may not be precisely right, there is unlikely to be a straightforward and objective way of picking a different point estimate. We address the issue of potential parameter asymmetry in the next section.

**Recommendation 6:** *The RFR, TMR and (re-levered) equity beta assumptions should be combined using the CAPM to produce a cost of equity range. The mid-point of the range should be used as the point estimate for the CAPM cost of equity.*

## Cross-checks to the CAPM cost of equity

The CAPM is a model of required returns; there is inherently some degree of parameter uncertainty. It is therefore important to sense check the resulting point estimate where there is evidence to do so. As available cross-checks themselves may be uncertain and reliant on assumptions, there should be a high evidential bar to deviating from the mid-point of the CAPM cost of equity range, derived using the recommendations in the previous sections.

We focus our discussion on the allowed return on equity, as the cost of debt can be estimated more directly using market evidence and is generally considered to be subject to less uncertainty than the cost of equity. For instance, in the PR19 appeals the CMA used this as an argument for selecting its point estimate within the range for the cost of equity, with the cost of debt being based on a point estimate.<sup>72</sup> We adopt the same approach in this guidance.

### Cross-checks: current approach

There is uncertainty around the true level of the cost of equity for the notional company. To reflect this uncertainty, regulators typically derive a range for the overall cost of equity and/or its constituent parameters, and then pick a point estimate within the range. In the past, the choice of a point estimate has usually reflected judgement in the round, rather than an outcome of a specific analytical framework.

Judgements have factored in considerations such as the view that a point estimate that is higher than a mid-point might minimise the perceived risk of under-investment and associated welfare costs. However, there is debate as to whether this approach delivers the best outcome for investors and customers in the long term, particularly where there are other mechanisms and protections in place that require and incentivise companies to meet their obligations. In recent determinations, the approach taken by regulators has been mixed. In water, Ofwat chose a mid-point for the cost of equity in PR19, whereas the CMA panel applied an uplift of 25bps to the mid-point cost of equity for the four companies which had appealed the PR19 determinations. In energy, Ofgem chose a point estimate of the cost of equity 25bps below the mid-point, which the CMA panel subsequently rejected on appeal.

### Main considerations in choosing a point estimate

Recent decisions have variously considered the following issues, when choosing a point estimate within the CAPM cost of equity range.

- 1. Cross-checks from market evidence:** Since the CAPM is just one model of expected returns, market benchmarks (such as market valuations from public markets or transactions) provide a sense-check on the CAPM point estimate when such market data are available. Despite judgement being required over their interpretation, such cross checks are important given they are founded on market pricing data.
- 2. The welfare impact from under-investment.** Views have been set out that given that the true required return is not known, this could result in under-investment if the allowed return is set too low. It has been argued that the consequences of misstatement are asymmetrical, with under-investment a worse outcome for customers than over-remuneration.
- 3. Asymmetry in the package of incentives:** The expected returns to capital providers depend not only on the allowed rate of return but also on performance against a range of financial incentives in a price control. If the overall distribution of returns is skewed such that the expected return on equity does not equal the base return on equity, it has been argued it may be appropriate to adjust the base level of allowed return to achieve this.

---

<sup>72</sup> The CMA focused on using median values on samples including a broad range of companies and considered that the backward-looking nature of the evidence did not merit creating ranges. See paras 9.632 -9.635 ['Ofwat price determinations, final report'](#).

4. **Asymmetry in the choice of parameters:** Ranges for the individual CAPM parameters rely on a degree of judgement, and it has been argued that it might be inappropriate to assume that the mid-point of the CAPM range is the most likely point estimate.
5. **Financeability:** Some regulators model the financial ratios of the regulated entity to assess the adequacy of expected cash flows to service debt payments and to raise new finance on reasonable terms. It has been argued that where modelled cashflow ratios are too low regulators should adjust the allowed return on equity to remedy this.

Different weight has been placed on the arguments above in recent decisions, depending on the circumstances of the relevant price control.

### *Cross-checks: guidance*

It has periodically been suggested that regulators should choose a cost of equity point estimate above the midpoint of the CAPM range by default, in order to address issues 2 through 5 from the above list.

As customers ultimately bear the cost of the allowed return, regulators agree there must be clear and convincing evidence to support that this is in their best interests where the cost of equity is set above a reasonable mid-point. Regulators agree that any decision to do so must be justified on a case-by-case basis by an assessment of the extent to which existing regulatory mechanisms can address these issues, or whether alternative new mechanisms could do so in a more targeted manner.

### *Cross-checks from market evidence*

The CAPM is just one of the models of expected returns – even if it is the most frequently used by regulators and market practitioners. Where market evidence provides convincing evidence that the required return on equity is different to the CAPM point estimate, it is advisable to consider whether an adjustment to the CAPM derived cost of equity is appropriate. However, this would need careful judgement where the data is uncertain and difficult to interpret.

The primary example of a market cross-check that is important in regulated sectors is the **Market-to-Asset Ratio (MAR)**. Where the regulated business comprises a large part of the value of a listed entity, it is possible to compare the traded enterprise value to the regulated asset value and this can provide information about the returns investors are willing to accept. A MAR above 1 indicates the market is willing to pay a premium over the regulated asset value of the business. As the regulated asset value represents the discounted value of future cash flows, MAR premia could be indicative of expected outperformance against future price controls (including potential outperformance on the cost of capital). MARs can also sometimes be observed when there is a transaction involving a regulated entity, with the purchase price representing the current market value of the business.<sup>73</sup>

The use of, and weight applied to, any cross-check requires careful judgement. For example there are a range of factors that could drive a MAR multiple above 1. Nonetheless, uncertainty from confounding factors can be addressed through presenting implied cost of equity results as ranged estimates. Regulators should consider MARs data over a suitably long period (e.g. several months) – or several transactions if focusing on unlisted equity - to gain assurance that conclusions are not overly influenced by transient volatility in share prices.

While recognising the principle that equity bears more risk than debt and so should normally receive a higher return, regulators consider that using the historical excess premium of equity over debt as a cross-check to the allowed return on equity may be misleading. A regulatory cost of equity founded on a long-run average 'through-the-cycle' TMR will

<sup>73</sup> For instance, Pennon acquired Bristol Water in June 2021 at a premium to Regulatory Capital Value of 44% and National Grid acquired Western Power Distribution in March 2021 at a premium of approximately 60% to Regulated Asset Value.

reflect a wider set of historical risk premia than the premium priced into the current cost of new debt – therefore the comparison is not like-for-like. In addition, the difference between the determined cost of new debt and equity will be influenced by expectations of long-term inflation, which have changed over subsequent regulatory determinations.

**Multi-factor models (MFMs)** have in recent regulatory consultations been proposed by companies and their consultants as another cross-check to the CAPM-derived cost of equity. Regulators consider that the predictions of these models should be interpreted with caution. Firstly, MFMs are extensions of the CAPM rather than representing a truly independent cross-check. Secondly, there are doubts around the out-of-sample predictive power of such models. For instance, size, which was included in the original Fama-French 3-Factor model has subsequently largely found to be empirically insignificant as a factor predicting returns.<sup>74</sup> Thirdly, the models themselves are significantly more complex and less transparent than other approaches, meaning they can be burdensome to replicate and keep up-to-date. The taskforce does not consider the suggested MFM cross-checks to be appropriate for inclusion in this guidance, but are willing to consider this issue further if evidence suggests such models meet evidential, transparency and stability thresholds that would justify placing weight on their results.

### *Welfare impacts from under-investment*

While any welfare impacts from under-investment are a valid concern, most regulatory frameworks have developed alternative ways of incentivising investment within the building blocks of a cost-based price control. These reduce or remove the need to explicitly uplift the allowed rate of return:

- **Statutory requirements:** significant investment is driven by statutory requirements or official planning exercises, as opposed to purely commercial motivations. Where statutory investment is included in business plans, regulators typically allow for the recovery of these costs (subject to an appropriate efficiency challenge) in the allowed expenditure profile. Failure by regulated companies to fulfil their statutory duties can result in enforcement action and could ultimately result in them forfeiting control of the license to operate, which is a powerful incentive against under-investment.
- **Service delivery incentives:** regulators increasingly rely on service delivery incentives to reduce the risk of under-investment (e.g. in general maintenance, asset health and in circumstances where spend is discretionary). Such incentives may mitigate the risk of under-investment in existing infrastructure.
- **Separate treatment of large one-off projects:** it may be possible to treat new investments separately from existing assets within the price control, where the cost of capital is set by a market exercise. For example, Ofgem has used a separate delivery approach for offshore investment (through the Offshore Transmission Owner (OFTO) regime) and Ofwat is making use of direct procurement for customers (DPC) in which water companies seek bids from third parties to design, finance, operate and build new infrastructure.
- **Pricing freedom for new investments when competing infrastructure and/or regulation of legacy services constrains market power:** For example, in recognising the scale of investment required for gigabit capable networks and the scope for competing network build in many parts of the country, Ofcom has allowed Openreach pricing freedom on most fibre broadband services, with anchor pricing (a safeguard cap) on the entry-level superfast broadband service. This approach allows scope for returns above the cost of capital on the new investment, in order to offset the risk that demand in future turns out to be insufficient to allow for recovery of the upfront investment.

There are also other features of the regulatory model which are favourable towards maintaining incentives to invest, such as the use of uncertainty and cost reconciliation mechanisms that provide remuneration for efficient investment.

<sup>74</sup> See e.g. S.Cho, 'The Size Premium and Macro Volatility Risks: Evidence from US and UK Equity Markets', 2019, which notes that 'the US or UK SMB [small minus big] factor... has almost zero risk premium unconditionally

Choosing a non-central point estimate for consumer welfare reasons is therefore only likely to be relevant in very specific circumstances, in particular, where there is uncertainty around cost recovery of investment and a lack of alternative mechanisms to incentivise investment.

### *Asymmetry in the package of incentives*

It has been argued that the cost of equity should be adjusted where the incentive regime leads to a downward skew in expected returns, suggesting that an efficiently-run company may not earn its cost of equity.<sup>75</sup> For instance, penalty-only incentives imply a downward skew to returns as there is potential for downside risk without any prospect of offsetting upside risk.

We recommend that analysis of asymmetry in the regulatory package should consider:

- a) asymmetry of incentives in the overall package; and
- b) the distribution of expected performance against which incentives are applied.

Asymmetry in incentives (e.g. the payment rates for rewards or penalties) by itself is not necessarily sufficient to demonstrate a case for choosing a point estimate different to the mid-point of the CAPM cost of equity range. This is because a countervailing skew in expected performance outcomes can have the effect of offsetting the asymmetry, resulting in a neutral (or even positive) impact on the distribution of achieved returns.<sup>76</sup>

In any case, we consider that regulators could aim in the first instance to address any returns asymmetry 'at source' through recalibrating incentives and/or performance commitments in a given policy area, rather than aiming off the allowed return on equity.

### *Asymmetry in the choice of parameters*

Where possible, we consider that any potential parameter asymmetry could be addressed in the choice of individual parameter ranges. While this document prescribes a more tightly defined methodology for some of the parameters, the final range will still be determined by each regulator. Especially for parameters such as the TMR and the beta, regulators, where possible, should aim to derive the low and high ends such that the range could be assumed to be broadly symmetric.<sup>77</sup> If it is not possible to derive a symmetric range for the parameters, regulators should explain the reasons for the asymmetry and why the mid-point of the range is not appropriate.

### *Financeability*

It has been common practice for regulators to test the cashflow adequacy of the regulatory settlement.<sup>78</sup> As part of this financeability assessment, regulators have typically modelled the cash flows of the notional company over the price control period to test whether key financial ratios (e.g. interest cover) would be consistent with a sufficiently strong credit rating. However, assessing financeability is a judgement in the round, and individual financial ratios are not mechanistically linked to credit ratings.

While return on equity adjustments can improve certain financial ratios, it is not clear that cash flow shortfalls or the need to meet specified levels of financial ratios indicates a need to adjust the allowed return on equity. Debt financial ratios are heavily influenced by assumptions on historical debt costs and capital structure. There is no clear link between these assumptions and the forward-looking cost of equity. For this reason, alternatives to uplifting the

<sup>75</sup> This follows from the usual regulatory convention that the base return is the cost of capital for a notional company.

<sup>76</sup> This would be observed if (as seems plausible) companies respond to the financial incentives they are set, and are on balance more likely to outperform them, as opposed to underperforming.

<sup>77</sup> This may be a defensible interpretation given that asymmetry may be due to sampling issues rather than a true reflection of the underlying parameter distribution.

<sup>78</sup> With the exception of Ofcom.

allowed return on equity (e.g. assuming equity injections) are likely to be more suitable remedies for resolving financeability issues.

**Recommendation 7:** *Cross checks may be used to sense check the CAPM derived point estimate. However regulators should only deviate from the mid-point of the CAPM cost of equity range if there are strong reasons to do so.*

## Cost of debt and notional gearing

### Cost of debt

Unlike the cost of equity, the required return on debt is more easily observed. Setting an allowance for the cost of debt therefore lends itself more readily to benchmarking approaches.

#### *Cost of debt: current approach*

As discussed in the beta section above, the standard CAPM-WACC framework defines the cost of capital as a weighted average of the cost of equity and the cost of marginal (i.e. new) debt. This forward-looking cost of capital is the relevant figure for capital budgeting and investment appraisal.

For the purposes of setting an allowed rate of return within a price control, most regulators allow for the recovery of costs from historically-incurred debt as well as the expected costs of raising new debt in the subsequent price control period. This largely reflects the regulators' interpretation of their financing duty.<sup>79</sup>

Rating agencies consider financial ratios based on the servicing of both existing and new borrowings, so an allowance based on new debt alone could work against the ability of companies to secure a strong investment grade rating.

In most sectors, the focus is on market yields on long-term investment grade corporate debt, as this is the primary source of debt financing for most regulated companies. Regulators use a mix of corporate bond indices and actual costs incurred by the companies they regulate to benchmark the cost of debt.

For historically-incurred debt, two estimation approaches are commonplace:

- a) **Balance sheet approaches:** using debt instruments issued by regulated companies to inform the notional benchmark, typically through company-level statistics (e.g. the sector median cost of debt).
- b) **Benchmark index approaches:** using external market indices with broadly similar credit ratings to the notional company to inform the allowance, typically via a multi-year trailing average.

Under both approaches, regulators have tended to set a single allowance for an efficiently-financed company under their chosen notional financing assumptions, as opposed to allowing each company their actual costs. Sector-wide actual costs have, however, remained important at least as a cross-check to avoid setting an allowance that is unduly generous or harsh relative to companies' actual costs.

The cost of new debt is typically benchmarked to a suitable corporate bond index, although this may also need to be cross-checked against available company data (e.g. on recent issuances).

#### *Other forms of financing and the use of derivatives*

Regulated companies use other forms of financing, not just bonds, depending on their financing strategy and risk appetite. Depending on their materiality within their sector, some weight has been given to these instruments in previous regulatory determinations.

- **Bank loans:** Bilaterally-arranged borrowings which may have index-linked, floating or fixed-rate characteristics. These instruments are not traded on public exchanges.
- **Short-term facilities:** These facilities fulfil working capital or liquidity requirements. Such facilities may incur a charge for both drawn down and non-drawn-down (capacity) elements as well as an arrangement fee.
- **Preference shares:** These instruments combine elements of equity and debt financing, for instance discretion over coupon payments.

<sup>79</sup> Ofcom does not have an explicit financing duty and does not model the balance sheet or cash flows of the regulated entity. However, in recent decisions, given the declining interest rate environment, Ofcom has also tended to set an allowance for the cost of debt which gave some weight to historical debt costs.

- **Derivatives:** Companies use such instruments to change the cash flows of debt instruments, for example, the timing of coupon repayments and/or principal. Typically, regulators have not reflected these impacts in the cost of debt allowance. This is primarily because the function of swaps is around treasury risk management rather than financing investment; the allowed return is intended to compensate only the latter.

## *Indexation*

Unlike historical debt, the cost of new debt is not known in advance and must be forecast. This raises the prospect of forecasting error, and either over- or under-recovery of efficient costs. To address this issue some regulators (e.g. Ofwat and Ofgem) have adopted indexation. This has allowed these regulators to mitigate forecast risk by using debt yield data much closer to the charging year in question to derive an allowance.<sup>80</sup> This results in a cost of debt that tracks market movements more closely. Where it has judged that the level of its preferred index could be improved upon as a fit for the debt costs of the notional company, Ofwat has applied an adjustment to the benchmark index to improve its accuracy, although such an adjustment was not included in the CMA PR19 panel's redetermination.

## *Cost of debt: guidance*

Given their significant control over the timing, tenor and nature of debt issued, regulated companies should be incentivised to strike a balance between minimising interest costs and managing risk.<sup>81</sup> Regulators have a role in supporting this by adopting a consistent approach to remunerating debt costs over time, to minimise the potential for windfall gains and losses, however this does not mean that each company's costs should be precisely remunerated at any point in time. A company's actual debt costs may vary from the regulatory allowed return on debt depending on the company's past financing choices. The allowance should be based on the notional financial structure, to limit the ability of individual companies to 'pass through' their costs to customers without checking these costs are efficient and reasonable.

This guidance recognises that the cost of debt is an area where it is reasonable for regulators to take different approaches, because the circumstances across the various sectors can be very different. For sectors with multiple regulated companies, an approach where the notional allowance is based on a benchmark drawn from sector average balance sheet costs and/or a benchmark index is likely to be reasonable in most circumstances. In sectors with one regulated company, it would also be reasonable to consider suitable benchmarks, potentially as cross-checks to provide assurance that actual debt has been prudently incurred.

Regulators using an index to benchmark notional company costs should consider how aligned the index characteristics are with both accepted features of the notional company and evidence from actual sector issuance (which provides insight into the cost base of an efficiently-run notional company). An adjustment to the index may be appropriate where there is strong and consistent evidence that suggests the unadjusted index is likely to provide a poor proxy for the notional company's cost of debt. In making such an adjustment, regulators should clearly set out the evidence base informing their decision, and the size of adjustment made.

UK economic regulators have not historically tended to make allowance for the cost of derivatives in the allowed return on debt, and this guidance supports a continuation of this policy. Derivatives are put in place for a variety of reasons, many of which relate to treasury management choices of particular companies that may not reflect the financial structure of the notional company - and so do not need to be included the notional allowance.

Finally, where regulators require a real cost of debt input, they should carefully consider the inflation assumptions required to deflate nominal yields. This is because outturn inflation above or below the regulatory assumption has the potential to be a driver of return on equity to the extent that the notional company has nominal fixed-rate debt in its

<sup>80</sup> Ofgem's RIIO-2 approach uses benchmark index data from the year prior to the charging year to set the allowance for that year. Ofwat's PR19 approach uses an end-of-period reconciliation to set an allowance using benchmark index data for the charging years.

<sup>81</sup> For instance, refinancing risk, which can be exacerbated by widespread adoption of very short tenor issuance.



capital structure. Using medium term forecasts or a long-term assumption (e.g. the Bank of England inflation target) to deflate are both acceptable approaches. Recognising the value of predictability and stability when attracting finance that may span several control periods, regulators agree that early signalling and an evidence-based rationale will be necessary to manage the effects of a change of approach in this area.

**Recommendation 8:** *Regulators should estimate an allowance for an efficient company under the notional financial structure with actual debt costs suitably benchmarked against other market evidence.*

## Notional gearing

Consistent with the other parameters of the cost of capital, regulators estimate the notional gearing, using a range of evidence, with the notional gearing not necessarily equal to the actual gearing of the regulated company (or companies). This approach protects customers from bearing much of the risk of companies' actual financing decisions. While companies are usually free to deviate from the notional gearing, they do so at their own risk, because incremental costs due to adopting a financial structure different to the notional company are not passed through to customers. The level of notional gearing chosen represents the regulator's judgement on the level of gearing which is appropriate for an average, efficiently-run, company, given the characteristics of the price control.

This guidance does not set a reasonable range for values which notional gearing should lie between, and regulators are agreed that this should reflect the particular circumstances of the sector in question. The following factors are relevant to regulators' decisions in this respect:

- **Notional company risk profile:** Whether the level of gearing provides the notional company with a sufficiently large equity buffer to absorb shocks, given its risk exposure in the market it operates in – including the extent of protection (or exposure) under the regulatory framework. Higher risk is associated with lower gearing levels.
- **Financial resilience:** The notional gearing assumption determines the basis on which allowed returns are set and underpins the financeability assessment (where this is relevant). As such, notional gearing has an important signalling and incentive function and should be set in a way which is consistent with the regulator's aims for sector-wide financial resilience.
- **Trends in actual gearing:** While the intention is to set a notional level of gearing (and thus avoid being solely reliant on the actual choices of the regulated company), the current and previous financing choices of the companies in the sector may give an indication of what the companies themselves judge to be an efficient capital structure, particularly where companies maintain a strong investment grade credit rating.
- **External benchmarks:** A range of benchmarks could be considered, not just the gearing of the regulated company in question. For example, the gearing of other firms in the sector (domestically or overseas) and/or that of firms undertaking similar activities can all provide useful benchmarks.
- **Relationship with the allowed return:** It may be important to sense check the combination of the notional gearing, asset beta and debt assumptions, and the relative impact of gearing on the WACC.

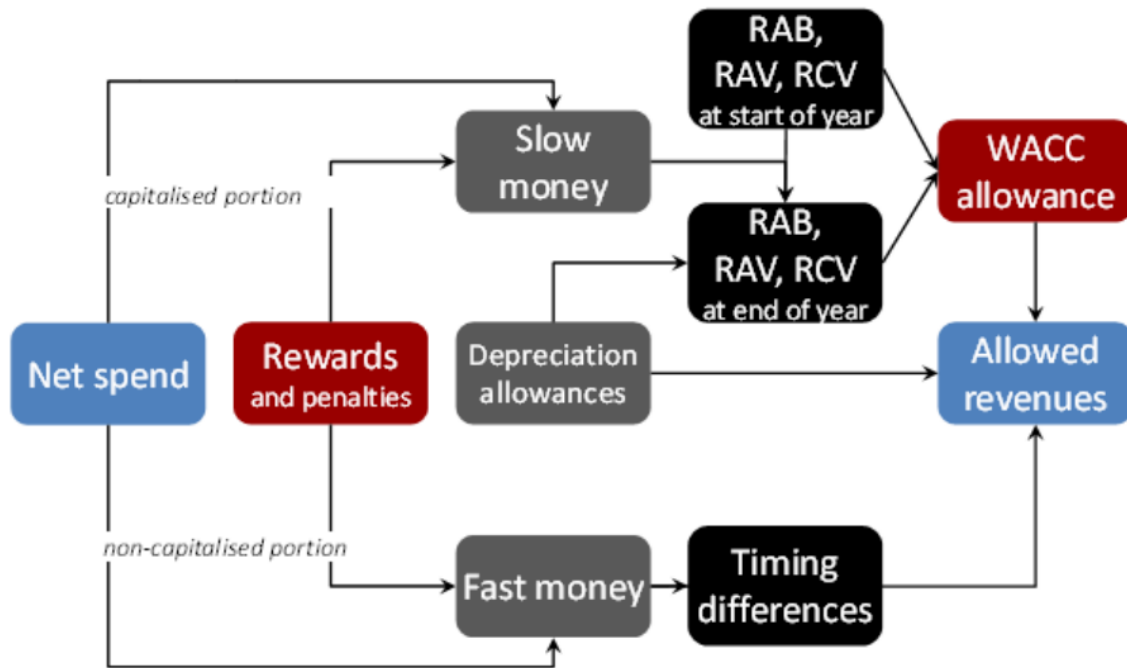
Where regulators decide to change the notional structure from one period to the next, it is reasonable that they consider whether the change is feasible for the notionally structured company, reflecting also the policy objectives of the sector in question.

**Recommendation 9:** *The notional gearing assumption should reflect the regulator's assessment of the balance of risks facing the regulated company, a wide range of benchmarks on gearing levels and overall regulatory policy objectives, not just that of the actual company (or companies) in question.*

## Annexes

### 1. Building blocks approach to setting price controls

Figure 4: Building blocks diagram



The classic building block diagram of how price controls work and where the allowed return on capital fits in is set out above. In simple terms, the annual allowed revenues within a building blocks control have three main components:

- An allowance for operating costs (sometimes referred to as fast money)
- An allowance for depreciation of capital expenditure (sometimes referred to as slow money)
- An allowance for profit: calculated as the average asset base (RAB, RAV, RCV) multiplied by the WACC

In some price controls, there could be other components, for example, financial rewards or penalties associated with different incentive mechanisms and an allowance for tax.

### 2. BEIS Economic Regulation paper Terms of Reference

Below is an excerpt from the BEIS consultation on economic regulation, which sets out the terms of reference for the Cost of Capital Taskforce.<sup>82</sup>

"In relation to the building blocks of the price control, it is the allowed return on the regulated assets which determines the base return for the regulated companies. This is typically set by reference to the Weighted Average Cost of Capital (WACC). While there are a number of similarities in how this assessment is made, in recent price

<sup>82</sup> BEIS, [Economic Regulation Policy Paper](#), January 2022.

controls, some differences remain with determining certain components of the Weighted Average Cost of Capital (WACC), such as the risk-free rate.

The economic regulators are working together to consider where there may be scope to achieve greater consensus on the approach to setting the WACC, via a taskforce supported by the UK Regulators Network (UKRN). The CMA have also agreed to provide input to this work. We welcome the collaborative input and expertise of the sector regulators, the CMA, and the UKRN in tackling the common challenges in setting the WACC.

The aim is to work towards greater consistency, and towards a common methodology, where appropriate, for the WACC when setting price controls. Ultimately, this will encourage greater confidence in the price control process across sectors for consumers, businesses, and investors, and in turn, to help encourage sustainable investment.

Broadly, the requirements are to identify those areas:

- where there is already close alignment of methodology on the cost of capital;
- where there is scope for greater alignment.

In doing so, the taskforce would be expected to consider:

- both methodology and sources of data; and
- the role of cross-checks and broader considerations which have a bearing on the determination of the allowed return in price controls.

It is not expected that the outcomes of this taskforce will result in complete alignment on all aspects of the cost of capital by all regulators, as there are key sectoral differences that will require bespoke approaches from regulators.

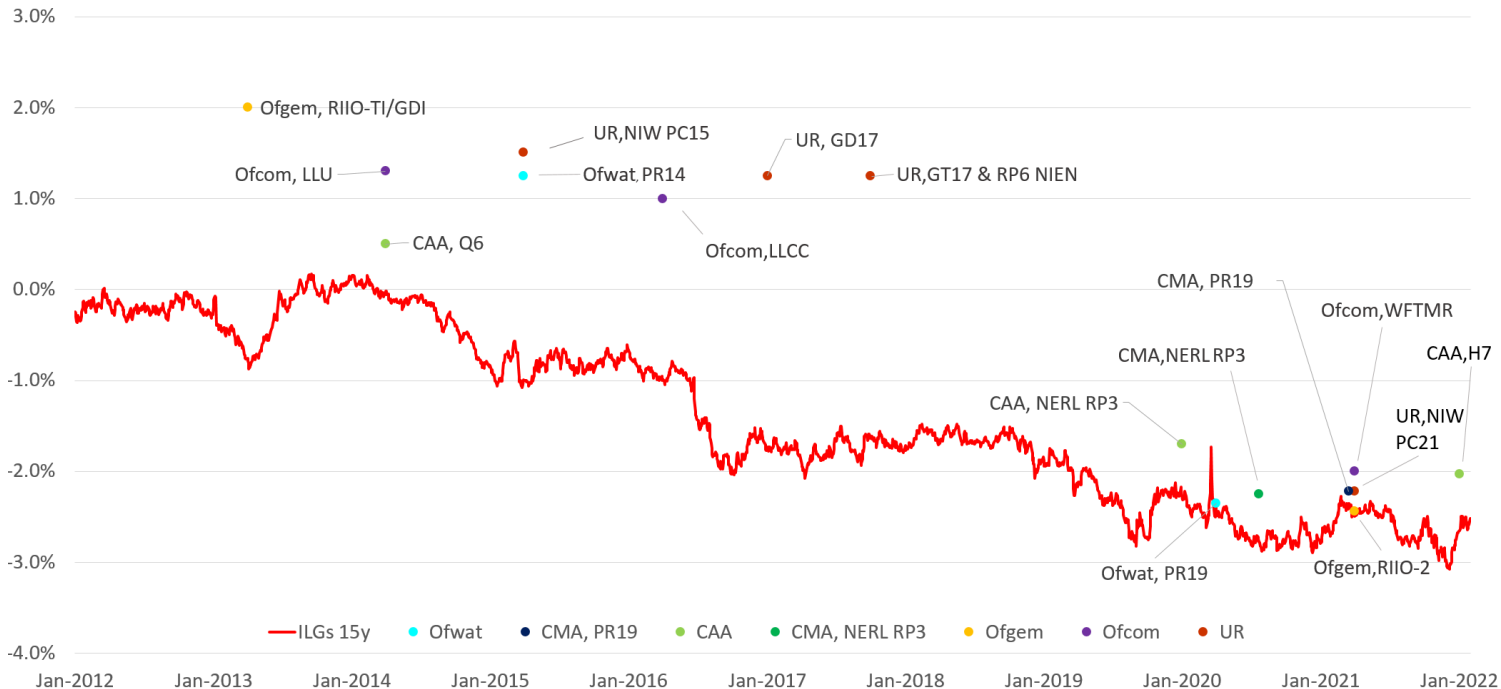
The Government expects the regulators, via the UKRN taskforce, to work towards alignment where clear benefits can be identified. This would include, where appropriate, consistency in three areas with regards to calculation of the WACC:

- Where common components of WACC methodologies are not influenced by sector-specific variables, there is a strong case for alignment on methodologies, input data and, ultimately the output used in the WACC calculation itself
- Where sectoral circumstances, e.g. sector-specific financial data, often lead to justified variation in outputs but where there may be greater scope for consistency in methodologies between sectors.
- Where different sector regulators include components in their WACC methodologies that are not used in other sectors, regulators could examine the case for greater alignment.

This work has commenced and the relevant regulators will work towards publishing findings on price control methodology in 2022. The Government will support the regulators, the CMA and UKRN where appropriate, to act on the taskforce's recommendations. Recognising the UKRN's key enabling role, and the positive impact on consumers and investors of greater consistency and transparency across economic regulators, the proposed review of economic regulator duties will consider whether any changes to regulator's duties could enhance cross-regulator collaboration."

## 3. Risk-free rate time series

Figure 5: Yields on index-linked gilts and selected regulatory decisions (RPI-real)



Source: Bank of England Gilt data and UKRN analysis of published regulatory decisions.

Note: All decisions as stated in RPI terms (or converted using an RPI-CPI(H) wedge of 90 basis points).