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

Contents

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 is an important component of the price for that service. 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.

Ensuring this expected 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 (Ofwat, Ofgem, Ofcom, the CAA and UREGNI) typically set the allowed rate of return by reference to a weighted average cost of capital (WACC).[1] These regulators start from a position of significant alignment in the overall framework and methodologies used to estimate the WACC,[2] but ultimately final decisions are taken independently, in light of each individual regulator's duties.

The BEIS review of economic regulation set out the expectation that regulators would 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.[3] 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.

As part of its review, BEIS asked Ofwat, Ofgem and Ofcom 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. The CAA and UREGNI have also worked with these regulators to put forward a set of recommendations which reflect the outcome of this joint work. The regulators have engaged with the CMA and welcomed their expertise, and the wider input from UKRN members in developing this guidance. This guidance has been subject to independent peer review by John Earwaker and Craig Lonie.[4] The UKRN taskforce is thankful for their input.

The primary focus of this draft 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. This guidance would not be binding and each regulator would continue to make decisions in accordance with its own statutory duties. Nothing in

[1] 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).
[2] Cost of Capital – Annual Update Report, July 2022.
[3] Department for Business, Energy and Industrial Strategy (BEIS), Economic Regulation Policy Paper, January 2022.
[4] The views expressed in this report should not be interpreted as necessarily reflecting the views of the external peer reviewers.

the guidance overrides relevant legislation or the principles of regulatory independence. However, the expectation is that the regulators named above would commit to having regard to this guidance in their future price control decisions where this is permitted by their statutory duties and deviate only where they consider there are good reasons to depart from it. We recognise that the development and publication of this document is at a time when some regulators have made or are in the process of making draft or final price control decisions. The approach to making those decisions will have been subject to appropriate consultation and careful consideration and we therefore do not expect the recommendations in this draft 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.[5]

The proposed recommendations 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 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.

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). Where the listed comparator 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: 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 balance of risks facing the regulated company and a wide range of benchmarks on gearing levels, not just that of the actual company (or companies) in question.

The value of a common methodology is its transparency and predictability. Nevertheless, we recognise that material developments in market conditions, finance theory and the statutory frameworks regulators operate under could constitute a case for revising regulatory practice. There are also areas of this guidance where further work may be required to refine some of the recommendations. For these reasons, we propose that the recommendations on a common methodology are subject to a periodic review by the regulators.

[5] 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.

Responding to this consultation and next steps

We welcome views on the proposed approach in this consultation by 23:00 on Wednesday 16th November 2022. Please email them to consultation.ukrn@caa.co.uk.

Specifically, we are seeking views on the following questions.

Question 1) Do you agree with the proposed recommendations?

Question 2) Do you have views on how this guidance could evolve over time, including views on potential issues for further investigation?

We will publish responses to this document on the UKRN website at https://www.ukrn.org.uk/. Subject to the following, by providing a response to this discussion paper you are deemed to consent to its publication.

Information provided in response to this document, including personal information, may be published or disclosed in accordance with access to information legislation – primarily the Freedom of Information Act 2000 (FoIA), the General Data Protection Regulation 2016, the Data Protection Act 2018, and the Environmental Information Regulations 2004. For further information on how we process personal data please see our Privacy Policy.

If you would like the information that you provide to be treated as confidential, please be aware that under the FoIA there is a statutory Code of practice which deals, among other things, with obligations of confidence.

If you think that any of the information in your response should not be disclosed (for example, because you consider it to be commercially sensitive), an automatic or generalised confidentiality disclaimer will not, of itself, be regarded as sufficient. You should identify specific information and explain in each case why it should not be disclosed and provide a redacted version of your response, which we will consider when deciding what information to publish. At a minimum, we would expect to publish the name of all organisations that provide a written response, even where there are legitimate reasons why the contents of those written responses remain confidential.

The UKRN intends to publish the final version of the guidance in early 2023.

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 capital providers (equity and debt).

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 rate of 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.[6]

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.[7]

The government expects regulators, via the UKRN, to work towards greater alignment where clear benefits can be identified.[8] Regulators involved in setting the main price controls (Ofwat, Ofgem, Ofcom, the CAA and UREGNI) recognise the value of further alignment in the approaches and ultimately the common parameter values used in each sector. Ofwat, Ofgem and Ofcom, with support from the CAA and UREGNI, have worked together via the UKRN Cost of Capital Taskforce to produce this draft guidance and anticipate further collaboration on these issues going forward. The regulators have engaged with the CMA and welcome their expertise and the wider input from UKRN members to achieve greater consensus on the approach to setting allowed returns.

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 may 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 may reduce the burden on regulators, appeal bodies and other stakeholders by not revisiting certain methodological debates every price control decision, unless there is a good

[6] For example, the allowed return accounts for around a fifth of regulated water and energy network revenues.
[7] Cost of Capital – Annual Update Report, July 2022.
[8] BEIS: Economic regulation policy paper, p.20. See Annex 2 for the terms of reference from BEIS.

reason to do so. Given the overall uncertainty around the true WACC, this is unlikely to result in any meaningful loss of precision in the allowed rates of return. However, a more streamlined approach to estimating the WACC could allow for more efficient use of resource with respect to other important issues within a price control, to the long-term benefit of customers.

This draft 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 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[9] 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), and these cases are not covered by this guidance.

We recognise that the development and publication of this document is at a time when some regulators have made or are in the process of making draft or final price control decisions in their sectors. The approach to making those decisions will have been subject to appropriate consultation and careful consideration and we therefore do not expect the recommendations in this draft 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.

This guidance is not binding and each regulator will continue to make decisions in accordance with its own statutory duties. Nothing in this document overrides relevant legislation or the principles of regulatory independence. However, we expect that the regulators named above would commit to having regard to 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 do so. We recommend that any such reasons should be set out transparently in their decisions.

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, which in regulated sectors is largely set taking account of backward-looking evidence.

[9] 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).

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.[10] 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. We do not propose that all sector regulators need to apply one or other approach but only that regulators 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.

[10] 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.

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 (β_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)

β_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 derived with relative ease. A UKRN-commissioned report in 2018 recommended that regulators should continue to use CAPM to estimate the cost of equity, which remains the recommendation that we follow in this draft guidance.[11]

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.

[11] 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 and other market benchmarks.

We propose 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 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.[12] In the RIIO-2 appeal (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"), 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.[13]

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. Regulators, and the CMA, have typically relied on externally-anchored inflation assumptions[14] or inflation forecasts from official sources, such as 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

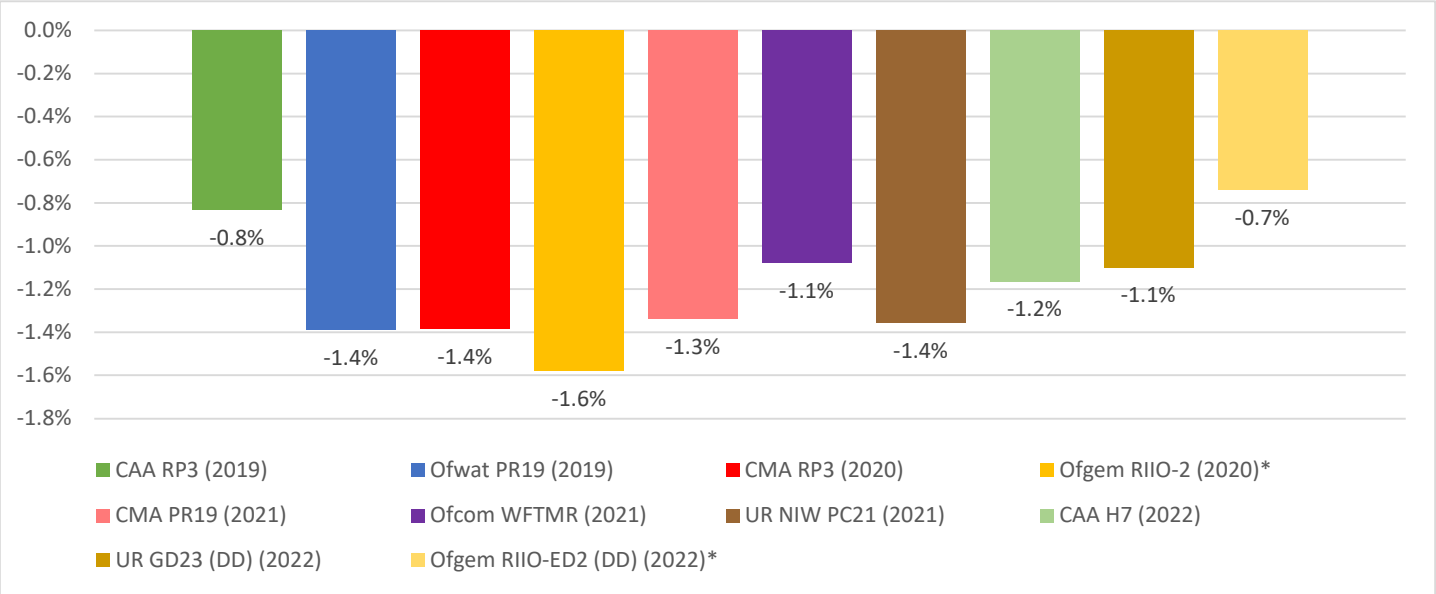
Recent regulatory determinations have addressed the potential for forecast error in different ways. Ofgem has adopted indexation for the RFR for RIIO-2, reducing the importance of making an accurate ex-ante forecast. Other regulators (for instance Ofwat at PR19) have used market-implied interest rate changes from yield curves to uplift

[12] 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.
[13] CMA RIIO2 Final determination: Volume 2A: Joined Grounds: Cost of equity, 28 October 2021, paragraphs 5.146-5.149.
[14] For instance, the Bank of England's 2.0% CPI inflation target.

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.[15]

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 draft 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.

Risk-free rate – proposed approach

Choice of benchmark

Given that most regulators operate real-terms price controls, estimating the RFR with reference to yields on index-linked gilts remains preferrable. While ILGs may not be a perfect proxy for the risk-free rate, overall there are advantages to using ILGs compared to alternative instruments. 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. For example, it would be appropriate to adjust the synthetic index used in the CMA's PR19 redetermination for premia relating to inflation, default and liquidity risk, as well as stripping out some ultra-long tenor borrowings. However, judgment is required in calibrating the appropriate adjustment for each risk premium, with a higher number of adjustments increasing the scope for estimation error. AAA-rated corporate bond indices may also feature instruments that have unusually high tenors, making them less relevant as data points to inform the rate for the notional company. [16] The CMA's redetermination of the Ofgem RIIO-2 price controls noted in one example that stripping out these instruments resulted in an AAA-rated index with just one instrument, meaning there is little practical impact of including the approach in the risk-free rate estimation process.[17]

[15] 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

[16] 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.

[17] CMA RIIO2 Final determination: Volume 2A: Joined Grounds: Cost of equity, paragraphs 5.101-103.

However, we do not rule out cross-checking the yields on index-linked gilts against other, suitably adjusted, benchmarks. Increased uncertainty around inflation expectations could be one factor to consider when evaluating the need for cross-checks. In deciding which cross-checks to use, we note that the Bank of England references SONIA swap rates as a risk-free rate for sterling markets that is deep, liquid and transparent at maturities up to 50 years.[18] Because SONIA swap rates are available at maturities consistent with the recommended 10-20 year investment horizon, they may therefore provide a useful cross-check.[19]

Current yields on index-linked gilts are likely to provide the most up-to-date proxy for what investors require on a risk-free investment on a forward-looking basis. 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.

Regulators should continue to use long-dated index-linked gilts to match the assumed investment horizon in their sector. Consistent with recent precedent, maturities of 10 to 20 years are likely to be suitable for most sectors.

Inflation issues

Regulators should continue to adjust the RPI yields into CPI(H) or nominal yields, if required by their price control methodology. Using 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 remains the preferred approach. 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.[20] 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 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. We also recognise that inflation has increased significantly in 2022 which may create further uncertainty around long-term inflation expectations. Continuing to rely on official forecasts wherever possible remains preferable.

Addressing the risk of forecast error

While there is some debate about the predictive power of forward rates, to achieve greater consistency across sectors, setting a risk-free rate by reference to recent data, without the use of forward rate adjustments, is likely to be preferable. 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 the index-linked gilts, with a maturity which matches the assumed investment horizon for their sector.*

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

[19] The CAA has currently adopted a different approach to the risk free rate to that set out in this paper. As set out in the Summary, the CAA 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.

[20] https://uksa.statisticsauthority.gov.uk/correspondence/response-from-the-chair-to-the-chancellor-of-the-exchequer-rpi-consultation-response/

TMR/ERP – current approach

The TMR[21] measures the return expected by the marginal investor from holding a diversified portfolio of all investible 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 ERP[22] 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,[23] as well as earlier reports by the same authors,[24] 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.[25] 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.

However, 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.[26] Although we recognise that 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 is typically derived from 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.

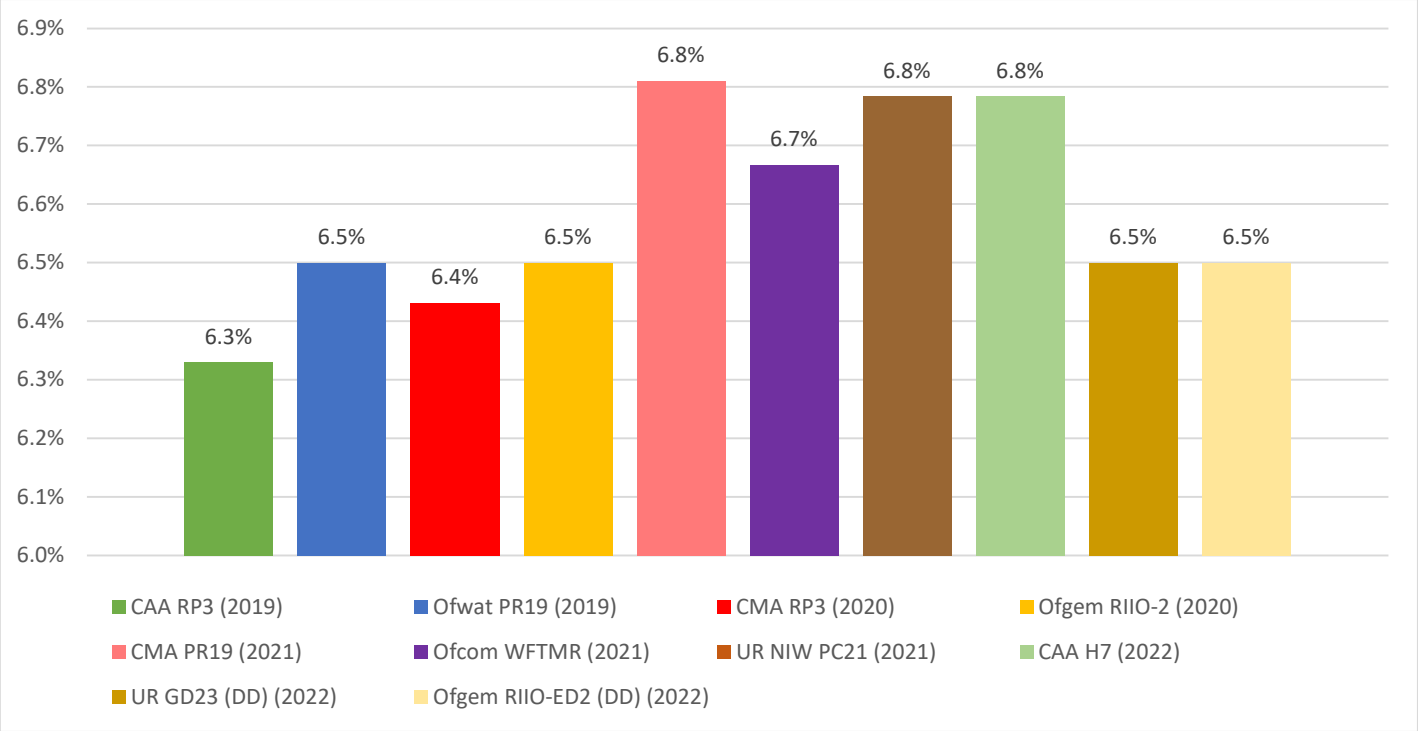
All regulators place weight on historical ex-post approaches and many of them on historical ex-ante methods. Some regulators have also considered forward-looking evidence in their most recent decisions.

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 GFC, the assumed TMR has not declined one-for-one with the RFR, consistent with the assumption of greater stability in the equity returns compared to government bond returns. Conversely, if interest rates rise, under current UK regulatory practice the allowed cost of equity would not rise as quickly as the RFR.

[21] Sometimes referred to as the EMR (Expected Market Return).
[22] Sometimes referred to as the MRP (Market Risk Premium).
[23] S. Wright et. al. 'Estimating the cost of capital for implementation of price controls by UK Regulators', 2018
[24] Smithers and Co Ltd 'A Study into certain aspects of the cost of capital for regulated utilities in the UK', 2003
[25] See e.g. Wright and Smithers 'The Cost of Equity Capital for Regulated Companies: A Review for Ofgem', 2014 pp. 13-16
[26] 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.

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%.[27]

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 draft 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.[28] 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, due to COLI's relatively limited coverage in terms of products and population, and concerns about the quality of weights.[29]

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-

[27] Source: Dimson et. al 'Credit Suisse Global Investment Returns Yearbook,' 2022, the figure refers to the UK ERP (whole-period arithmetic mean).
[28] Dimson et. al 'Credit Suisse Global Investment Returns Yearbook,' 2022.
[29] 'PR19 Redeterminations: Final report', paragraph 9.294

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.[30]

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 sparser set of costs and weights than those used to calculate latter-day CPI. More recently, the ONS has also published a back-cast series for CPIH.[31] 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).[32] However, in the RIIO2 appeals, the CMA found Ofgem not wrong in relying on CPI-deflated returns.

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.[33]

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).[34] UK regulators have in recent years tended to interpret this as 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.[35]

[30] https://uksa.statisticsauthority.gov.uk/news/uk-statistics-authority-statement-on-the-future-of-the-rpi/
[31] See: ONS, 'Consumer price inflation, historical estimates, UK 1950 to 1988 – methodology', May 18 2022
[32] 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.
[33] See CMA, 'PR19 redeterminations final report' March 2021, pp.813-819
[34] 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.
[35] 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.

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;[36] in RIIO2 the CMA found Ofgem 'not wrong' in adopting this approach.[37]

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 likely 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 are difficult to verify. However, for its RIIO-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.[38]

TMR/ERP - Proposed future approach

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. 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.

However, it is important to recognise that depending on the macroeconomic environment, a 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 which has persisted following the 2008 Financial Crisis, such an approach could overestimate returns. This is 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.[39]

[36] CMA, 'Ofwat price determinations, final report', March 2021, paras 9.335 to 9.338
[37] CMA RIIO2 Final determination: Volume 2A: Joined Grounds: Cost of equity, paragraphs 5.255 to 5.258
[38] CMA RIIO2 Final determination: Volume 2A: Joined Grounds: Cost of equity, 28 October 2021, paragraph 5.286
[39] 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

The potential for the proposed methodology to produce upwardly-biased estimates of the TMR is recognised by regulators, the CMA[40] and the authors of the 2018 UKRN Report.[41] This bias is likely to persist as interest rates rise because they still 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.

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 formula effect).

To deflate historical nominal returns, for the period of 1900-1947, using CED would be appropriate as a reasonable measure of historical inflation. For the period 1947-1988, relying on backcast CPI or CPIH data is preferable,[42] while from 1988 onwards sufficient data exists to directly produce reasonable estimates of CPI and CPIH.

Where regulators require an RPI-based or a nominal TMR, regulators should use official inflation forecasts insofar as possible (see previous discussion) to inform the appropriate RPI-CPI(H) wedge or long-term CPI inflation to convert the CPI(H)-deflated estimate.

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). 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 judgment in interpreting the data and deriving a range for the historical ex post evidence.

Historical ex ante evidence

We propose that regulators 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.[43] Broadly historical ex ante estimates tend to indicate a lower range for the TMR than historical ex post evidence.

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

[40] CMA, 'Ofwat price determinations, final report', March 2021', paragraphs 9.387-9.388 and 9.1314.
[41] CMA RIIO2 Final determination: Volume 2A: Joined Grounds: Cost of equity, 28 October 2021, paragraph 5.283(b)
[42] See: ONS, 'Consumer price inflation, historical estimates, UK 1950 to 1988 – methodology', May 18 2022
[43] See e.g. Mehra, R. "The equity premium puzzle: A review." Foundations and Trends in Finance 2.1 (2007): 1-81.

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 market-wide risks, captured by returns on a broad market portfolio of equities. By definition, the market index 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.

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

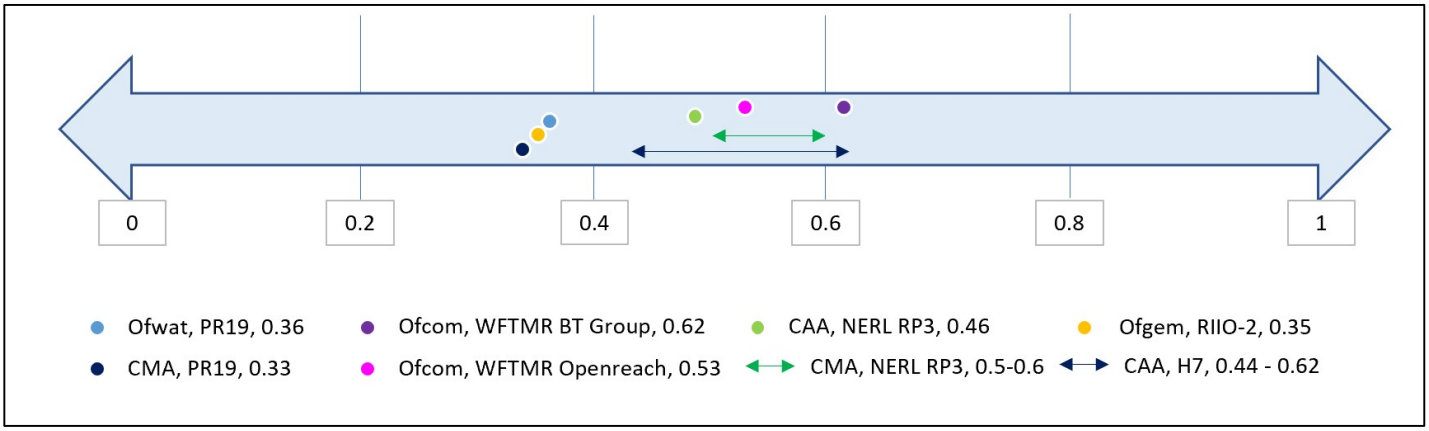
- First, identify listed companies which could form suitable comparators for the regulated activities for which price controls are being set. In some sectors, this is more straightforward than in others, but, in practice, there are very few pure-play listed benchmarks.[44]
- Second, estimate raw equity 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.[45] 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.

[44] 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.

[45] The Harris Pringle formula is: $\beta a = \beta e \cdot (1 - g) + \beta d \cdot g$, where βa is the asset beta, βe is the raw equity beta of the listed comparator, βd is the debt beta, and g is gearing, as defined by debt/(debt+equity).

Figure 3: Asset betas from recent regulatory decisions[46]



Source: UKRN analysis of regulatory publications

Equity beta: Proposed approach

Estimating raw equity betas

The approach of estimating "raw" equity betas using (as close as possible) "pure play" listed companies with business risk characteristics that match the notional company remains reasonable going forward. Regulatory judgment 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. Currently, the suite of UK companies which are likely to be most relevant in the markets of interest are Severn Trent, United Utilities, National Grid, BT Group and, going forward, Pennon.[47]

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.[48]

Interpreting beta regressions involves judgement and investigation of sector-specific issues. For instance, share prices of airports have been affected quite differently to the share prices of water companies by the COVID-19 pandemic, and therefore, the weight given to the data during the pandemic may need to be different depending on the sector. In addition, availability of data over long enough period may , constrain the length of estimation window which can be used in some sectors. For these reasons a 'one-size-fits-all' approach is unlikely to be appropriate. Nonetheless, there is scope to adopt a more streamlined approach to estimating betas.

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. 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[49] but without necessarily producing more reliable results. Finally, the market

[46] UREGNI did not calculate an asset beta in its recent decision PC21 for NI Water.
[47] 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.
[48] The impact of the Covid-19 pandemic is an example of this.
[49] 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.

index based on the most diversified local index in the relevant currency for the relevant country/economic area is preferable.[50]

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 should remain 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.

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. No single approach is clearly superior but previous regulatory point estimates have tended to lie in a range of 0.05 to 0.15.

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')[51] 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.[52]

We do not propose prescribing a particular methodology for estimating the debt beta at this stage, but for internal consistency we recommend that regulators sense-check the combination of their asset beta, debt beta and gearing, and specifically, investigate the relationship between the forward-looking cost of capital[53] and gearing.

Estimating a notional equity beta range

Based on the considerations above regulators should clearly state their preferred 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). Where the listed comparator has different gearing to the notional company, regulators should continue to de-lever and re-lever the raw equity beta.*

[50] 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).

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

[52] 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.

[53] I.e. a weighted average of the cost of equity and the cost of new debt.

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 cost of equity range (derived from the recommendations in the previous section).

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 debt being based on a point estimate.[54] We propose to adopt the same approach in this guidance.

Current approach

There is uncertainty around the true level of the cost of equity. 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 as 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 granted 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 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

[54] 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'.

return on equity, it has been argued it may be appropriate to adjust the base level of allowed return to achieve this.

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.

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

Proposed approach

Overall, we consider that for most of the considerations (welfare arguments, asymmetry of incentives, asymmetry of parameters, financeability), there are likely to be more targeted means of achieving the relevant objectives. Cross-checks from market evidence are potentially useful as they are based on different market data to the CAPM, although interpretation is also subject to uncertainty.

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.[55]

We note that market cross-checks such as MARs may not be available in all sectors.

Welfare impacts from under investment

While the welfare impacts from under-investment are important, 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

[55] For instance, Pennon acquired Bristol Water in June 2021 at a premium to RCV of 44% and National Grid acquired Western Power Distribution in March 2021 at a premium of approximately 60% to RAV.

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 exploring direct procurement for customers (DPC) in which water companies seek bids from third parties to design, 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. The current practice of allowing for both embedded and new debt costs in the calculation of the allowed returns provides significant protection against interest rate risk and also means that the marginal cost of financing new investment has been less than the allowed return on debt given the historical declining interest rate environment. This is likely to persist for some time, even as interest rates start to rise, given the long maturity profiles of debt in most sectors.

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.[56] 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. [57]

[56] This follows from the usual regulatory convention that the base return is the cost of capital for a notional company.
[57] 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.

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.[58] 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.[59] 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 should indicate that the cost of equity has been mis-estimated. 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 allowed return on equity are likely to be more suitable remedies for financeability issues.

Recommendation

Recommendation 7: *Regulators should only deviate from the mid-point of the CAPM cost of equity range if there are strong reasons to do so.*

[58] 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.
[59] With the exception of Ofcom.

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.

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.[60]

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. 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.

[60] 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.[61] This results in a cost of debt that tracks market movements more closely.

Proposed approach

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 interest rate risk. 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.

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.

It may also be appropriate to consider the likely financing strategy of the notional efficient company in allowance setting, including the likely tenor of debt and the likely mix of bond and other types of debt. For instance, while actual financing strategies may involve heavy reliance on a particular debt instrument (e.g. very long-dated debt, or foreign currency debt), it is reasonable for regulators to take a view on a prudent financing policy for a notional firm (which may differ from what is observed in practice for a given regulated company). This would be informed by factors such as the notional level of gearing, assumed credit rating, and assumed investment horizon.

Finally, in deriving a cost of debt, regulators must make adjustments when either the balance sheet or benchmark index approaches are used for purposes of deriving a real cost of debt and potentially also a nominal cost of debt. We recommend that typically the long term Bank of England target or long term official inflation projections should be used. However, there may be circumstances where an alternative forecast might be preferable, for example, if there is evidence that the long term Bank of England inflation target will not be met.

Recommendation 8: Re*gulators 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.

[61] 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.

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 judgment on the level of gearing which is appropriate for an average, efficiently-run, company, given the characteristics of the price control.

Going forward, it would be reasonable to consider the following issues when selecting the notional gearing assumption:

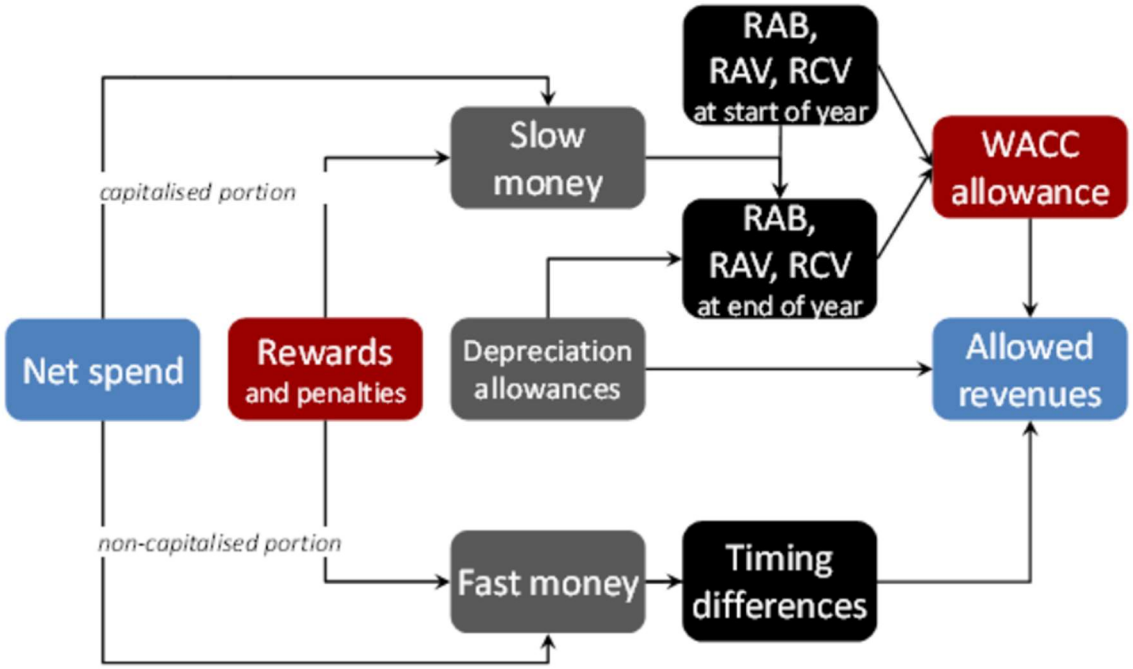
- **Notional company risk profile:** Whether the level of gearing provides the notional company with a sufficiently large equity buffer to absorb shocks, given its risk exposure in the market it operates in – including the extent of protection (or exposure) under the regulatory framework. Higher risk 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:** as discussed in the beta section, it is important to sense check the combination of the notional gearing, asset beta and debt assumptions, and the relative impact of gearing on the WACC.

Recommendation 9: *The notional gearing assumption should reflect the balance of risks facing the regulated company and a wide range of benchmarks on gearing levels, 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.[62]

"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

[62] 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.

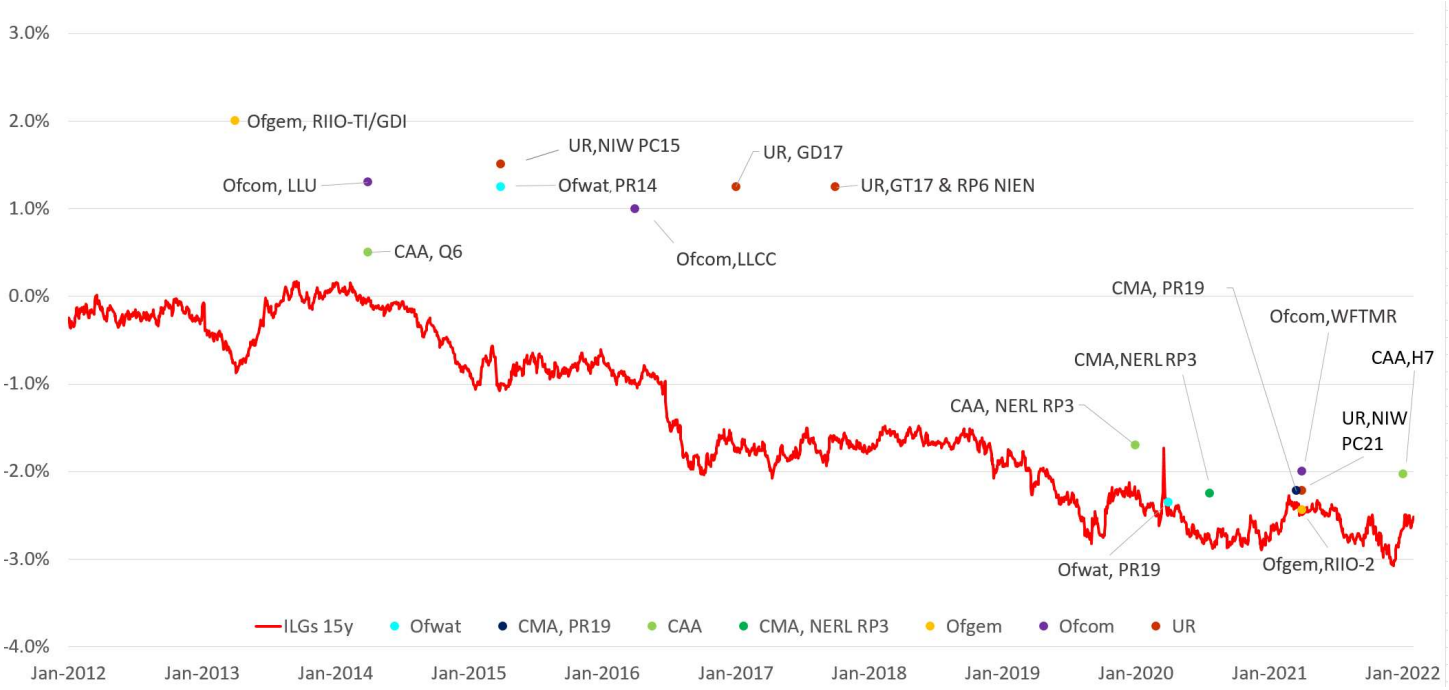
The Government expects the regulators, via the UKRN taskforce, to work towards alignment where clear benefits can be identified. This would include, where appropriate, consistency in three areas with regards to calculation of the WACC:

- 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).