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UPDATED COST OF EQUITY CROSS-CHECK EVIDENCE

A report prepared for Future Energy Networks

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Contents

Executive summary

This report provides new cross-check evidence for the Future Energy Networks (FEN) following Ofgem's RIIO-3 Draft Determinations (DDs) published in July 2025. It builds upon Frontier's 'Investability Report'[1] (produced March 2024) and 'Business Plan Cross-Checks Report'[2] (produced November 2024).

In RIIO-3, Ofgem is using a similar multi-step approach as used in RIIO-2 to set the allowed return on equity. This involves:

- Step 1: CAPM estimation of the cost of equity (CoE);
- Step 2: Cross-checks on equity financeability, and any concerns on broader equity 'investability'; and
- Step 3: Assessing whether expected returns match the allowed return estimate following Steps 1 and 2.

In this report, we focus on Step 2, the cross-checks on the CAPM CoE. We assess Ofgem's cross-check analysis, present our own cross-check analysis (while addressing Ofgem's critique on our cross-checks) and assess whether Ofgem's CAPM-derived CoE and Total Market Return (TMR) assumptions are supportive of its stated objectives to ensure that the RIIO-3 price control package is investable.

Ofgem's Step 2 assessment lacks transparency, is selective in evidence and it does not support Ofgem's Step 1 CAPM result

Ofgem's Step 2 assessment is not presented in a transparent manner. Our analysis highlights inconsistencies and lack of transparency in how Ofgem estimates and interprets cross-check results. For example, Ofgem does not provide details on the organisations or timeframes used in the OFTO implied equity IRR, Investment managers' TMR, or infrastructure fund implied IRR cross-checks.[3]

There is selective treatment of the evidence base. Robust and well-supported indicators (such as the hybrid bond and Dividend Growth Model-based cross-checks) are dismissed on the basis of methodological caveats that could equally apply to other cross-checks which Ofgem uses. This inconsistent application of standards, combined with a lack of transparency on how evidence is assessed and used, undermines the robustness of the

1 Frontier Economics (2024), Equity Investability in RIIO-3, submitted to Ofgem by the ENA as part of its response to the Sector Specific Methodology Consultation (SSMC)

2 Frontier Economics (2024), Updated Cost of Equity Cross-Check Evidence

3 We understand that OFTO data is confidential, but no indication of trends over time is given, with only a single figure provided and no discussion around the data.

Step 2 process. We address this in more detail in our 'Cross-Check Standards of Evidence Report' where we show that Ofgem and other regulators have not to date appraised different types of cross-checks on a consistent and objective basis.[4] The analysis in this report finds that a consistent standard of evidence applied to cross-checks means that Ofgem should:

- place weight on DGM-based TMR cross-checks, if they continue to assign weight to their MAR inference cross-check; and,
- place weight on debt-based cross-checks such as the hybrid bond cross-check when assessing the overall CoE, as the criticisms levied on the hybrid bond cross-check are present in regulators' own cross-checks.

Ofgem also fails to fully engage with the evidence it includes to inform the final CoE position. For example, in the case of the infrastructure fund implied equity IRR, it is not explained why Ofgem has failed to take account of its own result for this cross-check, that the relevant cost of equity (CPIH-real) is 8.5%, far higher than the cost of equity Ofgem has set.[5] This cross-check does not suggest that Ofgem's proposed cost of equity is "*sufficient to attract investors*".[6]

Ofgem's cross-checks would report higher values if they used more robust assumptions. For example, our calculations suggest that the infrastructure fund implied equity IRR was 9.6% CPIH-real in March 2025 compared to Ofgem's estimate of 8.5%. This is likely because Ofgem averaged the upward trend in H2 2024, overlooking the higher levels that have carried through into 2025. Further, our Market-to-Asset ratio (MAR) range (based on more recent market data and updated assumptions better reflecting the sample of companies) produces a midpoint of 7.27%, which is materially higher than Ofgem's midpoint of 5.2%.

A balanced set of cross-checks points to significant equity investability risks in the DDs

When we account for the issues identified in Ofgem's approach to its Step 2 assessment, we find that, contrary to Ofgem's claims, **the evidence from a more balanced set of cross-checks suggests that significant investability risks remain in the allowed equity returns proposed in the DDs.**

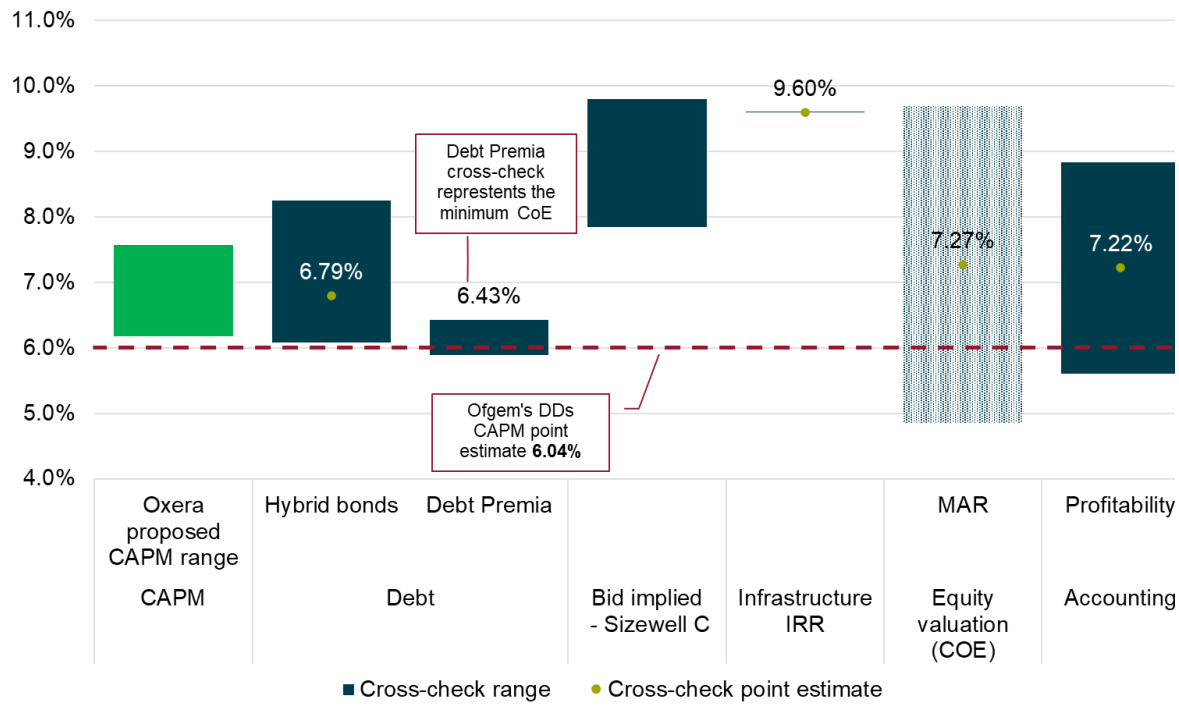
As a result, the Step 1 CAPM values should be revised upwards for the Final Determinations. If left unchanged, this level of allowed equity return would put at risk Ofgem's stated objective of ensuring that the RIIO-3 price control package is investable. The results are summarised in the figure below.

4 See Frontier Economics (2025), Cross-Check Standards of Evidence.

5 Ofgem (2025), RIIO-3 Draft Determinations - Finance Annex, para. 3.97

6 Ofgem (2025), RIIO-3 Draft Determinations - Finance Annex, para. 3.91

Figure 1 CoE estimates and cross-checks (CPIH-real)



Source: *Ofgem, Frontier Economics, Oxera*

Note: *We consider a 2% CPIH assumption and the Fisher equation to derive CPIH-real values for the cross-checks. For Debt Premia cross-check we present Oxera's minimum CoE to cross-check Ofgem's DDs CoE. We note that a higher minimum is needed to cross-check Oxera's proposed CAPM range.*

The above cross-checks suggest that Ofgem's Step 1 point estimate of 6.04% is highly unlikely to satisfy investability criteria. **The evidence is strongly indicating that a higher Step 1 CoE output is required to mitigate investability risks**. Taking what we consider the most relevant cross-checks in-turn:

- **Ofgem's DDs point estimate of 6.04% is materially below the hybrid bond cross-check point estimate, and lies below the lower bound of this cross-check** (this cross-check has a range of **6.1% to 8.3% CPIH-real**). This indicates Ofgem's CAPM CoE does not reflect equity-like risk premia in current market conditions. Ofgem's criticisms of our hybrid bond cross-check are addressed extensively (and described later in this report). On this basis, we find that relevant information being provided by this cross-check is being entirely discarded without a reasonable basis.

- Oxera has updated its **Debt Premia** (formerly **ARP-DRP**) cross-check which involves comparing the difference between the asset risk premium (ARP, the expected excess return from holding risky assets compared to riskless assets) and the debt risk premium (DRP, the expected excess return to holding risky

debt relative to riskless assets). This update implies a minimum CoE to cross-check Ofgem's CoE of 6.43%.[7]

- New evidence from the **Sizewell C nuclear plant**, a RAB-financed construction project with a low-risk regulated revenue stream in the construction phase, provides a further real-world benchmark for what is required for a sizeable new equity investment in a regulated infrastructure business. **Centrica reports that it expects a more than 10% nominal IRR in a 'high cost' scenario, and a more than 12% nominal IRR in a 'moderate cost' scenario** for its 15% equity stake, corresponding to a 'high cost' and 'moderate cost' scenario respectively. Given the scale and risk profile, this is a direct and highly relevant cross-check for required equity returns on regulated businesses carrying out large network investments.

- Since RIIO-2, **Ofgem's CoE has increased by 1.5 percentage points, while implied infrastructure equity IRRs have risen by 5.4 percentage points (to 9.6% CPIH-real in March 2025).** The widening gap points to a growing disconnect between regulatory allowances and capital-market pricing which indicates that a more significant increase in the allowed CoE is likely to be required for RIIO-3 than Ofgem has so far been minded to provide.

- We find that little comfort can be taken on investability based on evidence from **traded MARs**. Ofgem has used data from Ofwat's PR24 DDs, which is materially out of date. We find that a reasonable set of assumptions, formulated based on more updated data implies a higher lower bound but a much wider range as well. The wide range leads us to question the informational value of this cross-check.

- The long-term profitability cross-check also suggests that Ofgem's point estimate is likely to be insufficient as it sits right at the bottom of the range of this cross-check.

Not only are the cross-checks not supportive of DDs CoE point estimate; the cross-check evidence demonstrates that the bottom *half* of Ofgem's estimated DDs CoE range can be considered irrational. As we have previously set out in our Investability report, the rational level of expected equity return should be strictly above the expected return on debt instruments, as debt instruments are less risky than equity (leaving aside the exact margin by which the former should be above the latter). Given this, we have proposed a hybrid bond-based rationality check.[8]

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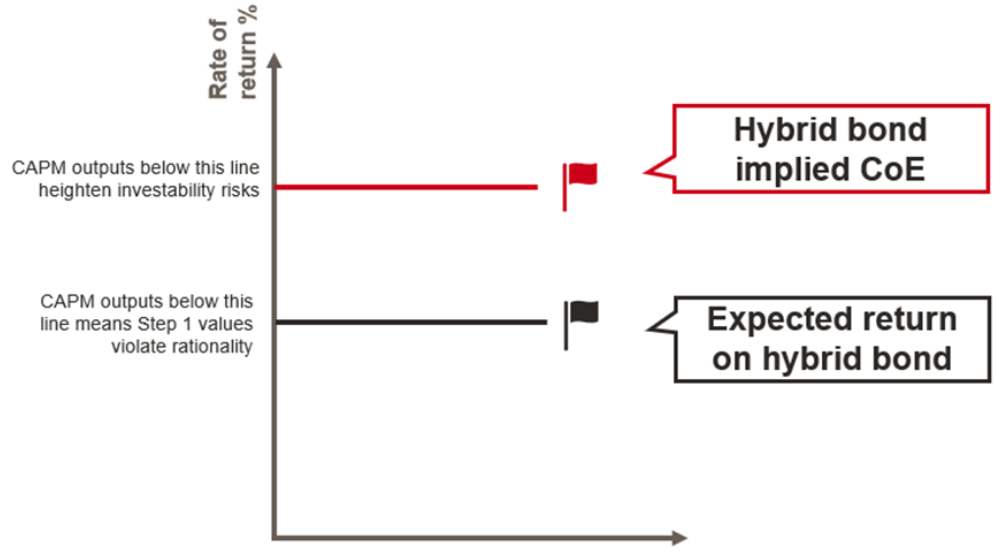
7 Oxera (August 2025), RIIO-GD&GT3 cost of equity and debt premium cross-check, Prepared for Future Energy Networks. Oxera provides a range of minimums based on different averaging periods. To pass the cross-check the CoE needs to be above this range.

8 Frontier Economics (2024), Equity Investability for RIIO-3, para 6 onwards

We show this by the following illustration drawing on hybrid bond data, shown Figure 2 below:

- The red line in the illustration represents our hybrid bond implied CoE, which uses information from hybrid bonds to estimate a rate of return that reflects equity risks. Where the mid-point of the CAPM range sits below this level, this raises a red flag and suggests that the risks to investability are heightened.
- The black line in the illustration represents the expected return on a representative hybrid bond. Since hybrid bonds are subordinated to senior debt, but paid before common equity, the CoE should lie strictly above the expected return on hybrid instruments at all times. Where this is not the case, this **raises rationality challenges**. Under normal market conditions, a rational investor would not invest in equity if the return is lower than hybrid bonds. We represent this threshold with a black flag.

Figure 2 Hybrid bond rationality check illustration with red and black flags



Source: Frontier Economics

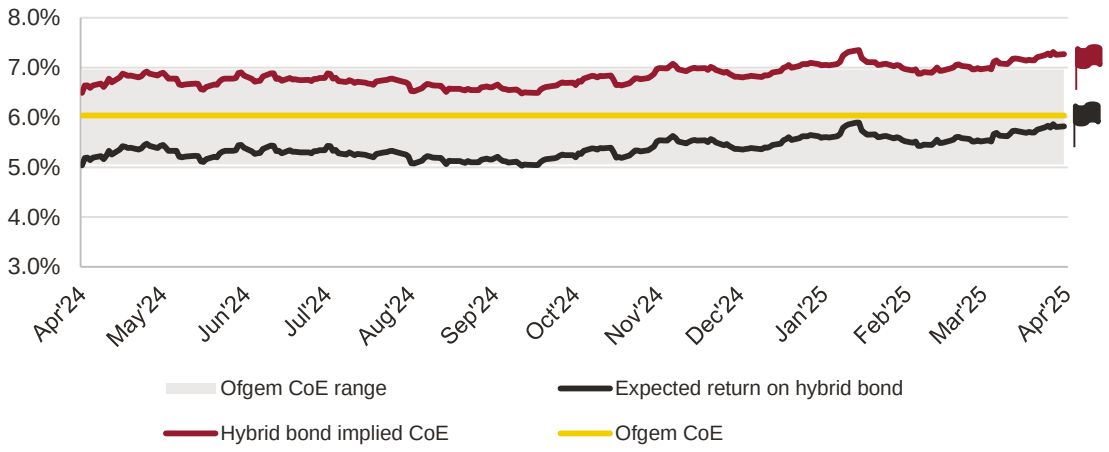
In Figure 3, we demonstrate these thresholds using actual data. We present the expected return of a representative hybrid bond over time over the past 12 months, comparing to the CAPM ranges in the DDs.[9]

[9] The representative hybrid bond return is measured as the average of the iBoxx GBP A and BBB indices (including the Ofgem proposed 25bps gas sector premium) plus the spread at issuance of NGG 2073 hybrid, net of default risk, over the benchmark (145bps).

The analysis shows that Ofgem's CoE range and point estimate raises red flags and, in places, black flags. The DDs CAPM point estimate (yellow line) is materially below the hybrid bond implied CoE (red flag) which suggests that investability risks are heightened. Further, the point estimate from the CAPM range is also on the cusp of falling below the expected return on the hybrid bond (black flag) at the end of March 2025. This therefore provides further evidence that there are significant investability risks in the DDs CAPM point estimate.

By the same principle, almost the entire lower half of the CAPM, towards the end of March 2025, is below the representative hybrid bond return (black flag). Therefore, the bottom half of Ofgem's range can also be considered irrational, failing to appropriately reflect the returns required for equity, therefore should be disregarded.[10]

Figure 3 Rationality check against Ofgem's CoE range



Source: *Frontier Economics analysis*

Note: *The senior bond yield is calculated the average yield of iBoxx £ Non-Financials A 10+ and iBoxx £ Non-Financials BBB 10, inclusive of Ofgem's proposed 25bps gas sector debt premium. Nominal values are converted in real terms using the Fisher equation, assuming a 2% inflation rate.*
The representative return is calculated as the senior bond yield plus our estimated HB spread of 145bps. This spread represents the default-risk adjusted spread to the NG2073 hybrid bond at issuance.
The Hybrid bond implied CoE is calculated as the senior debt plus our estimated HB spread of 145bps multiplied by two. This is to account for the 50% equity-like feature of Hybrid bonds.

Consistent with the rest of CoE cross-checks, this leads us to conclude **that the DDs point estimate is not sufficient to mitigate investability concerns.** This is because the result

10Y+ non-financials indices are used consistent with the cost of debt methodology in the DDs. For the avoidance of doubt, the outputs presented in our previous reports correspond to the red line. The updated red line average value for the past 12 months is the 6.79% referenced earlier in this section.

[10] We also emphasise that this analysis does not attempt to estimate an implied CoE (the red line in the illustration), eliminating the concerns raised by Ofgem's in the DDs with regards to hybrid bond evidence.

shows that an investor could earn a return similar to the equity return proposed in the DDs by investing in a lower risk asset.

By contrast, the top end of Ofgem's CAPM range has greater overlap with the cross-check evidence. In addition, Oxera's CAPM mid-point (6.84% CPIH-real) sits within the hybrid bond range and above the minimum CoE implied by Oxera's Debt Premia cross-check. This therefore provides a more credible prospect as an investable proposition. In light of the cross-check evidence, Ofgem should consider setting its CoE towards the top of its CAPM range to bring it into line with the weight of market-based evidence in order to support investability.

Ofgem's low TMR has likely contributed to the insufficient CoE estimate

Most of the cross-check evidence report higher estimates than Ofgem's TMR estimate of 6.90% CPIH-real, which indicates that Ofgem's TMR estimate in its Step 1 could be too low. This could explain why Ofgem's proposed CoE is too low when compared against an investable value implied by the cross-checks, in particular, the hybrid bond cross-check.

The **TMR Glider** is the primary way in which we propose DGM evidence can be utilised for estimating the TMR in a regulatory context. This is because the volatility of underlying DGM output is moderated through the relationship with long-term gilt yields.

In the DDs, Ofgem disregarded the TMR Glider as a cross-check for its TMR estimate, owing to its concerns with the use of the DGM. However, it is important to stress two key points regarding DGM:

- First, while Ofgem has not placed any weight on the TMR Glider due to concerns with DGM, we note that Ofgem continue to use MAR inference analysis as a cost of equity cross-check. As discussed in our Cross-Check Standards of Evidence Report, **the MAR cross-check is also based on DGM analysis**.[11] This is therefore inconsistent with Ofgem's decision to not place any weight on our DGM-derived TMR Glider.
- Second, we stress that DGM is a widely used technique for equity valuation and TMR estimation. Despite criticisms, its use by numerous reputable sources proves its relevance and applicability.

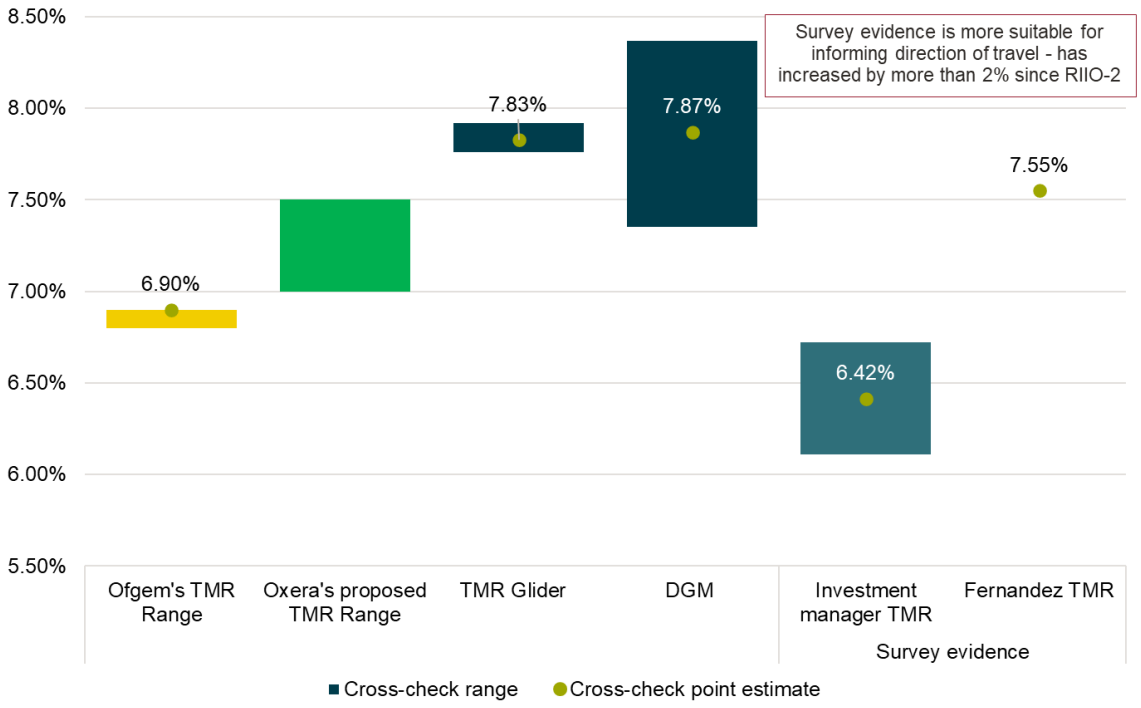
The TMR Glider value from March 2025 of **8.0%** and the 2-year moving average of **7.8%**[12] both suggest that Ofgem's historical TMR of 6.9% is materially below the current equity return required by the market.

11 See Frontier Economics (2025), Cross-Check Standards of Evidence.

12 We note that the TMR Glider remains elevated and implied a TMR of 8.1% in May 2025.

The key evidence across all TMR cross-checks is summarised in the chart below. The market-based TMR cross-check evidence suggests that the market required rate is currently significantly above the long run average historical realised returns, on which Ofgem rely for its estimation of the TMR.

Figure 4 Ofgem DDs TMR estimates against cross-checks (CPIH-real)



Source: *Ofgem, Frontier Economics analysis, Oxera*

Note: *TMR Glider range represents the 20-80th percentile range over the last 24 months, which is 7.76% - 7.92%, with an average of 7.83%. All figures presented to 2 d.p.*
The DGM range represents the 20-80th percentile range over the last 24 months which is 7.35%- 8.37% with an average of 7.87%. All figures presented to 2 d.p.
We derive CPIH-real figures using the Fisher equation and a CPIH assumption of 2%.
The investment manager TMR range is constructed from the mean of all observations and the mean of observations included in Ofgem's sample at RIIO-2. The mid-point of these values makes up the point estimate.

Oxera, in its latest CAPM report, have set out a TMR range on 7.0% - 7.5%.[13] The cross-check evidence would suggest that **the top end of this range would be more suitable, since the TMR Glider values currently lie beyond the range**.

The data also shows that there has been a significant increase in TMR values from all sources since the RIIO-GD2/T2 final determination. Even in the case of the lowest values in the TMR cross-checks – the investment manager survey – updated forecasts from 12 investment managers yield an average nominal TMR of 8.2%, with values from consistent

13 Oxera (August 2025), RIIO-GD&GT3 cost of equity and debt premium cross-check: Prepared for Future Energy Networks

institutions rising by c.2.4 % since RIIO-2. Further, the Fernandez academic and practitioner survey points to a TMR increase of c.2.8% (from 6.9% in 2020 to 9.7% in 2024).

We do not agree with Ofgem's criticisms of the Fernandez TMR survey. Ofgem also states that the survey is sent to more than 14,000 respondents, with 82 responses recorded for the UK.[14] We note that more than 1,600 responses have been received worldwide in the 2024 edition.[15] The inputs from more than 80 respondents should give a suitable indication of the expectations of UK TMR. Ofgem does not explain why its selection of nine financial institution forecasts is preferable, and whether this selection is consistent with its sample at RIIO-2.

Ofgem's estimate, albeit 0.4% higher than RIIO-2 and 0.15% higher than SSMD, remains below the relevant market-based evidence, as it fails to sufficiently reflect the increase in the forward-looking TMR. This, in turn, heightens the risks to investability of the RIIO-3 financial package.

Overall conclusion

We find that Ofgem's own cross-check analysis is not presented in a transparent manner. There are inconsistencies and lack of transparency in how Ofgem estimates and interprets cross-check results, including its own cross-checks results.

It has also, without suitable justification, discarded relevant, valuable market-based information proposed by networks and their advisors. In doing so, Ofgem has applied an inconsistent standard of evidence as the criticism it used to discard cross-checks proposed by networks can be used to disqualify its own cross-checks.

Ofgem needs to take into account wider market-evidence on the CoE (Hybrid Bonds, Debt Premia), TMR (TMR Glider) and the latest real-life large scale investment case of Sizewell C, and this would lead to a more balanced and comprehensive view of investability risks presented by the allowed equity return package in the DDs.

The updated evidence in this report shows that investability is not being supported by the Step 1 point estimate in the DDs. Furthermore, the entire bottom half of Ofgem's CAPM CoE range is inconsistent with the suite of evidence on an appropriate level of equity returns that would support investability at RIIO-3. A higher point estimate for the CoE is therefore required in the Final Determinations to address investability risks.

We find that Oxera's proposed CAPM range is more consistent with the cross-check evidence. Importantly, Oxera's mid-point of 6.84% is consistent with our hybrid bond cross-

14 Ofgem (2025), RIIO-3 Draft Determinations – Finance Annex, para 3.106

15 Fernandez, Pablo and García de la Garza, Diego and Fernández Acín, Javier (2024), Survey: Market Risk Premium and Risk-Free Rate used for 96 countries in 2024 , p. 2

check range and is above the implied minimum cost of equity from the Debt Premia cross-check.

1 Introduction

1.1.1 Frontier Economics has been commissioned by Future Energy Networks (FEN) to undertake further work on cross-check evidence for RIIO-3. This follows the publication of the Draft Determinations (DDs) in July 2025. We have also been commissioned by the Energy Networks Association (ENA) to undertake similar work on cross-checks.[16] The majority of sections are common across the reports, with the main exceptions of the Executive Summary, Hybrid Bond analysis (Section 2), and the review of the CoE cross-check evidence (Section 7) where sector specific figures are used.

1.1.2 The updates set out in this document build on the evidence presented in our 'Investability Report'[17] from March 2024 and our 'Business Plan Cross-Checks Report'[18] from November 2024.

1.1.3 The report is structured in two parts:

1.1.4 **Part 1 covers cross-checks that test the adequacy of the allowed Cost of Equity (CoE).** Specifically, these cross-checks test Ofgem's DDs 'Step 1' CAPM point estimate and range. A key objective of this part is to examine whether Ofgem's point estimate and range will mitigate investability risks. This is structured into six sections:

- Section 2 sets out evidence on the Hybrid bond cross-check;
- Section 3 presents evidence on the Infrastructure fund implied equity Internal Rate of Return (IRR) cross-check;
- Section 4 provides evidence from Market to Asset Ratios (MARs);
- Section 5 evaluates Ofgem's OFTO cross-check and proposes an additional bid implied cross-check based on Sizewell C;
- Section 6 sets out evidence from long-term profitability benchmarking; and
- Section 7 concludes with a review of all CoE cross-check evidence, including Oxera's latest Debt Premia (formerly ARP-DRP) cross-check results.[19]

16 Frontier Economics (2025), Updated Cost of Equity Cross-Check Evidence – A report prepared for the Energy Networks Association

17 Frontier Economics (2024), Equity Investability in RIIO-3, submitted to Ofgem by the ENA as part of its response to the Sector Specific Methodology Consultation (SSMC)

18 Frontier Economics (2024), Updated Cost of Equity Cross-Check Evidence

19 Oxera (August 2025), RIIO-GD&GT3 cost of equity and debt premium cross-check: Prepared for Future Energy Networks

1.1.5 **Part 2 sets out cross-checks that test the adequacy of the Total Market Return (TMR)**. These cross-checks test the range for the TMR that is used as an input to the Ofgem DDs 'Step 1' CAPM range. This part is structured into three sections:

- Section 8 presents evidence derived from dividend growth model (DGM) estimates of TMR;
- Section 9 provides evidence from surveys; and
- Section 10 concludes with a review of all TMR cross-check evidence.

PART 1: COST OF EQUITY CROSS-CHECKS

2 Hybrid bond cross-check

2.1.1 This section sets out our response to Ofgem's DDs position on our hybrid bond cross-check.

2.2 Overview

2.2.1 The hybrid bond cross-check we have developed is based on the principle that equity returns must materially exceed debt returns to reflect equity's relative risk. Otherwise, investing in equity would be irrational.

2.2.2 In the DDs, Ofgem has not incorporated this cross-check to assess the adequacy of the CAPM CoE. Ofgem's main criticism is focused on how equity-like hybrid bonds are, and the variability of hybrid bond spreads over time.

2.3 Evaluation and response

2.3.1 This section summarises Ofgem's key concerns as outlined in the DDs and sets out our response.

2.3.2 In its SSMD, Ofgem acknowledged the theoretical basis for this cross-check but raised concerns about the supporting evidence focusing exclusively on the NGG 2073 hybrid. As explained in our response, the focus on this bond was deliberate.[20] Nevertheless, we conducted additional robustness checks building on the sensitivity tests already presented. This included reviewing a broader sample of hybrid bonds issued by European utilities to benchmark and validate our findings.[21]

2.3.3 In its DDs, Ofgem introduces new criticisms. As a result, it proposes to not use the hybrid bond cross-check.[22] Specifically, Ofgem raises:

(a) The **observed variability in hybrid bond spreads to conventional bond yields**, which Ofgem claims makes it difficult to reliably infer required equity returns; and

(b) The **tenor between issuance and first call date,** typically several years, which in Ofgem's view undermines the equity-likeness of hybrid bonds.

2.3.4 Despite these criticisms, Ofgem still notes that the point estimate we set out in our Business Plan Cross-Checks report falls within the DDs CAPM range. We respond to each of these points below.

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20 Frontier Economics (2024), Business Plan Cross-checks Report, para 2.1.5

21 Frontier Economics (2024), Business Plan Cross-checks Report, para 2.1.5

22 Ofgem (2025), RIIO-3 Draft Determinations - Finance Annex, para 3.99

2.3.1 The observed variability in hybrid bond spreads

2.3.5 In its review of our robustness analysis, Ofgem acknowledges that spreads of hybrid bonds over the iBoxx Utilities index have remained consistently positive. However, it states that these vary from just over 0.50% to nearly 3.0%. It argues this variability limits the evidence's usefulness in inferring the required return on equity.

> *"Frontier present data over time to support their view of consistency. The consistency shown in the paper is that the spread of hybrid bond yields over the relevant iBoxx utilities yield index has been positive over the last seven years. The spreads themselves have varied from just above 0.50% to nearly 3.0%. We consider that this variability makes it difficult to solve for the required returns on equity."*[23]

2.3.6 The evidence that Ofgem reviewed, a large sample of hybrid bonds spreads of European utility bonds, was clearly intended to demonstrate robustness of the hybrid bond analysis, not to produce a precise estimate for the hybrid bond cross-check. Namely, it was to show that the National Grid hybrid bond, which had been selected as the most relevant bond for estimating the cross-check, was aligned with other bonds in the same asset class. We concluded that the National Grid hybrid was closely aligned with spreads at issue typically observed on other hybrid bond issued by utility companies – providing confidence that there was nothing unusual about the bond selected.[24]

2.3.7 Nevertheless, addressing Ofgem's critique, we highlight two key points.

(a) Firstly, we note that the figures quoted by Ofgem are minimum and maximum data points from a sample of 55 utility company hybrid bonds. Minimum and maximum data points from a period spanning seven years should not be considered representative of the asset class, when the vast majority (80 percent) of the observed spreads in the sample were within a relatively narrow range of 100bps to 213bps. **We find this narrow range a compelling feature of the data and one that shows the cross-check can be applied robustly.**

(b) Secondly, some degree of variability in the spreads of hybrids relative to senior debt is expected and reasonable. Contributing factors include:

   (i) The inclusion of hybrid bonds issued by a broad range of energy companies with diverse characteristics, geographies, and business models, both regulated and unregulated. Therefore, a degree of variation

23 Ofgem (2025), RIIO-3 Draft Determinations - Finance Annex, para. 3.99

24 A further robustness check we have undertaken is to check the bid-ask spread data for the NGG Finance 2073 hybrid bond. We find that daily data which is available for 2013 (the year the hybrid was issued) on LSEG workspaces shows an average bid-ask spread of 6bps. This is a relatively narrow spread, and does not highlight any liquidity issues.

in spreads is to be expected, reflecting the relative risk of different issuers. When we focus on spreads at issuance related to the three NGG Finance hybrid bonds only, we find a much narrower range of 121bps to 172bps.[25]

(ii) Changes in perceived market and issuer-specific risk over time. Yields on hybrid bonds reflecting changes market expectations, and variability in prices is common across many financial markets. This is true of debt and equity markets, which Ofgem commonly draws upon when conducting analysis elsewhere in the WACC methodology. Variability in prices is not considered a barrier in these other cases, so we do not consider it a valid reason for exclusion here either, as doing so would be inconsistent.

2.3.8 Overall, we find that Ofgem's remarks, which focus on 2 of the 55 data points we provided, fail to fairly represent the data. We note Ofgem recognises there is a consistently positive spread between hybrid bond yields and senior bond yields, and further explore the implications of this finding in Section 2.4.2.

2.3.2 The tenor between issuance and first call date

2.3.9 Ofgem criticises the characterisation of hybrid bonds as equity-like, pointing to concerns regarding whether that can be assumed. Specifically, it notes that while we highlight the potential for hybrid bonds to have very long tenors – reflecting the perpetual nature of equity – in practice, these instruments are designed to be called at the first call date, thereby shortening their effective tenor.

> *"Frontier argue that one of the equity-like characteristics of hybrid bonds is that they can be of very long tenor, covering multiple decades, making them similar to the perpetual nature of equity. However, Frontier has highlighted that in practice many hybrid bonds are designed to be called at the first call date."* [26]

2.3.10 Ofgem also notes that our robustness analysis did not provide tenor details, and refers to the tenors to first call date of an initial sample of hybrid bonds issued by National Grid and SSE ranging from 5.8 to 12.3 years.[27] Ofgem argues that such durations make the hybrid bonds less comparable to equity and questions their usefulness in deriving an appropriate cost of equity estimate.

> *"Frontier's updated paper does not detail the tenors from issue date to call date for the hybrid bonds. In a previous paper Frontier focussed on six hybrid bonds with tenors from issue date to call date that ranged from 5.8 years to 12.3 years. We consider that these tenors make the hybrids less*

25 Relative to the iBoxx Utilities index in the relevant currency.

26 Ofgem (2025), RIIO-3 Draft Determinations - Finance Annex, para 3.99

27 Frontier Economics (2024), Investability Report, Table 10

equity-like, and we question their utility in deriving an appropriate alternative estimate of the cost of equity".[28]

2.3.11 In response to Ofgem's critique, we begin by highlighting that assigning some equity-likeness to hybrid bonds is **driven by multiple characteristics**, not just tenor. These include:

(a) The option to skip coupon payments – which conventional senior debt does not have; and

(b) The subordinated nature of hybrids relative to senior debt – meaning payments are after senior debt, but before common equity.

2.3.12 We would also emphasise that the primary bond our analysis focuses on had over 12 years to first call date when issued, and that all bonds in our wider sample used to assess robustness had a minimum of 5-years to first call date.[29]

2.3.13 We also stress that assuming hybrid securities have equity characteristics as well as debt characteristics is something explicitly accounted for in rating agency methodologies.[30] Equity credit is assigned to hybrid bonds based on their features, with some features contributing towards greater equity-likeness.

2.3.14 For example, according to the Moody's framework, hybrid instruments can receive 50% equity credit if they: (i) have an initial maturity of at least 30 years (or are perpetual); (ii) include unrestricted optional coupon skip provisions; and (iii) have at least 10 years remaining to maturity.[31] Depending on the blend of characteristics hybrid bonds can also be assigned other equity credit values e.g. 25% and 75%, and the criteria for falling into these groups is set out in the relevant methodologies.

2.3.15 For these reasons, equity-attributes cannot be dismissed. Equity-likeness is based on an assessment of multiple characteristics, and is an explicit part of the way rating agencies treat hybrid debt when reviewing companies.[32] When conducting our analysis, we also:

28 Ofgem (2025), RIIO-3 Draft Determinations - Finance Annex, para. 3.99

29 See selection criteria in Frontier Economics (2024), Business Plan Cross-Checks Report, para. 2.3.6.

30 Moody's Investors Service (February 2024), Hybrid Equity Credit Methodology

31 The NGG 2073 hybrid meets all these conditions, with a 12-year term to first call and a long contractual maturity.

32 We also note that were a hybrid bond considered by Ofgem to be more debt-like than the rating agencies assume, that it would imply an even higher CoE that we have estimated. This is because the

(a) Focus on yields at issuance, to ensure that the data we use in the cross-check has the longest possible tenor available – mitigating concerns about the data reflecting shorter-term market conditions.[33]

(b) Show sensitivities for the amount of equity-likeness assumed, providing a range, meaning that the analysis does not need to rely on the percentage of 'equity credit' ascribed to a hybrid bond by a rating agency at a point in time.

2.3.16 We therefore consider that appropriate steps have already been taken to mitigate the concerns Ofgem have shared.

2.3.17 Although we consider that assigning a positive level of equity-likeness is robust, we show an alternative version of the cross-check in Section 2.4.2 below, where this component is removed entirely. This version of the cross-check therefore abstracts entirely from critiques Ofgem has raised regarding equity-likeness.

2.4 Updated evidence

2.4.1 Update of the existing cross-check method

2.4.2 This subsection presents an updated set of results for the hybrid bond cross-check. Table 1 shows that the **point estimate as of end of March 2025 is 6.8% CPIH-real**. This analysis contains three updates:

(a) We've included the latest available market data up to March 2025.

(b) We've reflected Ofgem's updated DDs cost of debt methodology.[34] Specifically, we consider the average of the iBoxx £ Non-Financials A and iBoxx £ Non-Financials BBB corporate indices rather than iBoxx £ Utilities.[35]

(c) We include a gas sector debt premium of 25 bps following Ofgem's initial estimate in the DDs.[36]

33 We use yield-to-next-call data at the date of issuance rather than yield to maturity data. This is to remove complexity associated with the presence of call options. The yield to next call date refers to the estimated annualised rate of return assuming the hybrid bond is called by the issuer. This is standard convention for hybrid bonds because the terms of the bond can change after a call date.

34 Ofgem (2025), RIIO-3 Draft Determinations - Finance Annex, para 2.15

35 This change in benchmark has no material impact on the results.

36 Ofgem (2025), RIIO-3 Draft Determinations - Finance Annex, para 2.20

Table 1 Updated Hybrid bond cross-check for the Gas sector

	Component	March 2025
A	Spread to iBoxx A/BBB Non-Financials 10-15Y at issue[37] (adjusted for default risk)	+145bps
B	Equity-likeness %	50%
C = A / B	Higher returns on equity	+290bps
D	iBoxx £ A/BBB Non-Financials 10Y+	5.8%
E	Gas sector premium[38]	+25bps
F = C + D + E	**Nominal equity returns**	**8.9%**
	CPIH-real equity returns 2% inflation)	**6.8%**

Source: *Frontier Economics analysis*

Note: *The spread to iBoxx 10-15 includes a 15bps default-risk adjustment; iBoxx 10+ value a 1-year average. We note that in our Business Plan Cross-Checks Report the initial spread was 136bps, based on the iBoxx Utilities. Fisher equation used to deflate nominal to CPIH-real equity returns.*

2.4.3 In line with our previous reports, we have also conducted a set of sensitivities to test the robustness of our hybrid bond cross-check and construct a plausible range around the central estimate. The **updated range is 6.1 to 8.3% CPIH-real**.[39]

2.4.4 This includes a refinement of sensitivities compared to the initial methodology, as explained in Annex A The updated methodology is intended to increase the robustness of these estimates, but it does not impact the conclusions. It primarily reduces the upper end of the range.

Table 2 Updated hybrid bond cross-check range for the gas sector

Summary results	Low	High
Sensitivity on historical hybrid-iBoxx spread	8.0%	10.3%

37 We follow the same approach used in the Investability Report, applying the 10–15 year benchmark to estimate the spread rather than the 10Y+ benchmark. This aligns with the hybrid's tenor at issuance, ensuring a like-for-like comparison and avoiding distortions in the spread that could arise from differences in maturity.

38 We note that NERA (August 2025) "Gas Network Premium (GNP) and Additional Cost of Borrowing (ACB) for GD/GT3" estimates a gas sector debt premium of 45bps. While with a 25bps premium our cross-check raises investability concerns, our analysis remains subject to the final determination of the appropriate gas sector debt premium.

39 In line with our point estimate, this updated range includes Ofgem's proposed 25 bps premium on gas sector debt.

Summary results	Low	High
Sensitivity on the percentage of equity-like	8.0%	11.8%
Sensitivity on iBoxx averaging	8.6%	9.1%
Nominal equity returns (average of sensitivities)	8.2%	10.4%
CPIH-real equity returns (2% inflation)	6.1%	8.3%

Source: *Frontier Economics analysis.*

Note: *Results for the cost of equity range are obtained by a simple average of the low and high values of each sensitivity column respectively. These figures include Ofgem's proposed 25 bps premium on gas sector debt. Please see Annex A for a detailed explanation of each of the sensitivities.*

2.4.2 Testing the CAPM range for 'red and black flags'

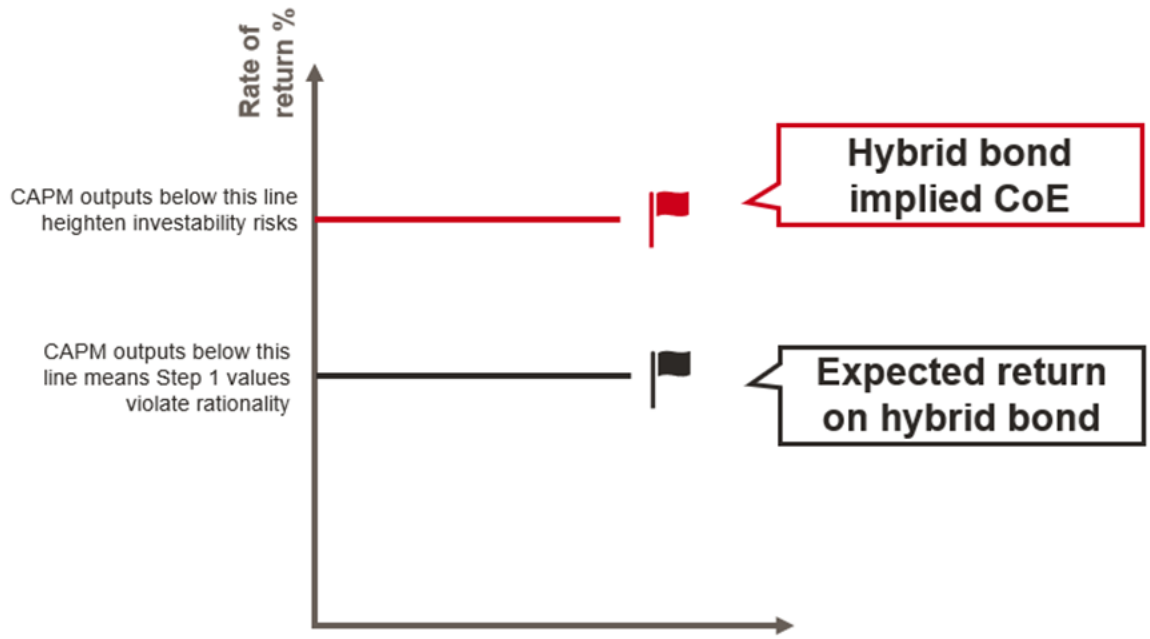
2.4.5 In Section 2.3, we noted some of the concerns raised by Ofgem regarding how precisely equity-likeness can be applied to hybrid bond data in order to infer a cost of equity. Below, we set out an alternative version of the hybrid bond cross-check that abstracts from equity-likeness. By removing that step of the check entirely, we remove Ofgem's source of concern.

2.4.6 Building on our previous reports, we set out a hybrid bond-based rationality check to illustrate more clearly that hybrid bond evidence can be used to demonstrate investability risk, as shown in the figure below:

(a) The red line in the illustration represents our hybrid bond implied CoE, which uses information from hybrid bonds to estimate a rate of return that reflects equity risks. Where the mid-point of the CAPM range sits below this level, this raises a red flag and suggests that the risks to investability are heightened.

(b) The black line in the illustration represents the expected return on a representative hybrid bond. Since hybrid bonds are subordinated to senior debt, but paid before common equity, the CoE should lie above the return on hybrid instruments. Where this is not the case, this **raises rationality challenges**. Under normal market conditions, a rational investor would not invest in equity if the return is lower than hybrid bonds. We represent this threshold with a black flag.

Figure 5 Hybrid bond rationality check illustration with red and black flags



Source: Frontier Economics

2.4.7 In Figure 6, we demonstrate these thresholds using actual data. We present the expected return of a representative hybrid bond over time over the past 12 months, comparing to the CAPM ranges in the DDs. [40]

2.4.8 The analysis shows that Ofgem's CoE range and point estimate raises red flags and, in places, black flags. The DDs CAPM point estimate (yellow line) is materially below the hybrid bond implied CoE (red flag) which suggests that investability risks are heightened. Further, the point estimate from the CAPM range is also on the cusp of falling below the expected return on the hybrid bond (black flag) at the end of March 2025. This therefore provides further evidence that there are significant investability risks in the DDs CAPM point estimate.

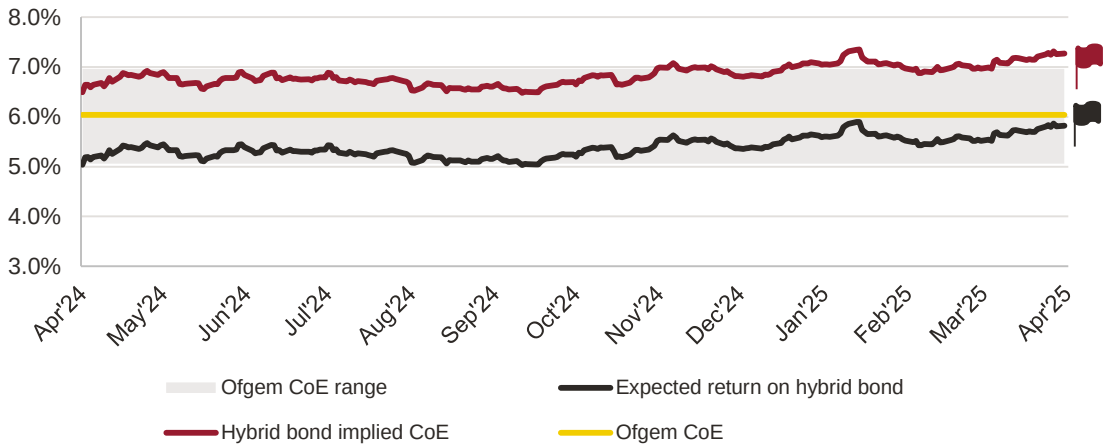
2.4.9 By the same principle, almost the entire lower half of the CAPM, towards the end of March 2025, is below the representative hybrid bond return (black flag). Therefore, the bottom half of Ofgem's range can also be considered irrational,

40 The representative hybrid bond return is measured as the average of the iBoxx GBP A and BBB indices (including the Ofgem proposed 25bps gas sector premium) plus the spread at issuance of NGG 2073 hybrid, net of default risk, over the benchmark (145bps).

10Y+ non-financials indices are used consistent with the cost of debt methodology in the DDs. For the avoidance of doubt, the outputs presented in our previous reports correspond to the red line. The updated red line average value for the past 12 months is the 6.79% referenced earlier in this section.

failing to appropriately reflect the returns required for equity, therefore should be disregarded.[41]

Figure 6 Representative hybrid bond return against Ofgem's CoE range



Source: *Frontier Economics analysis*

Note: *The senior bond yield is calculated the average yield of iBoxx £ Non-Financials A 10+ and iBoxx £ Non-Financials BBB 10, inclusive of Ofgem's proposed 25bps gas sector debt premium. Nominal values are converted in real terms using the Fisher equation, assuming a 2% inflation rate.*
The representative return is calculated as the senior bond yield plus our estimated HB spread of 145bps. This spread represents the default-risk adjusted spread to the NG2073 hybrid bond at issuance.
The Hybrid bond implied CoE is calculated as the senior debt plus our estimated HB spread of 145bps multiplied by two. This is to account for the 50% equity-like feature of Hybrid bonds.

2.5 Implications for the RIIO-3 CAPM

2.5.1 In the DDs, Ofgem notes that the implied cost of equity derived from the hybrid bond cross-check lies within the range produced by their CAPM-based analysis. This is interpreted as indicating that the cross-check either supports the proposed cost of equity or, at the very least, does not contradict it.

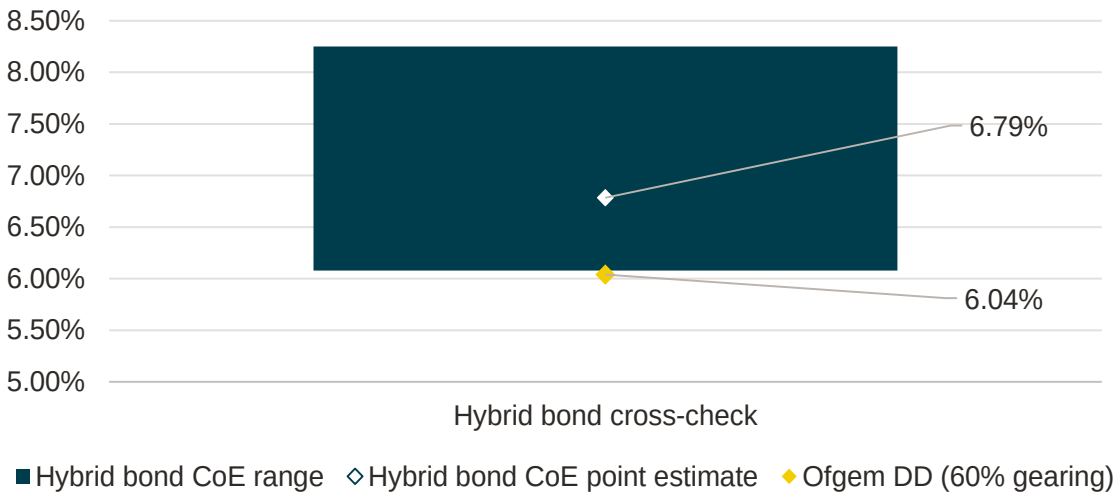
2.5.2 This interpretation is incorrect, as we explain below.

2.5.3 **Firstly, Ofgem's CoE point estimate (i.e. 6.04% within a range of 5.06% to 6.96%, at 60% gearing) continues to present investability risks.** The range produced by any CAPM analysis is not the value that companies will actually receive. Regulatory decisions are based on a point estimate, and therefore the relevant comparison is between the hybrid bond analysis and Ofgem's selected point estimate. When assessed on this basis, the evidence from hybrid bonds clearly indicates that investability risks persist.

41 We also emphasise that this analysis does not attempt to estimate an implied CoE (the red line in the framework), eliminating the concerns raised by Ofgem's in the DDs with regards to hybrid bond evidence.

2.5.4 As shown in Figure 7, Ofgem's proposed cost of equity of 6.04% estimated at 60% gearing falls below the hybrid bond cross-check range. This highlights a significant misalignment with market-based evidence from hybrid bonds and reinforces the concern that the proposed return in the DDs is likely to be insufficient to retain and attract equity.

Figure 7 Hybrid bond analysis against Ofgem's CoE point estimate



Source: Frontier Economics analysis

2.5.5 **Secondly, a large portion of Ofgem's CoE range (5.06% to 6.96% at 60 % gearing) should be disregarded.** As shown in the analysis in the previous section, there is considerable overlap between the lower half (5.06% to 6.04% at 60% gearing) of this CAPM range and the expected return on a representative hybrid bond without any adjustment for equity-likeness to infer a CoE. This overlap raises material concerns about the investability of the lower end of the DDs CAPM range. Particularly given that, under normal market conditions, equity returns would be expected to exceed those of hybrid bonds.

2.5.6 Furthermore, the CAPM point estimate is on the cusp of falling below the return available on a representative hybrid bond. This leads us to conclude that the DDs point estimate is not sufficient to retain and attract equity.

3 Infrastructure fund implied equity IRR

3.1.1 This section presents our assessment of Ofgem's use of the infrastructure fund implied equity internal rate of return (IRR) as a cross-check in the DDs to the CAPM estimates.

3.2 Overview

3.2.1 Ofgem obtained discount rates for a set of infrastructure funds that invest in private finance initiatives and private utility assets. It then inferred an IRR for each fund by deflating the discount rates by the premium-to-net asset value (NAV) for each fund to account for outperformance of the underlying assets.

3.2.2 This cross-check was originally introduced by Ofgem at RIIO-2 and has been retained for RIIO-3. It remains one of four equity cross-checks that Ofgem proposes to use in Step 2 to test the validity of its CAPM-derived cost of equity estimates.[42]

3.3 Evaluation and response

3.3.1 We have previously raised a number of critiques regarding the direct use of infrastructure IRR as a basis for setting allowed returns,[43] which Ofgem has not addressed. Nonetheless, if such data were to be used, we have stated that it should be used primarily for identifying trends in investor expectations over time.[44]

3.3.2 In the DDs, Ofgem reaffirms its intent to continue using this cross-check. It reports an average implied equity IRR of **10.7% nominal (8.5% CPIH-real)**. Ofgem acknowledges that this figure has increased, reflecting discounts to NAV across the fund sample. But it does not engage with the implications of this increase or explain how this evidence has influenced its assessment in Step 2.

> *"We propose that we continue to use an infrastructure fund implied cost of equity check. We have updated the data on nine infrastructure funds. The average implied equity IRR has risen to 10.7% (nominal) or 8.5% in CPIH-real terms. This reflects the fact that all the funds are now trading at discounts to their net asset values. As stated in our SSMD it is important*

42 Other cross-checks include MARs, OFTO implied returns and unadjusted investment managers' implied cost of equity.

43 See para 3.4.1 of the Business Plan Cross-Checks Report and paras 238 – 242 of the Investability Report.

44 Frontier Economics (2024), Investability Report, Section 6.4.4

that we make our crosschecks as useful and relevant as possible, but do not 'cherry pick' only those that provide a certain view for each control." [45]

3.3.3 This raises several concerns:

(a) **The IRR cross-check value is significantly greater than even the top-end of the Step 1 CAPM range**. Despite this, Ofgem does not clarify how this evidence is weighted, i.e. contributes to its judgment that Step 2 outcomes support CAPM results.[46] Given the magnitude of the divergence between this cross-check and Step 1 outputs, a greater degree of transparency would be expected regarding how this evidence has been reflected in the final calibration.

(b) **The updated IRR figures point to a significant and sustained upward shift in implied equity returns since RIIO-2.** We present the detailed values of this development in Section 3.5, after presenting the updated results.

3.4 Updated evidence

3.4.1 We have updated our results using the same methodology and sample of nine infrastructure funds as in our Business Plan Cross-Checks Report.[47] **As of March 2025, the average implied equity IRR stands at 11.8% in nominal or 9.6% in CPIH-real terms**.[48] The figure below further confirms that the upward trend in implied IRRs has persisted into 2025.

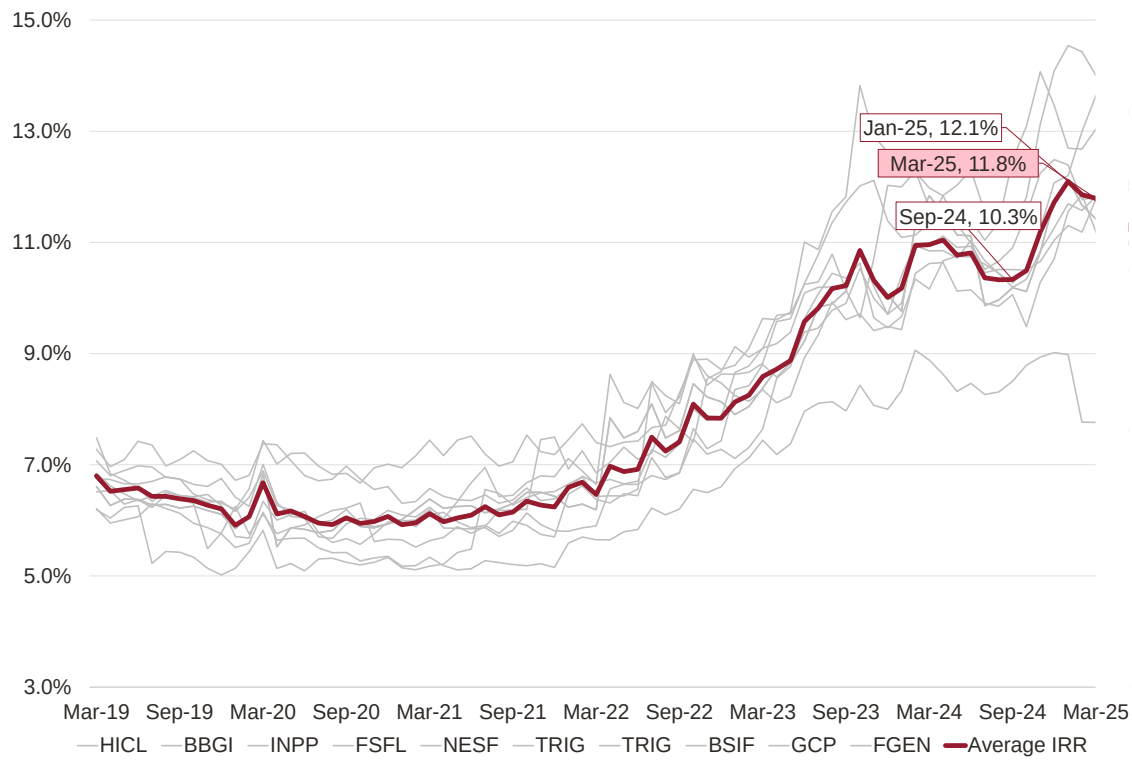
45 Ofgem (2025), RIIO-3 Draft Determinations - Finance Annex, para 3.97

46 Ofgem (2025), RIIO-3 Draft Determinations - Finance Annex, para 3.131

47 Frontier Economics (2024), Business Plan Cross-checks Report, Section 3.3

48 Using a CPIH inflation assumption of 2%.

Figure 8 Nominal infrastructure fund implied equity IRR



Source: *Frontier Economics analysis on Bloomberg data and published reports*

Note: *Analysis as of June 2025 using the most recent discount rate in annual reports. The analysis excludes 3 funds considered by Ofgem in RIIO-2 (i.e. GRP, JLIF and JLP). For GRP, we have not been able to find the updated net asset value data throughout the period. JLIF and JLG were sold to investment firms in September 2018 and 2021 respectively. We have excluded Greencoat UK Wind (i.e., UKW) series due to a change in the company reporting that made the previous analysis irreconcilable*

3.4.2 Ofgem's reported figure of 10.7% nominal aligns with the H2 2024 average in our data, though the lack of transparency in Ofgem's estimate does not allow us to verify it. In particular, Ofgem provides no detail on:

(a) The specific nine funds included in its sample; and

(b) The time period over which the data point it cites is calculated.

3.4.3 While Ofgem's estimate **does not alter the interpretation of the results** it is important to highlight that **Ofgem's estimate is lower than the values we observe**. This difference reinforces the need for transparency in Ofgem's analysis. Values in the first quarter of 2025 were consistently above 11% in nominal terms.

3.5 Implications for the RIIO-3 CAPM

3.5.1 Ofgem has rightly cautioned against placing undue weight on any single cross-check. We agree with this principle. No individual test should be considered in

isolation, and all evidence must be interpreted in context. However, this does not diminish the value of the IRR cross-check in tracking changes in investor sentiment over time, nor does it justify overlooking the largest divergence observed between cross-check results and the CAPM.

3.5.2 The updated evidence highlights a significant and sustained upward shift in implied equity returns since RIIO-2.

3.5.3 We consider this cross-check offers two key insights:

(a) **Direction of travel**: The movement in implied equity IRRs from 4.2%[49] CPIH-real (RIIO-2) to 9.6 % CPIH-real represents a shift of 5.4 percentage points. By contrast, Ofgem's proposed CoE has increased by around 1.5 percentage points.[50] **This raises doubt over whether the CAPM-based allowance is aligned with prevailing market expectations**. **Specifically, doubt about whether the allowances in the DDs have kept pace with recent changes in infrastructure capital markets.** A failure to keep pace heightens risks around networks being able to raise and retain equity. In our opinion, a change of this magnitude is exactly the kind of "strong reason" that the UKRN guidance is referring to when it discusses departing from the CAPM range mid-point. [51]

(b) **Magnitude of gap**: The infrastructure IRR estimate lies about 3.5 to 4 percentage points above the midpoint of Ofgem's Step 1 CAPM ranges (5.6% and 6.0% at 55% and 60% gearing respectively). If Step 2 is intended to serve as a validation check, then evidence of this scale should be expected to influence the final calibration. At present, it is not possible to trace how this data has been used to inform Ofgem's position. A gap of this size should prompt further review of whether the point estimate being used is appropriate.

3.5.4 These insights raise valid questions about whether Ofgem's CAPM result satisfies the investability requirement of retaining and raising equity. Crucially, **the implications of this significant increase of 5.4% hold regardless of the specific point estimate used**.[52] Failing to engage with such evidence, without a clear and reasoned explanation, leaves a significant gap in the Step 2 assessment.

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49 Ofgem (2020), RIIO-2 Draft Determinations - Finance Annex, Table 24

50 Using results at 60% gearing.

51 See Recommendation 7 in UKRN (2023) guidance for regulators on the methodology for setting the cost of capital.

52 Using Ofgem's lower value of 10.7%, the direction of travel would indicate a 4.3 percentage points increase compared to RIIO-2 and a current gap of 2.5-2.9 percentage points above the midpoint of Ofgem's Step 1 CAPM at 60% and 55% gearing.

4 MARs

4.1.1 This section presents our assessment of Ofgem's use of the Market-Asset-Ratios (MARs) as cross-check in the DDs to validate the CAPM estimates.

4.2 Overview

4.2.1 Ofgem has continued to rely on MARs as one of its cross-checks at draft determinations. However, in contrast to its position at SSMD, it has focused on traded MARs, recognising that transaction premia are difficult to interpret due to the associated lack of information around synergies.[53]

4.2.2 We have previously raised concerns about the challenges of interpreting transaction MARs in our Business Plan Cross-Check Report, and we welcome Ofgem's move to placing more weight on traded MARs in the DDs.

4.2.3 Ofgem's MAR cross-check indicates a cost of equity within the range of 4.2% to 6.2% CPIH-real.[54] We note that this range is drawn directly from Ofwat's Draft Determinations and not the updated range from December 2024 PR24 Final Determinations.[55]

4.2.4 Likewise, the traded MAR evidence is directly drawn from the PR24 analysis published by Ofwat, which used MARs for United Utilities, Severn Trent, and Pennon to infer an indicative range for the cost of equity.[56] Ofwat's MAR cross-check uses a stylised inference model which calculates an implied cost of equity for a given MAR, RAV growth and expected outperformance. This is in line with regulatory precedent including Ofgem's use of MARs at RIIO-ED2.[57]

4.2.5 Finally, Ofgem does not attempt to infer a cost of equity for National Grid, despite it being a listed utility. This reflects the challenges of estimating a MAR for a diversified group with multiple regulated business units, as discussed in our Business Plan Cross-Checks Report.[58]

53 Ofgem (2025), RIIO-3 Draft Determinations - Finance Annex, para 3.91 and 3.107

54 Ibid., Table 19

55 See Ofwat (2024), PR24 Draft Determinations – Aligning Risk and Return appendix, Table 12 – which sets out a 4.2% - 6.2% CPIH-real range; and Ofwat (2024), PR24 Final Determinations – Aligning Risk and Return appendix, Table 12 – which sets out a slightly higher 4.3% - 6.3% CPIH-real range.

56 Ibid., para 3.93

57 Ofgem (2023), RIIO-ED2 Draft Determinations – Finance Annex, Appendix 6

58 Frontier Economics (2024), Business Plan Cross-Checks Report, Footnote 42

4.3 Evaluation and response

4.3.1 In this section we review Ofgem's use of MARs, setting out our views on the use of this cross-check for investability purposes.

4.3.2 We agree with Ofgem's position that transaction premia are difficult to interpret. As we noted in our Investability Report, it is not possible to untangle factors which are embedded in acquisition prices given these are private information.[59]

4.3.3 As we have previously noted, traded MARs also suffer from significant limitations. Ofgem's CoE inference based on traded MAR evidence relies on the market's valuation of utilities.[60] It follows that MARs are time sensitive and subject to wider market dynamics. In addition, Ofwat's PR24 analysis makes a set of stylised assumptions into perpetuity to draw inferences about how investors perceive the regulatory settlement – including on long-run RCV growth and outperformance. These assumptions introduce a material degree of uncertainty and, coupled with reliance on MARs from a defined period, limit the reliability of this cross-check.

4.3.4 We disagree with Ofgem that large MAR premia cannot be justified by assumptions other than higher than required returns or lengthy and consistent expected outperformance.[61] As previously discussed, the key challenge with drawing inferences from MARs is that there are multiple unknowns that drive valuation, including expected future baseline allowed return, outperformance, RAV growth and any upward bias in pricing. It is very challenging to explain precisely *why* MAR premia are at their observed levels.[62]

4.3.5 While we strongly believe that there are inherent challenges around inferring a CoE from MARs, we consider that Ofgem's (or rather, Ofwat's) MAR analysis should be adapted if Ofgem intends to place any weight on MARs as a cross-check.

4.3.6 A first step would be to update the analysis to reflect the latest available data. The Ofgem quoted CPIH-real range of 4.2% to 6.2% is based on analysis undertaken by Ofwat at the time of the PR24 Draft Determinations. We note that the analysis cut-off date at PR24 Draft Determinations was March 2024.[63] As this evidence is now over a year old (and a year older than Ofgem's analysis cut-off date), an update is necessary to ensure the assessment remains robust.

59 Frontier Economics (2024), Investability Report, para 206

60 The enterprise value is the market value of a firm.

61 Ofgem (2025), RIIO-3 Draft Determinations - Finance Annex, para 3.94

62 Frontier Economics (2024), Business Plan Cross-Checks Report, para. 4.3.3

63 See Ofwat (2024), PR24 Draft Determinations Aligning risk and return - Allowed return appendix, p. 7.

4.3.7 Moreover, the PR24 Final Determinations (FDs), published in December 2024, have set a different baseline CoE for water companies than the one considered in the inference model.[64] Basing MAR inferences on an outdated DDs cost of equity is at odds with what the market is reasonably expected to price in currently for those regulated water networks. In addition, we also note that Business Plan Incentive awards, which directly influence each Water Company's allowed equity returns, have not been included in the inference exercise, when based on Ofgem/Ofwat's logic, they should be.[65] Ofgem should use the CoE set at PR24 Final Determinations instead of Draft Determinations, and incorporate the BPIs received by water companies in its inference model.

4.3.8 As we set out above, the applicable MAR estimates should be updated for more recent data. Accordingly, the relevant inference assumptions should be revisited. The analysis used in Ofgem's DDs adopts a range of 0% to 2% for both RAV growth and RoRE outperformance. As we explain in Annex B these assumptions appear unduly conservative for the companies in question relative to Ofwat's FDs, historical evidence, and the prevailing sentiment around investment needs in the water sector. We therefore consider Ofgem should update these assumptions to reflect updated public information on the PR24 settlement.

4.3.9 A further caveat is that MAR inference is predicated on similarities one could draw between traded comparators and the target sector. If the strategic trajectories of the sectors diverge, the insights that can be drawn from this cross-check decline. This should also be considered while using MAR inference as a cross-check.

4.3.10 We present our updated MARs below.

4.4 Updated evidence

4.4.1 The table below presents the latest evidence on MARs, based on the methodology set out in our March 2024 Investability Report and incorporating updated company data published since our Business Plan Cross-Checks Report.[66] The table shows that the traded utility MARs have not moved significantly since our previous review of the evidence.[67]

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64 Ofwat's allowed Cost of Equity increased from 4.80% to 5.10% between Draft and Final Determinations - see Ofwat (2024), PR24 Final Determinations - Aligning Risk and Return, p. 6.

65 See Frontier Economics (2025), Cross-Check Standards of Evidence, section 3.2 for a more detailed discussion of the logic of the MAR inference.

66 We have drawn on the latest available data on Enterprise Value, using market capitalisation figures from Bloomberg, net debt estimates from company accounts, and the most recent published information on RCV values.

67 Frontier Economics (2024), Business Plan Cross-Checks Report, Table 3. In light of recent transactions, we have also sought to update the proportion of Pennon's Enterprise Value attributable to its regulated business. Given

Table 3 Traded Market-to-asset ratios

Utility	MARs estimated using book value of debt	MARs estimated using market value of debt
United Utilities	1.04	1.05
Pennon	1.02	1.00
Severn Trent	1.09	1.02
Water average	**1.05**	**1.03**

Source: *Frontier calculations using data from Bloomberg and company annual reports. Pennon includes SES Water, and Severn Trent includes Hafren Dyfrdwy.*

Note: *We source this information from annual reports as we consider annual reports to be the most comprehensive record of net debt outstanding. Value of debt is taken from half year results dated 30th September 2025 – the latest available update from company reports as of 31st March 2025. Market capitalisation data is as of 31st March 2025.*

4.4.2 Even though we have not been able to fully replicate Ofwat's approach (as the underlying data and calculations were not published), we have managed to obtain MAR multiples that are in line with those reported by Ofwat at its Final Determinations, which gives us comfort that our approach is aligned with Ofwat's.[68]

4.4.3 As we set out in Annex B we have refined Ofwat's original CoE inference assumptions to reflect a more updated and consistent set of investor expectations around RAV growth and outperformance:

- RAV growth ranging from 2% to 4%; and
- Outperformance ranging from 0% to 5% (with different assumptions for each company based on Ofwat's RoRE modelling[69] and analysis of historical outperformance).

4.4.4 We consider that the assumptions we propose are well grounded in information available from PR24 Final Determinations and an analysis of historical data on the sector and are better suited to the three traded water networks. Figure 9 illustrates the impact of applying this updated assumption set, in addition to our earlier update to the MAR range.

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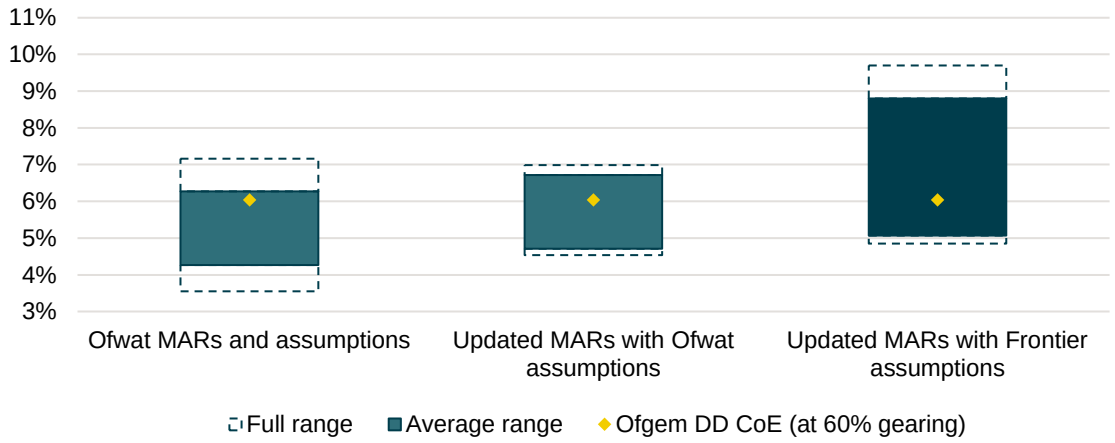
the calculations underpinning Ofwat's MAR calculations are not published, we cannot directly observe the regulated share assumed. To reconcile Ofwat's estimate, we assume a 95% regulated share - midway between 91% (based on the share of the debt book attributable to the regulated business as of March 2025) and 98% (based on SOTP valuations from Jefferies and JP Morgan analyst reports dated January and July, respectively).

68 Looking at the September 2024 values, Ofwat has reported MAR multiples of 1.08 for UU, 1.16 for SVT, and 0.97 for PNN. We have estimated MAR values of 1.09, 1.14, and 0.95 respectively for the same time period. See Ofwat (2024), PR24 Final Determinations: Aligning risk and return – allowed return appendix, Table 16.

69 Specifically, Ofwat's PR24 RR04 model.

Figure 9 Cost of equity range implied by traded MARs



Source: *Frontier Economics analysis*

Note: *For each company, the MAR multiple used is based on the average of the MARs calculated using the net debt and book value of debt, as shown in Table 3 above. Detailed calculations underlying the construction of this inference range are provided in Annex C.*
The CoE range corresponds to the average of the company-level minimum, base and maximum values in the Ofwat approach. In our estimation of the implied CoE, we report the full range obtained under the minimum, base and maximum for all companies.
We note that water companies are notionally geared at 55%.

4.4.5 The analysis shows that the implied CoE based on the updated MAR evidence continues to suggest a very wide range, which is consistent with the findings presented in our earlier reports. Specifically, we estimate an implied CoE range of 4.85% to 9.69% (CPIH-real).

4.4.6 Applying Ofwat's averaging approach - where the implied CoE range is derived by averaging the company-level minimum and maximum values - results in a narrower CoE range of 5.07% to 8.80%. While this approach offers a simplified view, we note that it can obscure important company-level variation given MARs are inherently company-specific and reflect differences in regulatory parameters and investor expectations. As such, averaging across companies may dilute the precision and relevance of the inference exercise. Having said that, the full range is quite wide, and we therefore question its utility as a cross-check.

4.4.7 We further note that MARs have moved since the March 2025 cut-off date,[70] and the corresponding inferred CoE range is 4.65% to 9.19% based on market data available as of July 2025. This range becomes 4.95% to 8.59% following Ofwat's averaging approach.

[70] Pennon's average MAR has fallen by 2%, while the remaining MARs have risen 2% - 5%.

4.5 Implications for RIIO-3 CAPM

4.5.1 We continue to view the MAR cross-check as being subject to important limitations, which we've outlined extensively in our previous reports. In this report, we've also identified several areas where assumptions underpinning the inference model for water companies' traded MARs could be improved. These are set out in detail in Annex B . While these refinements do not fully address the inherent limitations of the MAR cross-check, we consider them a necessary step toward improving the robustness and credibility of the analysis.

4.5.2 When such improvements are incorporated, the evidence from MARs paints a consistent picture: there is a wide implied CoE range, driven by variability in MARs across listed water companies. **While Ofgem's proposed CoE falls within our modelled range, the breadth of outcomes and the positioning of the CoE within it suggest that the CAPM-based range may be underestimating the true cost of equity**. This reinforces the view that risks to investability remain material.

4.5.3 In this context, Ofgem should carefully review the assumptions underlying the cost of equity inference from traded MARs and ensure that they are realistic and reflect prevailing market sentiment.

5 Implied bid information

5.1 This section sets out our position to Ofgem's DDs OFTO bid implied equity IRRs. We also set out new information covering Sizewell C that we think is directly relevant for Ofgem's consideration.

5.2 OFTO bid implied equity IRRs

5.2.1 Ofgem continues to rely on OFTO bid implied equity IRRs as a cross-check, reporting an updated 5.7% cost of equity estimate (CPIH-real).[71] This figure is based on more recent OFTO bid implied IRR, specifically 2022-2024. Ofgem does not provide any justification for choosing bids from this time period nor does Ofgem provide any further context to the data. We also note that the OFTO bid implied IRR is confidential, therefore, parties have no visibility over the assumptions or reasoning underlying these observations.

5.2.2 Ofgem acknowledges the limitations of this cross-check (some of which we have previously discussed in detail)[72], maintaining that there is benefit in using evidence from competitive processes, and OFTO projects are similar to network investments in having a comparable level of risk and long-term time horizons.

5.2.3 We do not consider OFTOs to provide a relevant point of reference as a cross-check. Two key reasons for this are:

(a) There are no construction activities associated with OFTO bids; and

(b) OFTOs do not operate under a RAB model.

5.2.4 For these reasons, comparisons to networks are challenging. Our recommendation would be to discard the OFTO benchmark altogether. If Ofgem is to continue relying on OFTOs, it should justify its choice of time period and, where possible, reveal the underlying IRRs for each year, such that any trends can be ascertained. Given the shifts that have taken place in capital market conditions over the past several years it is important to understand how these are being reflected in OFTO figures.

5.2.5 We consider that there are other recent data points of much greater relevance, namely, Ofgem should consider the bid-implied IRR of Sizewell C. This is discussed below.

71 Ofgem (2025), RIIO-3 Draft Determinations – Finance Annex, Table 19

72 Frontier Economics (2024), Investability Report, Section 6.4.2

5.3 Sizewell C IRR

5.3.1 Sizewell C (SZC) is a project to construct a 3.2 GW nuclear power station with two European Nuclear Reactors (EPR).[73] It is planned to be delivered at a capital cost of around £38 billion, and have a commercial operations date commencing in the mid-to-late 2030s.[74]

5.3.2 Following a competitive process among potential equity providers, the UK Government has announced that Centrica (amongst other investors) has secured a 15% stake in SZC. Centrica reports that it estimates its project IRR to be more than 12% post-tax nominal in a scenario where there is a "moderate" outturn on costs and delivery schedule. In addition, Centrica also estimates that its post-tax nominal IRR would be more than 10% in a scenario where there are "severe" overruns on costs and delivery timings.[75]

5.3.3 There is further detail on Sizewell C's arrangements in Annex D , but what we have found is Sizewell C is a RAB financed construction project with a low-risk regulated revenue stream. Therefore, it provides a further real-world benchmark for what is required for a sizeable new equity investment in a regulated infrastructure business.

5.3.4 **Given the scale, arrangements and risk profile of Sizewell C, this is a direct and highly relevant cross-check for required equity returns on a regulated business carrying out large network investments.**

5.3.5 **Ofgem should at least consider SZC's IRR in addition to, if not in place of, Ofgem's OFTO bid implied returns** and the Infrastructure fund cross-check.[76]

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73 European Pressurised Reactor / Evolutionary Power Reactor.

74 DESNZ (2025), Documents for the Sizewell C new nuclear power station

75 Centrica's estimated range is broader but these appear to be the primary thresholds Centrica considers. Centrica reported that its IRR is above 12% based on a Lower Regulatory Threshold scenario. Centrica's IRR is above 10% based on a Higher Regulatory Threshold scenario. The gearing assumed for these figures are not disclosed by Centrica. Other modelling assumptions include an assumption of ~2% CPIH inflation. The modelling considers all cash flows through to the end of the construction and initial operations period, and a terminal value of 1.0x RAB. Please see Centrica's announcement on Sizewell C.

76 See para. 3.5.1.

6 Long-term profitability benchmarking

6.1.1 This section provides updated results for our long-term profitability cross-check.

6.2 Overview

6.2.1 The long-term profitability cross-check looks at accounting information on companies' profitability to benchmark equity returns. We provide a full explanation of the methodology in our Investability Report.[77]

6.2.2 At the DDs, Ofgem decided not to place any weight on the long-term profitability cross-check. Ofgem noted that we did not provide an updated analysis of this cross-check in the Business Plan Cross-Checks Report and Ofgem continues to have concerns over the non-regulated businesses and sectors within the cross-check as well as the differing levels of gearing.

6.3 Evaluation and response

6.3.1 We did not provide an updated range in our Business Plan Cross-Checks Report, citing the long-term nature of this cross-check. However, the long-term profitability benchmarking cross-check uses annual data on realised company returns. For our Business Plan Cross-Checks Report, there was no additional data available relative to our March 2024 Investability Report to update this cross-check. Now that we have 2024 data available, we have provided an updated range in the section below.

6.3.2 As we noted in our Business Plan Cross-Checks Report, although we recognise all of these issues as limitations of this cross-check, we consider Ofgem's total dismissal of the informational value of this cross-check is unwarranted. This is because some of Ofgem's own cross-checks suffer from very similar challenges, for example:[78]

- OFTO bid CoE , infrastructure fund IRR and investment manager surveys all have data that are based on gearing levels that are not easy to control for;
- Infrastructure fund IRR also suffers from similar issues with imperfect comparability in terms of risks as these are not always regulated utilities.

6.3.3 Overall, we consider profitability metrics are a helpful reference point to ensure the CAPM-CoE point estimate falls within a reasonable location of the range of long-

[77] Frontier Economics (2024), Equity Investability in RIIO-3, submitted to Ofgem by the ENA as part of its response to the Sector Specific Methodology Consultation (SSMC).

[78] We discuss the different standards that Ofgem apply to different cross-checks further in Frontier Economics (2025), Cross-Check Standards of Evidence.

term average profitability metrics. If the CAPM-CoE range sits outside the range of outturn profitability of other utilities, this may be an indication for regulators to review CAPM parameter ranges to ensure they are comfortable with judgements made in their estimation.

6.4 Updated evidence

6.4.1 The table below shows the smallest, largest and median CPI-real return on common equity achieved by comparable investment opportunities averaged over 2002 to 2024 (nominal returns are converted to real terms using outturn CPI inflation figures).[79]

Table 4 Real return on common equity for comparable sector indices and comparable utilities in EU and US

	Average 2002-2024
Low	5.6%
Median	8.8%
High	17.5%

Source: Frontier Economics analysis of Bloomberg data. Comparators considered for the profitability benchmarking include the Utility indices from FTSE and S&P. Utilities include four EU regulated energy network utilities and five US regulated energy network utilities

6.4.2 The range in values of the return on common equity is relatively large, and appears to be positively skewed. On this basis, we focus on a range implied by the low and median estimates which we consider provides a good coverage of the sample we considered. On this basis we consider a reasonable range for this cross-check is 5.6% - 8.8%.

6.5 Implications for RIIO-3 CAPM

6.5.1 The fact that Ofgem's proposed CoE is towards the low end of the wide range of realised outcomes suggests that the CAPM-based range may be underestimating the true cost of equity. This reinforces the view that risks to investability remain.

[79] We average over the 2002-2024 period since these are the complete years of data available on Bloomberg.

7 Review of CoE cross-check evidence

7.1.1 This section presents our conclusions on the CoE cross-check evidence.

7.2 Summary of the CoE cross-checks

7.2.1 Below we bring together the key findings for each of the CoE cross-checks.

7.2.2 Regarding **hybrid bonds**, none of the concerns raised by Ofgem are sufficient to place no weight on the hybrid bond evidence. This is because the concerns are either mitigated or have been considered as part of robustness analysis. Our Cross-Check Standards of Evidence Report shows that had Ofgem used the same quality standard they use to dismiss the hybrid bond analysis, its own cross-checks would not be given any weight either. We continue to stress that the hybrid bond cross-check is a relevant, robust debt-based cross-check on the CAPM derived CoE.

7.2.3 The latest hybrid bond cross-check results raise serious concerns with the proposed Step 1 outcome. The first issue is that the CAPM point estimate of 6.04% sits below the range produced by the cross-check (**6.1% to 8.3%**), and it is significantly below the central estimate produced by the cross-check (**6.79%**). The second issue is that even under a much more conservative version of the cross-check, centred around the expected return on a representative hybrid bond, issues arise. This raises rationality challenges, as many investors would have difficulty justifying an investment in equity if the return is lower than the expected return on a representative hybrid bond – which is a blend of senior debt and equity risks. Ofgem's point estimate is only marginally above this rationality threshold and the lower half of the CAPM range, at the end of March 2025, is entirely below the expected return on a representative hybrid bond. Therefore, this half of the range can be considered implausible, failing to appropriately reflect the returns required for equity, and therefore should be disregarded.

7.2.4 In particular, the lower half of CAPM range has consistently been falling below hybrid bond returns over the past year.

7.2.5 **Infrastructure fund IRRs** have remained elevated over the past year (**9.6%** CPIH-real as of March 2025). And of particular significance is the scale of change in this cross-check compared to the same readings at the time of the RIIO-2 FDs. The cross-check shows the IRRs are 5.4 percentage points higher than the equivalent value from RIIO-2. This compares with a cost of equity in the DDs which is only around 1.5 percentage points greater than the RIIO-2 FDs equivalent.[80] This raises serious doubts over whether the Step 1 outputs have kept pace with trends in the

[80] Comparing 60% gearing figures.

wider infrastructure capital market. It is also concerning that Ofgem fails to acknowledge the implications of its own evidence, which suggests a return of 8.5% CPIH-real.

7.2.6 New evidence from the **Sizewell C** nuclear plant, a RAB financed construction project with a low-risk regulated revenue stream in the construction phase, provides a further real-world benchmark for what is required for a sizeable new equity investment in a regulated infrastructure business. Centrica reports that it expects a more than 10% or more than 12% nominal IRR for its 15% equity stake, corresponding to a 'high cost/schedule' and 'moderate cost/schedule' scenario respectively. Given the scale and risk profile, this is a direct and highly relevant cross check for required equity returns on regulated business carrying out large network investments.

7.2.7 Oxera has also updated its **Debt Premia** (formerly ARP-DRP) cross-check which involves comparing the difference between the ARP (the expected excess return from holding risky assets compared to riskless assets) and the debt risk premium (DRP, the expected excess return to holding risky debt relative to riskless assets). This update implies a **minimum** CoE to cross-check Ofgem's CoE of 6.43%.[81] The DDs CoE of 6.04% is significantly below this minimum.

7.2.8 We find that little comfort can be taken on investability from **traded MARs**. Ofgem has used data from Ofwat that is out of date. A more realistic range of assumptions for asset base growth and regulatory performance shows that the Step 1 output in the DDs sits at the lower-end of a very wide cost of equity range, which has a mid-point of 7.3%.

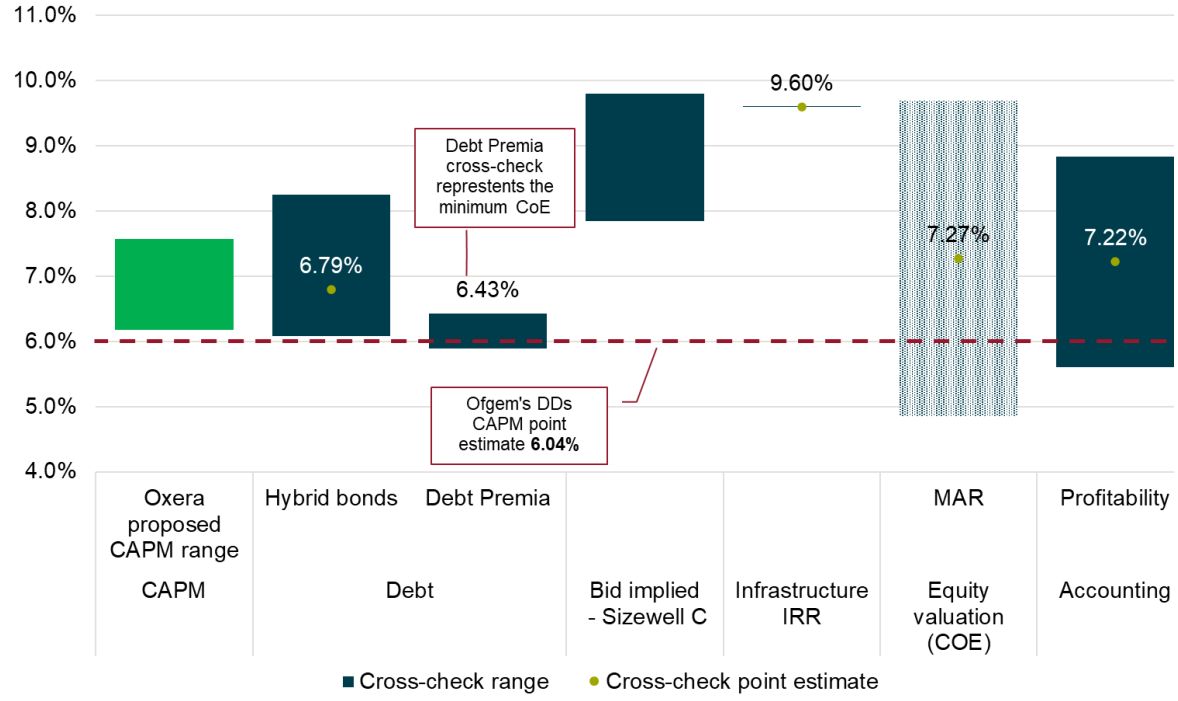
7.2.9 We draw a similar conclusion from our updated **long-term profitability analysis**. The latest figures here show that the Step 1 output from the DDs sits at the very bottom of a wide range which has a median value of 8.8%.

7.3 Conclusion on the CoE cross-checks

7.3.1 The key evidence across all cross-checks is summarised in the chart below. As shown, the point estimate of 6.04% sits either below, or at the bottom of the ranges produced by this wide range of cross-checks. In contrast, the top-end of the CAPM range (6.96% at 60% gearing) set out in the DDs has a greater degree of overlap with the cross-checks set out.

81 Oxera (August 2025), RIIO-GD&GT3 cost of equity and debt premium cross-check: Prepared for Future Energy Networks. Oxera provides a range of minimums based on different averaging periods. To pass the cross-check the CoE needs to be above this range.

Figure 10 CoE estimates and cross-checks (CPIH-real)



Source: *Ofgem, Frontier Economics, Oxera*

Note: *We consider a 2% CPIH assumption and the Fisher equation to derive CPIH-real values for the cross-checks. For Debt Premia cross-check we present Oxera's range of values to cross-check Ofgem's DDs CoE. We note that a higher range is needed to cross-check Oxera's proposed CAPM range.*

7.3.2 Overall, **this evidence suggests that significant investability risks remain in the Draft Determination's CoE** – and as such the Step 1 CAPM point estimate should be revisited for the Final Determination in order to reach a more balanced position on investability to retain and attract equity.

7.3.3 If left unchanged, this level of allowed equity return would not achieve Ofgem's stated objective of ensuring that the RIIO-3 price control package is investable for an equity investor.

7.3.4 The updated evidence in this report shows that investability is not being supported by the Step 1 point estimate in the DDs. In fact, the entire bottom half of Ofgem's CAPM CoE range is irrational, as it overlaps with the expected hybrid bond range, which is lower risk compared to equity. A higher point estimate for the CoE is therefore required in the Final Determinations to address investability risks..

7.3.5 We find that Oxera's proposed CAPM range is more consistent with the cross-check evidence. Importantly, Oxera's mid-point of 6.84% is consistent with our hybrid bond cross-check range and is above the implied minimum cost of equity from the Debt Premia cross-check.

7.3.6 **We continue to find that a key contributor to the DDs CoE range being too low is likely the TMR range proposed by Ofgem. This is explored in Part 2 of the report.**

PART 2: TOTAL MARKET RETURN CROSS-CHECKS

8 Dividend Growth Model derived cross-checks

8.1.1 In the sections that follow, we present various TMR cross-checks. Building on the previous evidence provided, we present new analysis on Calibrated DGM. This new analysis demonstrates the robustness of the DGM evidence we have produced, directly addressing critiques that Ofgem raised in the DDs.

8.2 Overview

8.2.1 At the SSMC stage, to provide evidence on TMR for Ofgem with their upcoming RIIO-3 decision, we formulated a 'TMR Glider'. The Glider is calibrated using historical market implied TMR based on a Dividend Growth Model (DGM) and contemporaneous interest rates (gilt yields).[82] The TMR Glider provides a framework for the TMR to move with gilt yields but is much less than a one-to-one relationship. The TMR Glider therefore provides a framework for the TMR which is 'stable but not fixed' in line with UKRN Guidance.

8.2.2 The Glider is a tool that recognises some of the limitations of applying DGM outputs directly when making regulatory decisions. By establishing a relationship between interest rates and equity market conditions it moderates the volatility inherent with applying DGM outputs directly.

8.2.3 In our Business Plan Cross-Checks Report , we provided updated evidence from our DGM and 'TMR Glider'. We presented the DGM-based evidence alongside long-term historical average equity returns, to assess the extent to which Ofgem needed to adapt its RIIO-2 TMR decision.

8.2.4 In applying these TMR cross-checks (DGM and TMR Glider), we paid particular attention to setting a TMR which is 'stable but not fixed', and that supports an investable CoE in RIIO-3.[83] We concluded that prevailing market conditions in the past two years would strongly suggest a RIIO-3 TMR range of 7.0% - 7.5% and we recommended that the point estimate should be towards the top of that range.

8.2.5 In the DDs, Ofgem decided not to use the TMR Glider or DGM as a cross-check for its TMR estimate. This was solely due to concerns with the use of the DGM.

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82 We developed this framework in our report prepared for National Grid Electricity Transmission at SSMC stage, see Frontier Economics (2024), The relationship between total market return and gilt yields. For ease of reference, we may refer to this report as our 'TMR Glider' report in other sections of this report.

83 We note the UKRN Guidance does not recommend a through the cycle approach e.g. the Guidance states that "This approach does not imply that regulators should simply pick the same fixed value for the TMR in each decision for all time". See for example UKRN (2023) UKRN guidance for regulators on the methodology for setting the cost of capital, p 19.

8.2.6 In its reasoning for placing no weight on the TMR Glider cross-check, Ofgem cites the following concerns regarding the use of DGM:

- Not all companies pay dividends, so the model is only applicable to those that do.
- The dividend growth model also assumes perpetual dividend growth. However, a company's dividend might fluctuate or indeed be cut completely.
- Dividend growth models are also highly sensitive to assumptions about the future dividend growth rate.

8.2.7 We address each of these concerns in Section 8.3 below.

8.3 Evaluation and response

8.3.1 Before addressing Ofgem's concerns individually, it is important to stress two key points regarding DGM:

(a) First, while Ofgem has not placed any weight on the TMR Glider due to concerns with DGM, we note that Ofgem continues to use MAR analysis as a cost of equity cross-check. As discussed in our Cross-Check Standards of Evidence Report, **the MAR cross-check is also based on DGM analysis**.[84] This is therefore inconsistent with Ofgem's decision to not place any weight on the DGM derived cross-checks that we proposed in our Business Plan Cross-Checks Report.

(b) Second, we find that DGM is a widely used technique for equity valuation and TMR estimation. Despite criticisms, its widespread use by numerous reputable sources proves its **relevance** and **applicability**.

8.3.1 Response – not all companies pay dividends

8.3.2 To say that the dividend growth model is only applicable to companies that pay dividends is incorrect. Ofgem should therefore not consider it a barrier to drawing on DGM evidence.

8.3.3 There are many reasons that companies may not pay dividends in a given time period. A common reason is that they are a growth company, and that it is value maximising to retain earnings for investment rather than paying them out.

[84] See Frontier Economics (2025), Cross-Check Standards of Evidence

8.3.4 Contrary to Ofgem's assertion, the DGM is valid for growth companies, this is articulated clearly in Principles of Corporate Finance, where the authors set out that, "*The dividend discount model is still logically correct for growth companies*".[85]

8.3.5 Similarly, Damodaran considers DGM valid as a means of valuing stocks that currently pay low or no dividends, as well as valuing entire markets. Damodaran states that, *"If the dividend payout ratio is adjusted to reflect changes in the expected growth rate, a value can be obtained even for non-dividend-paying firms".*[86] Our DGM specification uses data on dividend forecasts rather than applying the observed level of dividends. Therefore, we consider that our DGM reflects the adjustments that Damodaran describes and is applicable to firms that have low or no dividends.

8.3.6 We emphasise that we consider dividend forecasts for the entire stock market in our model, so low or no dividend paying firms will be captured in the average dividend yield data being applied.

8.3.7 We acknowledge there is an ongoing debate around how well DGM performs as a predictive tool in the presence of growth stocks – namely where cash dividends are only expected very far into the future. But it is important to note our analysis is based on the UK stock market, which has a much lower proportion of large growth stocks compared to other stock indices such as the S&P 500.

8.3.8 In Annex E , we also set out the widespread use for DGM as a tool for understanding trends in a range of global stock markets, demonstrating that growth stocks are not a barrier to the application of DGM by a range of practitioners.

8.3.2 Response – assuming perpetual dividend growth

8.3.9 Ofgem's statement is correct, DGM does typically apply a long-term dividend growth rate that is perpetual (the model does not have a fixed number of time periods).

8.3.10 We stress that our model is of an entire stock market index (the FTSE All-share) reflecting the dividends of a large number of companies, not the given dividend policy of any individual company.

8.3.11 It is standard practice for economic growth models to assume a positive real long-run growth rate. An expectation that long-term real growth was not possible would be a highly unusual conclusion for a macroeconomic model. Consistent with long-term real growth in economic activity, it is logical to assume that corporate payouts grow at a broadly similar rate too (to avoid very high outcomes at long time

85 Brealey, Myers and Allen (2014), Principles of Corporate Finance, 11th Global Edition, pages 83-84

86 Damodaran, A. Investment Valuation, 3rd ed. (Wiley, 2012)

horizons). This, in turn, should be mirrored by payouts across a large sample of listed corporations.

8.3.12 Historical evidence also supports this, demonstrating that corporate profitability in the UK relative to the size of the economy (as measured by GDP) is broadly stable.[87]

8.3.13 If we were analysing a single stock Ofgem's concerns may have greater validity, but when considering an entire market, it is standard to assume positive long-run growth in dividends. Any other assumption would imply a fundamental shift in the relationship between corporate payouts and the wider economy.

8.3.3 Response – sensitivity to long-run growth assumptions

8.3.14 We understand that a common concern regarding using DGM outputs for setting the TMR is the reliance on a long-run dividend growth assumption. While no assumption is perfect, our approach of using long-run forecasts of UK GDP as our long-run dividend forecast growth rate is preferred for three main reasons:

- **Stable:** First, the assumption that dividends grow in line with GDP growth means that dividends remain stable as a proportion of GDP. This avoids situations where company payouts fundamentally diverge from the overall scale of the economy. It is also a feature that is consistent with measures of corporate profitability over time. Since the 1990s, UK corporations' operating surplus as a share of GDP has remained broadly stable.
- **Credible:** The GDP forecasts are sourced from a credible and independent third party (the International Monetary Fund), who has published forecasts on a consistent basis for nearly 30 years. This ensures continuity in the series and means that there is a greater degree of independence (from the user) when generating the outputs.
- **Widely used**: It aligns with common practice among institutions like the Bank of England (BoE) and the European Central Bank (ECB) when applying DGM methodologies. We note that the Bank of England draws upon IMF forecasts when undertaking DGM modelling (although in addition to UK data they also draw upon Eurozone and US data). The ECB also uses GDP growth for the long-term when looking to understand the cost of equity for European stock markets – drawing on forecasts from Consensus Economics.

8.3.15 Although we consider these properties of the growth assumption contribute to robust outputs **there are further methods that can be deployed to overcome**

87 This can be shown with ONS data by comparing Gross operating surplus (or net operating surplus) of corporations to GDP over many years.

these concerns. In particular, we have developed a 'Calibrated DGM' as a further robustness check.

8.3.16 The Calibrated DGM uses long-term historical ex post returns to calibrate the long-run dividend growth assumption such that any bias of the DGM estimate is removed. This is explained in more detail in Section 8.4.2, where we also include the outputs form this robustness check.

8.3.17 Overall, we find that **the Calibrated DGM provides further confidence that our DGM results are robust**, and that techniques based on our DGM modelling can be used appropriately alongside existing sources of evidence used to set TMR (such as the DMS data on historical ex-post returns).

8.4 Updated evidence

8.4.1 We consider that the Dividend Growth Model (DGM) provides a useful analytical framework for assessing TMR as it reflects current market conditions, through prevailing stock prices and expectations for dividend growth.

8.4.2 While DGM provides useful evidence on current market conditions, it can, in isolation, be volatile and contain idiosyncratic movements.

8.4.3 At SSMC, in a report prepared for National Grid,[88] we set out to develop a framework to operationalise setting a stable but not fixed TMR by estimating a (linear) relationship between the market-implied required TMR and gilt yields: the TMR Glider.[89] The development of the TMR Glider involved the following steps:

(a) Estimate the market-implied TMR using a two stage DGM model.
(b) Estimate a linear relationship between DGM estimates of TMR and gilt yields.
(c) Use the TMR Glider with the latest gilt yield to cross-check Ofgem's proposed TMR range.

8.4.4 The Glider provides a reading on the required TMR based on current market conditions, but is moderated by the risk-free rate environment and is less subject to the more volatile movement of the equity market premium.

8.4.5 It provides evidence to adjust the CAPM TMR above or below the long-term historical average TMR that Ofgem uses to set its TMR estimate.

88 Frontier Economics (2024), The relationship between total market return and gilt yields

89 The TMR Glider developed at that stage was intended as a cross-check.

8.4.1 Updated results

8.4.6 In this section, we show updated evidence from the TMR Glider and DGM modelling.

8.4.7 We have updated our TMR Glider analysis, in line with the latest data available from Bloomberg. As part of this update, we have used a daily DGM and gilt rate as inputs into our Glider analysis rather than the monthly data that we have used previously. Using daily data better captures equity market events and provides more detail on current market conditions. The overall shape and levels of our DGM and TMR Glider analysis have not changed from our previous monthly specification.[90]

8.4.8 Following this update, our latest TMR Glider equation is relatively unchanged from our Business Plan Cross-Checks Report: [91]

$$Nominal\ TMR = 8.34\% + 0.354 \times (20\ year\ nominal\ gilt\ yield\ )$$

8.4.9 The updated evidence is shown in the figure below which covers:

(a) the 125-year arithmetic average (6.92% CPIH-real and 9.06% nominal) as a benchmark of the long-term historical average (dashed black line);

(b) our two-stage DGM modelling;

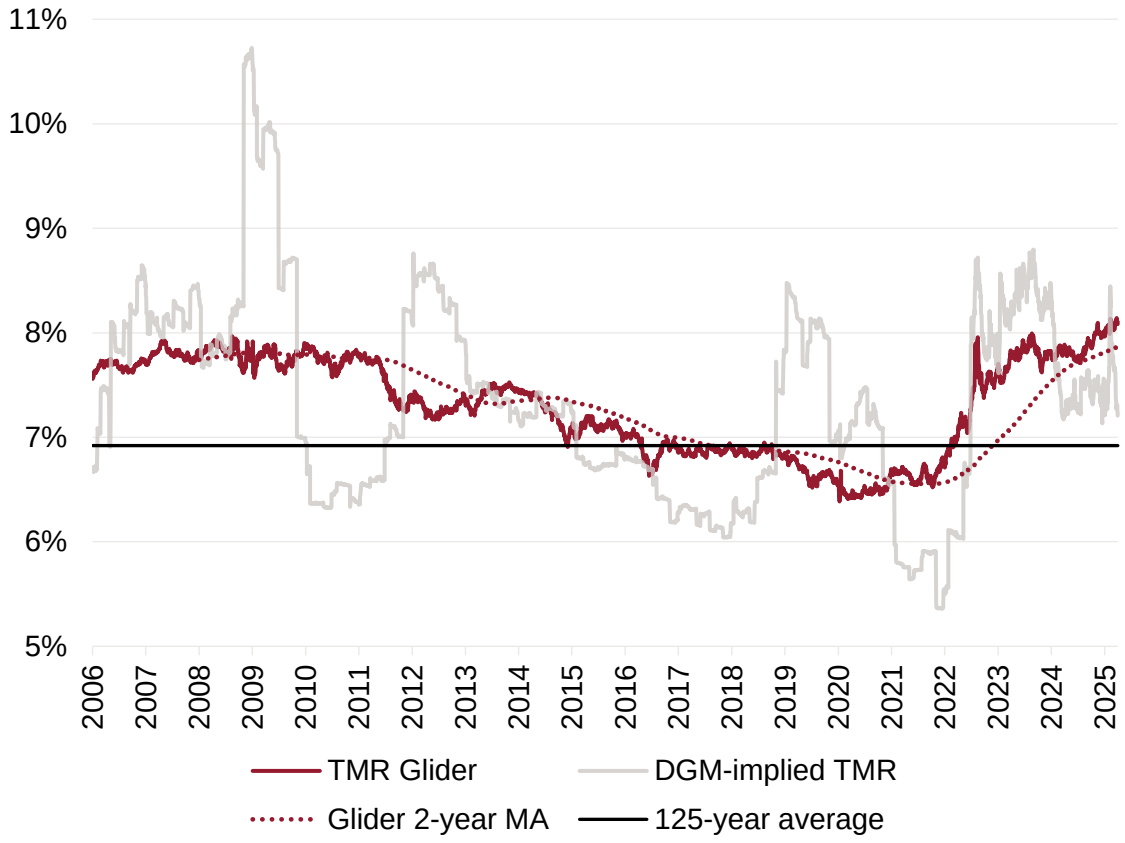
(c) historical values from the TMR Glider, based on prevailing gilt yields;

(d) a two-year moving average of our TMR Glider values.

90 See Annex E for more detail.

91 The equation for our Business Plan Cross-Checks report was: Nominal TMR=8.34%+0.353 x 20-year nominal gilt yield.

Figure 11 DGM-based TMR cross-check evidence and the 125-year arithmetic average TMR (CPIH-real)



Source: Frontier analysis, Ofgem

Note: CPIH-real figures have been derived using an inflation assumption of 2%.

8.4.10 We observe that since mid-2022, the DGM and TMR Glider values sit above Ofgem's long-term average of 6.92% CPIH-real. This indicates that current expectations of TMR lie above long-term average values.

8.4.11 At the end of March 2025, the 2-year moving average of the TMR Glider is 7.83%. By using 2 years of data, we can capture recent market conditions without placing too much weight on short term fluctuations in the gilt yield.[92] The 2-year moving average of the DGM-implied TMR provides a similar estimate of 7.87%.

[92] To note that the precise length of the moving average is purely illustrative at this stage.

8.4.12 We also use 2 years of data to construct our TMR Glider cross-check range. Using the 20th and 80th percentile as the low and high end of our range gives a range of 7.76 - 7.92% CPIH-real.[93]

8.4.13 Some may challenge that the TMR Glider is producing relatively high estimates, based on gilt rates, and question whether the level of TMR predicted by the Glider is commensurate with historical levels of interest rates and TMR. In other words, if the current risk-free rate is close to, or below the long-run average, then the TMR should be set at long-run historical values as well.

8.4.14 We find that multiple data sources suggest that current rates are above historical measures.

- First, we consider 10-year index-linked gilt (ILG) rates since 1997. The current 10-year ILG rate is 1.1%, is above the 0.4% average since the Bank of England's independence in 1997.
- We can also consider deflated nominal bond yields since 1900. Deflated 10-year yields since 1900 also shows that 2024 values (2.1%) are greater than the long-term average (1.4%).[94]

8.4.15 This evidence suggests that the current interest rate environment raises challenges around setting the TMR at long-run historical average values. Current market conditions highlight the need for a careful reconsideration of the methodologies used in determining the appropriate TMR for regulatory decisions.

8.4.2 Calibrated DGM as a robustness check

8.4.16 In this section, we provide more detail on our 'Calibrated DGM' (CDGM) robustness check which addresses Ofgem's concern with the long-run dividend growth assumption in the DGM and the TMR Glider.

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93 The March 2025 cutoff date ensures consistency with the figures presented in other sections of the report. If data through May 2025 were included, the 2-year moving average of the TMR Glider would be 7.86%, with a corresponding range of 7.79 - 8.03%.

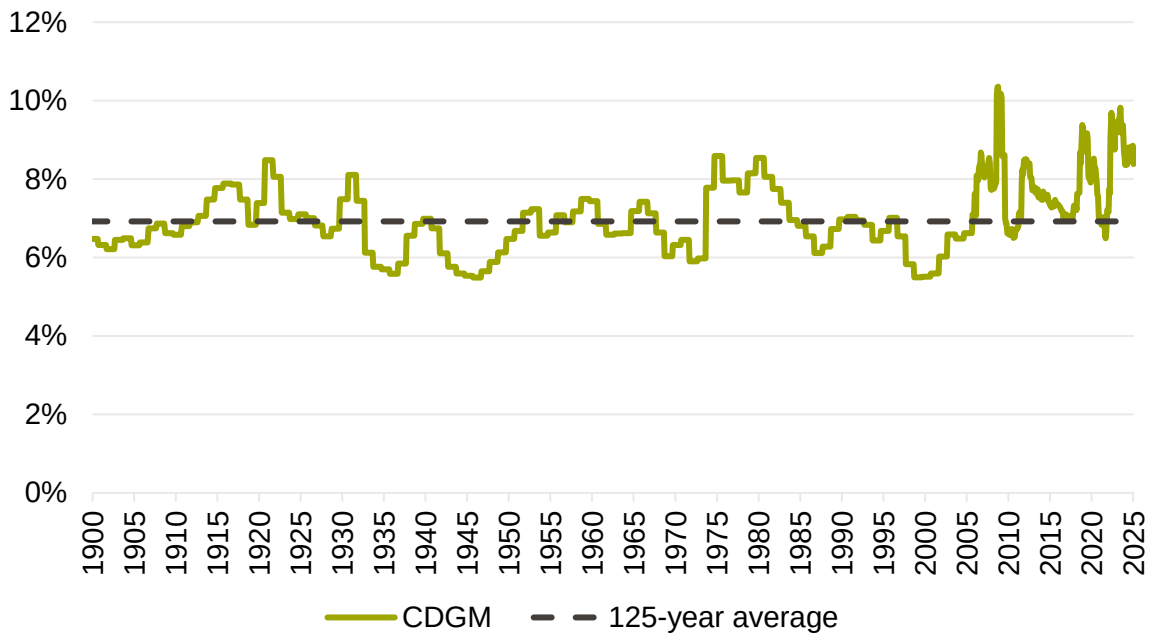
94 Looking back further in time, we can see that most government bonds were 'nominal' bonds rather than index-linked. Therefore, to understand trends in real government bond yields, we need to deflate historical nominal bond yields. We source nominal yield data using The Bank of England's "millennium of data", which reports yield series back to 1929 for 10-year nominal government bonds and back to 1900 for 'annuities and consols' (which are longer-term securities). We also relied on another academic source: Academics Martin Ellison (University of Oxford) and Andrew Scott (London Business School) have compiled nominal bond yields (10-year) back to 1915. We then have to deflate these nominal yields. To have the cleanest comparison with bond yields today, long-term expected inflation is the ideal data to have. The Bank of England has developed an estimate of long-term inflation expectations which we draw upon as our primary deflator. We also review actual (outturn) inflation data as a proxy, e.g. the CED/CPIH series that is used when deflating historical equity returns. Real yields are estimated using these datasets and the Fisher equation. Our focus, has been on deflated 10-year yields. We also considered whether the outputs could be compared to modern inflation metrics – we note differences can arise due to the deflator used and there can be differences in the extent to which inflation has been captured.

8.4.17 Like the standard DGM, the CDGM equates the current share price to the present value of future dividends. However, rather than using an exogenous assumption for the long-run dividend growth rate which may be subjective, the CDGM 'calibrates' the model by solving for the long-run dividend growth rate within the model so that the historical average of the CDGM-derived TMR over the period 1900-2025 aligns with a chosen target.

8.4.18 Such a calibration reduces the influence of long-term growth assumptions sourced externally, but maintains the informational advantage of using the DGM, in that the outputs would reflect current expectations based on contemporaneous share prices and expectations of short-term dividend growth.

8.4.19 In this case, we use Ofgem's 125-year arithmetic average of 6.92% (CPIH-real) as our target. This ensures that the output is not biased relative to the existing TMR estimation methodology. The output from our CDGM estimation is shown in Figure 12 below.

Figure 12 CDGM-implied TMR back to 1900 (CPIH-real)



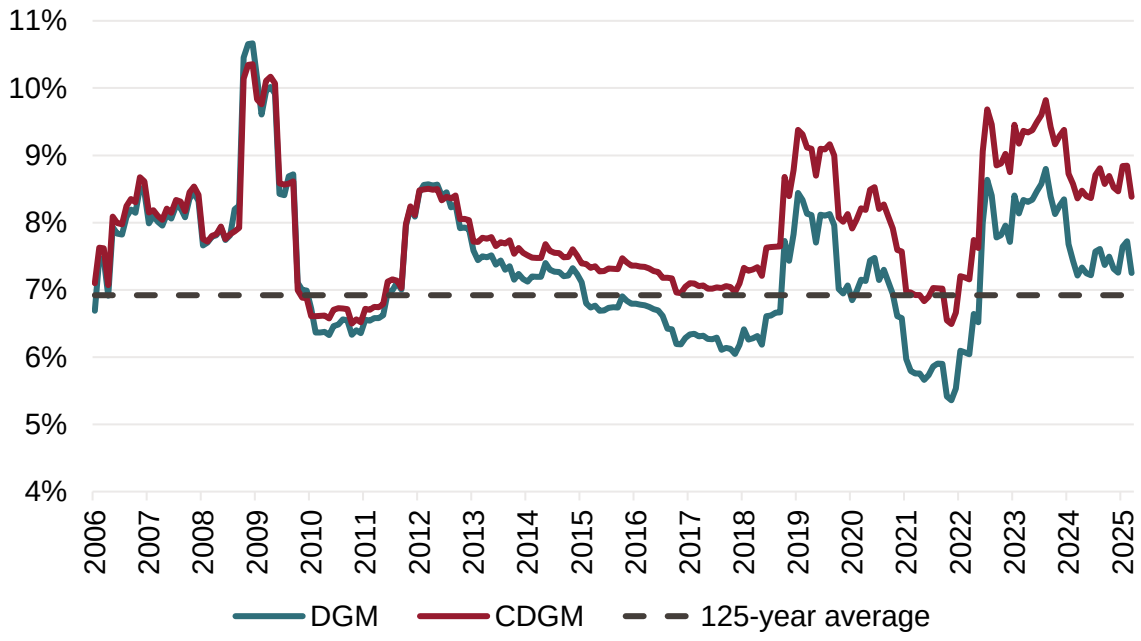
Source: Frontier analysis, Ofgem
Note: CPIH-real figures have been derived using an inflation assumption of 2%.

8.4.20 By design, the Calibrated DGM does not directly inform on the appropriate level of TMR, as the TMR input is externally imposed by the modeller. However, the model's output **can be used to assess whether the current DGM-implied TMR appears high or low relative to the long run historical trend**. This offers an unbiased lens to reinforce or challenge the conclusions of the standard DGM in guiding regulatory decisions on TMR in light of prevailing market conditions.

Currently, the CDGM implies that the TMR is high relative to the long run historical trend.

8.4.21 As shown in the figure below, the current TMR implied by the CDGM, which does not rely on a subjective assumption about dividend growth, **also stands above the estimate from the standard DGM**.[95] This provides confidence that the DGM output, and by extension the TMR Glider, is not overstating the market-implied TMR due to our chosen dividend growth assumption.[96]

Figure 13 DGM- and CDGM-implied TMR (CPIH-real)



Source: Frontier analysis, Ofgem
Note: CPIH-real figures have been derived using an inflation assumption of 2%.

8.4.22 For more detail on the methodology and intuition behind the Calibrated DGM, please see Annex F

8.5 Implications for RIIO-3 CAPM

8.5.1 We consider that DGM information, when used in partnership with other evidence, can provide valuable market information. Particularly in a world where regulators adopt a policy where TMR is stable but not fixed. Reflecting market information

95 At the end of March 2025, the 2-year moving average of the CDGM implied TMR estimate is 8.95% (CPIH-real).

96 Although the long run growth rate implied by the CDGM is currently higher than the long-run assumption in our DGM, this has not been the case for the entire period since 2006. The divergence around 2013 coincides with the IMF downgrading the economic growth forecasts for the UK as growth expectations weakened following the global financial crisis.

such as this when cross-checking TMR can help operationalise this policy in a way that supports investability.

8.5.2 The TMR Glider value from March 2025 of 8.0% and the 2-year moving average of 7.8% **both suggest that Ofgem's historical TMR of 6.9% is materially below market expectations**. On this basis, the Ofgem's TMR estimate is insufficient from an investability perspective.

8.5.3 As we have set out in this section of the report, **we do not agree with Ofgem that DGM based evidence should not be given weight**. We have shown that DGM is a credible, widely used technique in academia, regulation and central banking. As we argued in the Cross-Check Standards of Evidence Report, Ofgem relies on MAR analysis as a cross-check, which is entirely DGM based , so it is inconsistent and irrational to dismiss our Glider analysis on the basis that it is based on DGM estimates.

8.5.4 We have also addressed Ofgem's concerns raised in the DDs, clearly outlining why the concerns are unfounded, or, where they are valid, showing the ways in which robustness has been ensured. In particular, we highlight that Calibrated DGM acts as a useful tool for confirming that DGM outputs are not biased, and can be deployed consistently alongside other TMR data sources that Ofgem commonly uses.

8.5.5 Oxera, in its latest CAPM report, has set out a TMR range on 7.0%-7.5%.[97] The TMR Glider evidence would suggest that **the top end of this range would be suitable, given that cross-check values currently lie beyond the range**.

[97] Oxera (August 2025), RIIO-GD&GT3 cost of equity and debt premium cross-check: Prepared for Future Energy Networks

9 TMR survey evidence

9.1.1 This section presents our position to TMR survey evidence, including investment manager TMR forecasts and Fernandez TMR survey evidence.

9.2 Overview

9.2.1 In the DDs, Ofgem has continued to rely on its own TMR survey cross-check, and rejected the Fernandez TMR survey that we have proposed.[98]

9.2.2 There are two main issues with Ofgem's approach:

- Ofgem has proposed to use survey evidence as a CoE cross-check, which requires further RFR and beta assumptions which might not reflect those considered by survey respondents;
- Ofgem's TMR survey cross-check uses a small sample of observations which is not likely to reflect the broad market sentiment.

9.2.3 We discuss these points in detail below.

9.3 Investment managers' TMR forecasts

9.3.1 This section responds Ofgem's approach to investment manager TMR forecasts.

9.3.1 Ofgem's use of the cross-check

9.3.2 Ofgem has continued to rely on the investment manager TMR forecasts as a CoE cross-check, collating forecasts from nine financial institutions. Ofgem does not specify which nine financial institutions comprise the sample. It acknowledges that this evidence is a more direct cross-check on the TMR assumption, maintaining that it can still bring value to the CoE determination process.[99]

9.3.3 Ofgem reports that the average TMR forecast from these financial institutions is 5.9% CPIH-real (8.0% nominal).

9.3.2 Evaluation and response

9.3.4 There are a number of issues with Ofgem's approach to TMR survey evidence. Firstly, Ofgem has proposed to use survey evidence as a CoE cross-check. This requires further RFR and beta assumptions which might not reflect those considered by survey respondents, and masks any differences in underlying

98 Ofgem (2025), RIIO-3 Draft Determinations – Finance Annex, para 3.106

99 Ofgem (2025), RIIO-3 Draft Determinations – Finance Annex, para 3.96

assumptions across respondents. Deploying the evidence as a TMR cross-check can therefore enhance the robustness of results.[100]

9.3.5 Ofgem has only looked at the forecasts of nine financial institutions, which can lead to a biased TMR forecast result which may not accurately be representative of overall market expectations of TMR.

9.3.6 Additionally, Ofgem has not specified which nine institutions have comprised its sample of forecasts, creating issues of replication and traceability. As survey evidence is most useful for ascertaining trends, we have previously suggested it is useful to consider such evidence reported on a consistent basis over time.[101]

9.3.7 Ofgem criticises the Fernandez TMR survey precisely for the reason of traceability, but draws on a cross-check that has the same issue and is based on a smaller sample.

9.3.3 Updated evidence

9.3.8 We have attempted to replicate the results Ofgem has reported on this cross-check by collecting updated data on TMR forecasts from the institutions in the sample that Ofgem considered at RIIO-2 (where available), and by also considering TMR forecasts published by further financial institutions.

9.3.9 In order to infer a TMR from a consistent set of funds, we have also compared the TMR estimates from the sample presented by Ofgem in its draft determinations in July 2020 against the latest TMR forecasts. The results of this exercise are presented in Table 5 below.

Table 5 Investment manager forecasts of TMR

		Data as of March 2025		
Author	**Date**	**Scope**	**Horizon**	**Nominal TMR**
Schroders [1]	Dec-24	UK	10	11.50%
Blackrock [2]	Mar-25	UK	10	7.63%
Quilter (formerly Old Mutual) [3]	Mar-25	UK	10	10.03%
Aon Hewitt [4]	Jul-24	UK	10	7.00%
JP Morgan [5]	Sep-24	UK	10 to 15	8.10%

100 Frontier Economics (2024), Business Plan Cross-Checks Report, Section 8.1

101 Ibid.

		Data as of March 2025		
Author	**Date**	**Scope**	**Horizon**	**Nominal TMR**
Candriam [6]	Aug-24	UK	10	8.60%
Northern Trust [7]	Feb-25	UK	10	5.40%
Deutsche Bank [8]	Mar-25	UK	10	9.10%
Amundi [9]	Mar-25	UK	10	8.70%
BNY [10]	Nov-24	UK	10	9.00%
EFG [11]	Jan-25	UK	7 to 10	7.38%
Ninety One [12]	Mar-25	UK	10	6.30%
Lowest mean from nine observations				**7.6%**
Highest mean TMR from nine observations				**8.9%**
Mean – all observations [1]-[12]				**8.2%**
A potential construction of Ofgem's 8% [2]-[5], [7]-[11]				**8.0%**
Institutions included in Ofgem's sample at RIIO-2 [1]-[5]				**8.9%**
Ofgem's cross-check result at RIIO-2				***6.7%***
Ofgem's cross-check result at RIIO-2 for [1]-[5]				***6.5%***

Source: *Published forecasts of each author, Ofgem (2020), RIIO-2 Draft Determinations Finance Annex Table 23*

Note: *These forecasts include a 1% uplift from geometric average to arithmetic average to put them on a comparable basis to Ofgem's TMR forecasts, which also include the 1% uplift (as discussed in RIIO-T2/GD2 SSMD (May 2019)).*

We rely on five institutions Ofgem has previously collected forecasts from. Of the remaining six authors that Ofgem considered at RIIO-2, we have not found updated forecasts for three authors (Nutmeg, the FCA and Willis Towers Watson). The fourth author is listed as "redacted author" in Ofgem's RIIO-2 draft determination and so we are unable to identify the relevant institution to provide an updated forecast. Aberdeen has discontinued its forecasts, and we have further excluded Vanguard from the overall sample. This is because we understand the Vanguard portfolio contains fixed income instruments, which was why Ofgem did not fully consider Vanguard in its cross-check previously, even though their description of approach has been inconsistent. Please see RIIO-2 SSMD, Finance Annex, para 3.92, and RIIO-3 SSMD, Finance Annex, FN89. We also exclude Aberdeen as the last available update was published in June 2023

9.3.10 We have attempted to enrich the data set, and therefore we have obtained publicly available forecasts from 12 financial institutions that published a forecast for the UK over the past year. There is a subset of nine forecasts from this sample that yields the 8.0% TMR Ofgem has arrived at, with a minimum of 7.6% and maximum of 8.9% based on which subset of nine funds is being considered. The average nominal TMR of all forecasts is 8.2%.

9.3.11 Importantly, **considering the same set of funds on a consistent basis**, the sample of funds used at RIIO-2 yield an average nominal TMR of 8.9% (compared

to 6.5% at RIIO-2).[102] **This shows a significant increase in TMR values of 2.4 percentage points for a consistent set of institutions over time.**

9.3.12 The data in the table above demonstrates the difficulty of inferring a robust TMR from a set of nine observations, and that **Ofgem's TMR cross-check value of 8.0% (nominal, 5.9% real CPIH)) is at the lower end of the range of market evidence (7.6% to 8.9%, nominal, 5.5% to 6.8% real CPIH) that is available**.

9.3.4 Implications for RIIO-3

9.3.13 Ofgem's investment manager TMR forecast cross-check does not seem to have incorporated all the available market evidence. Taken together, the evidence points to a higher TMR than that Ofgem has reported.

9.3.14 As this cross-check is based on a relatively small sample and is highly sensitive to the particular institutions included in the sample, we propose that it is supplemented with the Fernandez TMR survey, which is discussed below.

9.4 Fernandez TMR survey

9.4.1 This section presents our response to Ofgem's criticisms of the Fernandez TMR survey evidence.

9.4.1 Ofgem's use of the cross-check

9.4.2 The annual survey of risk-free rates and market risk premium (MRP) conducted by Fernandez *et al.* asks academics, analysts and managers of companies across many countries about the risk-free rate and MRP used 'to calculate the required return to equity in different countries'.[103]

9.4.3 Ofgem proposed not to use this cross-check, as it already utilises a cross-check based on the TMR forecasts from investment managers' firms. It also stated that the Fernandez survey had 82 responses for the UK TMR estimate, and that there is no detail on who the respondents are.

9.4.2 Evaluation and response

9.4.4 We do not agree with Ofgem's criticisms of the Fernandez TMR survey. Ofgem also states that the survey is sent to more than 14,000 respondents, with 82 responses recorded for the UK.[104] We note that more than 1,600 responses have

102 Ofgem (2020), RIIO-2 Draft Determinations – Finance Annex, Table 23

103 Fernandez, Pablo and García de la Garza, Diego and Fernández Acín, Javier (2024), Survey: Market Risk Premium and Risk-Free Rate used for 96 countries in 2024 , p. 2. The 2024 edition has outputs for 96 countries.

104 Ofgem (2025), RIIO-3 Draft Determinations – Finance Annex, para 3.106

been received worldwide in the 2024 edition.[105] The inputs from more than 80 respondents should give a suitable indication of the expectations of UK TMR. Ofgem does not explain why its selection of nine financial institution forecasts is preferable, and whether this selection is consistent with its sample at RIIO-2.

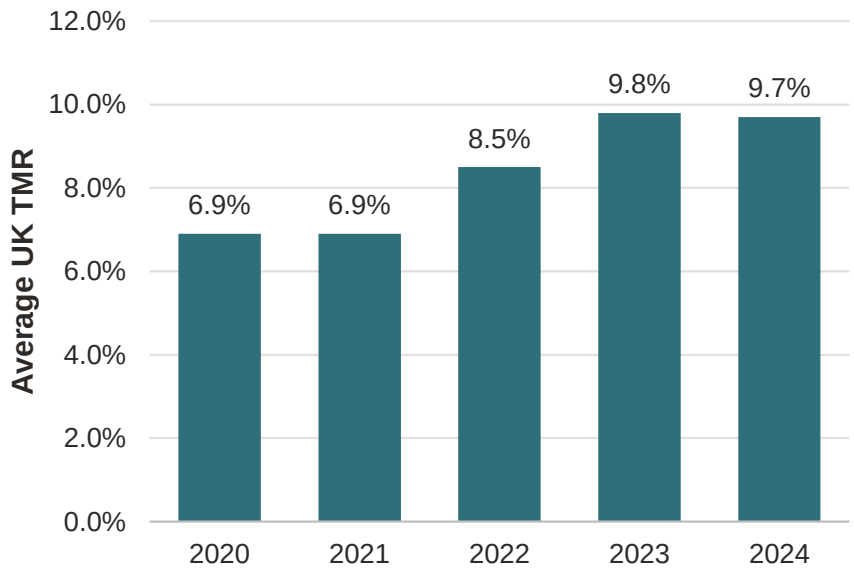
9.4.5 The respondents to the survey are not identified, but the survey recipients are professionals working in relevant academic and commercial areas. The study also takes additional steps to enhance the robustness of the results, e.g. exclusion of outliers, and filtering out the countries and parameters for which fewer than a certain number of responses have been received. Taken together, these features give more confidence on the reliability of results.

9.4.6 We further reiterate that the TMR survey evidence should be used to ascertain trends rather than arriving at point estimates, and the Fernandez survey is well suited for this purpose as it covers a wide sample and is reported on a consistent basis.

9.4.3 Updated evidence

9.4.7 We provide updated evidence from the Fernandez TMR survey in the figure below.

Figure 14 Average UK TMR estimates as per Fernandez et al. (nominal)



Source: Fernandez et al. (2024), Survey: Market Risk Premium and Risk-Free Rate used for 96 countries in 2024

105 Fernandez, Pablo and García de la Garza, Diego and Fernández Acín, Javier (2024), Survey: Market Risk Premium and Risk-Free Rate used for 96 countries in 2024 , p. 2

9.4.4 Implications for RIIO-3

9.4.8 The evidence from the Fernandez survey points to a significant increase in the TMR between 2020 and 2024 **– an increase of around 3 percentage points from 6.9% in 2020 to 9.7% in 2024 in nominal terms**. The figure between 2023 and 2024 for the UK was stable, only varying by 0.1 percentage points.

9.5 Overall findings from TMR survey evidence

9.5.1 Taken together, and when measured consistently, **the available evidence points to a significant increase in market expectations of TMR since RIIO-2**, and a higher TMR than Ofgem reports in its cross-check. Ofgem must consider this wider market evidence carefully and incorporate it into its TMR cross-check.

10 Review of TMR cross-check evidence

10.1.1 This section presents our conclusions on the TMR cross-check evidence.

10.2 Summary of the TMR cross-checks

10.2.1 Below we bring together the key findings for each of the TMR cross-checks.

10.2.2 The **TMR Glider** is the primary way in which we propose DGM evidence can be utilised for estimating the TMR in a regulatory context. This is because the volatility of underlying DGM outputs are moderated through the relationship with long-term gilt yields.

10.2.3 The TMR Glider value from March 2025 of **8.0%** and the 2-year moving average of **7.8%** both suggest that Ofgem's historical TMR of 6.9% is materially below market expectations.[106]

10.2.4 We've also detailed the numerous reasons why it is **not appropriate to dismiss DGM evidence,** setting out how the modelling has been made robust and objective. Calibrated DGM addresses concerns about dividend forecast subjectivity directly, revealing that our DGM outputs should be considered conservative. We therefore find that Ofgem has discarded relevant market-based evidence without reasonable justification.

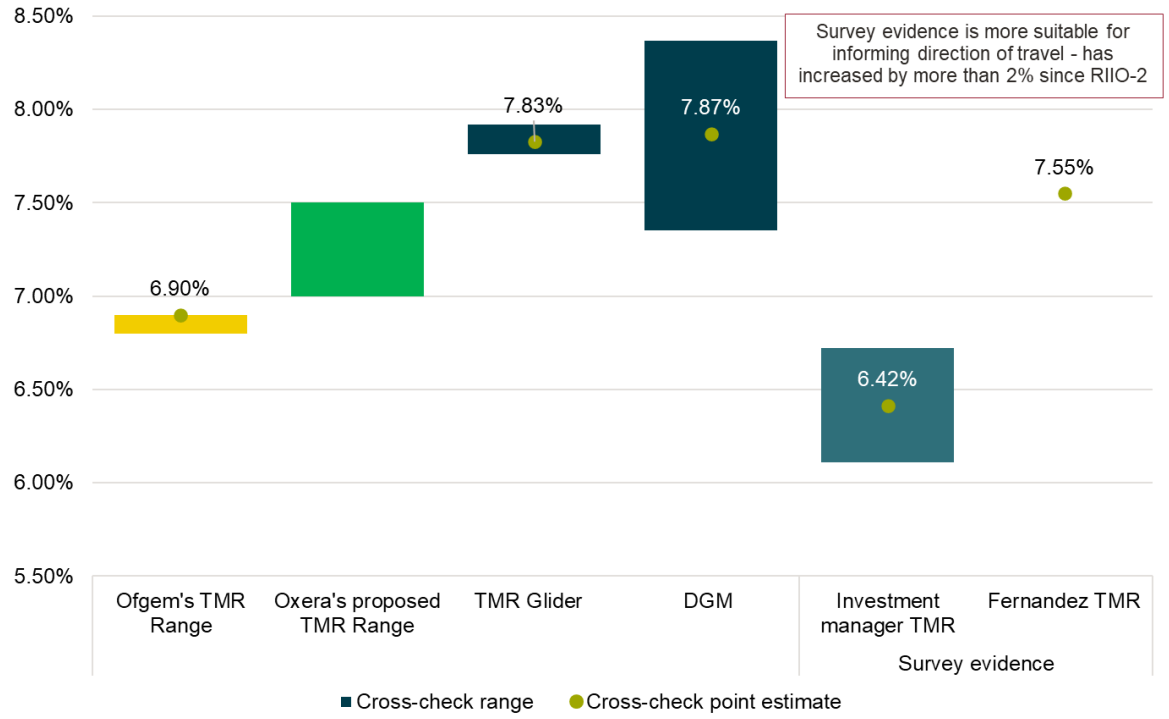
10.2.5 **TMR survey evidence** further reinforces the view that TMR values in the DDs are too low. The investment manager forecasts, when we compare like-for-like samples over time, show an average nominal TMR of 8.9% compared to 6.5% in May 2020, **an increase of 2.4 percentage points**. The evidence from the Fernandez survey also points to a significant increase in the TMR between 2020 and 2024 – **an increase of around 3 percentage points** in nominal terms.

10.3 Part 2 conclusion

10.3.1 The key evidence across all cross-checks is summarised in the chart below. As shown all TMR cross-check evidence suggests that the market required rate is currently significantly above the long run average.

106 We note that the TMR Glider remains elevated and implied a TMR of 8.1% in May 2025.

Figure 15 TMR estimates and cross-checks (CPIH-real)



Source: *Ofgem, Frontier Economics analysis, Oxera*

Note: *TMR Glider range represents the 20-80th percentile range over the last 24 months, which is 7.76% - 7.92%, with an average of 7.83%. All figures presented to 2 d.p.*
The DGM range represents the 20-80th percentile range over the last 24 months which is 7.35%- 8.37% with an average of 7.87%. All figures presented to 2 d.p.
We derive CPIH-real figures using the Fisher equation and a CPIH assumption of 2%.
The investment manager TMR range is constructed from the mean of all observations and the mean of observations included in Ofgem's sample at RIIO-2. The mid-point of these values makes up the point estimate.

10.3.2 The cross-check evidence therefore indicates that Ofgem's TMR estimate of 6.90% is too low, which could explain why Ofgem's proposed CoE is too low when compared against an investable value implied by the hybrid bond cross-check.

10.3.3 Oxera, in its latest CAPM report, has set out a TMR range on 7.0%-7.5%.[107] The cross-check evidence would suggest that **the top end of this range would be suitable, given that the TMR Glider values currently lie beyond the range**.

10.3.4 The data also shows that there has been a significant increase in TMR values from all sources since the RIIO-GD2/T2 final determination. This casts serious doubt on whether a relatively small increase in the TMR values used by Ofgem since then of 0.4 percentage points is sufficiently reflecting the scale of change in the market, and whether the set TMR is supporting investability.

107 Oxera (August 2025), RIIO-GD&GT3 cost of equity and debt premium cross-check: Prepared for Future Energy Networks

Annex A – Methodological updates to the Hybrid bond cross-check

A.1 As we set out in Section 2, this annex includes details on our methodological changes to the Hybrid bond cross-check. These changes aim to enhance the robustness of this cross-check, in particular relating to the sensitivity analysis used to construct the range.

A.2 We explain the changes in each of the three sensitivities we set out in our March and November reports in turn.

A.2 Sensitivity 1 – Extended Historical Spread Window

A.3 This sensitivity tests the robustness of using the hybrid bond spread at issuance by considering the daily traded yield to next call date relative to the appropriate senior debt benchmark.[108] In our previous reports we calculated the daily spread between the NG2073 Hybrid bond and the maturity matched iBoxx £ Utilities.[109] We then derived the 10th and 90th percentiles of the spread distribution as a credible range to reflect the volatility around the central spread estimate at issuance.

A.4 In this updated analysis, we refine the construction of the spread in two ways.

(a) We limit the window used to calculate the historical spread to exclude the full year prior to the NGG Finance 2073 bond's first call date. This aims to exclude distortions caused by illiquidity and elevated bid-ask spreads that can arise closer to the call date.[110] This adjustment helps reduce noise in the spread estimate and aligns better with long-term expectations.

(b) We update the senior debt benchmark index to reflect Ofgem's revised CoD methodology, i.e. we use the maturity matched average of iBoxx £ Non-Financials A/BBB. We continue to take the 10th and 90th percentile bounds consistent with the framework applied in prior analysis.

A.3 Sensitivity 2 – Alternative Equity-Like Percentage

A.5 Our Hybrid bond cross-check point estimate applies a 50% equity-like assumption, reflecting investor and credit rating agency expectations. This sensitivity tested the

108 Frontier Economics (2024), Equity Investability in RIIO-3, Section 5.4.1

109 For example, when the hybrid bond is six years from its next call date, we use the iBoxx 5-7 year index as the benchmark, in line with the bond's remaining time to call. This maturity matching ensures consistency with the duration profile of the hybrid instrument over time.

110 Given the NG2073's call date of 18 June 2025, we consider daily spreads from the bond's issue date until 18 June 2024.

impact of using 25% and 75% equity-like assumptions, capturing plausible variations in market perceptions about the hybrid's equity content.[111]

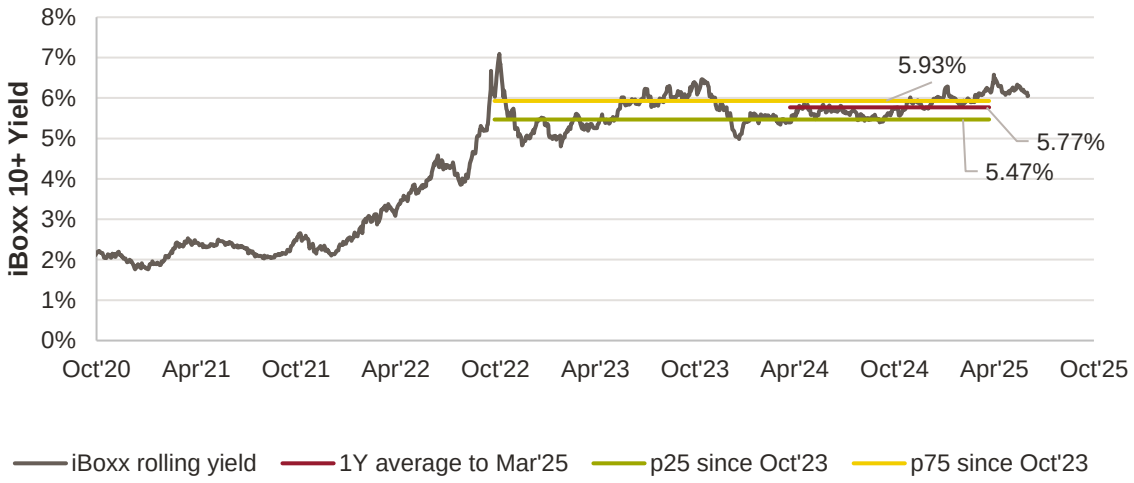
A.6 No methodological changes were made to this sensitivity. We continue to apply alternative weightings of 25% and 75% around the base case of 50%, providing a robust range consistent with prevailing market practice.

A.4 Sensitivity 3 – Alternative iBoxx Benchmarking Windows

A.7 This sensitivity tests how alternative windows for the senior debt benchmark yield affect the estimated cost of equity under the Hybrid bond cross-check. This allows us to explore how sensitive our estimates are to our main approach, which uses the one year average up to March 2025.

A.8 With yields stabilising since their peak in October 2022, we focus the analysis on this single period, which reflects a "new normal" in monetary conditions. We calculate the 25th and 75th percentiles of daily iBoxx £ Non-Financial A/BBB 10+ yields, as shown in Figure 16 below.

Figure 16 Different iBoxx benchmarks considered



Source: *Frontier Economics using S&P data*
Note: *We consider iBoxx £ Non-Financials A/BBB in line with Ofgem's CoD methodology.*

111 Frontier Economics (2024), Investability Report, Section 5.4.2

Annex B – Issues with Ofwat's MAR inference and our updated assumptions underlying MAR inference

B.1 In this Annex, we describe in detail the issues that arise since Ofgem has adopted Ofwat's MAR inference from the PR24 DDs stage. We also present the detail underlying the assumptions we have used in the CoE inference. Using this set of assumptions would be consistent with inferring a CoE from more recent MAR ratios as the market would have priced in the PR24 FDs package.

B.2 Issues with the MAR cross-check adopted in Ofgem's DDs

B.2 To operationalise the MAR inference CoE cross-check, we require assumptions on: the baseline allowed equity return, outperformance, RAV growth, and of course the MAR ratios. We describe each of these below. Given that Ofgem has directly drawn on Ofwat's MARs analysis, we begin by reviewing the inference assumptions which underpin the inferred cost of equity.

B.3 In its range of scenarios, Ofwat has assumed that investors price in either 0% growth 0% performance (low), or a 2% growth 2% performance (high). We consider this set of assumptions to be unrepresentative of what can be expected of the three water companies considered in this cross-check.

(a) There is limited basis for the 0% performance assumption. As Figure figure below shows, United Utilities, South West Water (Pennon's primary regulated water business) and Severn Trent have historically been consistent outperformers in the water sector.[112] The outperformance assumptions should therefore not reflect a stylised assumption of 0% and 2% outperformance but take into account both past and expected future performance.

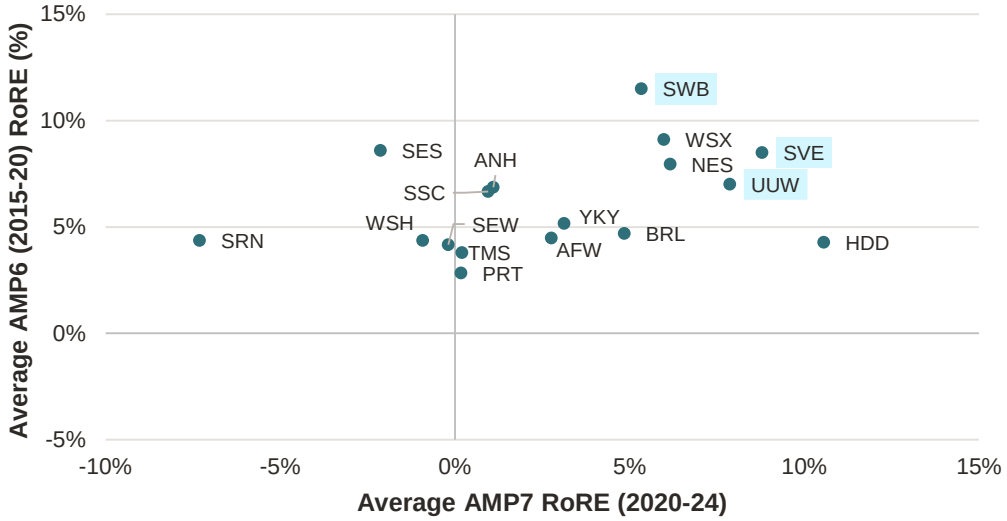
(b) There is limited basis for 0% RAV growth assumption – historically, the sector has grown by more than 2% in real terms in the last 20 years.[113] It is also widely understood that the sector has a very significant need for investment spanning multiple decades going forward. This investment is required to meet environmental standards, increase resilience to extreme weather, and meet increased demands from population growth on an ageing network. [114]

112 Similarly, the companies in question received rewards from standard or outstanding business plans as a result of the quality and ambition assessment at PR24 FDs. See Ofwat (2024), PR24 Final Determinations: Quality and ambition assessment summary, Table 1.

113 Average water sector growth from 2000 to 2020 (AMP3 to AMP6) was 2.4% per annum. See Ofwat PR24 Final Methodology, Appendix 11.

114 Independent Water Commission (2025), Final Report, para 745

Figure 17 Return on Regulatory Equity (RoRE) in the water sector over the past two price controls



Source: *Ofwat, Monitoring financial resilience (2024) and (2020)*

Note: *While some of the listed groups also own other water companies, highlighted in blue represent their main operations. Ofwat has not yet published its 2024/25 financial resilience assessment, which will cover the RoRE for the full AMP7 period (corresponding to the PR19 price control).*

B.4 Given these issues with the assumptions Ofwat has relied on, we have adapted the assumptions in our inference set out in Chapter 4 (and Annex C).

B.3 Adapted assumptions underlying the MAR inference

B.5 We now explain our alternative set assumptions, which we consider a minimum requirement as an update to Ofwat's analysis, along with an update to the time horizon that has been considered.

Baseline allowed cost of equity

B.6 First, we have reflected the allowed return at PR24 FDs in the inference model. Given that Ofwat's point estimate of the allowed return on equity increased from 4.80% to 5.10% between PR24 DDs and FDs, and given that we rely on updated MARs from March 2025, we consider this an appropriate and indeed critical step such that we incorporate how the market perceives the regulatory package. In addition, we include Business Plan Incentive awards, since these are directly comparable to a higher allowed return on equity.

B.7 The table below presents the baseline allowed cost of equity assumptions we have used in our cost of equity inference from traded MARs.

Table 6 Baseline allowed cost of equity – United Utilities

Scenario	Value	Underlying assumption
Base case	5.10% + 0.05%	PR24 final determination, including adjustment for BPI.[115]
High case		
Low case		

Source: PR24 Final Determinations

Table 7 Baseline allowed cost of equity – Pennon

Scenario	Value	Underlying assumption
Base case	5.10% + 0.30%	PR24 final determination, including adjustment for BPI.
High case		
Low case		

Source: PR24 Final Determinations

Table 8 Baseline allowed cost of equity – Severn Trent

Scenario	Value	Underlying assumption
Base case	5.10% + 0.30%	PR24 final determination, including adjustment for BPI.
High case		
Low case		

Source: PR24 Final Determinations

115 Strictly speaking we note the BPI adjustment can be classified as a kind of outperformance but we have included it here as it affects what Ofgem terms as the real return on equity, which is one of the primary assumptions required for MAR inference. The real return on equity is the sum of the baseline allowed CoE plus expected outperformance. See for example Table 16 in the ED2 Draft Determinations, Finance Annex.

Growth assumptions

B.8 Second, we have updated Ofwat's MAR inference assumptions of 0% (low) and 2% (high) growth to reflect a more realistic outlook on the water sector.

(a) Regulators' MAR inference is a perpetual model. As such, it would be appropriate to consider what a very long-term view of growth looks like.

(b) We have assumed a stylised investment cycle comprising one 'high-growth' AMP, based on average RCV growth at PR24 Final Determinations, followed by four 'business as usual' AMPs using historical average growth (AMP3 to AMP6).

(c) The five-AMP (25-year) cycle length is derived from the inverse of the average run-off rate, which is just a kind of technical asset life. This cycle repeats to 2100 to estimate a long-term RCV growth rate for the sector. This yields a long-run growth rate of 3.18% for the industry, which forms our base case. We use 2% and 4% as the lower and upper bounds for this parameter.

B.9 In the tables below, we present the RAV growth assumptions we have used in our cost of equity inference from traded MARs.

Table 9 RAV growth – United Utilities

Scenario	Value	Underlying assumption
Base case	3.18%	Modelling based on stylised investment cycle
High case	4.0%	Upper bound of growth assumption
Low case	2.0%	Growth in the sector lower than historical average

Source: Frontier Economics analysis based on Ofwat PR24 Final Determinations

Table 10 RAV growth – Pennon

Scenario	Value	Underlying assumption
Base case	3.18%	Modelling based on stylised investment cycle
High case	4.0%	Upper bound of growth assumption
Low case	2.0%	Growth in the sector lower than historical average

Source: Frontier Economics analysis based on Ofwat PR24 Final Determinations

Table 11 RAV growth – Severn Trent

Scenario	Value	Underlying assumption
Base case	3.18%	Modelling based on stylised investment cycle
High case	4.0%	Upper bound of growth assumption
Low case	2.0%	Growth in the sector lower than historical average

Source: Frontier Economics analysis based on Ofwat PR24 Final Determinations

Outperformance assumptions

B.10 It is challenging to specify outperformance assumptions as fundamentally the MAR cross-check requires the user to 'guess' the market's views of likely performance in the very long-term. Given this, a balance likely needs to be struck between forward-looking views on the performability of the prevailing price control, as well as the company's track record of performance, as we consider that investors would likely place weight on both of these aspects in their valuations.

B.11 On constructing forward-looking assumptions: at PR24, Ofwat has undertaken a risk modelling exercise looking at outcomes, totex, and financing for each company. The P10 and P90 results are reported, which are meant to reflect the range of performance observed across the sector across PR24 and not extreme possibilities.[116]

(a) The totex risk range is informed by the P10 and P90 values from the spending performance of companies across 2015-2020 (costs vs allowances).

(b) Financing risk is defined as risk relating to performance against the allowed cost of debt, split into inflationary impacts and performance on raising new

116 Ofwat (2022), Final methodology for PR24 – Aligning risk and return, Section 2

debt. The level of outturn inflation is tested as a +/-1% range around the 2% long-term CPI target to test the impact on the component of the RCV financed by fixed rate debt. For performance on raising new debt, the P10-P90 range of fixed rate issuances compared with the allowed return on new debt is presented.

(c) Outcomes risk is based on Monte Carlo modelling, where 1,000 simulations of performance were generated for each company, with a corresponding performance value for each PC for each year. These were translated into annual total ODI payments, and the 10th and 90th percentiles of payments across all simulations were calculated for each company.[117]

B.12 We note that there is an ongoing appeals process for PR24, which might imply that PR24 is a more challenging price control than envisioned that might not allow outperformance to the extent modelled. However, we think the downside risk on performance could be limited for the companies in question as they historically are among the best performers in the industry (as we discuss in the previous subsection). In any case, ascertaining the outperformance rate to perpetuity is challenging, and we note that the PR24 risk modelling remains significantly more optimistic than outturn PR19 performance for the three companies in question.

B.13 Taking all of these points together, we augment our previous approach included in the Business Plan Cross-Checks report with Ofwat's PR24 modelling to update our outperformance assumptions. We construct the high case outperformance rates based the midpoint of AMP7 outturn performance published by companies in their Annual Reports, and Ofwat's PR24 risk modelling. The base case is then this value reduced by half for each company. This approach gives weight to the calibration of the prevailing price control as well as the companies' track record of performance.

B.14 We further note that our outperformance base case is in line with what some companies have been communicating to their investors.[118]

B.15 In the tables below, we present the outperformance assumptions we have used in our cost of equity inference from traded MARs.

Table 12 Expected outperformance – United Utilities

Scenario	Value	Underlying assumption
Base case	1.75%	High case reduced by half

117 Ofwat (2025), PR24 Final Determinations – Outcomes approach to risk modelling appendix

118 See for example Pennon Group's Investor Summary following PR24 Final Determinations, p. 5

Scenario	Value	Underlying assumption
High case	3.50%	Average of PR24 FDs RoRE model, and PR19 realised outperformance
Low case	0%	No room for outperformance

Source: PR24 Final Determinations; United Utilities (2025), Annual Performance Report 2024/25

Table 13 Expected outperformance – Pennon

Scenario	Value	Underlying assumption
Base case	1.60%	High case reduced by half
High case	3.20%	Average of PR24 FDs RoRE model, and PR19 realised outperformance
Low case	0%	No room for outperformance

Source: PR24 Final Determinations; Pennon (2025), Annual Report and Accounts 2025
Note: The overall upside in RoRE terms is weighted by RCV and includes SES

Table 14 Expected outperformance – Severn Trent

Scenario	Value	Underlying assumption
Base case	2.50%	High case reduced by half
High case	5.00%	Average of PR24 FDs RoRE model, and PR19 realised outperformance
Low case	0%	No room for outperformance

Source: PR24 Final Determinations; Severn Trent (2025), Annual Performance Report 2024/25
Note: The overall upside in RoRE terms is weighted by RCV and includes Hafren Dyfrdwy.

Annex C – MAR inference

C.1 In this annex, we provide detail on how we arrived at the CoE inference based on the parameters set out in Annex B . For this inference exercise, we have employed Ofwat's model employed at PR24.[119]

C.2 Our range of 4.85% - 9.69% considers all scenarios from all MARs set out in this annex.

C.2 Inference from traded MARs

C.3 In this section, we present the inference from traded MARs.

C.4 In the table below we present our inference results based on United Utilities' traded MAR. We note that the Low Case inferred CoE for United Utilities forms the bottom end of our MAR cross-check range.

Table 15 MAR inference, United Utilities

	Calculations	Base Case	Low Case	High Case
Baseline allowed return on equity	A	5.15%	5.15%	5.15%
Expected outperformance	B	1.75%	0.00%	3.50%
Return on equity	C = A + B	6.90%	5.15%	8.65%
Projected RAV growth	D	3.18%	2.00%	4.00%
Dividend payout ratio	E = 1 - (D/C)	53.96%	61.17%	53.78%
Dividends paid	F = E x C	3.72%	3.15%	4.65%
MAR	G	1.05	1.05	1.05
Notional Gearing	H	55.00%	55.00%	55.00%
Equity Multiple	I = (G - H)/(1 - H)	1.11	1.11	1.11
Inferred CoE	J = (F/I) + C - F	6.55%	**4.85%**	8.21%

Source: *Ofwat, Frontier*

Note: *All figures are presented in real terms. The MAR value is the average of the MAR estimated using the market value of debt and book value of debt.*
Table 3 reports MAR values (G) based on data as of 31st March 2025. If updated to reflect market capitalisation as at 17 July 2025 together with FY2025 debt values, the corresponding inference range would be 6.31% , 4.65% and 7.91% for the base, low and high cases respectively.

C.5 In the table below we present our inference results based Pennon's traded MAR.

119 See Ofwat (2022), PR24 Final Methodology – Appendix 11: Allowed return on capital, Appendix A2.

Table 16 MAR inference, Pennon

	Calculations	Base Case	Low Case	High Case
Baseline allowed return on equity	A	5.40%	5.40%	5.40%
Expected outperformance	B	1.60%	0.00%	3.20%
Return on equity	C = A + B	7.00%	5.40%	8.60%
Projected RAV growth	D	3.18%	2.00%	4.00%
Dividend payout ratio	E = 1 - (D/C)	54.59%	62.96%	53.47%
Dividends paid	F = E x C	3.82%	3.40%	4.60%
MAR	G	1.01	1.01	1.01
Notional Gearing	H	55.00%	55.00%	55.00%
Equity Multiple	I = (G - H)/(1 - H)	1.02	1.02	1.02
Inferred CoE	J = (F/I) + C - F	6.91%	5.32%	8.49%

Source: Ofwat, Frontier

Note: All figures are presented in real terms. The MAR value is the average of the MAR estimated using the market value of debt and book value of debt.
Table 3 reports MAR values (G) based on data as of 31st March 2025. If updated to reflect market capitalisation as at 17 July 2025 together with FY2025 debt values, the corresponding inference range would be 7.06%, 5.45% and 8.67% for the base, low and high cases respectively

C.6 In the table below we present our inference results based on Severn Trent's traded MAR. We note that the High Case inferred CoE for Severn Trent forms the top end of our MAR cross-check range.

Table 17 MAR inference, Severn Trent

	Calculations	Base Case	Low Case	High Case
Baseline allowed return on equity	A	5.40%	5.40%	5.40%
Expected outperformance	B	2.50%	0.00%	5.00%
Return on equity	C = A + B	7.90%	5.40%	10.40%
Projected RAV growth	D	3.18%	2.00%	4.00%
Dividend payout ratio	E = 1 - (D/C)	59.77%	62.96%	61.53%
Dividends paid	F = E x C	4.72%	3.40%	6.40%
MAR	G	1.06	1.06	1.06
Notional Gearing	H	55.00%	55.00%	55.00%
Equity Multiple	I = (G - H)/(1 - H)	1.12	1.12	1.12
Inferred CoE	J = (F/I) + C - F	7.38%	5.03%	**9.69%**

Source: Ofwat, Frontier

Note: All figures are presented in real terms. The MAR value is the average of the MAR estimated using the market value of debt and book value of debt.
Table 3 reports MAR values (G) based on data as of 31st March 2025. If updated to reflect market capitalisation as at 17 July 2025 together with FY2025 debt values, the corresponding inference range would be 7.01%, 4.76% and 9.19% for the base, low and high cases respectively.

C.3 Forming the range from the available MAR cross-check evidence

C.7 We have considered all scenarios from all available MAR evidence to form the range of 4.85% - 9.69%. The bottom end of this range is represented by United Utilities' Low Case, and the top end of this range is represented by Severn Trent's High Case.

Annex D – Detail on the nuclear RAB model and Government Support Package

D.1 We give an overview of the key elements of the nuclear RAB business model and the Government Support Package below.

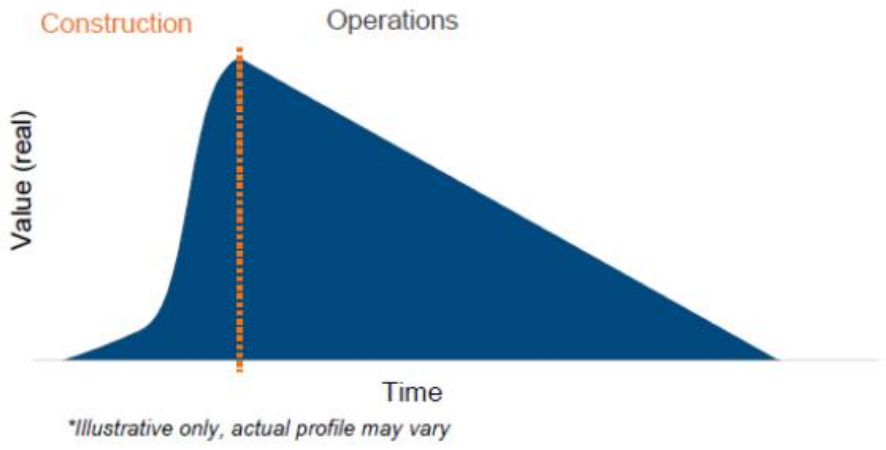
D.2 RAB business model and economic regulatory regime for nuclear

D.2 For new nuclear capacity, the Government has stated that a RAB model would require an Economic Regulatory Regime (ERR), where a project company would be allowed to receive regulated revenue entitlement (the 'Allowed Revenue') backed by a licence. In addition, for Sizewell C, the Government has stated that Allowed Revenues should be received by the developer for the **construction and operation** phases.

D.3 The allowed revenue is based on a standard set of 'building blocks' that would enable the recovery of costs by the project company (as approved by the regulator) and to generate a return on capital invested to finance those costs.

D.4 Importantly, the nuclear RAB model sets out that allowed revenues can be recovered during both the construction and operational period, with charges increasing over the construction period in line with the cumulative project spend. This is illustrated in the figure below. DESNZ has stated that this would support the derisking of nuclear build (by sharing these risks with taxpayers), and indeed, enhances the similarities between new nuclear such as Sizewell C and regulated networks.

Figure 18 Illustrative RAB balance over nuclear project life



Source: DESNZ

D.5 In terms of costs, there are two main thresholds for allowed capital costs – the Lower Regulatory Threshold ("LRT") which is based on a moderate outturn on cost and schedule, and the Higher Regulatory Threshold ("HRT") which is based on a severe outturn on cost and schedule.

- **Up to the LRT**, 100% of construction costs will be added to the RAB plus 50% of the cost savings below LRT.
- **Between the LRT and the HRT**, 50% of additional construction costs will be added to the RAB.
- When costs are **above the HRT**, and in the event further funding is unavailable from the private market, Government has committed to provide the required funding.[120] There are further protections in place, including discontinuing the project and providing compensation to investors in this event, which is discussed further in the next section. This means that there is a cap on overall totex risk.

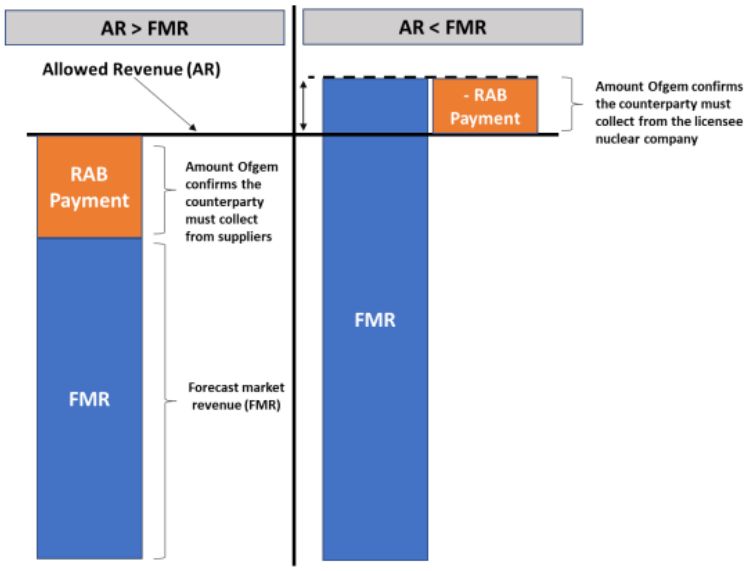
D.6 Government set out that the allowed revenue will flow to SZC via a levy on energy suppliers, and explained the role of the LCCC as the revenue collection counterparty.[121] The figure shows that LCCC will operate a true-up mechanism to the extent that SZC's Forecast Market Revenue does not match the Allowed Revenues determined using the RAB model, thereby providing a stable profile of revenues over its lifetime.[122]

120 Please see Centrica's announcement on Sizewell C, in particular PDF page 2. See also page 19 of Government Response to the consultation on the methodology to determine the IWACC, CDA, LRT and HRT in the proposed Economic Licence for SZC. We note that HMG considered that it was appropriate to set the LRT "somewhat higher than SZC's point estimate, to build in a degree of contingency against what the SoS considers represents an ambitious forecast cost, with gain share incentives on the upside with consumers to encourage SZC to control costs."

121 See Consultation outcome: Revenue stream for the nuclear regulated asset base (RAB) model.

122 The draft Economic Licence and GSP documentation provided to us were dated April 2024.

Figure 19 RAB payment mechanics in the operational phase



Source: Page 16, DESNZ (2022) Revenue Stream for the Nuclear RAB Model. Consultation in respect of revenue regulations relating to the implementation of the nuclear RAB model revenue stream.

D.7 In the operational phase, Ofgem will assume its full regulatory role, with 5-yearly periodic reviews at which it will reset the regulated return and calibrate the incentives regime. The RAB model is expected to largely insulate SZC from material market volume and price risk in this phase, as LCCC will operate a true-up mechanism to the extent that SZC's Forecast Market Revenue does not match the Allowed Revenues determined using the RAB model. This will provide a stable profile of revenues over the project lifetime.[123]

D.8 Decommissioning will be required once SZC reaches the end of its useful life. We note that the expected decommissioning costs of SZC will be addressed through a Funded Decommissioning Programme, as part of the "building blocks" making up the allowed revenue. Decommissioning typically represents material risk and/or liability for nuclear plant, and we can see that the business model specifically accounts for this aspect.

D.3 The Government Support Package (GSP)

D.9 The Government has committed to provide a support package alongside the RAB business model and ERR. The GSP is to provide protection to investors against

123 The draft Economic Licence and GSP documentation provided to us were dated April 2024.

specified low probability, high impact risks that the private sector would not be able to bear. We understand that the GSP protects against the following risks:[124]

- **Material cost and/or timeline overruns,** covered by the Contingent Financing Agreement.
  - The agreement sets out the terms on which SZC can obtain financing in case the HRT is reached.
  - More generally, the agreement sets out the terms under which the Government will provide support in case of material time or cost overruns.
- **The right to discontinue the project,** covered by the Discontinuation and Compensation Agreement.
  - The agreement enables the Secretary of State and the SZC investors to discontinue the project under certain circumstances.
  - The level of compensation to debt and equity investors is set depending on the discontinuation circumstances.
- **Liquidity risks,** covered by the Government Liquidity Facility Agreement.
  - The agreement offers a revolving loan facility to SZC to support debt liquidity, though there are provisions in place to discourage its use and protect public funds.

Other elements of the package include agreements to cover a Special Administration Regime, the provision of nuclear-specific insurance (which may not always be commercially available), and the conditions under which revenue allowances under the regulatory framework can be adjusted.

124 DESNZ (2025), Sizewell C: government support package

Annex E – DGM annex

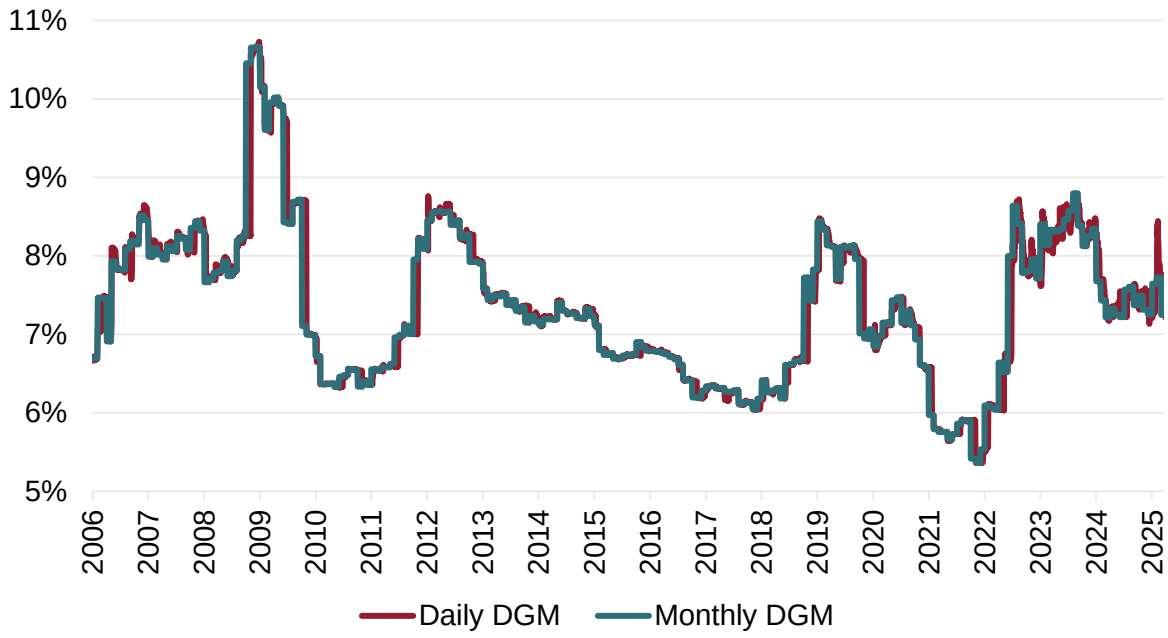
E.1 Methodological updates to our DGM analysis

Frequency of data

E.1 The DGM analysis presented in this report is based on a daily frequency of data. Using daily data better captures equity market events and provides more detail on current market conditions.

E.2 As shown in the figure below, the overall shape and levels of our DGM are consistent with those produced using a monthly specification, as in our Business Plan Cross-Checks Report.

Figure 20 DGM-implied TMR (CPIH-real): Daily vs Monthly Data



Source: Frontier Economics analysis

Outliers in the TMR Glider equation

E.3 As detailed in this report and in our previous 'TMR Glider Report',[125] the TMR Glider relies on an estimated linear relationship between DGM-implied TMRs and 20-year gilt yields, using data from 2006 to 2025. To provide a better fit, the linear

[125] Frontier Economics (2024), The relationship between total market return and gilt yields

regression model controls for historical periods of high volatility in financial markets, as reflected in the FTSE UK 30-day volatility index (i.e. the 'VIX').

E.4 The daily analysis controls high-volatility periods by including a dummy variable equal to 1 when the VIX on a given day exceeds two standard deviations above the mean over the period 2006-2025, and 0 otherwise. The monthly analysis adopts a similar approach, controlling for two main sustained periods of high volatility: February 2008 to April 2009 (the Global Financial Crisis), and from February to June 2020 (the Covid-19 pandemic).

E.2 Application of DGM is widespread

E.5 The DGM is widely endorsed in core finance textbooks and academic literature as a reliable tool for valuing equity. Damodaran's *Investment Valuation* (2012)[126] describes the DGM as the simplest method for valuing equity, both to individual companies and to the entire market. The model's various forms, from the simple growing perpetuity to multi-stage growth models, have "proven to be surprisingly adaptable and useful in a wide range of circumstances" (p. 340).

E.6 The widespread application of the DGM across various sectors reinforces its role as a trusted tool in equity valuation, underscoring its practical value. As shown below, the model is employed by central banks, regulatory bodies, and academic researchers.

Central banks

E.7 **Bank of England (BoE)**: In 2004, the BoE assessed the long-tern equity return predictability in the UK using several empirical models motivated by the DGM, and found that dividend yields can predict long-term returns under certain conditions[127]. In 2017, the BoE described the DGM as a simple model that can be used to estimate the ERP and to understand the drivers of past movements in equity prices. At the same time, it introduced an improved version of the DGM incorporating share buybacks and time variation in long-term growth expectations, which closely resembles the DGM applied in our report[128].

E.8 **Banco de España (BdE)**: In 2022, the BdE estimated the ERP using data from the Eurostoxx 50 from 2001 to 2021 and applying different DGM specifications. It concluded that the three-stage DGM, dividing dividend growth into an extraordinary, transitional and steady-state phase, delivered the highest forecast accuracy. The study also highlighted the importance of incorporating share

126 Damodaran, A. Investment Valuation, 3rd ed. (Wiley, 2012)

127 Bank of England, Long-Horizon Equity Return Predictability: Some New Evidence for the United Kingdom, (Working Paper No. 244, 2004)

128 Bank of England, An improved model for understanding equity prices (Quarterly Bulletin 2017 Q2)

buybacks in the DGM to reflect the additional shareholder payments during the COVID-19 pandemic[129].

E.9 **European Central Bank (ECB)**: In 2018, the ECB described the DGM as "the workhorse model to derive the cost of equity and the ERP",[130] and proposed various improvements to the model. These included accounting analysts' short-term earnings forecasts and accounting for share buybacks. Given the uncertainty in the estimates, the ECB recommended focusing on the dynamics, i.e. how the ERP evolves over time, rather than on its exact level.

Regulatory bodies

E.10 **Australia:** The Independent Pricing and Regulatory Tribunal (IPART), which regulates energy markets in New South Wales (Australia), estimates the ERP by relying on five different DGM models. Specifically, the market risk premium is set at the midpoint between 'historic' estimates, defined as the arithmetic average of past excess market returns over the risk-free rate, and a 'current' estimate. The 'current' estimate is derived by giving a two-thirds weight to the median outcome of five DGM models and one-third weight to a market indicator estimate.

E.11 **The United States:** Some US Public Service Authorities (PSAs) rely on the DGM to determine the allowed return on equity. For example, in the New York PSA's regulation of Consolidated Edison, Inc., which is one of the largest investor-owned energy companies in the country, the authorised equity return is based on a weighted average between the outcome of CAPM (one-third) and DGM (two-thirds).

Academic studies

E.12 **Chen, Da, & Zhao (2013)**[131] is a widely cited study that examines stock price movements by applying an Implied Cost of Capital (ICC) model, a DGM-based approach that decomposes the drivers of stock price movements into two components: changes in expected cash flows and changes in expected discount rates. The authors find that cash-flow news dominate discount-rate news for horizons over two years, both at the firm level and at the aggregate market level.

E.13 **Damodaran (2024)**[132] compares the accuracy of three approaches to estimating the S&P 500 ERP: *investor and manager surveys*, which depend on who you ask and how you frame the question; *historical premiums*, which vary significantly with

129 Banco de España, Measuring the ERP with dividend discount models (Documentos Ocasionales, no.2207, 2022)

130 ECB, Measuring and interpreting the cost of equity in the euro area (ECB Economic Bulletin, Issue 4/2018)

131 Chen, L., Da, Z., & Zhao, X., What Drives Stock Price Movements? (The Review of Financial Studies, 2013)

132 Damodaran, ERPs (ERP): Determinants, Estimation, and Implications (The 2024 Edition)

choices about sample period and averaging method; and *implied premiums*, estimated with a DGM that incorporates share buybacks. While the implied premium does not hold predictive power over one-year horizons, it is the strongest predictor of the ERP over five- and ten-year periods.

Annex F – Calibrated DGM methodology

F.1 This annex provides further detail on the Calibrated Dividend Growth Model (CDGM). In particular, it explains how the CDGM addresses Ofgem's main critique of the standard DGM, i.e. the reliance on a long-run dividend growth assumption, and how it operates in practice.

F.2 Long-run dividend growth assumption in DGM

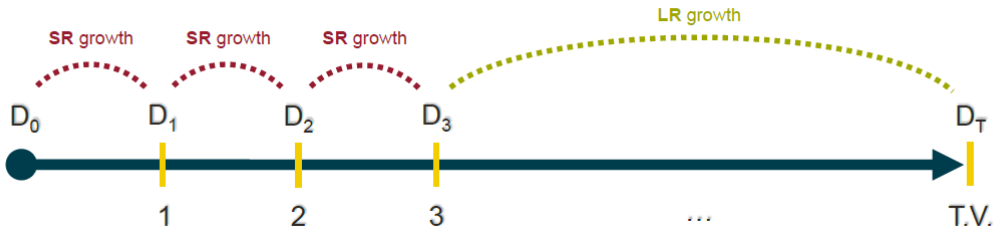
F.2 One of Ofgem's criticisms of the DGM at the DDs concerned the model's assumption on the long-run dividend growth rate. The CDGM isolates the effect of that assumption, and therefore serves as a robustness check on the outputs of the DGM. This section provides further context for the long-run dividend growth rate assumption and the CDGM.

A recap of the Dividend Growth Model (DGM)

F.3 The DGM is a standard method for calculating the expected forward-looking return on a security, based on the fundamental assumption that the present value of a dividend is the sum of all its future dividends discounted to the present.

F.4 The model is typically used in one of two forms; (i) a constant growth model, or (ii) a two-stage DGM.[133] The two-stage model is used to calculate the current present value of expected future dividends (or current index price) for a stock that is expected to grow dividends at different rates over different periods.

F.5 As shown in the following diagram, our model assumes a short-run growth rate for dividends in the first three years, and a long-run growth rate for a terminal dividend value from year 3.



F.6 More specifically, our two-stage DGM estimates the forward-looking TMR by solving for the r in the formula below. The resulting r is the expected return that equates the index price today to the sum of future dividends in present value terms:

133 Multi-stage DGM models are also sometimes applied, which have multiple periods before eventually introducing a long-term growth assumption.

$$(1) \qquad P_0 = \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \frac{D_3(1+g)}{(1+r)^3(r-g)}$$

where:

(a) P_0 is the current UK stock market index.

(b) D_1, D_2, D_3 represent the expected dividends per share of each of the first three periods, calculated using the initial dividend value, D_0, and a constant short-term growth rate, f:

(i) $D_1 = D_0 * f$

(ii) $D_2 = D_1 * f$

(iii) $D_3 = D_2 * f$

(c) r is the required rate of return.

(d) g is the expected future growth rate in perpetuity.

F.7 For more detail on the DGM, please refer to the Annex A of our March 2024 TMR Glider Report.[134]

The long-run dividend growth assumption in DGM

F.8 To solve for the forward-looking TMR, r, in equation (1), data is needed to populate all other variables in the equation. While there is historical data available on short-term dividend forecasts, there is no directly observable data on the expected long-term dividend growth rate, g. Therefore, this parameter needs to be estimated.

F.9 Our DGM uses long-term forecasts of UK nominal GDP from the International Monetary Fund (IMF) as a proxy[135]. In other words, the model assumes that*, in the long run, dividends grow in line with GDP growth*. While no assumption is perfect, this is our preferred approach since it is stable, credible and is commonly used.[136]

F.10 Annex A of our TMR Glider Report compares Frontier's DGM outputs to those from the Bank of England in their 2017 paper *An Improved Model for Understanding Equity Prices*. The two sets of DGM outputs match very well in terms of the rise and fall of the expected TMR, which provides confidence in our DGM specification used for this report.

F.11 While the choice of long-term dividend growth rate is well justified, we go a step further to address Ofgem's concerns by introducing the CDGM methodology as a robustness check on DGM outputs that isolates the impact of the long-term

134 Frontier Economics (2024), The Relationship Between Total Market Return and Gilt Yields

135 The IMF publishes 5-year nominal GDP forecasts on a semi-annual basis.

136 Please refer to Section 8.3 of this report for more detail.

dividend growth assumption. The rationale behind this approach is explained below.

F.3 Purpose of the CDGM

F.12 Like the standard DGM, the CDGM equates the UK stock market index price on a given day to the net present value of all future dividends. However, it introduces a calibration step: the long-run dividend growth rate, g, is adjusted so that the historical average of the resulting TMR aligns with a predefined target. In this case, the target is 9.06% nominal, which reflects Ofgem's 125-year ex-post average TMR of 6.92%, adjusted to nominal terms using a 2.0% CPIH figure.

F.13 More specifically, the CDGM endogenously solves for the long-run dividend growth rate, g, by applying equation (1) to each time period from 1900 to 2025, such that the average of all the resulting TMRs matches Ofgem's ex-post historical average over the same time period. The analysis therefore matches the time period of Ofgem's average return calculation to ensure comparability.

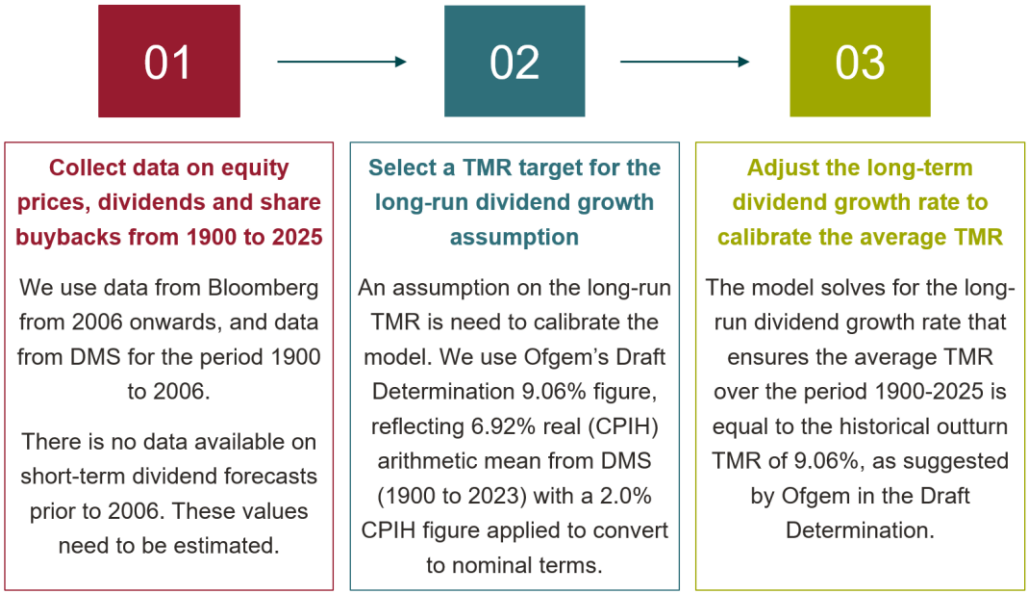
F.14 The CDGM provides a long-run dividend growth rate and a corresponding TMR for each point in time. By construction, the CDGM output cannot inform on the right estimate of TMR, as it is calibrated such that its average matches a predefined target. Instead, it provides a way to determine whether our DGM-implied TMR is high or low in an unbiased manner, by addressing the subjectivity of the long-run growth rate assumption. In this sense, while the CDGM cannot be a cross-check for the TMR itself, it serves as a robustness check on the DGM output.

F.15 Since the CDGM removes the impact of the long-term dividend growth rate assumption, if the CDGM-derived TMR is in line with or higher than the DGM output, this indicates that our DGM implied TMR is not inflated due to this assumption; it reflects market conditions above the long-run historical trend.

F.4 How the CDGM works in practice

F.16 In practice, the CDGM is implemented in three steps, as shown in Figure 1 below.

Figure 21 CDGM in three steps



Source: Frontier analysis

F.17 First, we need data on the variables that reflect prevailing market conditions over the 1900-2025 period. For 2006 onwards, we use Bloomberg data on the FTSE All-Share Index (used for P_0 in the equation) and the short-term dividend forecast (D_1, D_2, D_3). Bloomberg data is also used to incorporate share buybacks into dividend values, reflecting more accurately the total cash returns to investors.[137]

F.18 However, Bloomberg does not provide complete data prior to 2006 on the stock market index or short-term dividend forecasts. To address these data gaps, we adopt the following measures:

(a) **Stock market index**: We rely on historical stock market returns from 1900 to 2006 using the Dimson-Marsh-Staunton (DMS) dataset, in line with Ofgem's historical estimates of the TMR.

(b) **Short-term dividend forecasts**: We apply a regression-based back-casting technique that estimates historical short-term dividend forecasts prior to 2006, using more recent forecast data. This method is detailed in Section F.5 below.

(c) **Buyback adjustment**: We apply an uplift to the back-casted short-term dividend forecasts prior to 2006, to ensure consistency with more recent dividend values that already incorporate share buybacks.

137 All these data sources are in line with those used in our standard DGM analysis, as listed in Annex B of our March 2024 TMR Glider Report.

F.19 Second, we select a TMR target to calibrate the long-term dividend growth rate. We use a 125-year average outturn TMR of 9.06%, derived from the DMS dataset over the period 1900-2025. This figure reflects Ofgem's CPIH-real average of 6.92%, converted to nominal terms using a CPIH rate of 2.0%. This approach ensures the alignment of DGM with benchmarks and sources regulators are familiarised with.

F.20 The third step is the calibration itself. We adjust the long-term dividend growth rate (g) until the average TMR over the period 1900-2025 is equal to the target TMR, in this case the historical outturn of 9.06% (in nominal terms, based on a 2.0% CPIH).

F.5 Regression-based back-casting technique

F.21 The CDGM equates the current index price to the sum of future dividends in present value terms for each time period from 1900 to 2025, calibrating the long-run dividend growth rate such that the average of the resulting TMRs matches the average outturn TMR of 9.06% over the same period. Accordingly, the calibration step of CDGM requires data on equity prices, dividends, and share buybacks for each time period from 1900 to 2025.

F.22 The main challenge with the CDGM approach is the lack of complete data on short-term dividend forecasts prior to 2006. To run the model, forecast data on dividend yields one, two, and three years ahead, i.e. D_1, D_2, and D_3 in equation (1), is required for 1900 onwards. However, existing data from Bloomberg is only available from 2006, and the DMS database does not provide data on short-term dividend forecasts.

Methodology and key assumptions

F.23 To address this data gap, we apply a back-casting technique to forecast the historical short-run dividend forecasts, based on the more recent data we have available.

F.24 The key assumption underlying the back-casting technique is that the relationships observed in recent data are representative of the pre-2006 period. To strengthen the validity of this assumption, we focus on the period from 2010 to 2025, despite having short-term dividend forecasts data from 2006 onward. This is to avoid distortions caused by the heightened volatility during the 2008-2009 Global Financial Crisis.

F.25 Our chosen approach is a linear regression model that regresses short-term dividend forecasts on other contemporaneous variables observed after 2010. We then apply the estimated relationship to earlier periods and infer historical short-

term dividend forecasts for dates prior to 2006. and our preferred approach underlies the CDGM outputs presented in the main body of this report.

F.26 Our preferred specification takes the following form:

$$D_{3\mathrm{F},t} = \beta_0 + \beta_1 D_{0,t} + \beta_2 D_{0,t-1} + \beta_3 GR_t + \varepsilon_t$$

where:

(a) β_0 is the intercept of the linear regression model.

(b) $D_{3F,t}$ is the three-year ahead dividend yield forecast made by analysts at each month, t, from 2006 to May 2025.

(c) $D_{0,t}$ is the contemporaneous dividend yield observed ex-post for each month, t, in which a forecast is made.

(d) $D_{0,t-1}$ is the lag of the contemporaneous dividend yield, i.e. the dividend yield observed ex-post for each month preceding the month in which a forecast is made.

(e) GR_t is the UK nominal GDP growth rate observed for the same month in which the forecast is made, based on the index series published by the Office for National Statistics (ONS).

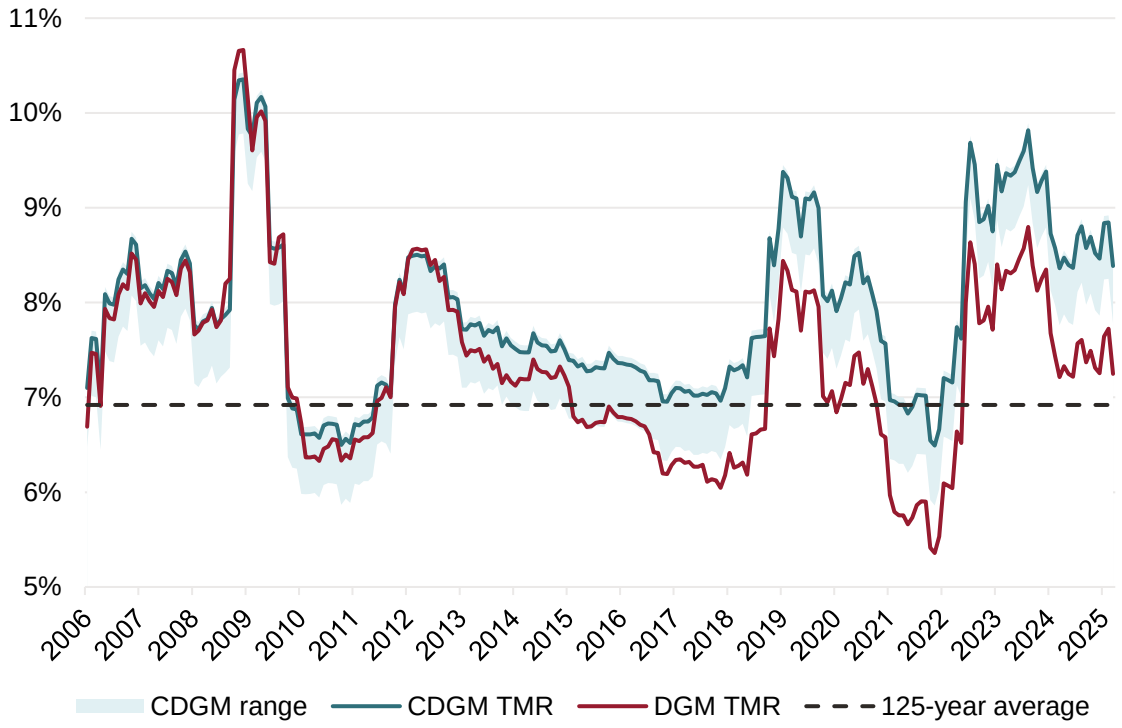
(f) ε_t is the error term of the linear regression model, which captures the variability in $D_{3\mathrm{F},t}$ that is not explained by our predictors.

F.27 Two variables with yearly historical data extending back to 1900 were considered for the analysis: gilt yields and UK nominal GDP growth rate. Of these, only the latter is included in the final specification, as it is the only predictor sufficiently correlated with forecast dividend yields to improve the adjusted R-squared. The chosen number of lags balances model fit and model complexity, according to statistical tests such as Bayesian Information Criterion (BIC) score.[138]

F.28 We have tested four alternative specifications, and the figure below shows that the main conclusion of the CDGM analysis holds regardless of which specification is used to back-cast short-term dividend forecasts prior to 2006. Specifically, the result presented in the main body of the report, i.e. that the DGM-implied TMR is high in an unbiased way, is robust to the choice of the regression model in the back-casting step.

[138] The BIC score is defined as $BIC = \ln(n) * k - 2\ln(L)$, where n is the sample size, k is the number of estimated parameters in the model (including lagged values), and L is the maximum value of the likelihood function. The BIC therefore penalises model complexity through k and rewards model fit through L.

Figure 22 CDGM-based & DGM-based TMRs (CPIH-real)



Source: *Frontier Economics analysis*

Note: *The CDGM range captures the maximum and minimum CDGM-implied TMRs for each period and across the different specifications.*