Oxera

What is the link between debt indexation and allowed returns?

Prepared for Energy Networks Association

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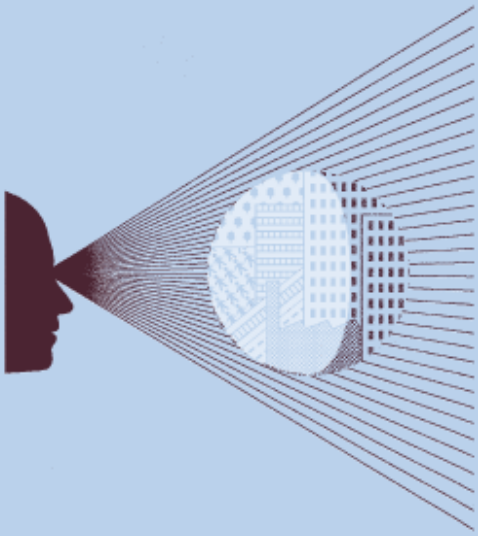

Executive summary

The fixed allowance approach that Ofgem has historically taken to the cost of debt included a margin over the ten-year average yield as explicit allowance for risk that the market cost of debt increases over the price control period. This risk is borne by equity, and, although compensation for the risk is presented as a margin in the fixed cost of debt allowance, the impact is to increase the expected returns to equity. The margins between the fixed cost of debt allowances for GDPCR and DPCR5 and the ten-year trailing average that is proposed as the cost of debt index were approximately 30bp.

Indexation of the cost of debt allowance has the potential to transfer the risk of changes in the market cost of debt away from the company. However, the effectiveness of the risk transfer depends on the extent to which the cost of debt index accurately tracks a company's actual weighted average cost of debt. While companies may have some flexibility to adjust their financing structures to achieve a better match with the index, many factors that influence a company's choice of financing structure are outside the company's control. These include, for example:

– the size and profile of CAPEX programmes;
– the efficient size of debt issues;
– restrictions imposed by capital market institutions.

The key issue when moving from a fixed to an indexed allowance for the cost of debt is therefore the impact on risk, and thus the adjusted margin that is required as compensation for the residual risk that remains under indexation. The overarching principle of the analysis is for companies to be faced with the same trade-off between risk and expected return under debt indexation as under the current fixed allowance regime.

The margin in the fixed cost of debt allowance is entirely separate to the margin in the risk-free rate component of the cost of equity allowance. Since the cost of equity is not being indexed, the impact on required returns as a result of debt indexation is limited to the required margin on debt.

The modelling presented in this report measures the proportion of cost of debt risk that is removed by indexation under different scenarios, which have been chosen to reflect the constraints faced by individual companies regarding their choice of financial structure. The modelling confirms that, in theory, indexation can eliminate all cost of debt risk, and hence eliminate the required margin in the cost of debt allowance relative to the ten-year average of yields. However, by relaxing some of the assumptions that are necessary if the cost of debt index is to match exactly the company's actual cost of debt, the residual risk under debt indexation relative to a fixed allowance can be quantified. The main drivers of risk are:

– **the proportion of existing debt that is refinanced during the price control**—if only 40% of debt is refinanced (compared with the 80% that is necessary to match the index perfectly), and there is no RAV growth, the cost of debt risk is the same under both indexation and the fixed allowance. If less than 40% of debt is refinanced, risk is higher under indexation than with a fixed allowance;

– **the size of the CAPEX programme**—very large CAPEX programmes (eg, 400% RAV growth) will lead to some residual cost of debt risk with indexation, although risk is lower than with a fixed allowance;

– **the frequency of debt issuance**—a company that issues debt relatively infrequently is exposed to the risk that its actual cost of debt differs from the annual average yield that

is used to calculate the index. This impact is compounded if the company issues debt less than once per year.

The analysis shows that, if the assumptions necessary for the company to match exactly the cost of debt index do not hold, the company will be exposed to residual risk from changes in the market cost of debt. For companies to face the same risk and expected return trade-off as under either a fixed allowance with a margin above the ten-year average yield, or indexation based on ten-year average yields, it is necessary to set the margin consistent with the level of residual risk exposure.

Although all companies will be exposed to some degree of residual cost of debt risk, this exposure will vary across companies, and the consistent amount of margin to be retained on the cost of debt will therefore also vary.

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1 Introduction

Ofgem's approach to setting the cost of debt allowance has historically been to consider the evidence—with particular focus on the ten-year trailing average of yields on a ten-year sterling corporate bond index—and to set a fixed allowance above this ten-year average.[1] The role of the margin between the fixed allowance and the ten-year average was to provide companies with a degree of protection against the risk of the cost of debt rising during the price control period.

In the RIIO strategy decision, a new approach is outlined whereby the cost of debt allowance is linked to an index and updated annually rather than being fixed for the duration of the price control period.[2] The significant degree of uncertainty over the future path of interest rates is identified as a key driver of the decision to switch from a fixed to an indexed allowance, and indexation is considered the most robust option for protecting both companies and consumers.[3]

There is an unresolved question in relation to the interaction between debt indexation and risk, however. Ofgem's current proposal to set the cost of debt at the ten-year trailing average with no allowance for headroom implies that indexation eliminates all risks associated with the cost of debt:

> The introduction of indexation removes the need for such so-called 'headroom' in the cost of debt allowance.[4]

In contrast, companies have raised concerns about the risks associated with debt indexation and, importantly, that these risks are difficult if not impossible to hedge:

> The main argument against indexation is that no hedging mechanisms exist to protect the companies against movements in the index, which could push the companies to 'track' the index by issuing 10-year bonds on an annual basis.[5]

The risks associated with debt indexation are heavily dependent on whether 'how companies choose to finance themselves is a matter for their management'.[6] In practice, companies' freedom of choice over their financing structure may be constrained by a number of factors, as highlighted by respondents to the RIIO strategy consultation, which include the following.

– **The size and profile of CAPEX programmes**:

> Evidence suggests the profile of capital expenditure for the electricity and gas transmission and distribution sectors is not even when considered over periods of 5, 7 or 10 years. A trailing 10-year index gives no allowance for any requirement to raise debt substantially above an average level to reflect significant medium-term investment

[1] Ofgem (2011), 'Decision on strategy for the next transmission and gas distribution price controls—RIIO-T1 and GD1 Financial issues', para. 3.22.
[2] Ibid., pp.18–30.
[3] Ibid., para. 3.23.
[4] Ofgem (2010), 'Consultation on strategy for the next transmission and gas distribution price controls—RIIO-T1 and GD1 Financial issues', para. 3.38.
[5] Ofgem (2011), op. cit., para. 3.16.
[6] Ofgem (2010), op. cit., para. 3.18.

requirements. An index would seem to increase the potential to penalise even the most efficient companies in situations where capex and funding exceeds an average level.[7]

– **Efficient size of debt issues**:

it is not possible for companies to issue bonds in small sizes, say £5–10 million, each day or as investment needs arise and to achieve an efficient cost of funding. There is not enough investor appetite for securities issued in this manner, and there are comparatively higher administrative costs to such a route.[8]

– **Restrictions imposed by capital market institutions**:

The timing of the refinancing of a company's debt depends on a number of factors e.g. maturity profile of debt, credit rating agency restrictions designed to protect liquidity, bank covenants and the state of the markets.[9]

Ofgem has recognised the impact of potential financing constraints by undertaking modelling that demonstrates that, under the current debt indexation proposals, a company raising debt to fund a large CAPEX programme in an environment of rising interest rates would expect to recover less than its actual cost of debt.[10] This indicates that debt indexation may leave some companies with significant residual exposure to the risk of changes in the market cost of debt.

Ofgem also engaged advisers to assess the extent to which network companies currently hedge against the fixed allowance.[11] The advisers considered hedging in both a 'financial sense', concluding that indexation had no impact, and an 'economic sense', where it is acknowledged in a number of places that residual risk would remain under debt indexation:

Even with perfect hedging of underlying gilts relative to an Ofgem reference, firms would not have perfect hedges of their total cost of debt relative to an Ofgem reference[12]

and:

We do consider it plausible that the imperfection of hedges might be greater with a cost of debt indexation mechanism.[13]

The analysis undertaken by Oxera for this report aims to measure the proportion of financing risk that is removed by debt indexation under various scenarios, and thus allow assessment of a consistent adjustment to the margin between the allowed cost of debt and the ten-year average of yields. The overarching principle of the analysis is for companies to be faced with the same trade-off between risk and expected return under debt indexation as under the current fixed allowance regime.

The analysis is conducted on a stylised basis to identify the drivers of residual risk exposure and to illustrate general principles. As such, the analysis does not necessarily represent the situation of any individual company, which will inevitably involve a combination of different risk drivers.

[7] Bank of America Merrill Lynch (2011), 'Response to Ofgem Consultation on RIIO-T1 and RIIO-GD1 Financial Issues', February 4th.
[8] Ibid.
[9] AMP Capital response to RIIO Strategy Consultation.
[10] Ofgem (2011), op. cit., Figure 3.7.
[11] Ofgem (2011), op. cit., para. 3.25.
[12] Europe Economics (2011), 'The Weighted Average Cost of Capital for Ofgem's Future Price Control—Phase III report', para. 3.24 (c).
[13] Ibid., para. 3.24 (d).

2 Analytical approach

There are two steps to the analytical approach:

– understanding how risks due to changes in the market cost of debt are recognised under the pre-RIIO price controls (GDPCR, TPCR4, and DPCR5), and hence how changes in this source of risk under debt indexation can consistently be translated into changes in allowed returns;

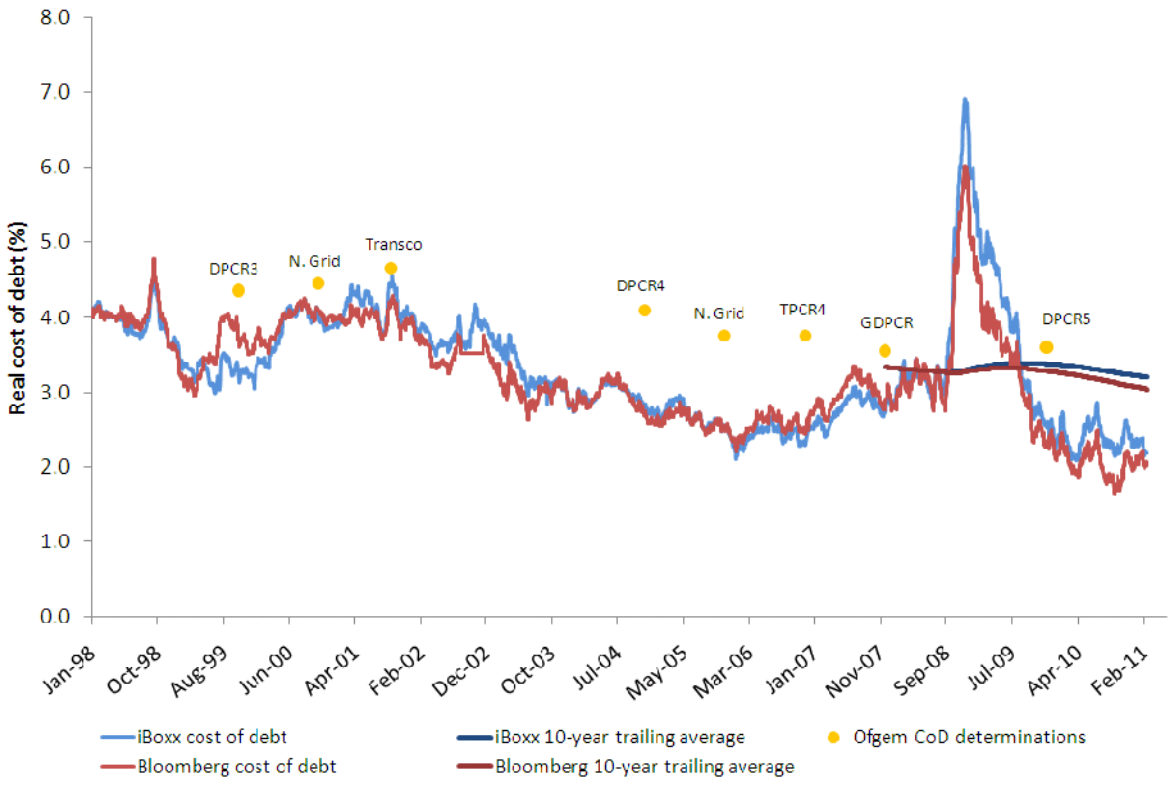
– modelling the difference in the risk and expected return trade-off under debt indexation compared with a fixed allowance, and identifying the main drivers of residual risk under debt indexation.

This section describes these two steps.

2.1 Link between risk and allowed returns

Ofgem has previously set the cost of debt for regulated energy networks above ten-year trailing averages of corporate bond yields. A margin of approximately 30bp between the cost of debt allowances for GDPCR and DPCR5 and the ten-year trailing average is measured by the difference between the yellow circles and the dark red and dark blue lines in Figure 2.1, presented in Ofgem's RIIO strategy decision document.

Figure 2.1 Margin between cost of debt allowance and ten-year average



Source: Ofgem (2011), 'Decision on strategy for the next transmission and gas distribution price controls—RIIO-T1 and GD1 Financial issues', Figure 3.4.

Ofgem and other regulators have also tended to set the risk-free rate component of the cost of equity higher than that implied by capital markets at the time of the price control determination.[14] This is due to a view that the costs of over- and underestimating the risk-free rate are asymmetric, and that greater weight should be attributed to the risk that an increase in market rates during the price control period could make equity investment a negative-net-present-value decision, and hence create an underinvestment problem. Since Ofgem is not proposing to index the cost of equity, the impact on required returns as a result of debt indexation is limited to the required margin on debt.

There is, nevertheless, an interaction between debt indexation and required return on equity. For a regulated network that is partly financed by debt, a fixed cost of debt allowance introduces the risk that actual financing costs deviate from the costs that are recovered from customers. This risk would be expected to be priced into required equity returns. However, in past determinations, rather than explicitly increasing allowed equity returns as compensation for this risk, Ofgem has adjusted the cost of debt (and hence the overall weighted average cost of capital) by setting a cost of debt allowance above the ten-year trailing average.

> In the past, Ofgem tended to look at the ten-year trailing average on ten-year sterling (GBP) corporate bonds, as well as additional evidence, and then set a fixed allowance that was higher than observed rates in order to protect the network companies against the risk of the cost of debt rising during the price control period.[15]

However, since any shortfall between the allowed cost of debt and the actual cost of debt will be borne in full by equity rather than debt, the margin above the ten-year average allowed by Ofgem is similar to an insurance premium[16] that equity holders receive as compensation for bearing the risk of a fixed allowance.[17]

To the extent that debt indexation reduces risk, it would be consistent for investors to require a lower return on equity by accepting a lower margin on the allowed cost of debt. In an extreme case, where debt indexation completely protects the company from the risk that its actual cost of debt deviates from the cost of debt allowance, the appropriate adjustment would be to remove the margin on the cost of debt. In cases where circumstances suggest that debt indexation will not affect risk, or will even increase risk, it would be appropriate to maintain or increase the margin in the cost of debt allowance by remunerating companies at 30bp or more above the cost of debt index.

The modelling exercise described in section 2.2 therefore compares two approaches to setting the cost of debt allowance:

– fixed allowance set at 30bp above the current ten-year trailing average of the market cost of debt;
– indexed allowance set at the ten-year trailing average of the market cost of debt, and updated annually throughout the eight-year modelling horizon.

This modelling approach enables a comparison of both risk and expected return under debt indexation against the approach taken in past Ofgem determinations. Moreover, the modelling allows the drivers of residual cost of debt risk under indexation to be analysed, and quantification of the reduction (or increase) in risk that is achieved by moving from a fixed

[14] See Oxera (2011), 'What is the cost of equity for RIIO-T1 and RIIO-GD1?', report prepared for Energy Networks Association, February 4th, section 2.3.

[15] Ofgem (2011), 'Decision on strategy for the next transmission and gas distribution price controls—RIIO-T1 and GD1 Financial issues', para. 3.22.

[16] An alternative approach to valuing the cost of debt risk as an insurance premium is to apply an option-pricing framework.

[17] This is entirely different from the margin that tends to be incorporated in the risk-free rate for the purpose of setting the cost of equity, the justification for which (as described above) is unaffected by indexation of the cost of debt, since no such indexation is proposed for the cost of equity.

allowance to indexation. The change in risk is defined as the change in the normalised standard deviation of return on equity (ROE).

Individual companies are likely to vary in their exposure to the different drivers of residual risk under debt indexation, and therefore also experience different changes in risk by moving from a fixed to an indexed allowance. Although there is no analytical model for translating the results of the Oxera model into the appropriate margin over the ten-year average cost of debt index, for individual companies the *percentage change* in the normalised standard deviation of ROE that is the result of the move from the fixed allowance approach to indexation (under scenarios that capture company-specific circumstances) could be taken as a proxy for the appropriate percentage change in the margin. For example, a scenario that models the financing profile of a particular company might result in an expected ROE of 7.5% with a standard deviation of 50bp under the fixed allowance (including a cost of debt margin over the ten-year average yield), and an expected ROE of 7.0% with a standard deviation of 25bp under indexation (with no margin over the ten-year average). The normalised standard deviation—dividing the standard deviation by the expected return—is 6.7 under the fixed allowance and 3.6 under indexation. Since the normalised standard deviation is 46% lower under indexation, the appropriate margin for cost of debt risk is 46% lower. Based on the approximate 30bp margin in the cost of debt that companies have earned in the past, the appropriate margin for residual risk under debt indexation in this example is approximately 16bp.

2.2 Debt indexation modelling

All the modelling is performed in real terms for a stylised notional company using the following core assumptions:

- no out- or underperformance on regulatory assumptions: actual OPEX and CAPEX (and depreciation and RAV growth) exactly match forecast OPEX and CAPEX (and depreciation and RAV growth);
- CAPEX is funded at the notional level of gearing with dividends and net equity issuance adjusting to maintain static gearing;
- a cost of equity of 7% at 65% gearing;
- price control starts in April 2011—this removes uncertainty in the cost of debt over the next two years;
- in the past, companies issued debt at the annual (April–March) average of Ofgem's cost of debt index, where the historical data for the cost of debt is taken from the spreadsheet published by Ofgem;[18]
- the allowed cost of debt under debt indexation is calculated as the ten-year trailing average up to March 31st of the previous year—this assumes that the index is applied without any time lag;
- the allowed cost of debt under a fixed allowance is set at 3.5%, which is equal to the current ten-year trailing average up to April 2011 plus 30bp of headroom;[19]
- a straight-line depreciation profile consistent with asset lives in Ofgem's latest decision for electricity transmission (20 years for existing assets, 45 years for new assets).[20]

Using the assumptions above, the model calculates key equity and credit metrics, including ROE and post-maintenance interest coverage ratio (PMICR). To analyse the residual risk under debt indexation versus a fixed allowance, different paths for the annual change in the cost of debt are simulated using Monte Carlo analysis. All scenarios assume that the market cost of debt starts at 2.4%,[21] and that the annual change in the cost of debt is normally

[18] Ofgem (2011), 'Cost of debt indexation model: RIIO-T1 and GD1'.

[19] The ten-year trailing average is based on the data provided by Ofgem, which is available only up to March 11th 2011.

[20] The model has also been tested using the depreciation profile and asset life assumptions for gas transmission and gas distribution. Results have been found to be robust under these alternative specifications.

[21] The average for April 2010–March 2011 based on Ofgem's data.

distributed with a standard deviation of 0.5%.[22] Various scenarios for the average annual change were considered. The paths of Ofgem's proposed cost of debt index from its starting point of 3.2% were modelled based on the simulated paths for the market cost of debt.

The resulting distributions of the key equity and credit metrics are compared under various scenarios to assess the change in risk. Specifically, the percentage change in the normalised standard deviation (defined as the ratio of standard deviation to the mean) under debt indexation compared with a fixed allowance is analysed. Rather than measuring the absolute change in risk under indexation, the normalised standard deviation captures the change in risk relative to the change in expected equity return, thereby allowing the trade-off between risk and expected return to be assessed.

[22] Based on the historical within-year standard deviation of yields from the annual average yield.

3 Results

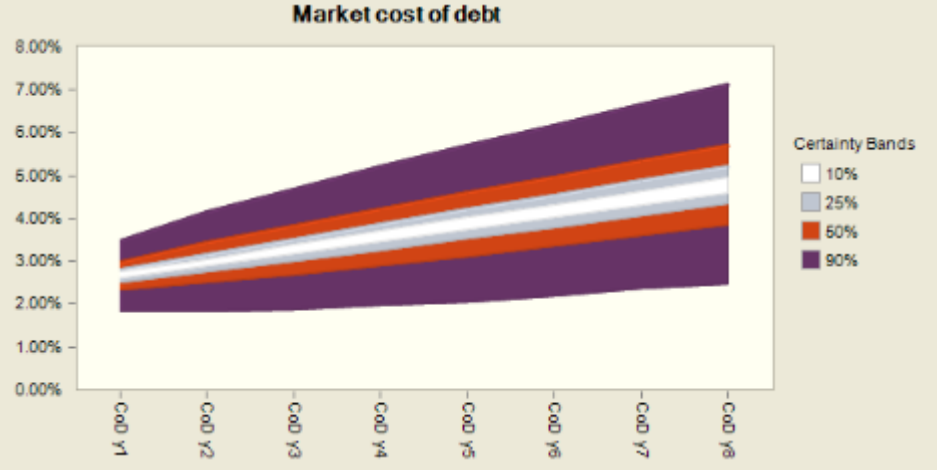
This section presents the results of the risk modelling exercise under a base case in which there is no residual risk under debt indexation, and under scenarios that illustrate the drivers of residual risk. The objective of the modelling is to measure the residual cost of debt risk under indexation—or, equivalently, the degree to which indexation is imperfect—and thereby to calculate the adjusted margin that is required under indexation.

All scenarios assume that the market cost of debt starts at 2.4% and is expected to increase on average by 30bp each year, such that by the end of the price control the central forecast for the market cost of debt is 4.8%. The cost of debt index (or allowed cost of debt) starts at 3.2% and increases to 3.5%. Results have been checked and found to be robust under other central forecasts of the market cost of debt, including:

– annual change of zero;
– annual increase of 50bp;
– others, including a sharp increase in the early years followed by no change.

Figures 3.1 and 3.2 show the distribution of the market cost of debt and the allowed cost of debt under debt indexation, under the main scenario of an average increase of 30bp every year.

Figure 3.1 Evolution of the market cost of debt over the price control



Source: Oxera.

Figure 3.2 Evolution of the cost of debt index over the price control

Source: Oxera.

The results are generated with the model set to the asset lives and depreciation profiles in Ofgem's decision for electricity transmission. Although not presented in this report, an identical set of results has been generated based on the asset lives and depreciation profiles for gas distribution. The results are identical because the model is constructed such that the ultimate determinants of the cost of debt risk are the profile of RAV growth and the rate at which existing debt is refinanced. Varying the asset lives and depreciation profiles therefore only affects risk through changing the rates of RAV growth or refinancing.

The rest of this section presents the results for the following scenarios, chosen to reflect the constraints that individual companies may face regarding their choice of financial structure:

– base case (indexation perfectly matches the actual cost of debt);
– lower debt issuance frequency than in the base case;
– slower refinancing than in the base case;
– CAPEX programme larger than in the base case;
– CAPEX programme weighted towards the end of the price control.

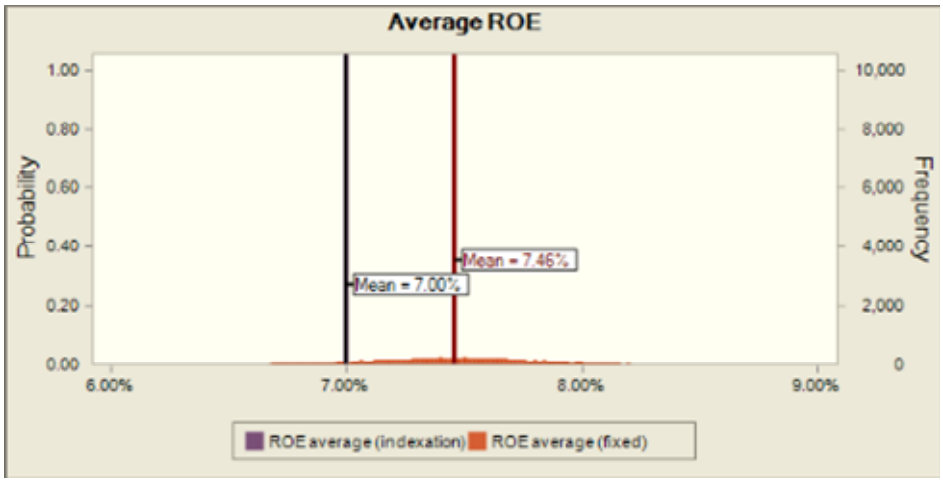
3.1 Base-case findings

The base case is constructed to illustrate the assumptions that are necessary if Ofgem's proposed cost of debt index is to track exactly the actual cost of debt index—ie, for the ten-year trailing average of the market cost of debt to be a perfect benchmark for the real cost of existing debt. The base case uses the following assumptions:

– debt outstanding at the start of the price control consists of ten bonds, each of ten-year maturity issued in each of the preceding ten years, implying that 10% of existing debt needs to be refinanced each year to keep the RAV constant;
– existing and new debt is issued at the annual average of the market cost of debt;
– no real RAV growth.

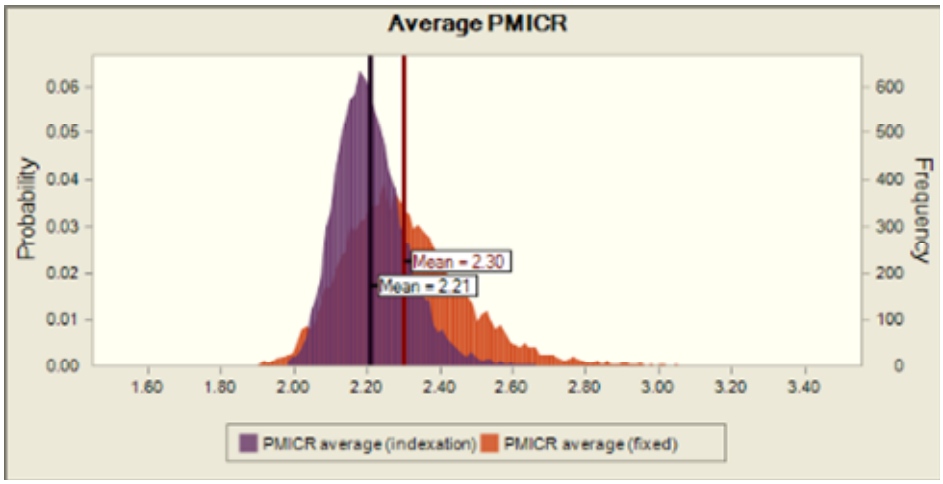
Figures 3.3 and 3.4 below show the distribution of average ROE and average PMICR over the eight-year price control period.

Figure 3.3 Average ROE distribution—base case



Source: Oxera.

Figure 3.4 Average PMICR distribution—base case



Source: Oxera.

The results confirm the expectation that debt indexation has both lower risk and lower expected return relative to a fixed allowance set above the ten-year average yield. Standard deviation of ROE reduces to zero under debt indexation, since the allowed cost of debt is equal to the company's actual cost of debt. Standard deviation of outturn PMICR is lower under debt indexation, but not zero, since cash flows and therefore PMICR vary over the price control period even under regulatory assumptions.

Expected values of ROE and PMICR also reduce under the indexation scenario due to the elimination of the margin between the fixed cost of debt allowance and the ten-year average of yields. In the base case, the expected ROE under indexation is exactly equal to the allowed cost of equity, since there is no scope for outperformance on the cost of debt.

On the basis that the margin between the fixed allowance and the ten-year average is compensation to equity for cost of debt risk, the 100% reduction in the normalised standard deviation of ROE under indexation is consistent with removing all of this margin in the allowed cost of debt.

The base case is an extreme example to illustrate the assumptions that have to hold for indexation to hedge companies completely against cost of debt risk, and hence for it to be consistent to remove the margin completely over the ten-year average that has historically

been provided in the fixed allowance. Companies will differ in their ability to achieve a risk reduction of this magnitude. The following sections explore the extent to which specific risk drivers leave the company with residual exposure to cost of debt risk.

3.2 Risk driver 1—frequency of debt issuance

The base case assumes that companies issue debt at the annual average yield of the market cost of debt, and that they issue debt every year. This section relaxes both of these assumptions individually. Section 3.2.1 assesses the risk implications of issuing debt only once a year. Section 3.2.2 analyses the impact of issuing debt once every two years rather than every year. Although the sources of risk are analysed separately, in practice companies are likely to be exposed to a combination of risks from both sources.

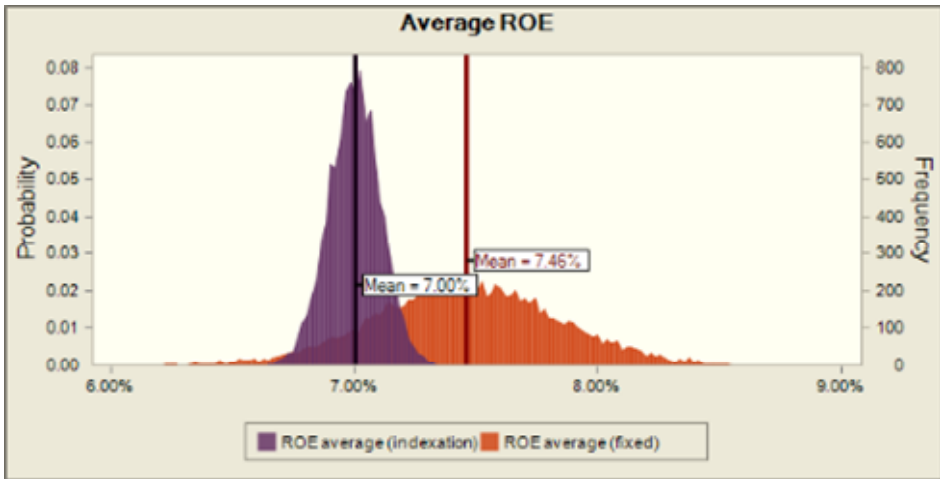
This risk driver reflects the situation of companies that are unable—due to a minimum efficient debt issue size—to issue debt as frequently as is necessary to match the index.

3.2.1 Intra-year issuance frequency

If a company issues debt only once per year, it is exposed to the risk that the cost of debt on the issuance date is different to the annual average that is used to calculate the index. This scenario assumes that there is a spread between the issuance yield on any new debt, and the annual average yield. The spread is assumed to be normally distributed, with an expected value of zero and standard deviation of 0.5% (calibrated against historical data). The values for the spread are randomly determined during the Monte Carlo analysis.

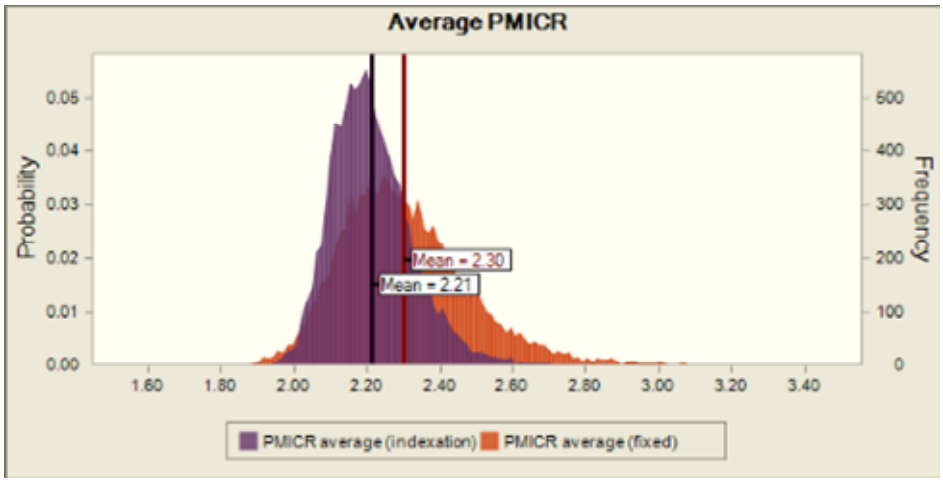
Figures 3.5 and 3.6 show the distributions of average ROE and average PMICR in this scenario.

Figure 3.5 Average ROE distribution—intra-year issuance frequency



Source: Oxera.

Figure 3.6 Average PMICR—intra-year issuance frequency



Source: Oxera.

Standard deviation of average ROE under indexation is no longer zero, as in the base case, although expected values of both ROE and PMICR remain unchanged, since the cost of debt at issuance is assumed to be above or below the annual average yield with equal probability.

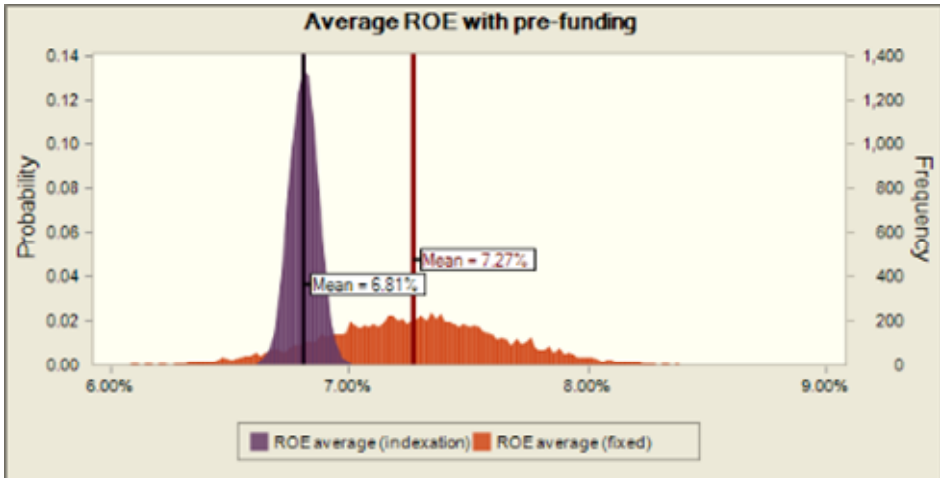
The reduction in the normalised standard deviation of ROE is 70% in this scenario—ie, the reduction in risk compared with a fixed cost of debt allowance is smaller than in the base case. It would therefore be appropriate to adjust the margin over the ten-year average to approximately 9bp (30% of 30bp).

3.2.2 Intra-price-control issuance frequency

If a company issues debt less frequently than every year, it is exposed to the risk that its actual weighted average cost of debt is different to the simple average used in the index. This scenario assumes that debt is only issued every two years, rather than annually. Effectively, the company raises a portion of debt ahead of when it actually needs the financing.

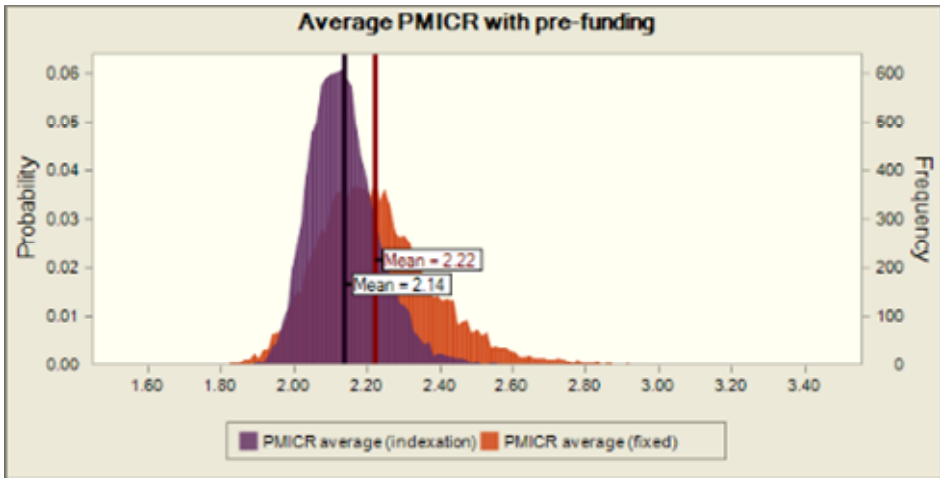
Figures 3.7 and 3.8 show the distributions of average ROE and average PMICR in this scenario.

Figure 3.7 Average ROE distribution—intra-price-control issuance frequency



Source: Oxera.

Figure 3.8 Average PMICR distribution—intra-price-control issuance frequency



Source: Oxera.

Comparing the distribution of outcomes under the fixed allowance to that in section 3.2.1 suggests that the risk from issuing debt every two years at the annual average is slightly smaller than that from issuing debt every year but deviating from the annual average. The actual debt issuance profile differs from the debt issuance profile implied by Ofgem's index. To match the index, the company would need to raise debt in each year of the price control, and the amount issued would need to be equal to 10% of outstanding debt at the beginning of the period.

The reduction in the normalised standard deviation of ROE under debt indexation as compared with the fixed allowance is 83% in this scenario. It would therefore be appropriate to adjust the margin over the ten-year average to approximately 5bp (17% of 30bp).

In cases where companies issue debt less frequently than once every two years, the companies will have higher exposure to residual risk. Moreover, companies will be exposed to a combination of both differences in intra-price-control issuance frequency relative to the base case, and intra-year deviations relative to the annual average cost of debt (as modelled in section 3.2.1).

3.3 Risk driver 2—proportion of existing debt to refinance

The base case assumes that companies annually refinance 10% of debt, such that 80% of debt is refinanced over the course of the eight-year price control. This section relaxes this assumption, first by making the extreme assumption that no debt is refinanced (section 3.3.1), and second by estimating the proportion of debt to refinance such that companies are faced with the same risk–return trade-off under either indexation or a fixed allowance. For clarity, such that the analysis is driven solely by different refinancing assumptions, both sections assume no RAV growth. In practice, adding moderate RAV growth to these scenarios is likely to increase the risk of the fixed allowance relative to indexation.

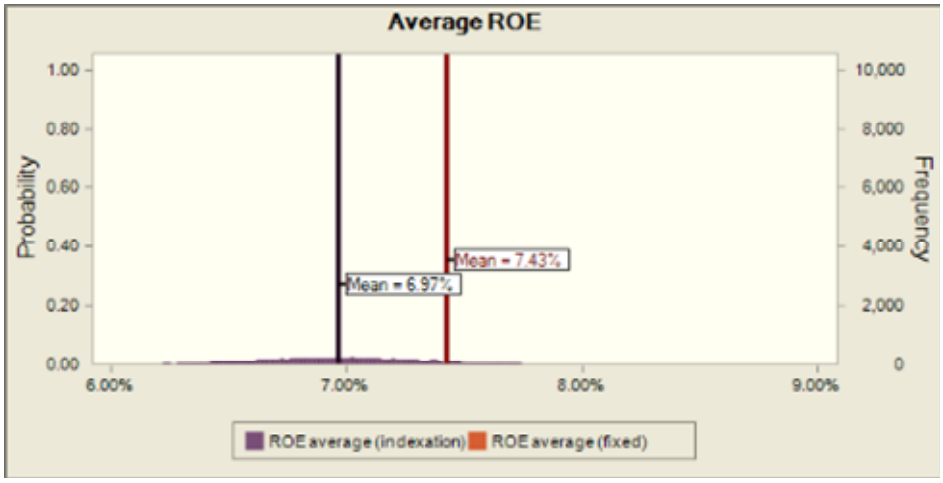
This risk driver reflects the situation of companies that are limited in their discretion over refinancing choices, for reasons such as credit rating requirements, debt covenants, and legacy financing structures.

3.3.1 No refinancing

If a company does not refinance any debt that is outstanding at the start of the price control, and does not raise any debt to finance RAV growth, it is exposed to the risk that the index changes while the cost of existing debt remains fixed.

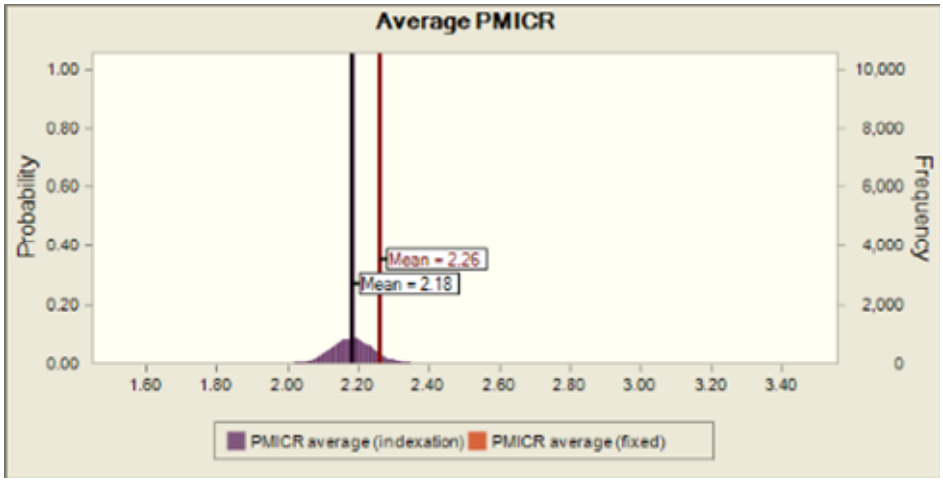
Figures 3.9 and 3.10 show the distributions of average ROE and average PMICR in this scenario.

Figure 3.9 Average ROE distribution—no refinancing



Source: Oxera.

Figure 3.10 Average PMICR distribution—no refinancing



Source: Oxera.

With a fixed cost of debt allowance, since both actual and allowed costs of debt are fixed, standard deviation of ROE and PMICR is zero. In contrast, under debt indexation, the company's revenues are exposed to changes in the market cost of debt, while costs are fixed.

The normalised standard deviation of ROE is positive under debt indexation and zero under a fixed allowance. Furthermore, compared with the fixed allowance in the base-case scenario, the indexed allowance in the no-refinancing scenario has actually slightly greater risk when measured by normalised standard deviation.[23]

With an extreme assumption for refinancing, debt indexation leads to significantly higher residual risk compared with a fixed allowance. Depending on specific circumstances, some companies may therefore be exposed to significantly more risk with debt indexation, although

[23] Standard deviation is the same under both scenarios, but normalised standard deviation is higher under the indexed no-refinancing scenario, since the expected return is lower.

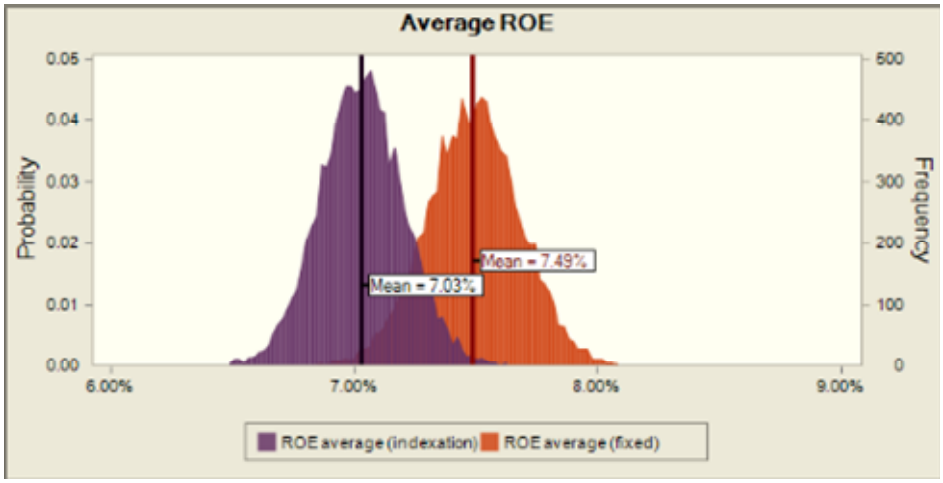
such cases are likely to be rare. In such a case it would be appropriate to increase the margin in the cost of debt relative to the ten-year average of yields.

3.3.2 'Break-even' refinancing

This scenario uses a less extreme refinancing assumption than that considered in section 3.3.1. It shows the percentage of existing debt that needs to be refinanced during the period such that the normalised standard deviations of ROE under the fixed allowance and debt indexation are approximately equal.

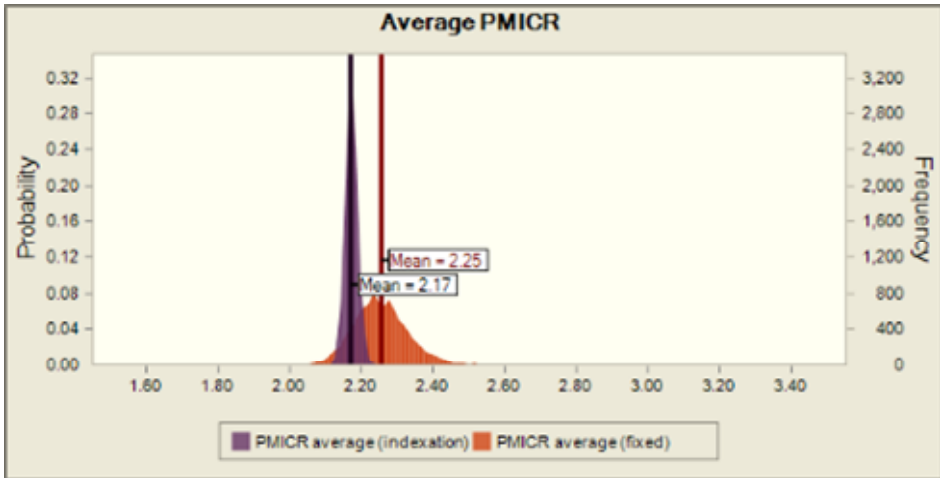
Figures 3.11 and 3.12 show the distribution of average ROE and PMICR assuming that 40% of existing debt is refinanced during the period.

Figure 3.11 Average ROE distribution—'break-even' refinancing



Source: Oxera.

Figure 3.12 Average PMICR distribution—'break-even' refinancing



Source: Oxera.

The normalised standard deviation of ROE is 0.024 and 0.025, under debt indexation and a fixed allowance respectively—ie, the residual risk is approximately equal under debt indexation and a fixed allowance. Although standard deviation is slightly higher with the fixed allowance (19bp) than with indexation (17bp), the fixed allowance also yields a higher expected return such that the normalised standard deviation is approximately the same under both approaches.

This intermediate scenario of 40% refinancing suggests that it is plausible that debt indexation offers companies the same trade-off between risk and expected return as a fixed allowance. In these circumstances, it would be appropriate to retain the full margin over the ten-year average yield that has been provided historically.

3.4 Risk driver 3—size of CAPEX programme

For the purpose of modelling a perfect match between the index and the actual cost of debt, the base case assumes a combination of no real RAV growth and 10% of existing debt being refinanced each year. This section analyses the impact of RAV growth in addition to the refinancing of existing debt. Section 3.4.1 looks at a scenario of moderate RAV growth, while section 3.4.2 analyses a high RAV growth scenario.

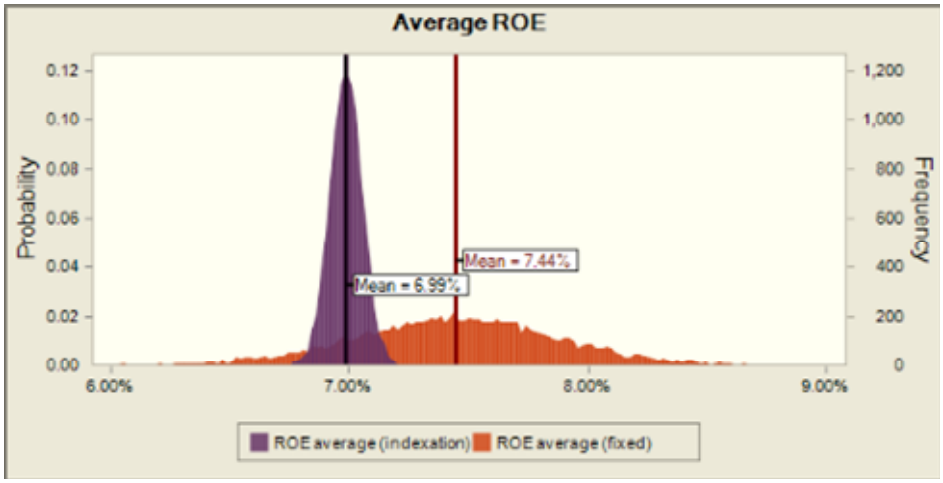
This risk driver reflects the situation of companies which have little discretion over the size of their CAPEX programmes and hence the amount of new debt that is required over the RIIO price control period.

3.4.1 40% RAV growth

If a company raises new debt to fund an increase in its RAV in addition to refinancing 10% of existing debt on an annual basis, it is exposed to the risk that its weighted average cost of debt is different from the simple average used to calculate the index.

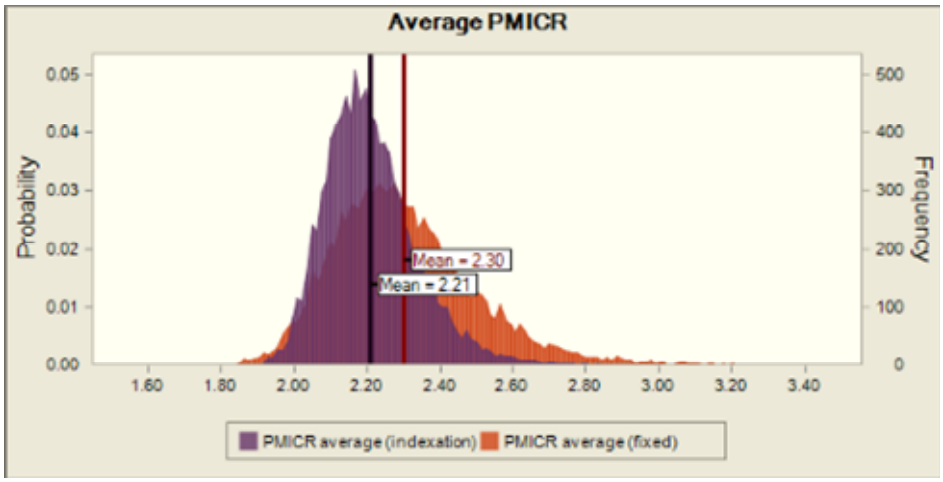
Figures 3.13 and 3.14 show the distribution of average ROE and PMICR, assuming cumulative real RAV growth of 40% over the price control period. The RAV is assumed to grow at a constant rate each year.

Figure 3.13 Average ROE distribution—40% RAV growth



Source: Oxera.

Figure 3.14 Average PMICR distribution—40% RAV growth



Source: Oxera.

Since constant RAV growth implies that the company will raise more debt towards the end of the period than at the start of the period, the company's weighted average cost of debt deviates from the ten-year trailing average, introducing variation in both ROE and PMICR compared with indexation in the base case.

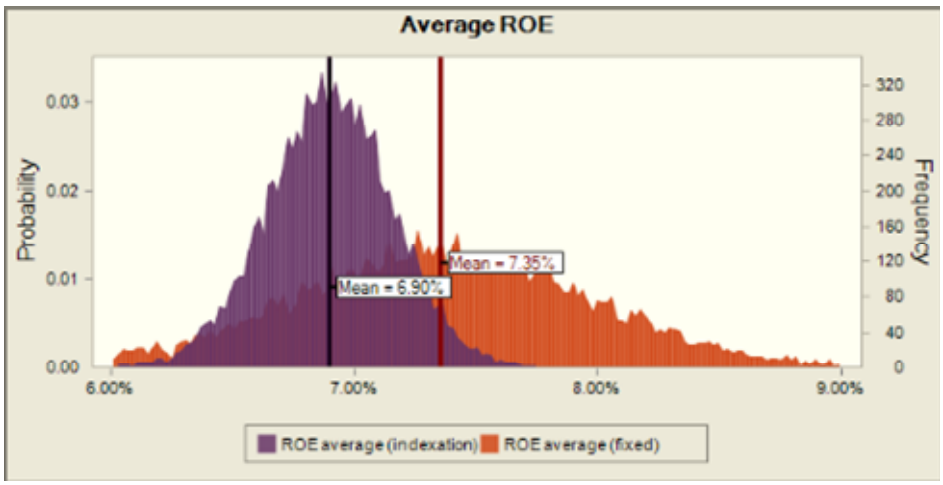
The reduction in the normalised standard deviation of ROE under debt indexation compared with the fixed allowance is 83% in this scenario. It would therefore be appropriate to adjust the margin over the ten-year average to approximately 5bp (17% of 30bp).

3.4.2 400% RAV growth

As the size of the CAPEX programme increases, the company becomes increasingly exposed to movements in the market cost of debt under both the fixed allowance and indexation approaches. The difference between the weighted average cost of debt and the ten-year trailing average becomes greater as faster RAV growth leads to more debt being raised towards the end of the price control period compared with the start of the period.

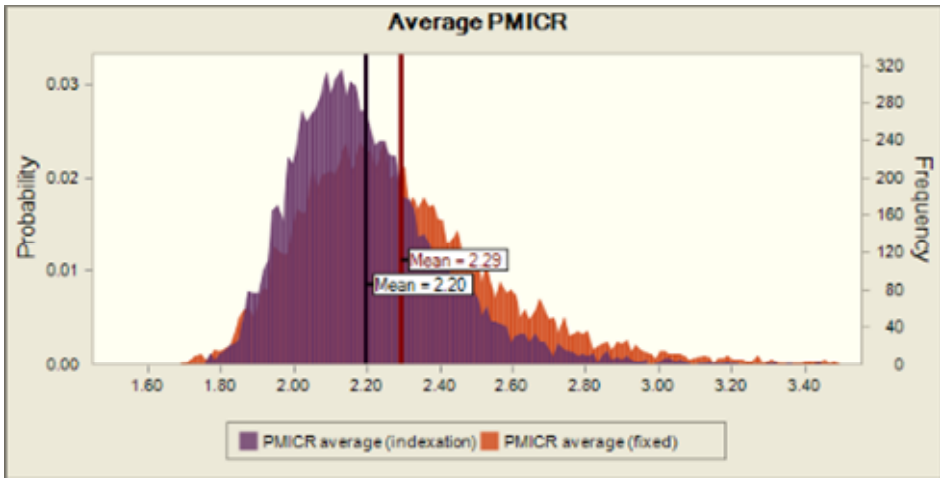
Figures 3.15 and 3.16 show the distributions of average ROE and PMICR, assuming cumulative real RAV growth of 400% over the price control period. As in the previous scenario, the RAV is assumed to grow at a constant rate each year.

Figure 3.15 Average ROE distribution—400% RAV growth



Source: Oxera.

Figure 3.16 Average PMICR distribution—400% RAV growth



Source: Oxera.

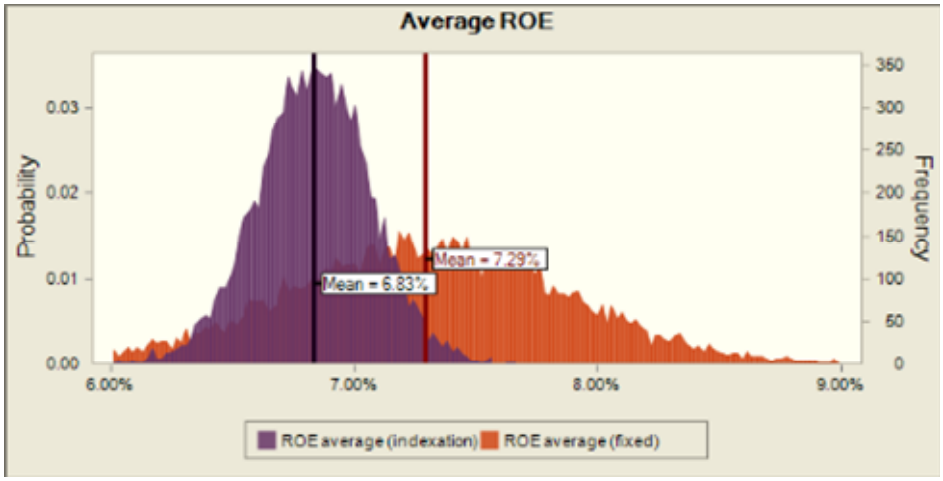
Standard deviations of ROE and PMICR increase further in this scenario, compared with the case of moderate RAV growth. The reduction in the normalised standard deviation of ROE under debt indexation compared with the fixed allowance is 55% in this scenario. It would therefore be appropriate to adjust the margin over the ten-year average to approximately 13bp (45% of 30bp).

3.5 Risk driver 4—profile of CAPEX programme

A CAPEX programme that is loaded towards the end of the price control rather than being spread evenly throughout the control will lead to a larger difference between the weighted average actual cost of debt and the allowed cost of debt. With increasing interest rates, at some point during the price control period the company will start to incur a shortfall relative to its actual cost of debt. The size of this shortfall will increase during the price control period.

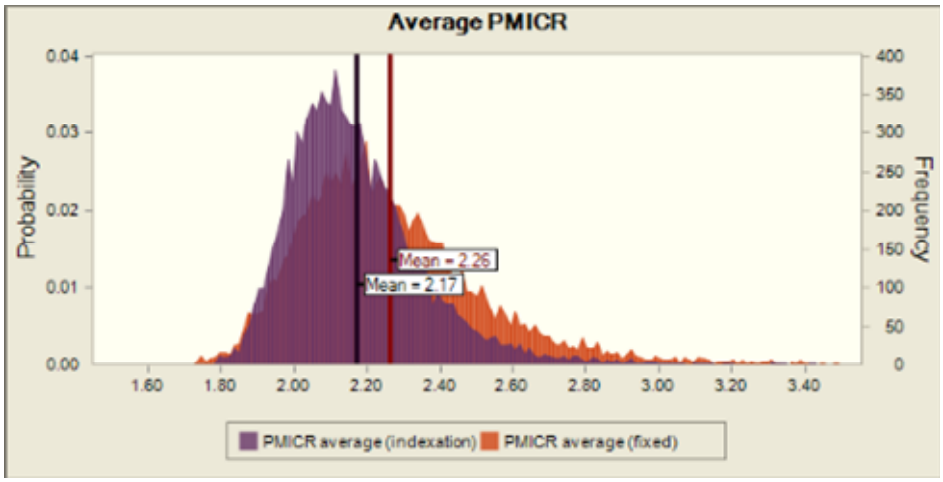
Figures 3.17 and 3.18 show the distributions of average ROE and PMICR, assuming cumulative real RAV growth of 400% over the price control period. However, RAV grows at an increasing rate, shifting a higher proportion of debt-raising towards the end of the period compared with a scenario in which RAV grows at a constant rate.

Figure 3.17 Average ROE distribution—increasing CAPEX profile



Source: Oxera.

Figure 3.18 Average PMICR distribution—increasing CAPEX profile



Source: Oxera.

However, the reduction in the normalised standard deviation of ROE under debt indexation compared with a fixed allowance is 58% in this scenario. It would therefore be appropriate to adjust the margin over the ten-year average to approximately 13bp (42% of 30bp). Relative to altering the size of the CAPEX programme, loading the CAPEX programme towards the end of the price control period appears to have a minimal impact on the risk of indexation relative to the fixed allowance.

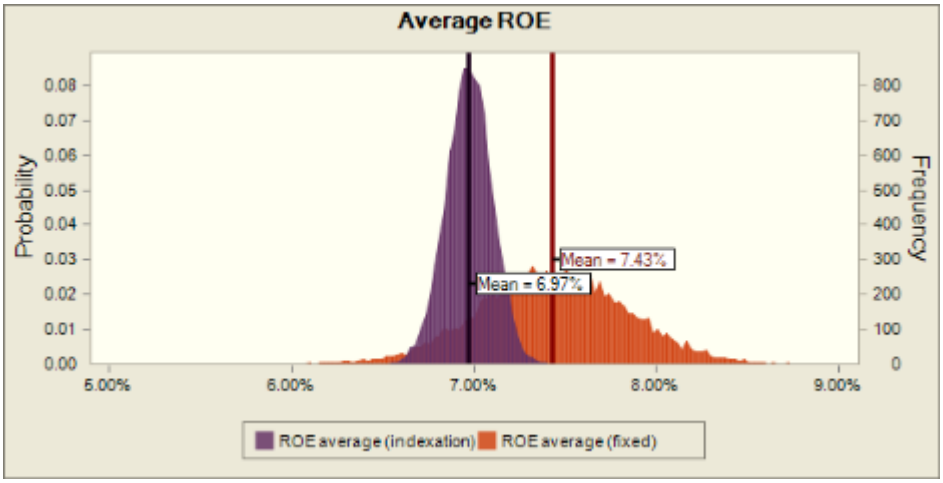
3.6 Multiple risk drivers combined

The previous sub-sections have analysed the impact of risk drivers individually. Since risk drivers are not necessarily additive, this sub-section presents a scenario that combines the following factors:

– intra-year issuance frequency is once per year;
– 40% of initial debt is refinanced during the price control;
– cumulative RAV growth is 100% with a constant annual growth rate.

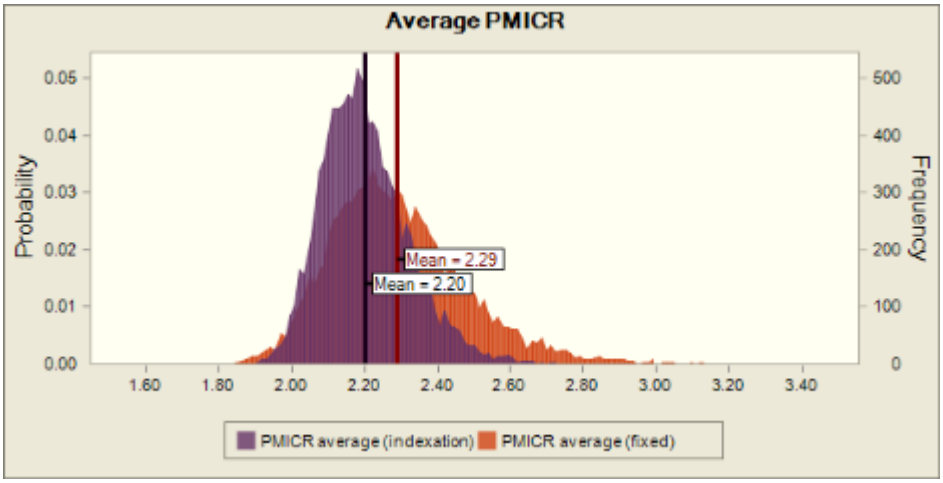
Figures 3.19 and 3.20 show the distributions of average ROE and average PMICR.

Figure 3.19 Average ROE distribution—multiple risk drivers



Source: Oxera.

Figure 3.20 Average PMICR distribution—multiple risk drivers



Source: Oxera.

The reduction in the normalised standard deviation of ROE under debt indexation compared with a fixed allowance is 67% in this scenario. It would therefore be appropriate to adjust the margin over the ten-year average to approximately 10bp (33% of 30bp). This scenario demonstrates that the residual risk exposure under a combination of multiple risk drivers is not the sum of the risk exposure under individual risk drivers. However, the scenario also suggests that, under a realistic combination of assumptions about constraints on a company's financing structure, although indexation lowers cost of debt risk, there is significant residual risk.

3.7 Summary

Table 3.1 summarises the reduction in risk under debt indexation compared with a fixed allowance, the proportion of cost of debt risk that remains under indexation, and the implications for the appropriate adjusted cost of debt margin, relative to the ten-year average of yields. Detailed modelling results are provided in Appendix 1.

Table 3.1 Adjusted cost of debt margin over the ten-year average yield

Scenario	Reduction in risk under debt indexation	Residual risk under debt indexation	Adjusted cost of debt margin (bp)
Base case	100%	0%	0
Intra-year issuance frequency	70%	30%	9
Intra-price-control issuance frequency	83%	17%	5
No refinancing	Not defined, since fixed allowance is zero risk	Not defined, since fixed allowance is zero risk	>30
'Break-even' refinancing	4%	96%	29
40% RAV growth	83%	17%	5
400% RAV growth	55%	45%	13
Profile of CAPEX programme	58%	42%	13
Multiple risk drivers combined	67%	33%	10

Source: Oxera analysis.

In the base case, indexation eliminates all the cost of debt risk, since Ofgem's proposed cost of index is assumed to be a perfect proxy for the company's debt costs. Relaxing some of the

restrictive assumptions of the base case leads to a smaller reduction in risk under debt indexation compared with a fixed allowance.

The greatest driver of risk is the profile of refinancing. In the extreme case of no refinancing, debt indexation increases cost of debt risk for equity holders compared with a fixed allowance, and it would be appropriate to increase the margin in the cost of debt relative to the ten-year average.

The second greatest driver of risk is the size of RAV growth. A larger CAPEX programme increases the company's exposure to changes in the market cost of debt. The profile of CAPEX is also a factor (ie, whether CAPEX is loaded towards the end of the price control period), although profiling of CAPEX is less important than the overall size of the CAPEX programme.

The final driver of risk analysed in this section is the issuance frequency. If companies issue debt only once per year, they are exposed to the risk that the yield on the date of issuance is different from the annual average used to calculate the cost of debt index. Similarly, if companies issue debt less than once every year, the reduction in risk under debt indexation is lower than in the base case. In practice, companies will be exposed to a mixture of these two effects.

A realistic combination of multiple risk drivers suggests that indexation is likely to reduce risk for a typical company by approximately 67%, suggesting that the margin between the cost of debt allowance and the ten-year average would be adjusted down from approximately 30bp to 10bp.

Overall, the modelling suggests that, under a realistic set of assumptions regarding the circumstances of companies, there is a material amount of residual cost of debt risk under indexation. While the circumstances of individual companies will vary such that the appropriate adjusted cost of debt margin (relative to the ten-year average yield) is different across companies, it is likely that this margin will be greater than zero for all companies.

4 Conclusions

The analysis in this report shows the necessary assumptions if a company is to match (or hedge perfectly) the cost of debt index such that there is no residual exposure to risk from changes in the market cost of debt. Under such a scenario it would be consistent to remove the margin that has historically been allowed between the cost of debt and the ten-year average as compensation for cost of debt risk.

The regulatory regime has also tended to set the risk-free rate component of the cost of equity above current market rates to account for uncertainty in how the market cost of equity might evolve over the price control period. Since Ofgem is not proposing to index the cost of equity, the impact on required returns as a result of debt indexation is limited to the required margin on debt.

The analysis also shows that, if the assumptions necessary for the company to perfectly match the cost of debt index do not hold, the company will be exposed to residual risk from changes in the market cost of debt. For companies to face the same risk and expected return trade-off as under either a fixed allowance with a margin above the ten-year average yield, or indexation based on ten-year average yields, it is necessary to set the margin consistent with the level of residual risk exposure.

Although all companies will be exposed to some degree of residual cost of debt risk, this exposure will vary across companies, and the consistent amount of margin to be retained on the cost of debt will therefore also vary.

A1 Full modelling results

Table A1.1 Full results of risk modelling under different scenarios

	Standard deviation of ROE		Mean of ROE		Normalised standard deviation of ROE	
Scenario	**Indexation**	**Fixed allowance**	**Indexation**	**Fixed allowance**	**Indexation**	**Fixed allowance**
Base case	0.00%	0.36bp	7.00%	7.46%	0.0000	0.0478
Intra-year issuance frequency	0.11%	0.38%	7.00%	7.46%	0.0151	0.0503
Intra-price-control issuance frequency	0.06%	0.38%	6.81%	7.27%	0.0086	0.0522
No-refinancing	0.36%	0.00%	6.97%	7.43%	0.0512	0.0000
'Break-even' refinancing	0.17%	0.19%	7.03%	7.49%	0.0244	0.0254
40% RAV growth	0.07%	0.42%	6.99%	7.44%	0.0095	0.0569
400% RAV growth	0.26%	0.61%	6.90%	7.35%	0.0372	0.0834
Profile of CAPEX programme	0.23%	0.58%	6.83%	7.29%	0.0336	0.0794

Note: All ROEs are calculated as averages over the price control period.
Source: Oxera analysis.

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