ALTERNATIVE APPROACHES TO SETTING THE COST OF DEBT FOR PR19 AND H7

OFWAT & CIVIL AVIATION AUTHORITY (CAA)

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FINAL REPORT

ORIGINAL

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EXECUTIVE SUMMARY

Context for the report

Cambridge Economic Policy Associates (CEPA) has been commissioned by two UK regulators, Ofwat, the economic regulator for water and wastewater services for England and Wales, and the Civil Aviation Authority (CAA), the economic regulator of British airports, to undertake a study of potential approaches to setting the allowed cost of debt. This report was commissioned to assist both regulators in determining whether, and how, to change their approach to setting the cost of debt in the forthcoming price control determinations (Ofwat's PR19 and the CAA's H7) and for any runway capacity determinations in aviation.

The cost of debt is an important component of the cost of capital, which is itself a key building block of price control regulation. The cost of capital is multiplied by the asset base to derive an allowed return for regulated companies. The cost of debt element alone at the most recent regulatory determinations, PR14 (water) and Q6 (airports), comprised 12% and 18% of charges respectively.

There are three fundamental questions regulators must address in setting the cost of debt:

- To what extent should the cost of debt be based on regulated company's actual cost ('actual' approach) or be based on an independent benchmark of cost ('notional' approach)?[1]
    - We recommend that Ofwat continue to place most weight on a notional approach (especially given the number of companies it regulates) and that the CAA places greater weight on a notional approach relative to the Q6 determination.
- How should the regulators estimate the cost of debt when setting the price control?
    - We recommend the use of an appropriate benchmark non-financial corporate bond index such as the iBoxx GBO index for both water and aviation sectors, with different times to maturity ('tenor'); 10yr+ for water and 10-15yr for aviation as starting point for estimating efficient cost of debt. In the water sector, the regulator should also take account of evidence of efficient sector cost of debt, given the larger number of regulated companies relative to the aviation sector. If the index differs from an efficient cost of debt, we recommend that a step-up or step-down adjustment is used.
- Should the allowed cost of debt be revised once actual company debt costs or benchmark debt costs are observed?

[1] This represents a spectrum of choice, for example a benchmark under a notional approach may include company bonds.

- We recommend that an adjustment mechanism is applied to new debt cost, reflecting observed values of the iBoxx benchmark. It would be possible to use a complementary adjustment mechanism in which companies share individual company outperformance (and underperformance) with customers. However, it is not clear to us that the introduction of such a mechanism leads to net benefits and there are risks that such a mechanism could incentivise gearing up and higher cost of debt in the longer term.

Framework for setting the cost of debt

Actual and Notional approaches

Background

The use of actual debt costs means regulated revenues, and therefore customer bills, reflect actual company costs. This protects companies' financeability, however it provides weak incentives for companies to achieve the lowest cost of financing. Customers also bear all the risk associated with changes in actual debt costs.

Conversely, having the allowed cost of debt independent of actual costs, under what we call a notional approach, provides stronger incentives to outperform the assumed cost of debt and transfers the risk associated with actual debt costs to equity holders. Revenue remains in line with the benchmark and therefore customer bills are unaffected by actual debt costs.

A regulator is unlikely to use either of these approaches without any adjustment. The use of actual debt costs creates a risk that the rates achieved are not cost-effective and so this approach typically uses an efficiency review relative to a benchmark index. With a notional approach, a benchmark index often will include bonds from regulated companies, so is not entirely separated from actual industry debt costs.

A benefit-cost sharing mechanism (applied after the price control begins) is an example of a blended approach. Companies retain an incentive to reduce debt costs while not being fully exposed to cost variations. Revenues adjust in response to changing debt cost, but not fully, and so customers share some of the benefit when debt cost are below that set in the price control, but also face somewhat higher bills when debt costs are higher than anticipated by the regulator.

Current approaches

For the most recent price control, PR14, Ofwat assessed the cost of new debt on the expected rate of a notional benchmark and applied that across all 18 regulated companies. Ofwat took a non-financial corporate bond index as the benchmark with an adjustment to more closely reflect efficient sector costs.

The CAA for their Q6 determination based the allowed cost of embedded debt on actual costs for Heathrow (cross-checked for efficiency), using current yields on Heathrow bonds and forward curves on government bonds to estimate the cost of new debt.

Recommendation

Our analysis indicates that there is a suitable index in both water and aviation for use in a notional approach. Our indices use GBP bond yields (i.e. the amount of return an investor will realise on a bond by holding this to maturity) with A and BBB credit ratings for non-financial corporates. For water, we recommend using a benchmark index with at least ten years' time to maturity ('10yr+ index') and for aviation we recommend using 10-15 years' ('10-15yrs index') time to maturity.

Regulated companies in the water and aviation sectors typically have the majority of debt in GBP-denomination and in bonds. However, this does not represent all debt (e.g. bank debt, EIB debt, index-linked debt), and these companies utilise other debt products and markets, consistent with behaviour we would expect from our notional entity. This can lead to different debt costs than would be derived from using an unadjusted benchmark index. We recommend assessing whether an adjustment is required to make the allowed cost of debt more representative of expected efficient debt costs.

How should the regulator estimate the cost of debt when setting the price control?

Background

The key difficulty regulators face is estimating the level of the cost of debt. Business plans companies submit to regulators provide capital spend profiles that can be used to test both the level and timing of spend required. Yet neither the regulator nor the company is able to accurately forecast the return on debt. Market forward rates may provide the best estimate of the cost of new debt. However, even using forward rates, regulators have consistently overestimated the cost of debt companies have achieved (i.e. have estimated a higher allowance than actual).

Recommendations

We recommend that regulators improve the approach used under a notional approach:

- Extending the trailing average of the index to twenty years in the water sector can better match the assumed tenor of debt from the 10yr+ index (that broadly matches the average tenor of debt in the sector).[2] Where a 20yr trailing average is chosen, it would suggest that other parameters (e.g. forward rates and breakeven inflation) should also use a 20yr tenor for consistency. Using a 10yr trailing average with 20yr debt risks being open to criticisms of beingmethodologically inconsistent, but in previous determinations a longer tenor not possible due to a lack of historical information. In aviation, the trailing average should be 10-15 years to match the tenor of the index.

[2] Noting that we focus on a rolling twenty year period, as embedded debt drops off as new debt is assumed to be issued.

- Greater weight should be placed on outturn cost of debt values from recent years. The current approach of using a simple twenty year average for embedded debt overstates the cost of embedded debt, as the quantum of debt from twenty years ago would be expected to be lower than in recent years (given asset base growth in this period) as rates have fallen. We recommend that more weight be placed on more recent years, and done using a general industry-trend figure rather than individual company figures in the water sector. It is possible to use company-specific weightings, however we recommend that this is limited to where the company is materially different to the broader industry and the size of past investment programmes e.g. RIIO indexation model for SHETL in energy.[3]
- Breakeven inflation (using RPI inflation expectations in the absence of robust CPI inflation expectations) is used for embedded debt, with an adjustment made for wedge between CPI and RPI where a CPI-based real estimate is required. This is necessitated by CPI expectations not existing at present for the longer lives of regulated utility debt. For deflating new debt, under our proposed adjustment mechanism we expect any adjustments will be made on a real basis.

Our recommended approach for embedded debt i.e. use of a notional benchmark with an adjustment, should lead to benefits to customers in the short-term as the adjustment to the benchmark value reflects the ability of companies to obtain more favourable terms in other debt markets, not just using nominal GBP-denominated bonds. However, this approach was taken at PR14 and the size of the adjustment that was made did not eradicate outperformance, so it is not without its own challenges.

In the medium term, we expect there to be customer benefits as regulated companies are incentivised to outperform the notional benchmark, while observing a lower cost of debt should permit a more accurate allowed cost of debt in future. This leads to lower rates faced by customers.

Should the allowed cost of debt decided at the price control review be adjusted (ex post)?

Background

With the exception of the RIIO price controls in energy, regulatory precedent in Great Britain has typically used a fixed allowance (i.e. with no adjustment mechanism) for setting the cost of debt (either on a notional basis or using actual costs).

An adjustment mechanism can be based on actual debt costs incurred by the companies or outturn values from a benchmark index ('indexation'). As with the setting of an allowance at

[3] It may be that applying this approach in conjunction with a longer trailing average period leads to very little weight being placed on those debt costs from between ten and 20 years ago in the case where a sector has experienced significant growth in the asset base.

the price control determination, there are multiple forms of application for these mechanisms.

We consider both main forms of adjustment mechanisms in this report.

- For an adjustment based on actual debt costs, we refer to this as a benefit-cost sharing mechanism; this may also be referred to as a pain-gain share mechanism.
- For indexation we consider two choices; one involves an adjustment to the cost of new debt only (i.e. not for embedded debt), while the other mechanism involves indexing the entirety of the cost of debt (the broad framework used by Ofgem).

It is possible to use both types of mechanism together or separately.

Recommendations

We recommend that adjustment mechanisms are introduced in both water and aviation sectors. Our preferred option is to use the indexation of new debt only. However, relative to a fixed allowance with no adjustment, there are merits from adopting both a full indexation mechanism and an adjustment mechanism based on actual costs. The full indexation model is likely to be more suitable in aviation than in water due to the industry characteristics.

Indexation of new debt only

We find that forward curves, the basis for estimating future market movements, are inaccurate and lead to windfall gains and losses for companies and customers due to forecasting error. The use of some form of indexation to 'correct' forecasts for outturn rates leaves customers paying the charge that a regulator would have chosen if it were to have perfect foresight of the benchmark, on the understanding that the benchmark provides an efficient barometer of costs. This approach mitigates risks for companies and we think that this should lead to customer benefits. This customer benefit exists as regulators currently need to compensate investors for the risks faced from forecasting uncertainty (either through the cost of debt allowance or with the cost of equity, or both). In addition, forward curves may already include a risk premium and so point to an allowed cost of new debt that is expected to be higher than the outturn cost of new debt in practice.

A further advantage is that an indexation approach can be more robust in taking account of the timing of debt issuance. This is particularly valuable for infrequent issuers, or those with large investment programmes to finance e.g. in the case of new runway capacity. This approach has been used for Ofgem in its cost of debt indexation model for SHETL in RIIO T1.

We have sought to look at both positives and negatives of adopting a certain approach. There are criticisms levelled against an indexation approach that we analyse more below. These include:

- Firms may look to mimic the index and this weakens incentives, leading to worse outcomes for customers.

- Indexation represents a risk transfer to customers that may not be justified by the customer benefits of this transfer.
- Indexation leads to volatility of bills for customers.
- We suggest that the first two criticisms do not hold up to scrutiny following further analysis and would not be reasons to avoid choosing an indexation approach.

From continuing to use a benchmark index, firms retain a clear incentive to reduce debt costs as much as possible. The idea of mimicking the index relates to timing risk, not the on the day cost of debt. There is an example with Northern Gas Networks looking to more closely mimic the timing assumed in the cost of debt indexation model in the energy sector for RIIO T1. This may be an issue if this impacts on choices for timing, debt type or tenor. Where the indexation approach is fixed and embedded within a licence, this may impair the ease of passing through outperformance benefits in future control periods. We would expect this to be more of a consideration with a full indexation approach.

Under a fixed allowance approach with no adjustment, regulators have tended to use an average of yields from a trailing average period for embedded debt and a simple average for new debt, so it is unclear that this represents a significant change between a fixed allowance and indexation. The same would apply for debt type and debt tenor. In our view, while using indexation is a more mechanical application, it is unclear that this should distort choices on timing relative to the fixed allowance counterfactual.

From a risk allocation perspective, it is important to consider the counterfactual, namely a fixed allowance approach. Under this approach, customers bear the expected market rate during the price review period. At the following price review, customers bear the actual market rates for the earlier period, as part of embedded debt. Companies bear the risk of unanticipated market movements during the price review period, but as the outturn market rates are used to set the debt cost, they do not bear this risk beyond the period. The real risk is forecasting risk and this would be moved from companies under a fixed rate approach to customers under indexation.

An indexation mechanism means that there is only residual risk for the company from movements in the market index in terms of forecasting – this exists as there is a time lag before the forecast is updated for outturn values. Companies still bear risk around performance relative to this index under all of these approaches.

From a risk perspective we think that it is better to avoid companies facing the risk of forecast error through an ex-post true up than it is to have the risk borne by the company. While this still passes a risk to customers, companies cannot manage this risk perfectly, so we believe that risk should be allocated to derive the greatest benefit to customers. We expect that customers bearing this risk leads to net benefits from indexation and is preferable for reasons relating to regulatory principles e.g. avoiding windfall gains and losses, or undermining the legitimacy of the a determination.

One way to think about risk may be that a regulator should choose to use a forecast that is correct each time for benchmark costs (which gives the same outcome to indexation, albeit with a time lag) rather than one which is often significantly different to outturn values (as per a fixed allowance with no adjustment).

Volatility is a legitimate concern. Making cashflow adjustments at the end of a price control avoids yearly volatility and upward movements within the price control period can be offset against downward movements to avoid unnecessary volatility. At the end of a price control, there is typically a step change in bills and an indexation adjustment would form part of this. Indexing the cost of new debt only also reduces volatility as the embedded debt allowance is fixed (with an adjustment made for a view on efficiency).

Indexation of all debt

Indexation of all debt has the same benefits for new debt as noted above for indexing the new debt portion of the cost of debt (but do not exhibit clear benefits on embedded debt). Reasons for adopting a full indexation model would be that investors have familiarity with such an approach given that it is used in the GB energy sector and that using a mechanistic approach may lead to greater certainty (if there is a plausible commitment to retaining the same mechanistic approach).

We recommend indexing only the cost of new debt however, as this avoids volatility in bills from changes in embedded debt costs and keeps a degree of regulatory discretion for embedded debt to ensure that the approach is appropriate at each price control. Maintaining a mechanistic approach without modifications may be challenging given the statutory duties of the regulator, and where modifications are required, the benefits of regulatory certainty are lost.

Benefit-cost sharing mechanism

The setting of an allowed cost of debt for a future period has difficulties. There may be changes in financial markets or decisions taken by companies that were not predictable at the start of the regulatory period. Using a benefit-cost sharing mechanism would allow customers to share in outperformance, though also face a share of underperformance.[4]

With the changes recommended in setting a cost of debt estimate and indexation of new debt, we do not think that a further mechanism is required. Due to information asymmetry, it is unclear that at present a precise estimate of debt costs across the entire debt portfolio exists.[5] Narrowing debt to price characteristics only may be misleading as there are other features that influence decisions e.g. use of collateral to obtain lower rates. This may discourage the use of choices that reduce the cost of debt but place other costs on the company. We think it is difficult to take this into account as part of a mechanistic adjustment.

[4] This is not necessarily the case, however we favour a symmetric adjustment mechanism where this is the case.
[5] There are estimates available at present, however it is unclear that these figures capture the entirety of companies' debt portfolios, or where they do the component information is not clear.

As companies do not bear underperformance in full, there will be weaker incentives and this can lead to higher customer bills under such an approach.

Conclusions

We recommend that both regulators place limited weight on company specific actual debt costs and instead focus on costs from notional benchmark indices provided by iBoxx for non-financial corporates and sector wide cost data where there are sufficient number of regulated companies such as in the water sector. For applying these indices to future price controls, we think there are changes that can be introduced to ensure that the methodology is internally consistent and that customer benefits are maximised.

Our preferred option for setting the cost of debt within a price control is indexation of new debt costs that in our view delivers benefits for customers and companies. An alternative in aviation with new runway capacity could be a commitment to a full indexation approach. In the water sector, we see fewer benefits from full indexation. However, a benefit-cost sharing mechanism is an option for the water sector that has some merit, yet requires further work to get an accurate estimate of overall debt costs and may lead to companies gearing up to the detriment of customers.

We have provided decision principles following testing of our recommendations under different scenarios and market conditions. One of these scenarios was a new investment programme. We have undertaken more detailed analysis of this scenario as it may be relevant to new runway capacity. As we expect the airport to have limited control of timing of debt related to this capacity, we recommend that a bespoke profile should be used based on actual timing of debt issuance. There are also greater arguments for a full indexation model with a longer price control (or regulatory commitment). This model has precedent in the form of the RIIO T1 cost of debt indexation model for SHETL.

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1. INTRODUCTION AND OVERVIEW

1.1. Introduction

Cambridge Economic Policy Associates Ltd (CEPA) has been commissioned by Ofwat and the CAA to consider the question of how they should best approach setting the cost of debt within the overall price determination.

Good practice involves reviewing regulatory approaches in the run-up to a price review – this includes the cost of debt. An investigation of the approach that the two regulators use is appropriate and timely because:

- The approach used in both water and aviation sectors has been effectively unchanged for several price determinations (with reviews of the approach taken at each price control). It is good practice to ensure that the approach is robust to the circumstances faced today and expected for the future, especially as those circumstances may be changing, i.e. the expected new airport capacity at either Heathrow or Gatwick.
- There has been financial outperformance in both industries as the actual cost of debt has been less than that allowed at the price determinations. In the water sector previous analysis has shown that financial outperformance has been a source of outperformance against the regulatory settlement. A concern of the regulators would be that this outcome is not consistent with maximising benefits for customers.
- The approach to the cost of debt in the water sector was noted by the National Audit Office (NAO) report and subsequently highlighted further by the Public Accounts Committee (PAC). The NAO estimated that had a cost of debt indexation (i.e. a mechanism that adjusts the cost of debt allowance based on outturn values) approach been adopted at PR09, customer bills would have been lower in 2010-15 based on outturn values compared to expectations.[6]

Role of the cost of debt

A regulated company requires financing for their investments. This financing is typically a blend of debt and equity. The cost of debt and the cost of equity, along with their respective weights, then provide a weighted average cost of capital (WACC). The WACC is multiplied by the asset base to derive an allowed return.

In determining allowed revenues within price control determinations, regulators compensate companies for efficient financing costs, for both debt and equity. For the cost of debt, regulators in the UK have typically included an allowance that includes the cost of new debt (i.e. debt to be taken out during the upcoming price control period) and the cost of embedded debt (i.e. debt already taken out). Given the long-life of utility assets, this approach is seen as

[6] House of Commons Committee of Public Accounts (2016) Economic regulation of the water sector.

a way to ensure that companies remain financeable. A chosen weight will be used to determine the split of new debt and embedded debt.

What approaches can you take on the cost of debt?

The allowed cost of debt can be based on regulated company's actual cost ('actual' approach), be based on an independent benchmark of cost ('notional' approach) or be based on a blend of these two approaches.[7]

The use of the actual cost of debt involves remunerating companies according to the cash costs they incur. This requires the setting of an initial estimation of the cost of debt when the price control is set, and then applying an adjustment after actual debt costs are observed. This 'true-up' could be to prices within a control period or to the following price control.

The notional approach may use a benchmark made up of average costs for a group of constituents, or choose upper quartile costs i.e. leading to a lower cost of debt. While there are several ways in which this approach may be applied, they all aim to set a cost of debt that represents an efficient notional benchmark.

History of setting the cost of debt

During the 1980s and 1990s much of the focus of UK regulators when considering the cost of debt was to use actual company data to determine the allowance, both through the debt premium and the amount of debt in the company (the level of gearing). Towards the end of the 1990s UK regulators moved away from relying solely on actual company data and began to consider a wider range of information. This was linked to a shift to the use of a notional approach to setting the cost of new debt and also the first explicit use of a cost of embedded debt (for PR99) i.e. an allowance for existing debt at the start of the price control period.

This shift in approach to a notional company became the norm for price reviews in the 2000's for water and airports. While application of a notional benchmark has remained unchanged, regulators have altered their assumptions about individual building blocks used to set the cost of debt. For example, the view about what was an efficient notional level of gearing changed (with increasing notional gearing) as take-overs of energy and water businesses took place and new capital structures, took effect. This approach has the benefit of customers not bearing the consequences of company behaviour that leads to higher cost.

Regulators have previously considered changing the way in which the cost of debt is determined. In 2007, Ofwat and ORR jointly commissioned CEPA to investigate the use of indexation for the allowed cost of capital.[8] Ofwat, the ORR and the CAA have considered but not adopted an indexation approach (including at subsequent determinations). Conversely, Ofgem decided to apply an indexation approach. The DPCR5 price control saw an initial exploration of a form of indexation which was further developed as part of the RPI-X@20

[7] Where independent means that the index is not impacted by the debt of firms being regulated.
[8] CEPA (2007) Indexing the allowed rate of return: A report for ORR/ Ofwat.

review and has been used for all RIIO network price determinations (i.e. from April 2013). The RIIO price controls were extended to eight years and this longer price control period led to greater potential benefits from cost of debt indexation. The length of the price control will be a factor in the choice around adjustment mechanisms like indexation.

What approaches do Ofwat and CAA currently take?

The approaches employed by the two regulators can be summarised as:

- CAA bases the cost of embedded debt predominantly on the airport's actual debt costs, cross-checked against a benchmark index for efficiency, with the cost of new debt based on expected movements in current debt yields; and
- Ofwat uses a notional approach for embedded debt and new debt, however with reference to actual costs (an adjustment was made at PR14 for outperformance of this index), with the cost of new debt based on expected changes in the iBoxx index used as a benchmark.

This shows that neither regulator takes a 'pure' approach by ignoring notional or actual costs. However, there is focus on one approach, with the other acting as a cross-check.

A feature of the cost of debt is that an allowance is reset periodically e.g. every five years. This means that companies bear risk of differences under the current approach for a fixed time period before a new allowance is set. This new allowance is not necessarily equivalent to their actual costs, so there is not the removal of risk, but a varying risk profile over time.

1.2. What are regulators looking to achieve by setting the cost of debt?

The suitability of any particular approach to setting the cost of debt depends on its ability to deliver desired regulatory objectives or outcomes (and whether there are alternative approaches that are better able to deliver those outcomes). In setting price controls regulators often seek to deliver a range of outcomes. In the context of setting the cost of debt a key objective will be to keep customer bills low. Other objectives may include:

- other consumer benefits such as predictable charges;
- appropriate incentives for companies to control costs, including to:
  1) raise debt as efficiently as possible; and
  2) make appropriate choices between debt and equity finance;
- ensuring that an efficient company is able to raise finance for new investment (especially with large one-off investments such as that required for a new runway);
- ensuring an appropriate balance of risk between companies and customers, and whether this can lead to outcomes that are beneficial for customers; and
- robust to potential adverse situations and outcomes.

Good regulatory practice would create appropriate incentives for companies to outperform so that more efficient costs can be passed onto customers in the longer run. Consequently, short-term outperformance is insufficient to draw the conclusion that a particular regulatory mechanism is inappropriate. As set out by the CMA in the RIIO-ED1 appeal raised by British Gas:[9]

"Lower financial risk, combined with strong incentives on financing costs can translate into a lower cost of debt environment which can be passed to consumers at future reviews."

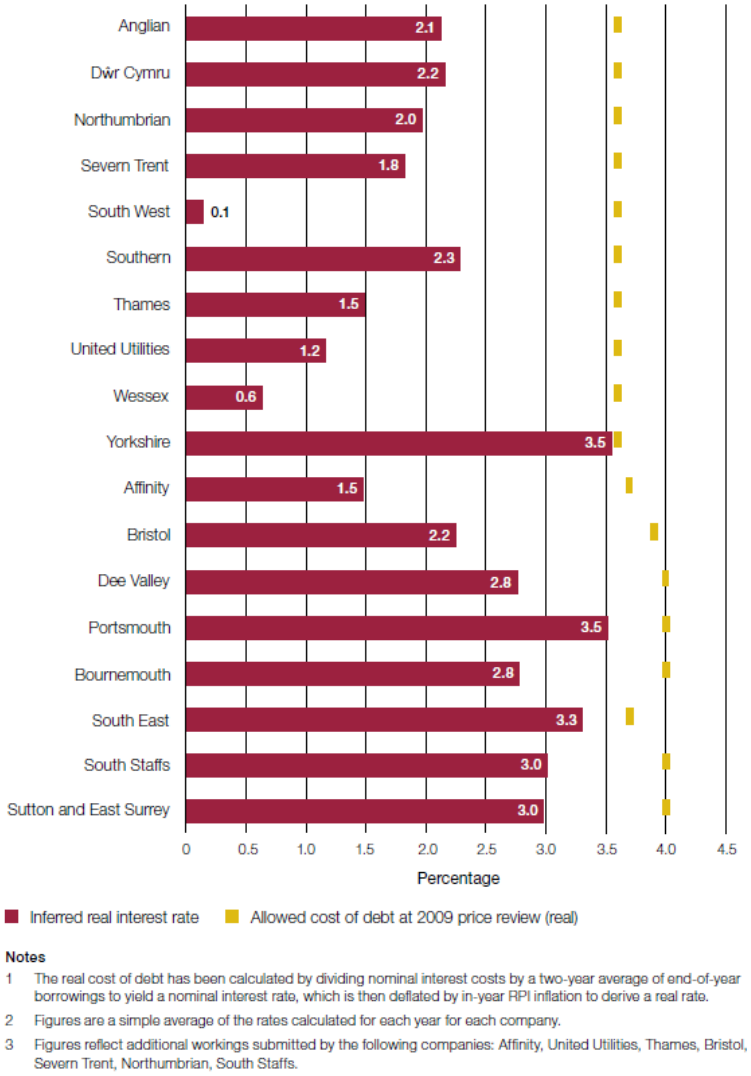
The benefits accruing to consumers do not necessarily need to be on the cost of debt itself – it may be reflected in a lower allowed cost of equity.

1.2.1. Evidence on outperformance

Recently evidence presented by the NAO shows a marked difference between the actual cost of debt incurred by water companies and that allowed. The figure below shows the degree of outperformance for each water company in 2015 which was a period characterised by low rates post Global Financial Crisis (GFC).

[9] CMA (2015) British Gas Trading Limited vs The Gas and Electricity Markets Authority, Final Decision, September 2015. Paragraph 8.56b.

Figure 1.1: The indicative real cost of debt versus the regulatory allowance (2010/11 to 2014/15)



Source: NAO

The basic premise of the NAO report is that companies have achieved a lower cost of debt than was allowed. Whether this necessarily supports the observation that customers paid £840m more than was necessary over the last price control period is difficult to determine from this evidence alone. Critically this kind of retrospective analysis ignores the impact that different regulatory approaches have on company behaviour. Had there been some kind of mechanism that required companies to share some of the £840m with customers in the form of lower bills, the incentive to outperform would have been weaker and companies may not have achieved such low rates. Nevertheless, a question that can be asked retrospectively is:

> *Was it more efficient for companies to face all the risk of volatile debt costs and customers benefit from stable bills, or would it be better for customers to face some (or all) of the risk of volatile debt costs, for example through the use of indexation?*[10]

[10] We do not seek to answer this question but note that understanding the risk allocation and what this means for customers is a key assessment criteria.

1.3. Divergence between the actual and allowed cost of debt

There are four reasons why there may be a difference between the actual and allowed cost of debt:

- 'On the day' costs: if a regulated company issues debt today, is the cost the same as a chosen benchmark index?
- Timing assumptions: how does the timing of debt issuance compare to what is assumed for the benchmark?
- Application of assumptions in deriving a benchmark: even where the 'on the day' cost and 'timing costs' match, there are a number of reasons why actual debt costs may not equal the assumed notional debt costs.
- Forecasting errors: at the price control a regulator has to predict as yet unobserved costs for the cost of new debt.[11]

On-the-day performance

Several factors could individually or collectively cause a difference between actual debt costs and benchmark debt costs (for debt issued on the same day). For example:

- form of debt instrument – companies do not only issue GBP-denominated nominal bonds. Other debt used includes index-linked securities, floating rate bank debt, private placements and EIB loans. These may give different rates to nominal fixed rate bonds (the extent depends on market conditions)[12];
- characteristics of the debt – actual debt with a different issuance size or different tenor, i.e. the time to maturity at issue, can lead to differences in yield i.e. the income return on an investment – the yield curve illustrates how yield changes with tenor;
- credit rating of the company – again the allowance is based on an assumption about the credit rating of the company, e.g. BBB+ and if the actual rating is better than this then the company is likely to be able to borrow more cheaply; and
- 'halo-effect' – infrastructure and utility companies may benefit from lower debt costs relative to a company of the same credit rating through perceptions of lower relative risk. The size of this effect will depend on the characteristics of the respective company and the benchmark index that is used. There is mixed evidence on the size of this effect in regulated sectors.

[11] With a real cost of debt, a forecast is required for both the nominal cost of debt and inflation.
[12] An added complication is that there will be non-price differences between these products – for example, bank debt may require the posting of collateral, but also may allow draw-down of debt over time.

Timing

The second possible cause for outperformance is the time at which debt is issued. There are three ways in which timing can affect outperformance/ underperformance:

- delays in investment[13] mean that funding does not need to be raised when was assumed at the price determination and consequently the company is able to benefit from the saving of delays in the need to pay for funding even though customers are financing the investment through the regulatory settlement;
- active management of debt raising means that the company may be able to benefit from advantageous rates even though this may mean pre-funding of some investment or a greater use of retained funds until debt is raised. Refinancing needs that are linked to historical debt positions also affect the choice of timing and may lead to under- or outperformance; and
- where outturn rates are different to expected for new debt; an example is in the airports sector, where our understanding is that Gatwick airport issued a significant proportion of the anticipated debt required over the Q6 regulatory period (though the exact details of the price control were not known). Forward rates at the time pointed to increases in yields, so it would have appeared a prudent decision, though since then rates continued to fall.[14]

This indicates that while there may be control, there is not necessarily implied outperformance from this degree of control.

Application of assumptions in deriving a benchmark

In setting a price control the regulator makes other assumptions that affect how the cost of debt impacts the companies' allowed return. If there is a divergence from the assumptions the regulator makes then there is the potential for outperformance. The issues include:

- the choice of new/ embedded debt split;
- application of forward curves for new debt;
- application of trailing averages for embedded debt;
- transaction costs;
- treatment of inflation; and
- choices linked to the use of ex-post adjustment mechanisms.

[13] However, we note that this is not as straightforward in water as additions to the RCV are based on the company's choice of PAYG ratio, which is not a direct translation of capex.
[14] In addition, for bond issues there is likely to be a more effective rate obtained for a bond of a certain sizes (e.g. £300m) compared to issuing a number of smaller bonds (e.g. £50m).

Given a divergence between companies' actual performance and the benchmark, the question is how can the benchmark be improved to be more cost reflective while still setting sufficient incentives for outperformance.

Forecasting errors

There are two causes of forecasting error for a cost of debt allowance. The first relates to the market-derived evidence on future rates. The second refers to a regulator's application of this evidence in setting the cost of new debt (there is no forecasting error on embedded debt).

Market-derived estimates, such as forward curves on government debt, have historically tended to be poor predictors of future yields. There are unforeseen events and changes in markets that mean that rates are volatile.

The regulator may choose to aim up from market-derived estimates of future rates. We refer to this as headroom. Regulators have to forecast the cost of new debt and their forecasts may turn out to be wrong. Where the regulated company faces the impact of these differences e.g. under a fixed allowance, the regulator may make a conscious choice to aim up in order to compensate the firm for the risk that they are incurring. However, the aiming up may be more implicit e.g. placing more weight on regulatory precedent at a time of falling yields, or through methodological choices that raise the cost of debt.

It may be that regulators choose not to include headroom on the cost of debt, but include this in the cost of equity estimate. For example, Ofgem explicitly state on the RIIO-ED1 price control:[15]

"We consider that any remaining under provision in the cost of debt is balanced by the headroom in our cost of equity estimate."

Any uplift should help ensure that companies are able to raise finance (and remain financeable) in the event that market debt costs rise, but aiming up leads to customers paying more in the short-term (and longer if headroom persists).

If the estimate of the cost of debt used in setting a price control does not represent the market derived expectation (for example where it includes headroom above this estimate), there is a benefit for equity holders in terms of the ease by which they can outperform the allowed cost of debt, but there is no clear benefit for customers (other than protecting the financeability of companies which can be achieved through other means at a lower cost to customers).

While the allowed cost of capital tends to be set at a real rate, this then is translated into a nominal allowance through the inflation adjustment made to the revenue allowance. If the inflation expectations used to adjust the nominal and real rates at the time of the determination differ from actual inflation over the life of the control then there is the potential for outperformance/underperformance. As noted by Ofwat in assessing the correct

[15] Ofgem (2014) RIIO-ED1 Draft Determinations: Financial Issues, July 2014.

form of inflation indexation, RPI has been more volatile than CPI, such that it may be more difficult to forecast RPI than CPI.[16]

The precise impact of unanticipated inflation (either greater than forecast or less than forecast) is not clear since it depends on the timing and type of debt raised. Firms typically have more fixed nominal debt than real debt. This leads to unanticipated inflation having a leveraged impact on equity returns. For example, Macquarie commented after the EU referendum that:[17]

"RPI will likely rise. With rising import costs, we should expect to see RPI rise with a lag effect. Regulated assets are regulated with RPI, and with fixed debt, RPI is leveraged approx 3:1 to returns to equity."

1.4. How to derive an accurate estimate of the cost of debt?

If a regulator wishes to more closely align their allowed cost of debt with actual debt costs, there are three broad ways to do so:

- using actual costs in the derivation of the allowance;
- changing the ex-ante setting of the allowance; and/or
- introducing ex-post mechanisms to deal with differences.

The trade-off of increasing cost reflectivity is typically the risk of muting incentives. Using actual costs is most cost reflective but it does not create strong incentives on companies as their own costs are used to derive their allowance. The incentive properties of such an approach can be slightly improved if the allowance is based on sector (average or upper quartile) costs, rather than on the individual company's costs as the company has less ability to influence the allowance. However, this approach is still prone to weaker incentives than a purely independent benchmark.

With stronger incentives to obtain the least cost on debt, we would expect lower financing costs to feed through to customers in the long-run – however this requires that some weight is placed on actual costs in future otherwise customers cannot benefit if this outperformance is never taken into account.

Changes to the setting of an allowance would ensure that the (unadjusted) index is not overcompensating firms at the costs of customers. This may be through an adjustment to the levels indicated by the benchmark, as Ofwat did at PR14, or through different choices on methodology. Such an approach places some weight on sector average costs to try to deliver these customer benefits.

[16] Ofwat (2016) Water 2020: Regulatory framework for wholesale markets and the 2019 price review – Appendix 1

[17] Macquarie (2016) UK Utilities: Brexit to increase utility bills… but uncertainty uncertainty uncertainty, 24 July 2016

Using ex-post adjustment mechanisms to adjust the allowed cost of debt based on outturn values can further improve the cost reflectivity of the allowance. It is important that the approach is determined at the price control however, as otherwise there will be uncertainty created that can lead to higher debt costs and higher costs for customers.

1.5. Structure and approach

In an ideal world, the ex-ante setting of a cost of debt allowance removes the need for ex-post adjustment mechanisms. As such, we first focus on the ex-ante setting of the cost of debt before looking at potential ex-post adjustment mechanisms.

Ex-ante mechanisms

There are two questions that are pertinent to creating the best proxy ex-ante. The first question we consider relates to the extent to which the cost of debt should be based on actual or notional costs. If the answer is to use actual costs, this renders other questions around timing and application of the allowance insignificant. Since some incentive for cost minimisation is desirable, a key question is whether a representative index exists for regulated water companies and airports rather than using actual individual company costs for each company. If it does not exist, what adjustments can you make to existing indices to make them representative notional proxies.

Our next question involves an assessment of whether actual timing or notional timing should be used if the notional benchmark approach is taken. For notional timing, there are options for how this is considered and does not necessarily mean a simple average approach as used previously. These issues are all discussed Chapter 3 of the report.

Questions around the application of assumptions in deriving a benchmark are contained in Chapters 6-12 of our report. These are more technical in nature, however they are fundamental to the allowance and can have a significant effect even when the benchmark index chosen is correct.

Ongoing adjustment mechanisms

The NAO and PAC commentary on the water sector suggested that the use of cost of debt indexation rather than a fixed allowance could have delivered significant savings during the PR09 price control. We discuss the question whether to use such a mechanism in Chapter 4 of our report.

This commentary and the regulatory precedent from Ofgem in the GB energy sector is based on a full indexation model i.e. indexation of both new and embedded debt. The use of indexation can reduce the reliance on forecasts (and reduce the impact of forecasting errors), one of the issues leading to a difference between actual and allowed debt costs. However, it is possible to remove the forecasting error through indexing new debt only (with a fixed allowance for embedded debt). This is similar as a mechanism to the WaterShare scheme

introduced by South-West Water at PR14. This chapter addresses whether a partial indexation model (i.e. indexation of new debt only) is preferable to a full indexation model.

Ex-post adjustment mechanisms

There may be economic events that are not predicted at the outset of the price control and there may be greater sharing of gains and losses with customers through ex-post adjustment mechanisms. If used, such an approach would bear similarities to the approach used for total expenditure in the water sector. Whether a benefit-cost sharing mechanism based on actual costs is appropriate is assessed in Chapter 5 of our report.

Assessment criteria

In Chapters 3-5 of the report, we score the options against six criteria:

- impact on customers – what are the bill and volatility impacts;
- incentives – what incentives are placed on companies;
- financeability and investment – what risks are there around ongoing financeability;
- risk allocation – what risks are faced by companies and customers;
- regulatory principles – is the approach consistent with good regulatory practice; and
- robustness to changes – how does the approach fare with changes in the regulatory regime or in financial markets.

Further details on these criteria are contained within Annex F.

We have sought to base our recommendations on the weights we understand that regulators place on these different criteria currently. However, it may be that regulators chose to ascribe different weightings to the criteria and as such may arrive at alternative decisions.

Quantitative analysis

Our assessment is supported by quantitative analysis to better understand the implications of our choices. Where necessary we have developed a model which uses data from the last decade (see Annex E for details). While we appreciate that this is using a period which has seen significant volatility, there are two key considerations:

- this is the period for which there is most complete information; and
- to ensure the robustness of an approach it is better to test it under the unusual circumstances of the last decade rather than choosing an approach that works under "normal" circumstances but would fail if something akin to the GFC happens again.

2. VARIATIONS BETWEEN THE ACTUAL AND NOTIONAL COST OF DEBT

Summary

In this section we consider how actual costs compare to notional benchmarks. This analysis allows us to understand the impact of policy choices and informs us in developing a methodology.

We find that actual sector costs are consistently below an iBoxx benchmark comprised of A and BBB rated non-financial corporate debt in the water sector and at present actual costs for Heathrow are below costs from the most suitable benchmark, though this has not always been this case. Outperformance may be for a number of reasons, as identified in Chapter 1, including differences in 'on the day' costs and in timing.

2.1. How do actual and notional costs compare?

Why does this matter?

We are reviewing the approach to the cost of debt in a price control setting. Considering how notional and actual costs provides insights that help us in making recommendations on the approach. For assessing the use of cost pass-through, the actual costs of companies is required to understand the potential impact on customers. If an actual approach is not chosen, this analysis can support our recommendations on the preferred notional approach.

Evidence

Notional and actual costs – water sector

There is no single benchmark that represents the notional approach. The notional approach is conceptual by nature and as such there are a variety of choices around how the benchmark is formed. We use the current benchmark indices that are used in the PR14 and Q6 determinations (noting that this is used sparingly in the Q6 context). This is only one variant of a notional approach compared to actual costs, but with a multitude of options we believe this is the appropriate baseline against which to compare alternatives. We do not make reference to the allowances in regulatory determinations themselves.

We compare the nominal industry cost of debt for the regulated England and Wales water sector with a ten year trailing average yield of a combined iBoxx A and BBB rated non-financial corporate 10yr+ index. The comparison below shows that the iBoxx trailing average has been higher than the water industry cost of debt in every year for the eight years shown, on average by 55 basis points with a range between 30 and 80 basis points.

Table 2.1: Nominal industry cost of debt – water sector

Year (end-March)	Water industry cost of debt (mean)	IBoxx 10yr+ NFC A/ BBB (ten year trailing average)	Difference in cost (actual minus benchmark)
2008	5.8%	6.2%	-0.4%
2009	5.5%	6.2%	-0.7%

Year (end-March)	Water industry cost of debt (mean)	IBoxx 10yr+ NFC A/ BBB (ten year trailing average)	Difference in cost (actual minus benchmark)
2010	5.5%	6.2%	-0.7%
2011	5.5%	6.1%	-0.6%
2012	5.4%	5.9%	-0.5%
2013	5.5%	5.8%	-0.3%
2014	5.2%	5.6%	-0.4%
2015	4.7%	5.5%	-0.8%

Source: Moodys, Markit

The fact that the water industry cost of debt has been below the figures quoted for our notional approach raises questions about its suitability as a proxy for an efficient cost of debt in the absence of an adjustment.

Notional and actual costs – aviation sector

In the aviation sector, we can conduct a similar analysis in comparing costs of Heathrow with a notional benchmark. We use publicly available information on the cost of BAA (SP) Limited/ Heathrow (SP) Limited debt, including the cost of accretion on index-linked debt.[18] For the notional index, we use the same family of iBoxx index as with the water sector, but with a10-15yr tenor. This index therefore excludes bonds over 15 years that would be included in the Ofwat benchmark index.

The information provided by Heathrow Airport, following a data request as part of this project, indicated that the weighted average tenor of debt issued between 2008 (when Heathrow Airport (SP) Limited was established) to the end of 2015 is 12.1 years (source: Heathrow Airport and CAA).[19] While this fluctuates over time, this appears consistent with our 10-15yr assumption. Use of a 10yr+ index (with an average 20yr tenor) would not be appropriate - given a typically upwards sloping yield curve, choosing a longer tenor would lead to customers paying more and overcompensating Heathrow Airport.

Table 2.2: Nominal industry cost of debt – Heathrow Airport

Year (end-December)	Heathrow (SP) Limited cost of debt (including accretion)	IBoxx 10-15yr NFC A/ BBB (ten year trailing average)	Difference in cost (actual minus benchmark)
2011	6.5%	6.0%	+0.5%
2012	5.8%	5.8%	0.0%

[18] Accretion refers to the change in the value of the principal from price changes. For example, with an index-linked bond, there is a payout of a coupon each year with an increase in the value of the bond itself – this latter increase is the accretion element.

[19] Our data for Gatwick Airport in the period 2009/10-14/15 gives a weighted average tenor at issue of 15.2 years. This would be closer to the average time to maturity of the 10-15yr index than the 10yr+ index.

Year (end-December)	Heathrow (SP) Limited cost of debt (including accretion)	IBoxx 10-15yr NFC A/ BBB (ten year trailing average)	Difference in cost (actual minus benchmark)
2013	6.0%	5.6%	+0.4%
2014	5.7%	5.4%	+0.3%
2015	4.8%	5.3%	-0.5%

Source: Heathrow Airport, Markit. Note: 2011 is first year cost of debt including accretion is quoted.

There has been a less consistent story with Heathrow Airport compared to our benchmark index – until 2015 there was some underperformance relative to the index, but last year there was more significant outperformance. We would place more weight on existing debt at present, but taking into account variation over time. The benchmark index is more challenging for companies however, given that it produces a lower yield than the 10yr+ index (10-20bps per annum).

There are multiple measures of actual costs. These include the cash interest costs, a simple weighted average of annual bond costs and debt costs reported in financial statements. These debt costs may include or exclude accretion and derivatives. If we replicate Table 2.2 with weighted average coupon costs of Heathrow bonds, we obtain the following results.

Table 2.3: Nominal industry cost of debt – Heathrow Airport using weighted coupon costs only

Year (Q4 of each year)	Heathrow Funding weighted average coupon cost	IBoxx 10-15yr NFC A/ BBB (ten year trailing average)	Difference in cost (actual minus benchmark)
2011	5.7%	6.0%	-0.3%
2012	5.5%	5.8%	-0.3%
2013	5.4%	5.6%	-0.2%
2014	5.1%	5.4%	-0.3%
2015	5.0%	5.3%	-0.3%

Source: Bloomberg. Based on all fixed coupon debt.

The weighted average coupon is one measure of cost.[20] In this case, it shows a fairly steady outperformance of the index by 20-30bps. This measure has the benefit of being based on public bond information. However, the drawback is that it does not capture all of the companies' debt and so may not present a complete picture of the costs faced by Heathrow. This issue is something we consider further in Chapters 3 and 5.

Summary

Actual costs in the water sector have historically been below the yields from the benchmark. In the aviation sector, there appears to be less clear a view on performance of Heathrow's

[20] This does not include other costs, such as bond discounts. For publicly traded bonds, this may underestimate total costs.

actual debt costs relative to the benchmark index. In the next section, we look to identify the reasons for these differences.

2.2. Can we identify the causes of these variations?

Why does this matter?

If we are able to identify why there are the differences between actual costs and our benchmark, this will inform our choices around the setting of the cost of debt. In Chapter 1, we identified different causes for potential outperformance/ underperformance.

These are:

- 'On the day' performance, including debt type, gearing and bond characteristics (e.g. tenor, credit rating, halo effect).
- Timing.
- Methodology in utilising a benchmark index.
- Forecasting error.

The last of these is not relevant to explaining the differences here as all figures are outturn values for notional and actual costs rather than the regulatory allowance where a forecast is required. We do not look in depth at questions relating to technical application as these are discussed in more detail in Chapters 6-12. However, the choice of index can have a significant impact, as shown below.

Table 2.4: Nominal yields from iBoxx indices

Composite indices			Nominal yield (%)			
Constituent	Tenor	Credit rating	Spot (31/12/15)	1yr average	5yr average	10yr average
Non-fin corporates	10yr+	A	4.02	3.77	4.44	5.10
Non-fin corporates	10yr+	BBB	4.42	4.08	4.74	5.58
Non-fin corporates	10-15yr	A	3.54	3.34	4.07	4.94
Non-fin corporates	10-15yr	BBB	4.16	3.81	4.56	5.57
Corporates	10yr+	A	4.10	3.84	4.65	5.49
Corporates	10yr+	BBB	4.54	4.20	5.04	5.96
Corporates	10-15yr	A	3.68	3.48	4.40	5.56
Corporates	10-15yr	BBB	4.35	3.96	4.97	6.07
Utilities	10yr+	n/a	4.28	3.96	4.59	5.16
Utilities	10-15yr	n/a	3.97	3.65	4.34	5.06

Source: iBoxx

As shown in Figure 2.1 below, the Bloomberg 20yr indices for A and BBB rated corporates and the iBoxx 10yr+ non-financial corporate indices for broad A and BBB rated debt give a relatively similar yield over time. The iBoxx indices do include higher yields during the spike at the GFC. From 1 April 2005 to 31 March 2015, the iBoxx indices are on average 10bps higher than their Bloomberg counterparts.

Figure 2.1: Nominal yield comparison for Bloomberg and iBoxx indices

Source: Bloomberg, Markit iBoxx

In their RIIO Strategy Decision (2011), Ofgem noted that benefits in support of the iBoxx index relative to Bloomberg include: the more transparent and predictable methodology; it is calculated with reference to more regulated utility bonds; and the 10yr+ index reflects the long-term nature of bonds issued by utility companies.[21] The approach was supported by networks and investors. In the five years since this decision, there is a greater proportion of regulated bonds in the index, while stakeholders will be more familiar with the use of the indices as they have been used as the reference point for a number of recent UK regulatory determinations.

Based on this analysis, we recommend the continued use of the iBoxx indices at present However we recommend that regulators review this at the time of the determination to ensure the indices are still representative and an appropriate tenor is chosen.

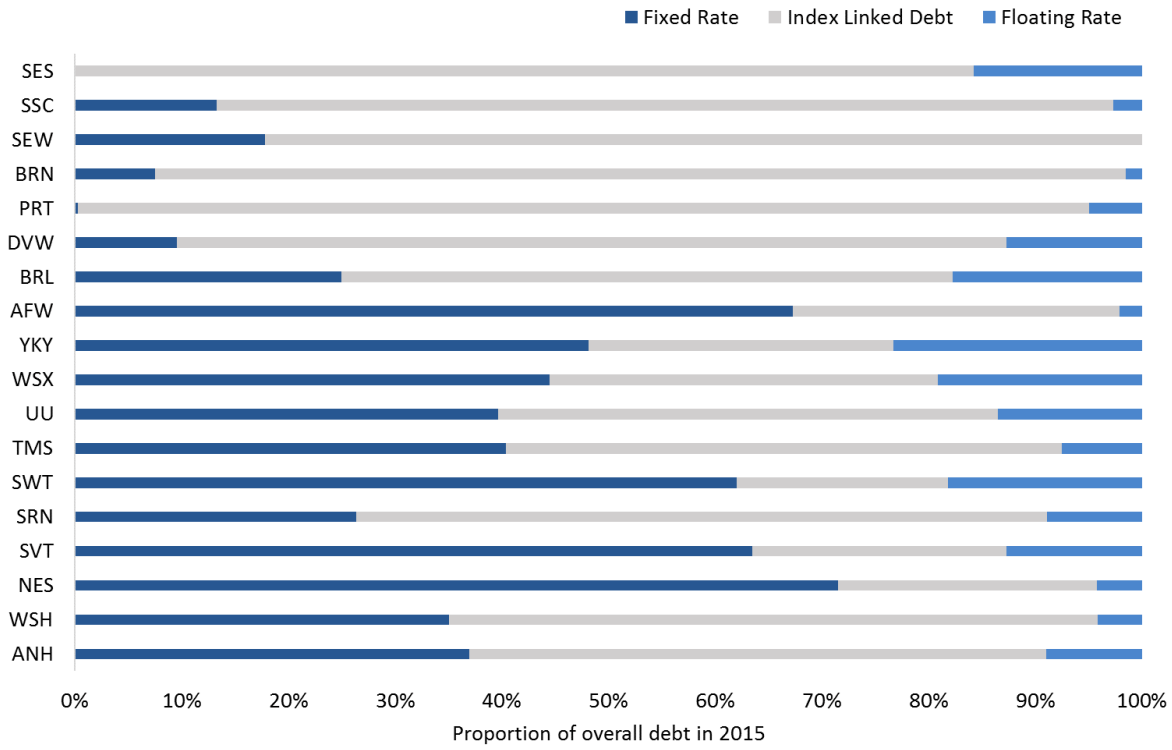
[21] Ofgem (2011) RIIO Strategy Decision for RIIO T1 and GD1: Financial Issues

2.2.1. On the day performance – debt type

In the water sector, we find that the majority of debt is fixed rate, either in nominal form or index-linked form. At PR14, Ofwat and its consultants estimated the cost of bank debt for water companies to be 183bps lower than the assumptions derived using bond finance only for the forthcoming price control (although this is comparing shorter-term bank debt to longer-term bond finance and so may not be 'like-for-like'). Bank finance represented 9% of debt finance for Water Only Companies (WoCs) and 1% for Water and Sewerage Companies (WaSCs).

Discussions with market participants have found the significant difference in yield between bond and bank finance still exists, though in the long-term there should not be a persistent difference between costs when assessing yields for the same tenor of debt for a company with the same risk profile. The same concept applies for index-linked debt where we expect index-linked debt to be at least the same expected cost as nominal rate debt. Where RPI (the basis for indexation for these bonds) is lower than expected at the time of issue, this can lead to shorter term differences between nominal and index-linked debt.

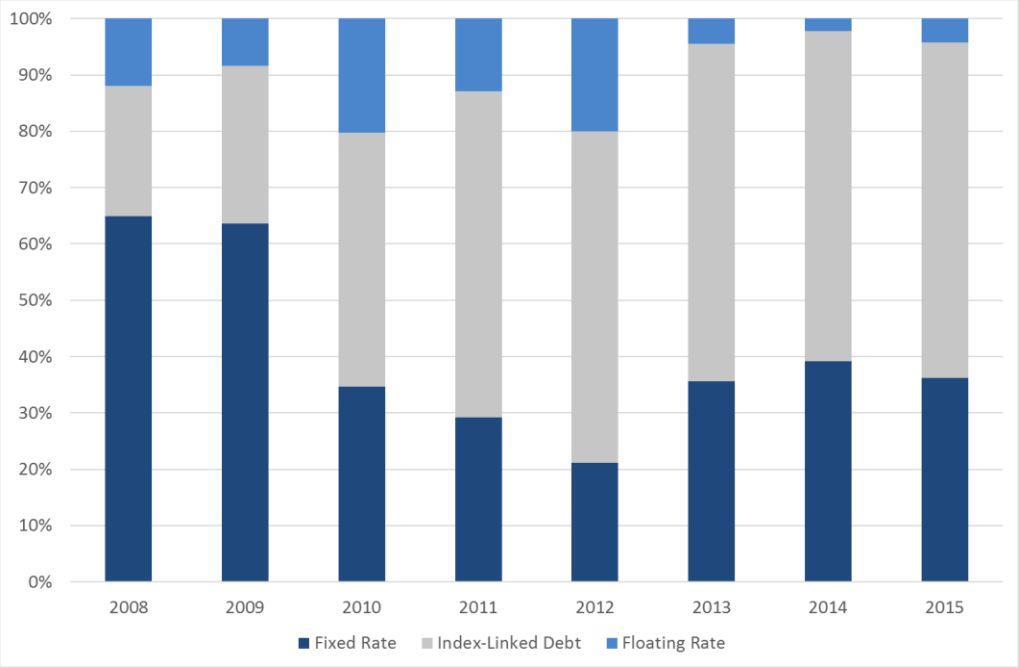
Figure 2.2: Debt type by company (end-March 2015)



Source: Ofwat

In the aviation sector we also see a low proportion of floating rate debt and a high proportion of index-linked debt over time.

Figure 2.3: Debt type for Heathrow Airport



Source: CAA, Heathrow Airport

It is unclear that debt type explains the full difference between actual costs and the benchmark index, although it may explain some part of the difference. There are also non-price differences between the types of debt that makes the comparison trickier e.g. ability to draw down bank debt or role of covenants and collateral in bank finance.

2.2.2. On the day performance – gearing

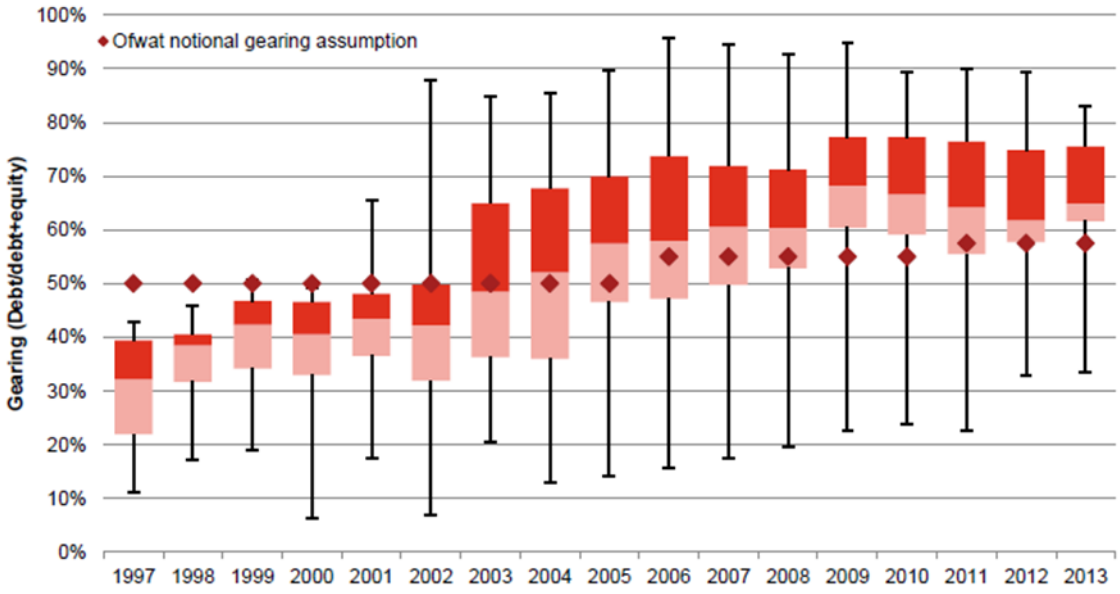
Our benchmark index uses non-financial corporates for assessing the appropriate yields. In assessing whether the index is representative of costs for regulated entities, gearing is one consideration. Higher gearing levels for regulated utilities (55-75%) relative to other non-financial corporates should lead, if anything, to a higher cost of debt for a more highly geared company.[22] There are not significant changes over time for non-financial corporates, with levels from 20-24% on average since 2009.[23]

In the water sector, companies have typically moved to a more leveraged capital structure over time, as shown in the supporting documents at PR14.

[22] Where firms trade at a premium to the RCV, using market capitalisation would reduce the gearing observed but a significant difference would still remain.

[23] This is based on Bloomberg analysis, using total debt and market capitalisation to estimate gearing. The gearing measures quoted are slightly different given the denominator.

Figure 2.4: Capital structure in the water sector



Source: Ofwat, PwC analysis

Note: The full vertical lines represent the full range of gearing across the industry. The top and bottom of the blocks represent the 25th and 75th percentiles. The dividing line between the two blocks represents the mean.

Source: PwC (2013) Methodological considerations for PR14

In the aviation sector, Heathrow's regulatory gearing is also significantly above the non-financial corporates level and has remained relatively steady.

Table 2.5: Heathrow Airport Senior Gearing

2008	2009	2010	2011	2012	2013	2014	2015
67%	68%	69%	68%	66%	68%	68%	68%

Source: CAA, Heathrow Airport

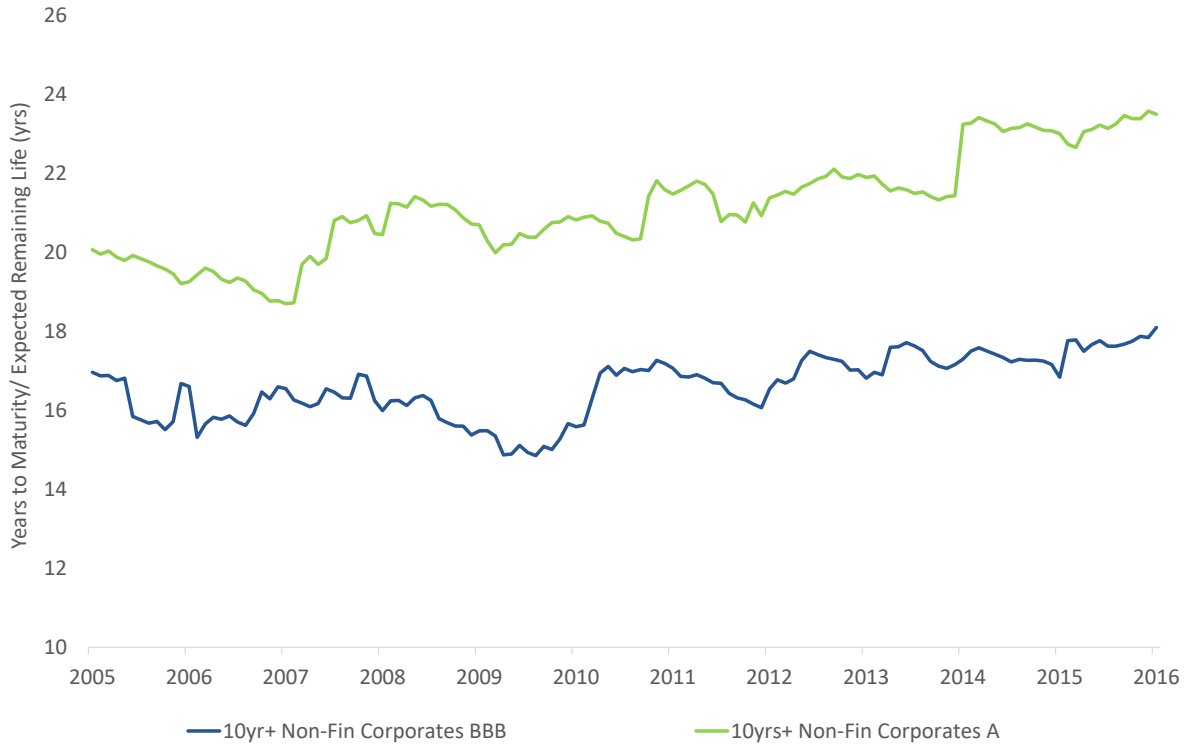
This indicates why the actual cost of debt may be higher than a notional benchmark due to higher levels of gearing, not why there might be outperformance on the cost of debt. With higher gearing there is less of an equity buffer for cost recovery and so we would expect a higher cost of debt.

We note here that we do not consider that junior or subordinated debt should be used given that the senior gearing levels are already above the regulatory assumptions and there is an allowance for equity (above the cost of debt), such that the firm would be overcompensated if this was taken into account in setting the cost of debt.

2.2.3. On the day performance – tenor

The choice of tenor for the benchmark index can have a significant effect on the observed yield. When the yield curve is not flat, the assumed tenor affects the benchmark cost of debt. Given that the iBoxx indices cover a timespan rather than an exact maturity, the time to maturity of the benchmark index is not constant. An example of the changing time to maturity is shown for the iBoxx 10yr+ non-financial corporates indices.

Figure 2.5: Time to maturity on iBoxx composite non-financial corporates 10yr+ indices



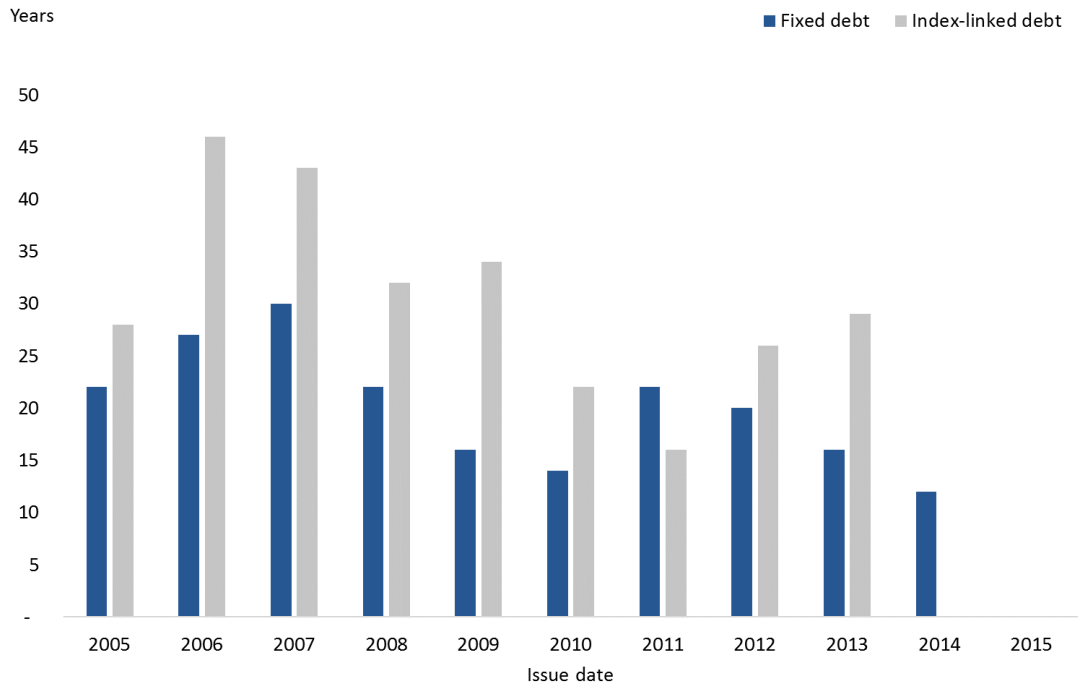
Source: iBoxx

The changes can be significant in terms of assumed tenor e.g. the A rated index has gone from 18.7yrs in 2007 to 23.5yrs in early 2016.

We note that relying on actual company information to understand what an efficient notional company would do is imperfect as the company choice is not independent of the regulatory package. We think that the information can be used as this issue is inherent to other areas where we look at actual debt costs.

In the water sector, the average tenor for actual debt costs has been decreasing while the 10yr+ index has been increasing. The use of the 10yr+ benchmark would appear appropriate based on the historical information. For Heathrow, the tenor of debt seems to be slightly lower than that of the water sector, although with variance between different years.

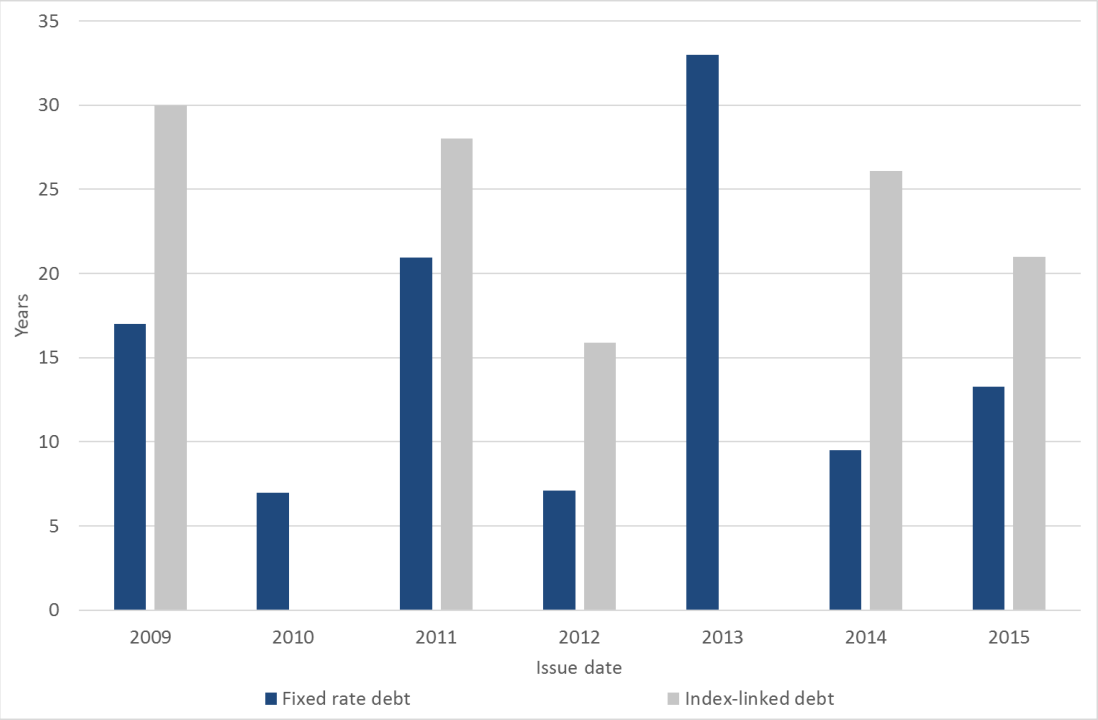
Figure 2.6: Average tenor of debt by bond type – water sector[24]



Source: Ofwat. Note that the information is compiled from publicly available bond data, but that the data may be incomplete. Complete information has often been unavailable for bank or intercompany debt.

[24] Average is weighted by issuance in the year.

Figure 2.7: Average tenor of debt by bond type – Heathrow Airport[25]



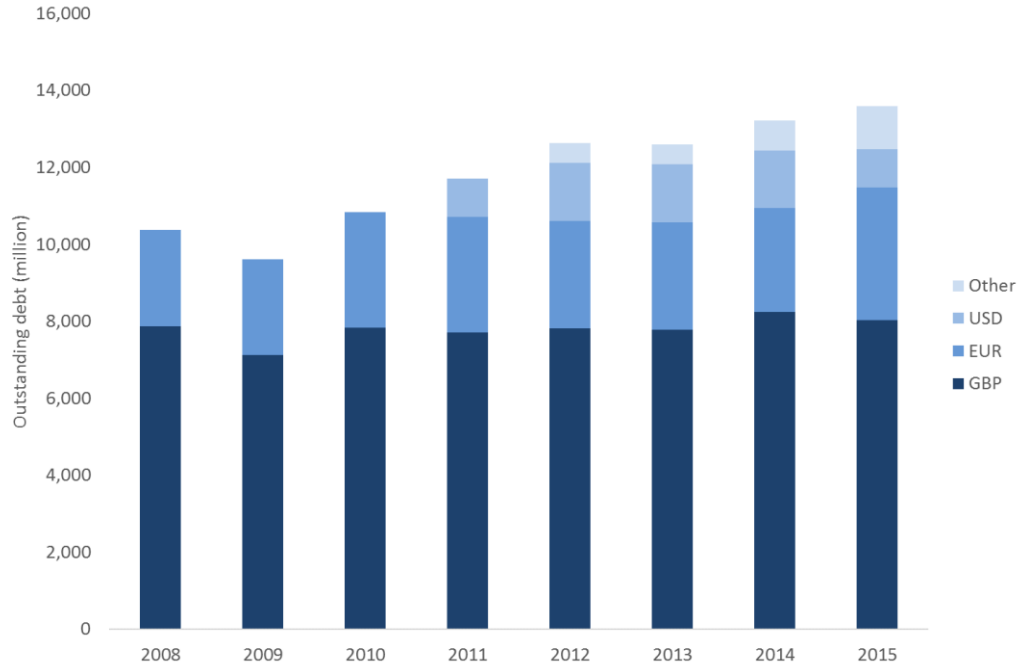
Source: CAA, Heathrow Airport

2.2.4. On the day performance – currency denomination

The benchmark indices used in assessing actual and benchmark costs are fully GBP-denominated bond indices. In the water sector, we understand that foreign-denominated debt remains a low proportion (<5%), although Heathrow has increasingly utilised overseas debt markets. Our analysis on developments in financial markets (Annex B) indicates that Euro markets have been able to achieve more competitive pricing in the last two years and this could help explain the improvement in Heathrow's cost of debt relative to the benchmark index over this period.

[25] Average is weighted by issuance in the year.

Figure 2.8: Currency denomination of Heathrow debt



Source: CAA, Heathrow Airport. This includes all debt types.

Looking more closely at Heathrow's debt portfolio, the costs of GBP coupons are materially higher than non-GBP coupons. There will also be swap costs involved for converting back to GBP.[26] The table below illustrates this impact.

Table 2.6: Coupons on nominal bonds by currency (as of 15/07/16)

Currency denomination of debt	Quantum of debt (£m)	Weighted average coupon
All	10,938	5.26%
GBP	5,904	6.90%
EUR	2,795	3.28%
CAD	787	3.39%
USD	751	4.88%
CHF	612	1.50%
NOK	900	2.65%

Source: Bloomberg

Coupons do not include swap costs to convert foreign denominations back into sterling. A reason for this would be the shorter tenor of non-GBP debt. With an upward sloping yield curve, shorter tenor debt will be less expensive than longer term debt. The analysis does highlight the variations in coupons by currency and why using an unadjusted GBP-only nominal bond index has the potential to be overly generous if the swap costs are less than the difference in coupon. An option would be to use a non-GBP denominated corporate bond

[26] This will reflect interest rate and currency valuation expectations.

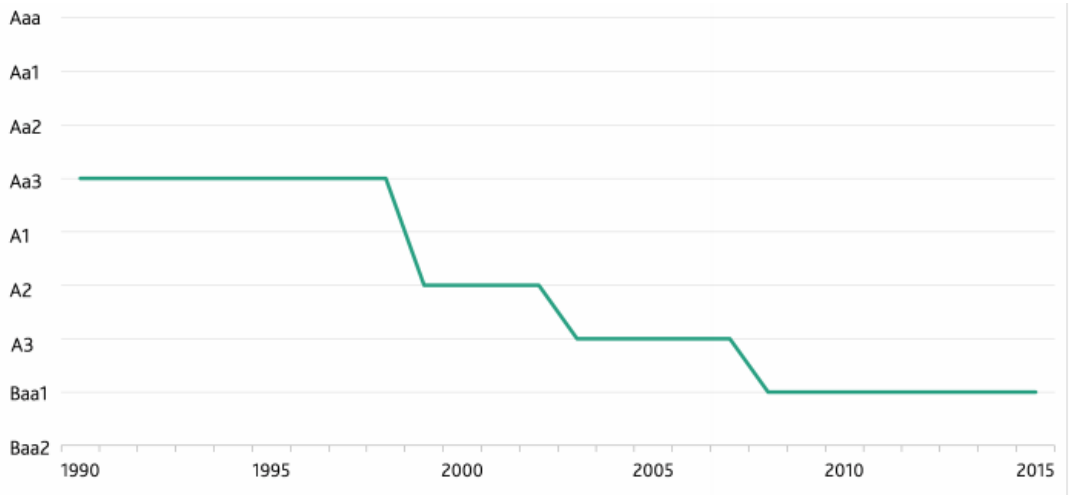
index – these are available from iBoxx in the same format as the GBP indices, with the addition of swap costs.

2.2.5. On the day performance – credit rating

Our notional indices use a blend of both broad A and BBB indices. Heathrow Airport is rated at A-, while the majority of water companies hold either a BBB+/A- credit rating.

Moodys' illustrates how the water sector credit rating has evolved over time.

Figure 2.9: UK Water Sector – rating history



Source: Moodys

If our analysis over time is to a benchmark with the same credit rating we would expect performance against the index to have deteriorated over time.

2.2.6. On the day performance – halo effect

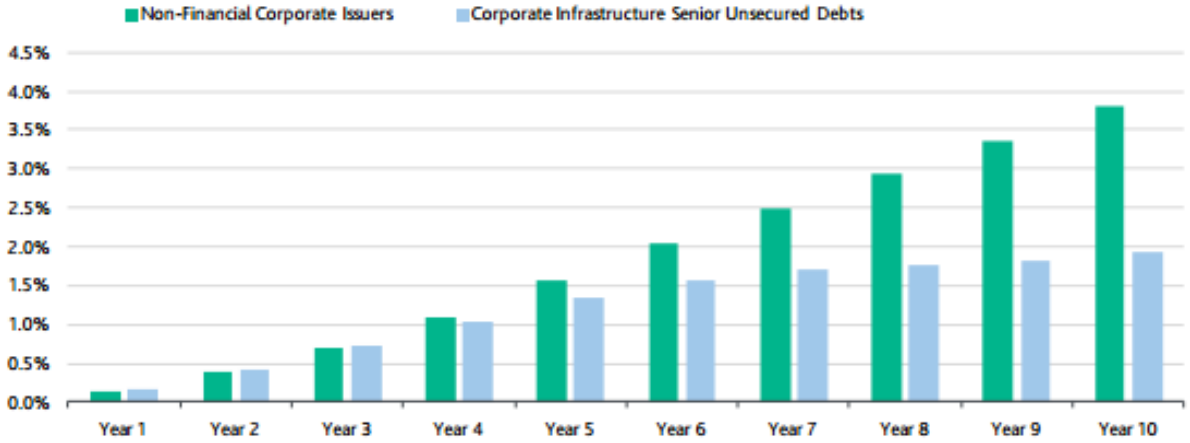
The halo effect is the phenomenon of regulated networks' bond yields being below yields of bonds of a similar tenor and the same credit rating. Ofgem in their RIIO ED1 Strategy Decision noted that over the history of the iBoxx index, network companies had been able to issue debt with yields below the market cost of debt on the corresponding date.[27] They ascribe the 'halo effect' benefits as being caused by:

- a guaranteed revenue stream;
- capital investments are maintained in value due to existence of RCV/RAB;
- no, or very low, competitive pressure;
- no volume risk on revenues (where a revenue cap is used);[28] and
- a well-established, well-understood regulatory regime.

[27] Ofgem (2013) RIIO ED1 Strategy Decision, Financial Issues p.11.
[28] As the aviation uses a price cap, this would not be a cause for a halo effect.

A Moody's review of global default rates for 1983-2013 finds that corporate infrastructure ratings, including utilities, tend to be more stable and less likely to be downgraded that non-financial corporates of the same credit rating in general.[29] This leads to a significant difference in default rates for broad BBB/ Baa rated corporate infrastructure debt as opposed to broad non-financial corporates. This is relevant for us as lower rates of default should lead to lower debt costs relative to other constituents within our benchmark index.

Figure 2.10: Cumulative default rates for Baa rated debt



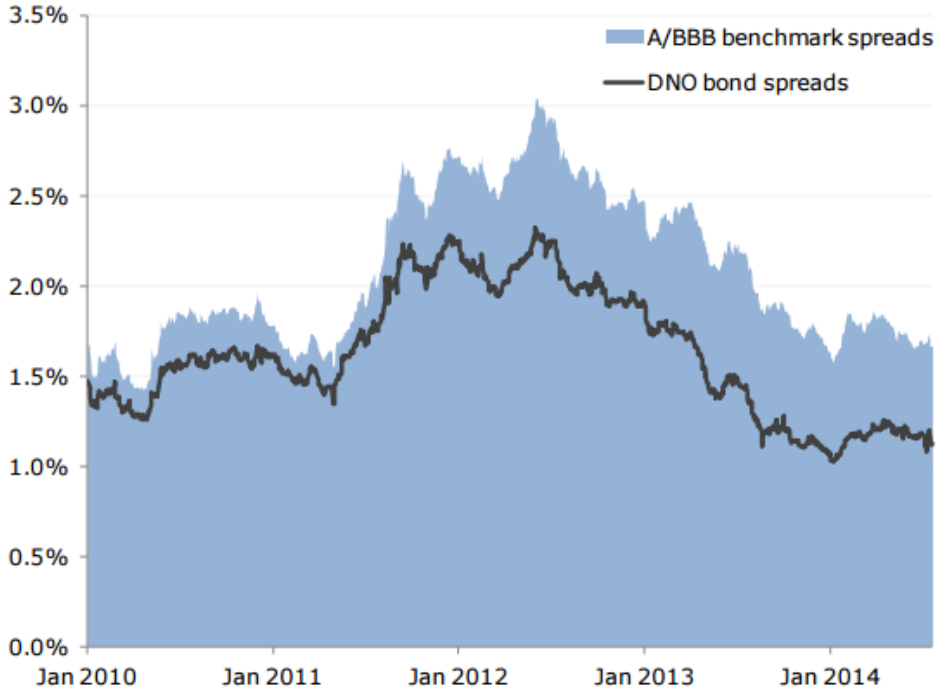
Source: Moody's

In addition, the analysis finds that there are higher recovery rates in the case of defaults for utilities i.e. a lower loss given default. This would support the rationale for a halo effect.

Ofgem for the RIIO-ED1 price control compared actual costs of electricity distribution networks to their chosen benchmark, the iBoxx 10yr+ A and BBB rated non-financial corporate indices.[30] Ofgem initially found a significant halo effect, as shown in Figure 2.11.

[29] Moody's (2014) Infrastructure Default and Recovery Rates, 1983-2013, May 2014
[30] Ofgem (2014) RIIO-ED1 Slow Track Draft Determination: Financial Issues.

Figure 2.11: Comparison of electricity distribution company debt compared to benchmark



Source: Ofgem

However, the size of the effect is disputed e.g. NERA argued that the size of the halo effect reduced once controlling for tenor and rating, with the DNO debt remaining time to maturity falling to 15 years compared to an average time to maturity in the index of 20 years.[31] In addition, the second point was related to the concativity of the yield curve. This means that the average tenor observed for five year debt and 25 year debt would be lower than for 15 year tenor.[32]

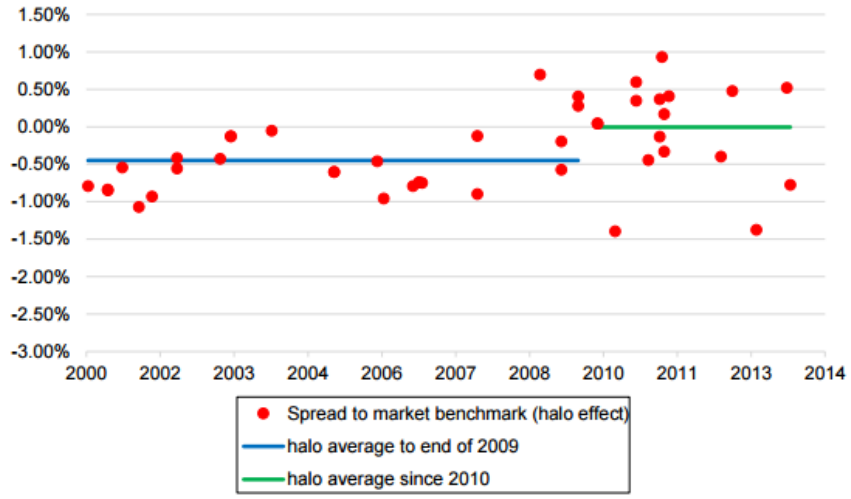
The RIIO-ED1 price control was referred to the CMA, with the cost of debt being an issue highlighted by an appellant, British Gas Trading Limited. The CMA found that the halo effect changed over time and that the size of the effect diminished since 2010. This may be through a general deterioration in the credit rating of those bonds used to calculate the halo effect or through other factors.

In the figure below, the CMA found a halo effect of over 40bps from 2000 to 2009, but then found there to be no halo effect observable from 2010.

[31] NERA (2014) A Response to Ofgem's proposals on the Cost of Equity and Debt for RIIO-ED1, 26 September 2014.

[32] This means that the total debt portfolio needs to be considered and not just the average tenor. This issue is covered in a 2013 CEPA paper for British Airways, 'Notes on a Cost of Debt indexation approach for Q6', June 2013.

Figure 2.12: CMA analysis of halo effect for RIIO-ED1 appeal



Source: CMA (2015)

We will now examine evidence for the halo effect in the water and aviation sectors as the issue is central to setting a representative allowance. It is important that the analysis is done by correcting for characteristics where possible e.g. tenor and rating, as noted in the aforementioned analysis.

Halo-effect for water companies

We have conducted our own analysis of the halo effect for water companies first, followed by aviation. When analysing this, it is important to ensure that the difference is due to the above noted factors rather than due to differences in maturity or other such factors.[33] As such, we have adjusted the yield using Bloomberg GBP corporate Bloomberg Fair Value (BFV) curves of A and BBB rating to make sure that we are comparing in a consistent fashion and are capturing the halo effect rather than a variety of other features.[34]

Our sample is limited to GBP bonds only, with either a A- or BBB+ credit rating, a nominal fixed coupon and bullet payment structure. This is to ensure consistency between bonds for analysis of the halo effect.

[33] An example of this may be the amount of debt issued. However, we are not aware of clear evidence of the impact this has on yields – for example, there is likely to be a 'sweet spot' of sufficient size to achieve economies of scale with transaction costs and not too big that the yield would need to increase for the next marginal investor.

[34] As an example, assume that a water company issued a ten year bond at 2.2% nominal. The iBoxx index has an average tenor of c.20 years. Therefore with an upward sloping yield curve, the bond yield is going to be below the benchmark due to differences in tenor. We use the A and BBB corporate curves to adjust the yield upwards; in this case we would have added the difference between ten and 20 year debt. We use linear interpolation where the tenor is more than a year from our nearest observation from the curve.

Figure 2.13: Analysis of the halo effect for water company nominal bonds (£)

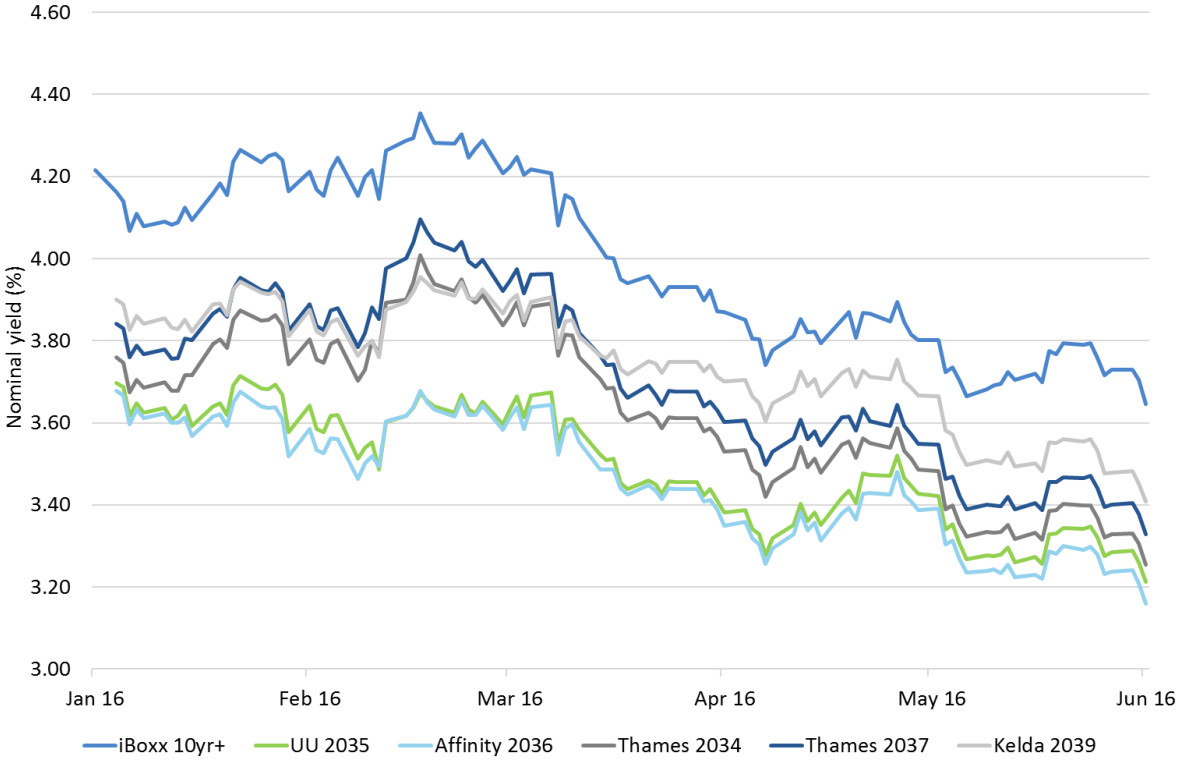
Source: iBoxx, Bloomberg, CEPA analysis

Where the costs incurred by water companies on their bonds are lower than the equivalent index value on the day, this indicates a halo effect. There would appear to be a halo effect on average over the period 2006-2013. From 2006-2009, the average halo effect was 36bps. From 2011-2013, the average halo effect was 29bps.

After 2013 there have only been a couple of issues of GBP nominal bonds. There is 14bps underperformance and 8bps outperformance on these two bonds (both issued by Thames Water). In isolation this would indicate there is not a halo effect at present. A reason for a diminished halo effect would be that the average credit rating in the water sector has declined and the index includes a greater proportion of regulated company bonds (which are typically lower priced than non-financial comparators). However, this is just one evidence source and two bonds provide a very limited sample. We would also note that the halo effect is simply considering issuance of GBP denominated nominal bonds and there will be other instruments in a companies' debt portfolio.

Looking at secondary yields (i.e. yields on traded bonds) can also help us estimate what the size of any potential halo effect might be. These provide an estimate of what the yield might be should a regulated company have issued debt at that time. We focus on five water sector bonds with maturity between 2034 and 2039. This should be comparable with the iBoxx non-financial corporates A and BBB 10yr+ indices in terms of average tenor.

Figure 2.14: Nominal yields to maturity on water sector bonds and iBoxx 10yr+ benchmark index



Source: Bloomberg, Markit iBoxx

This analysis indicates that there may still be a halo effect at present and the effect has not gone away.

The constituents of an index can have a significant effect on the yields. For example, if the bonds were all from regulated utilities, there would be no halo effect expected, as the risk profile would be the same.

Looking at the weighting of utilities in the non-financial index, we observe significant changes over time.

Table 2.7: Weighting of utility bonds within iBoxx 10yr+ non-financial corporates index

	Jan-2007	Jan-2010	Jan-2013	Jan-2016
Weighting	23.1%	17.0%	51.4%	49.8%

Source: iBoxx

The table below looks at the constituent bonds in the iBoxx benchmark indices that we have used, although this is just a snapshot and we have not normalised for different features such as average tenor. Our historical analysis in Table 2.1 indicates 30-80bps outperformance for actual costs against a notional benchmark – the analysis indicates that the halo effect may explain part of this.

Table 2.8: Features of different bond indices (as of 15 June 2016) for A rated bonds

Characteristic	IBoxx A rated GBP denominated non-financial corporates	Price-control regulated UK networks	Regulated England and Wales WaSCs and WoCs
Number of bonds	80	41	28
Total market size (£m)	50,500	18,341	9,944
Average bond size (£m)	631.3	447.3	355.1
Average weighted yield	3.17%	2.90%	2.90%

Source: Markit iBoxx

Table 2.9: Features of different bond indices (as of 15 June 2016) for BBB rated bonds

Characteristic	IBoxx BBB rated GBP denominated non-financial corporates	Price-control regulated UK networks	Regulated England and Wales WaSCs and WoCs
Number of bonds	80	29	4
Total market size (£m)	50,830	14,477	2,055
Average bond size (£m)	635.4	499.2	513.8
Average weighted yield	3.57%	3.47%	3.17%

Source: Markit iBoxx

Secondary yields on water company bonds are 27bps lower than the overall index for A rated debt and 40bps lower for BBB rated debt. Price-control regulated networks also indicate lower yields than the index in general.

We caution that this part of the analysis does not normalise for tenor or split by credit rating. We recommend that a detailed study is undertaken to review the size of any potential halo effect, and would need to be repeated at each price control determination.

Halo-effect for aviation

At the Q6 determination in aviation, where debt costs were referred to a notional index, the index used was a combination of A and BBB rated 10-15yr non-financial corporate debt denominated in GBP. We have focussed on Heathrow's GBP-denominated senior nominal bonds (rated A-) with fixed term in comparing the actual coupon to the benchmark. This removes the need for normalisation on junior debt, given the existence of senior debt and the average credit rating of our A and BBB bond indices.

We limit our sample to those bonds that are not issued in exchange for other bonds. This reduces our sample size, but the information provided should be more comparable. We normalise to reflect the difference in tenor between the 10-15yr iBoxx index and the tenor of the nominal bonds issued by HAL.

Table 2.10: Comparison of Heathrow GBP nominal bonds and iBoxx 10-15yr index (post-2008)

Bond issue date	Tenor at issue	Coupon paid by HAL	Nominal yield on iBoxx index[35]	Nominal adjusted yield on iBoxx[36]	Halo effect
26/07/16*	33 years	2.82%**	2.53%	3.05%	+23bps
12/06/14	20 years	4.17%	4.32%	4.98%	+81bps
31/10/13	33 year	4.63%	4.19%	4.85%	+22bps
03/12/09	17 years	6.75%	5.73%	5.95%	-80bps

Source: Markit iBoxx, Bloomberg. Note: based on announcement date, Note**:we have adjusted this coupon from 2.75% given that it was issued below par.*

There are differences between the actual costs and the benchmark, but there is no clear bias from this initial assessment. Different characteristics of the bond, in particular, their tenor, affect the nominal yields. The issue is made slightly more complicated by the changes in the structure of BAA in the autumn of 2008.

If we look prior to 2008, there were two bonds issued by LHR Airports Limited with 10-15yr tenor in GBP nominal terms (that are neither convertible nor callable) shown in the table below. It demonstrates on-the-day outperformance of our preferred indices.

Table 2.11: Comparison of GBP nominal bonds pre-2008 – no tenor adjustment required

Issue date	Tenor at issue	Coupon paid by HAL	IBoxx nominal yield at issue[37]	Halo effect
15/02/06	12 years	5.13%	5.31%	+18bps
27/11/03	10 years	5.75%	6.10%	+35bps

Source: Bloomberg, Markit iBoxx

There are two more bonds that we can use for analysing the performance of the benchmark index with actual on the day costs for Heathrow, however ones where normalisation for tenor is required.

Table 2.12: Comparison of GBP nominal bonds pre-2008 – tenor adjustment required

Issue date	Tenor at issue	Coupon paid by HAL	IBoxx nominal yield at issue[38]	Nominal adjusted yield on iBoxx[39]	Halo effect
10/12/01	30 years	5.75%	6.97%	6.67%	+82bps

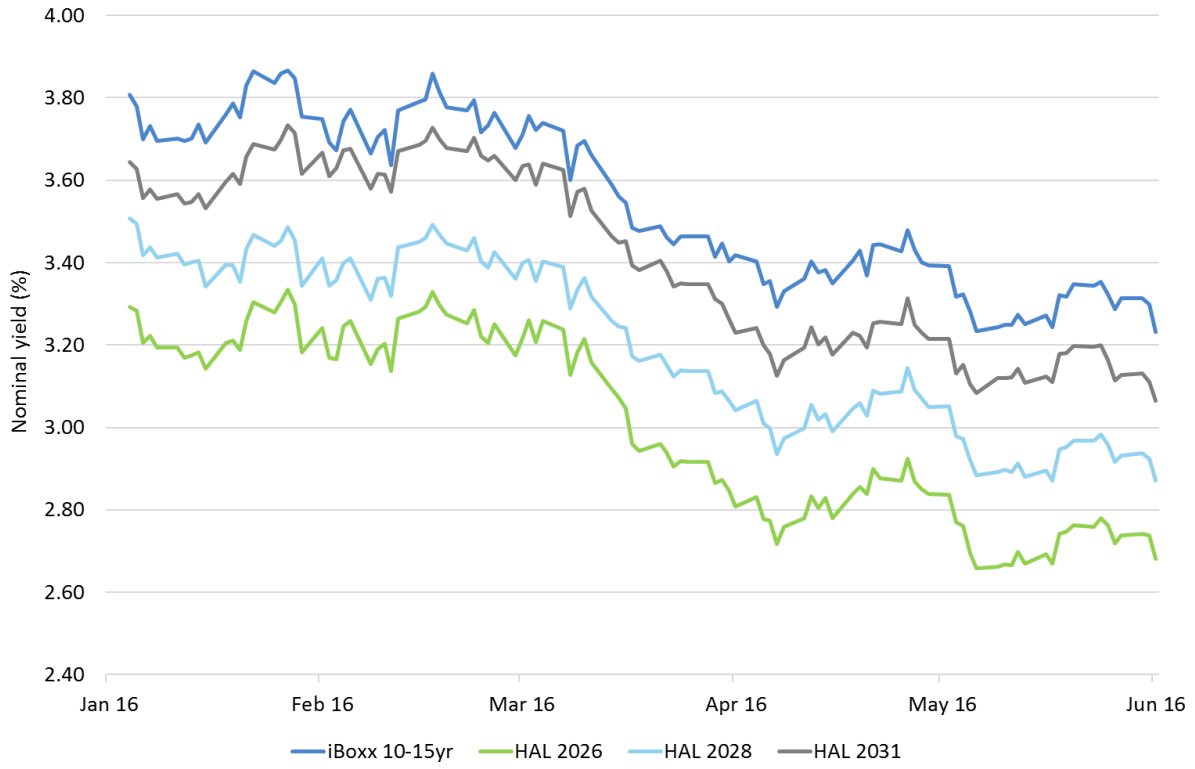
[35] The A and BBB rated non-financial corporate 10-15yr index.
[36] We have made an adjustment to correct for tenor. This involves making an adjustment based on a GBP Europe Composite A+,A,A- index from Bloomberg on the issue date. The adjustment involves taking the average nominal yield on both 10 and 15yr debt, then comparing this yield to the tenor of the bond (up to a maximum of 30yrs).
[37] IBoxx A and BBB rated GBP non-financial corporates 10-15yrs.
[38] IBoxx A and BBB rated GBP non-financial corporates 10-15yrs.
[39] We have made an adjustment to correct for tenor. As our preferred corporate curve is not available, we have used the UK sovereign curve as a proxy for this.

Issue date	Tenor at issue	Coupon paid by HAL	IBoxx nominal yield at issue[38]	Nominal adjusted yield on iBoxx[39]	Halo effect
30/01/02	30 years	5.75%	6.54%	6.23%	+48bps

Source: Bloomberg, Markit iBoxx

We can also look at secondary yields for this analysis. We compare the yields on Heathrow GBP senior bonds to the iBoxx A and BBB rated 10-15yr non-financial corporates indices.

Figure 2.15: Nominal yields to maturity on Heathrow nominal GBP bonds and iBoxx benchmark index



Source: Bloomberg, Markit iBoxx

It is also possible to compare the yields on Heathrow's (senior) index-linked debt as well, however this is less comparable as there is a different tenor between the bonds (10-15yrs for the index and 25-35yrs for the index-linked bonds). The debt premium is typically higher with increasing tenor and longer term breakeven inflation is also higher. This means that normalisation is required before comparing bonds. There are two sets of normalisation adjustment required for this analysis and it is not perfectly consistent e.g. use of 20 year breakeven inflation should be a decent proxy for longer term debt but is misaligned with 35 year debt.

Table 2.13: Comparison of Heathrow GBP index-linked bonds and iBoxx 10-15yr index

Bond issue date	Tenor	Coupon paid by HAL	Nominal yield on iBoxx index[40]	Nominal adjusted yield on iBoxx[41]	Real yield on iBoxx[42]	Halo effect
09/12/2009	30 years	3.33%	5.75%	5.93%	2.12%	-121bps
28/01/2014	25 years	1.38%	4.43%	5.17%	1.63%	+25bps
28/01/2014	35 years	1.37%	4.43%	5.13%	1.60%	+23bps
24/07/2014	25 years	1.24%	4.28%	4.97%	1.49%	+25bps

Source: Bank of England, Markit iBoxx, Bloomberg

The three bonds issued in 2014 point to a similar halo effect size as we found with our analysis of nominal bonds, however this is not the case for the bond issued in late 2009. For nominal bonds we found outperformance, with the exception of a nominal bond issued in December 2009. While there was the disposal of Gatwick Airport by BAA, the GFC and the redevelopment of Terminal 2, the reason Heathrow assign to the deviation from the benchmark index to actual costs relates to a negotiation with the Department for Transport around a special administration regime.[43]

This analysis gives us confidence that the benchmark index is appropriate for Heathrow, should they issue in-line with a 10-15 year tenor. The evidence indicates that Heathrow would be expected to outperform the index on the day – this provides a degree of comfort if Heathrow were to increase their debt tenor that the index would still provide Heathrow with a sufficient allowance on the cost of debt.

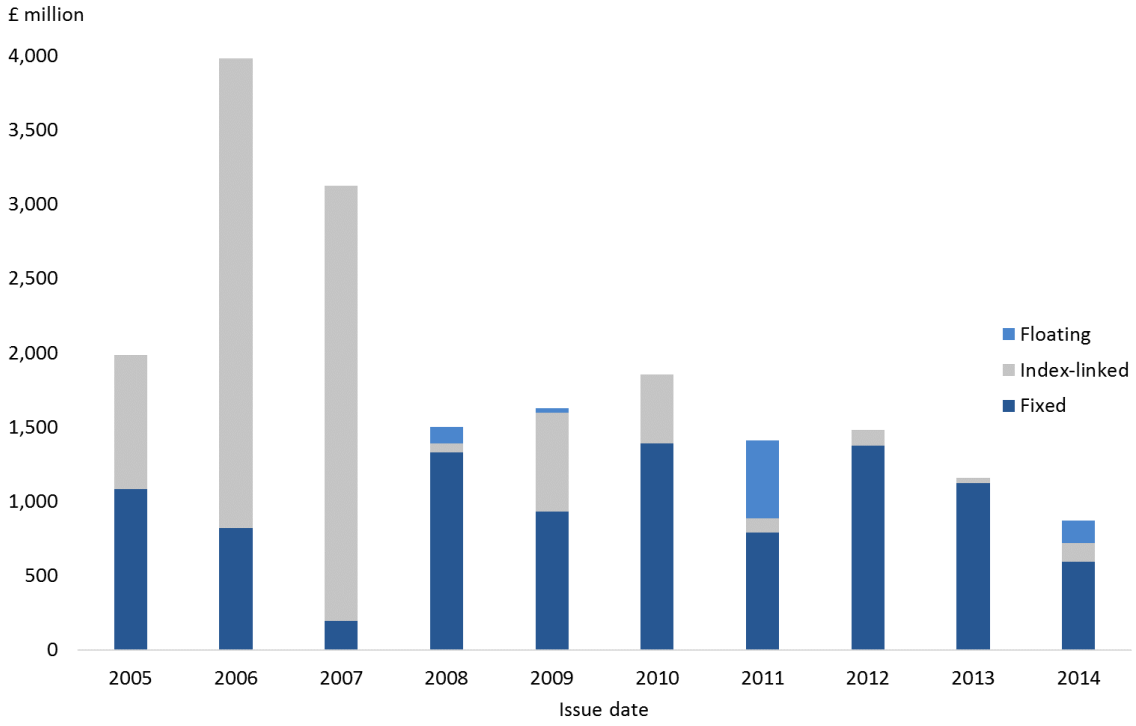
2.2.7. Timing

Our modelling indicates that both water companies and the regulated airports are likely to have achieved more favourable rates from timing than is assumed from our notional approach. However, this analysis is incomplete as we do not have complete information on each of the days debt was issued to be able to conclusively determine differences in costs.

The figure below shows the amount of debt issued each year in the water sector. There is a significant proportion of index-linked debt issued in the 2005-07 period, but this has dropped off since the GFC.

[40] The A and BBB rated non-financial corporate 10-15yr index.
[41] We have made an adjustment to correct for tenor. This involves making an adjustment based on a GBP Europe Composite A+,A,A- index from Bloomberg on the issue date. The adjustment involves taking the average nominal yield on both 10 and 15yr debt, then comparing this yield to the tenor of the bond (up to a maximum of 30yrs).
[42] Using 20yr breakeven inflation to deflate nominal yields with the Fisher equation.
[43] Heathrow Airport (2016) Consultation Response on the CAA's Strategic Themes for the review of Heathrow Airport Limited Charges (H7), April 2016.

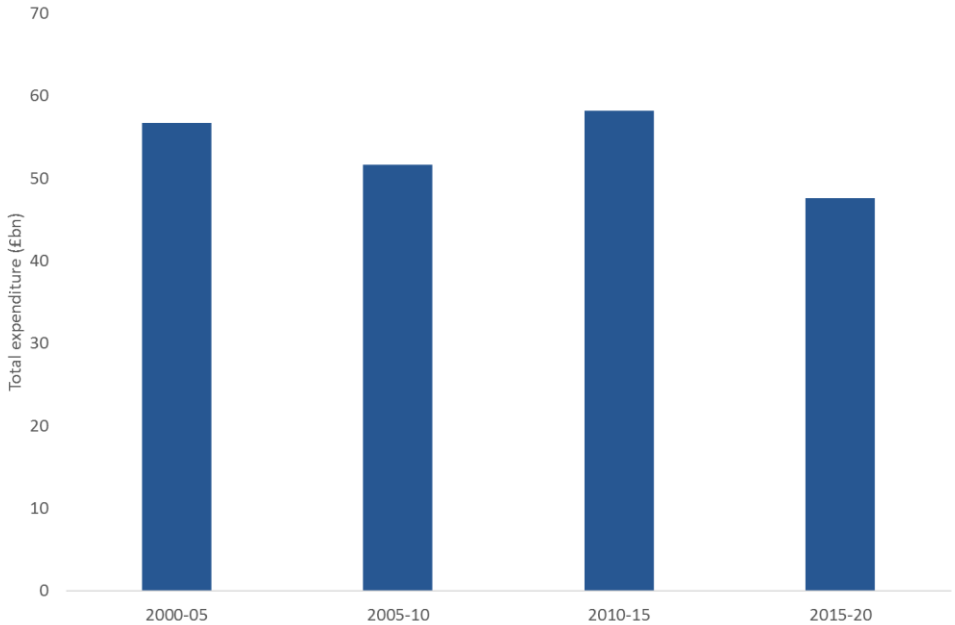
Figure 2.16: Debt issuance by year - water



Source: Ofwat

Totex over the period has been relative stable, so it is not clear that the timing of the debt issuance reflects the timing of investment and instead reflected gearing up by a number of companies during the 2005-07 period. For most companies gearing has subsequently decreased or remained stable.

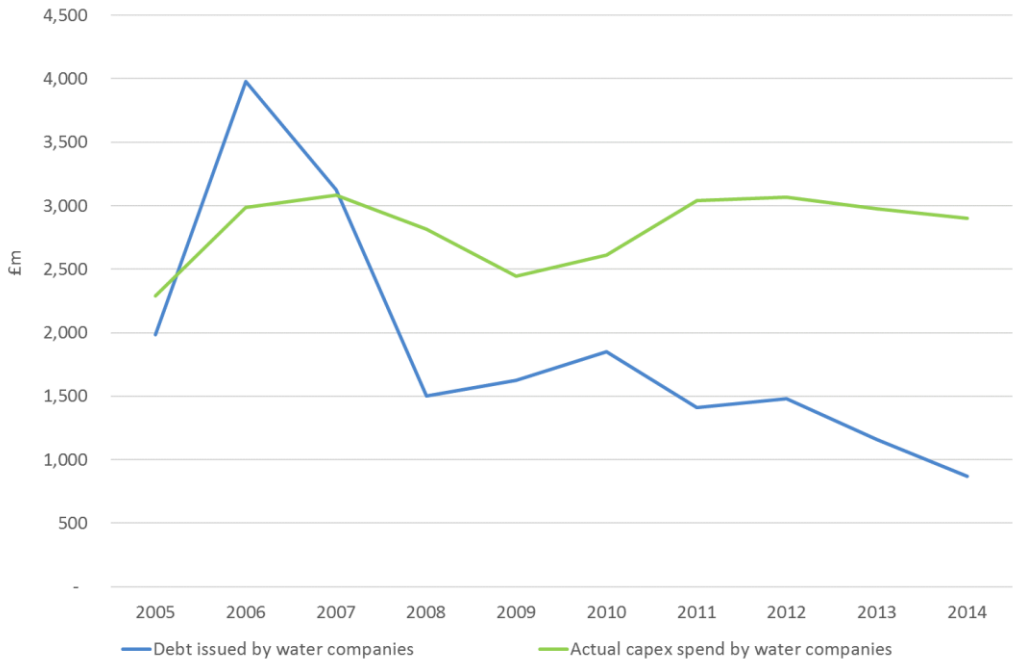
Figure 2.17: Totex programmes in the water sector



Source: NAO

The following chart shows how capex compares to debt issuance over a ten year period. There is no clear linkage, even when taking into account lags.

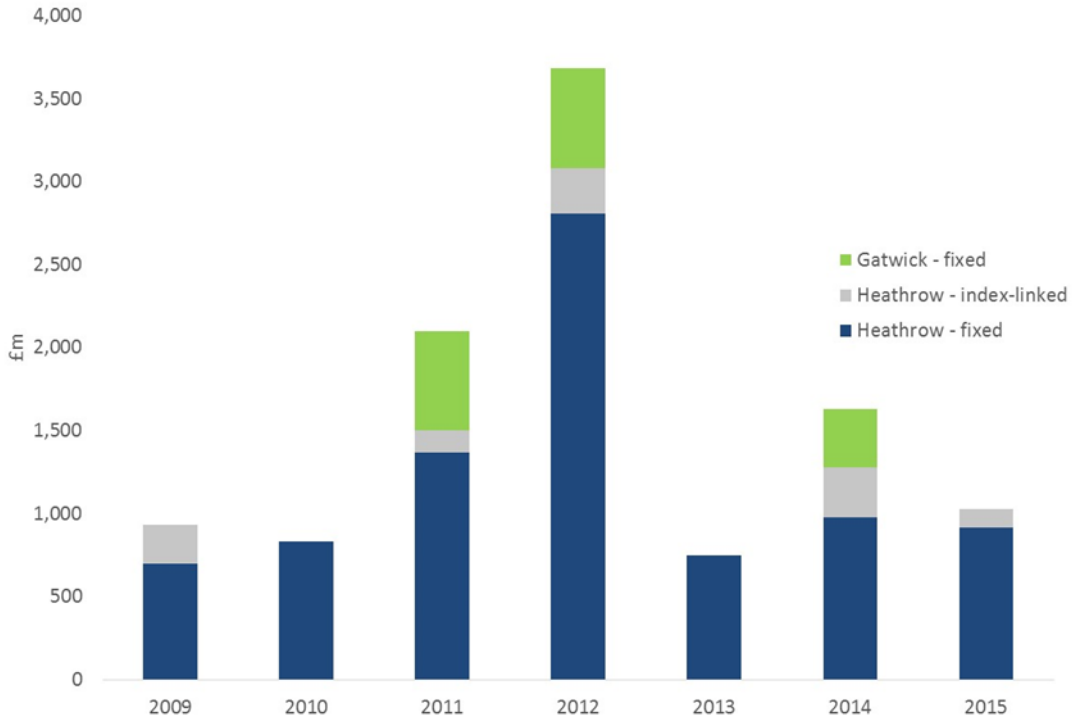
Figure 2.18: Relationship between debt issuance and capex



Source: Ofwat. Note – these correspond to total annual figures.

In the aviation sector, there is not a smooth issuance profile when looking at both Heathrow and Gatwick.

Figure 2.19: Debt issuance by sector – aviation



Source: Heathrow Airport, Gatwick Airport, CAA

In terms of looking to quantify what proportion of the difference in actual and benchmark costs can be explained by differences in timing of debt issuance, we have estimated the cost of debt using iBoxx 10yr+ bonds with weights that reflect actual timing in the water and aviation sectors.

Table 2.14: Weights based on timing

Year	Real yield from iBoxx 10yr+ A and BBB NFC	Weight under notional assumption	Weight under actuals - Water*	Weight under actuals - Aviation
2006	2.59%	3%	4%	2%
2007	2.38%	5%	8%	4%
2008	2.70%	8%	13%	5%
2009	3.97%	10%	6%	7%
2010	4.11%	13%	0%	8%
2011	2.53%	13%	21%	15%
2012	2.33%	13%	21%	30%
2013	1.98%	13%	14%	7%
2014	1.45%	13%	7%	12%
2015	1.51%	13%	7%	10%

Year	Real yield from iBoxx 10yr+ A and BBB NFC	Weight under notional assumption	Weight under actuals - Water*	Weight under actuals - Aviation
Average cost of debt based on weightings		**2.52%**[44]	**2.36%**	**2.43%**

**Industry average proxy.*

This analysis indicates that timing of debt can have a material impact and that the timing in both the water sector and aviation sectors has led to savings when compared to an average of the notional benchmark. The benefits in the water sector are greater than in aviation in our modelling. However, we would again caution that weight cannot be placed definitively on the values as yields change on a daily basis, with wide fluctuations possible within a year - our analysis takes an annual average.

Summary

It is very difficult to precisely identify the causes for differences between actual and notional debt costs, however there is evidence above that could support the figures that have been observed in both the water and aviation sectors.[45]

- 'On the day' factors
    - Debt type – likely to be some limited outperformance from this;
    - Gearing – no outperformance, in isolation possibly underperformance;
    - Tenor – unlikely to be source of outperformance;
    - Currency – likely to be some limited outperformance from this;
    - Credit rating – unlikely to be source of outperformance in recent years, though possibly historic;
    - Halo effect – mixed evidence, but possible that this exists, especially in earlier years.
- Timing – this may be a reason for some of the observed outperformance.
- Application of assumptions around benchmark – we cover the assumptions in Chapters 6-12 that discuss other reasons for outperformance or underperformance against a regulatory allowance.[46]

[44] Use of a simple trailing average gives 2.56%.
[45] We note that where a factor is unlikely to be a source of outperformance, this does not mean that the issue is not important, for example, tenor is a key consideration.
[46] We do not include discussion of forecasting error as the figures we are comparing are both outturn values and do not involve use of a forecast.

3. Use of Actual or Notional Costs

Summary

In this chapter we discuss options for setting the cost of debt with respect to the data informing our recommendation. We consider whether (i) the regulatory approach should allow the pass through of actual cost of debt or place more weight on a notional approach, (ii) a market derived benchmark should be used to determine the cost of debt and (iii) notional timing for when debt is raised should be used rather than use actual timing of debt issuance / asset additions.

We find that there exists a representative benchmark index both the water and aviation sectors, once a step-up or step-down adjustment is made to the benchmark index to make sure that the index is reflective of costs faced by the notional entity. At present the adjustment would be reducing the allowed cost of debt in the water sector (as at PR14), however this would need to be re-examined periodically.

We find that companies have control to some extent on timing of debt issuance where their financing requirement is not significant when compared with existing RCV; the exception would be in the case of significant RCV growth, for example, associated with the financing of new runway capacity.

We assess the options against the assessment framework set out in Chapter 1. We recommend that:

- actual financing costs should not be passed through to customers
- the allowance is set on a notional basis with companies facing some/all of the outperformance/underperformance related to actual financing costs within a price control
- the use of a cost of debt benchmark derived from the financial markets with an adjustment is preferable to using sector average costs
- notional timing for the assessment of when debt is raised should be used rather than rely on actual timing of debt issuance / asset base additions.

3.1. Pre-cursor questions

In each of Chapters 3-5 we look at pre-cursor questions. These either lead us to a recommendation immediately or provide sufficient information to undertake an assessment against the criteria identified.

There are three different pre-cursor questions we look at in this chapter. The questions and the reason why we include these are set out below:

- Our first question asks whether there is a benchmark index that we think is representative of the notional entity in our two sectors, noting that there is no reason to assume that the index should perfectly correlate - an adjustment may be required.
- The second question relates to whether there is a degree of controllability on timing. If there is no controllability, then there is no value in incentivising companies on timing. However, if there is some controllability then we will assess whether it is more appropriate to use an assumed notional timing profile or reflect a companies' actual timing for embedded debt.

- Our final question refers to whether a notional approach necessarily needs to use a simple average. If we compare a notional approach on timing to actual timing, it is important that we consider the optimal version of a notional approach – this is not necessarily a simple average and may use a weighted average i.e. assigning different weights to time periods to create a different profile.

3.1.1. Is there a representative benchmark index, with or without an adjustment?

Why does this matter?

If there is no representative index that can be used, UK regulators have tended to use actual embedded debt costs rather than base this on a notional benchmark. An example of this is the Competition and Markets Authority (CMA) determination on Northern Ireland Electricity (NIE) in 2014 where they set out that an appropriate benchmark index was not obvious and they placed most weight on NIE's existing debt – the CMA also noted that the use of a benchmark is more appropriate in regulating an industry than it would be a single firm.[47]

Evidence

As illustrated in Chapter 2, there are bond indices that cover the vast majority of regulated firms' debt, match the time to maturity, credit rating and include broadly similar constituent bonds (for example, the benchmark indices proposed include bonds from both water companies and Heathrow). There is some evidence of a halo effect in the water sector and more limited evidence on this with Heathrow Airport.

Our choice of the 10-15yr notional index in aviation follows analysis of the weighted average tenor in recent years (c.12 years), a comparison of yields at issue and analysis of secondary yields. Commentary by the CAA in the last determination indicated that the yields on Heathrow and Gatwick debt were not out of line with this benchmark. The iBoxx non-financial corporate indices themselves are sufficiently liquid and deemed to be reflective of other regulated utilities in the UK (e.g. by Ofwat and Ofgem).

It is more challenging in the aviation sector with fewer reference points for analysis and more extensive use of derivatives in aviation than the water sector as a whole.[48] There is also reduced regulatory precedent in the sector itself on the use of a benchmark directly to estimate yields. If the tenor of debt is expected to change for new debt (for example, with a potential new runway), it may be that there are two benchmarks that exist – one for embedded debt and one for new debt. This is problematic when there is no distinction between new and embedded debt e.g. a full indexation model.

There is a further risk as the benchmark index gives a lower cost of debt than set at the Q6 determination that relied more on actual debt yields. As shown in the figure below, the

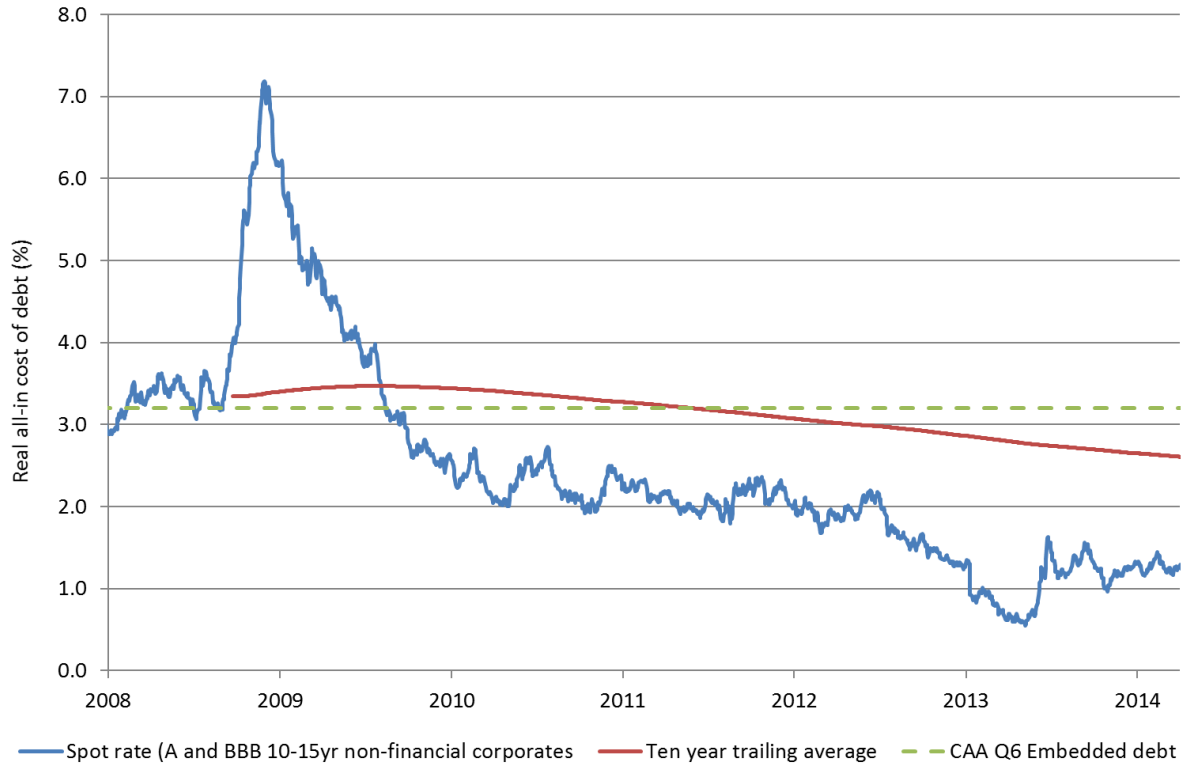
[47] CMA (2014) NIE Final Determination

[48] When comparing the benchmark with Heathrow's debt, we are seeking to compare on a like-with-like basis; this means that we focus on GBP bonds to match a GBP index.

embedded cost of debt (referenced by the ten year trailing average of the iBoxx 10-15yr non-financial corporate indices) would be lower under such an approach at the time of the Q6 determination (April 2014).

The figure shows the daily real yield from the iBoxx A and BBB 10-15yr non-financial corporate index, deflated by ten year breakeven inflation. The ten year average of this index is shown by the red line. The green dotted line shows that the Q6 cost of debt allowance for embedded debt was 3.2%, above the ten year trailing average at 1 April 2014 of 2.7%. At Q5 (2008-13), the allowed cost of debt was 3.55%.

Figure 3.1: Yields under a notional approach



Source: Markit iBoxx. Note that the green dotted line did not apply in the period shown, but is included for reference given the time required for the regulatory determination process.

This indicates that there is the potential to deliver customer benefits from using a notional approach, but the use of a benchmark represents a change in approach for the aviation sector. In Chapter 2, we compared the benchmark index yields with Heathrow's actual costs, so we do not believe that this creates undue financeability problems.

Summary

We think that the iBoxx GBP 10yr+ A and BBB non-financial corporate index is an appropriate benchmark for the water sector, however with an adjustment made for cost differences. This follows on from much of our analysis in Chapter 2, where we find the index to be similar in its characteristics to water companies at the industry level. The size of the adjustment will

change over time and as such the regulator will need to review this at each determination to ensure that the size of any adjustment is correct.

This follows the statement of the CMA in the British Gas appeal over RIIO-ED1[49]:

"If, on average, DNOs can be expected to outperform the iBoxx index over ED1, then the use of the index (unadjusted) could be wrong as it would result in consumers paying more than necessary for the portion of the index which relates to debt issued over ED1."

We think that this context is relevant for our recommendation and where evidence implies that an unadjusted index would result in customers unnecessarily paying more, then an adjustment should be made.

In the aviation sector the shorter tenor of the GBP 10-15yr A and BBB non-financial corporate index appears to be an appropriate benchmark based on our preceding analysis. It is also correct to make adjustments to better reflect expected debt costs for the notional entity. At present this can reflect the significantly lower costs from using bank debt rather than bonds or the arbitrage opportunities available from issuing debt in non-GBP denominations. Similar bond indices exist for different currencies; these may be a useful reference point where an explicit allowance is made for non-GBP currencies. These could then be used with an allowance for hedging costs to convert back into GBP.

An alternative approach would be to assume that arbitraging in financial markets reduces the scope for opportunities to issue in different currencies or to use nominal debt with a swap rather than index-linked debt for example. This is likely to be less accurate but is more straightforward an approach.

3.1.2. Is there controllability on timing?

Why does this matter?

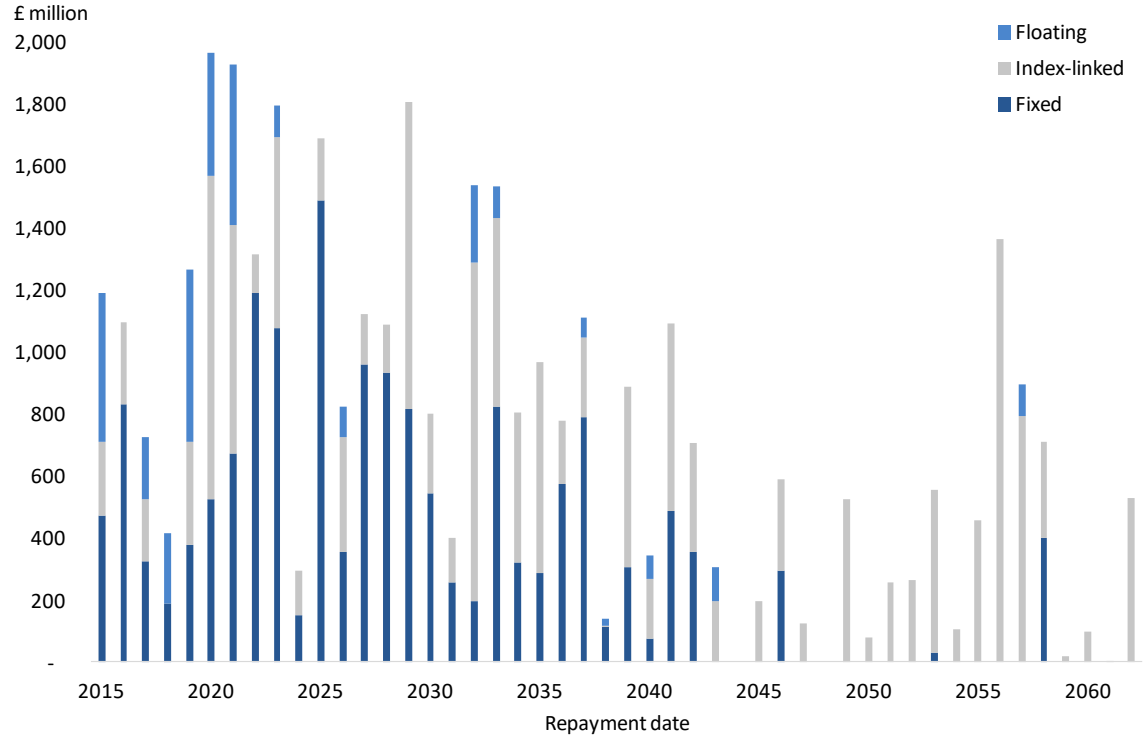
If the regulated company does not have control over timing of debt issuance, then there is little value to incentivising this through a notional profile and a stronger argument for using actual timing.

Evidence

We noted that the timing of debt did not necessarily correspond with the capex programme. This may be as it is sensible to issue debt in larger amounts to achieve economies of scale and lower overall debt costs. However, in both sectors, the investment profile in recent years did not represent a step change in their investment profile. We also see a relatively stable maturity profile - this is typically seen as key to good treasury management such that there are not spikes in refinancing needs.

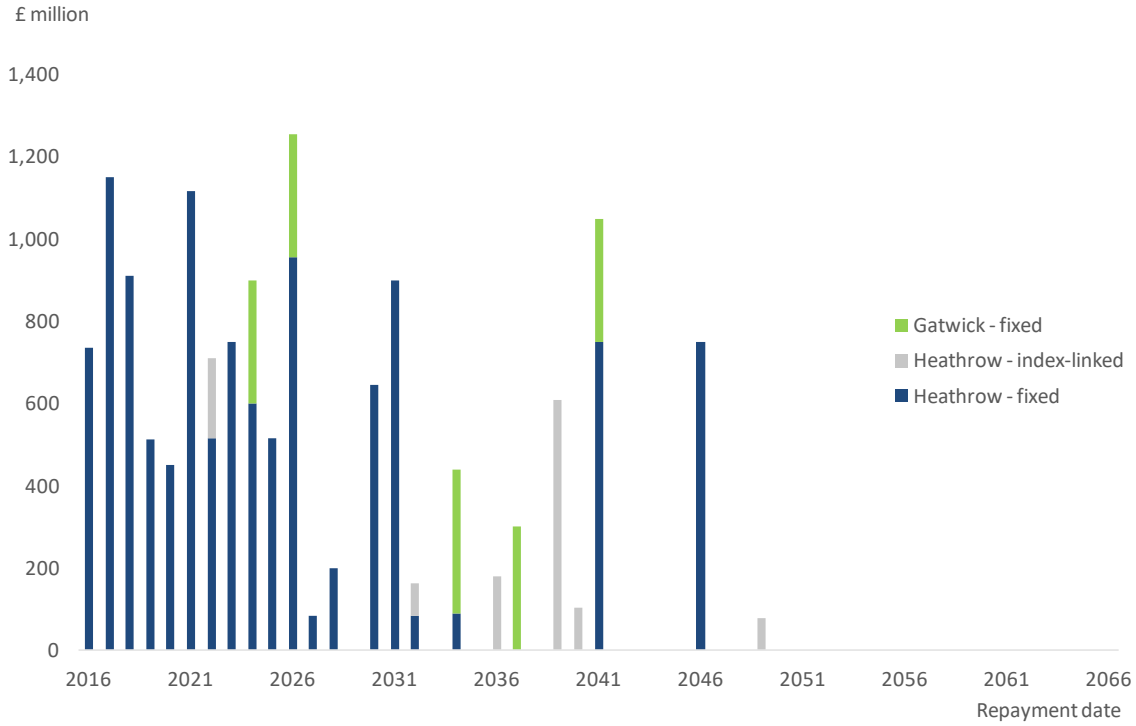
[49] CMA (2015) British Gas Trading Limited Final Determination, September 2015. Paragraph 8.45.

Figure 2.15: Maturity repayment date - water sector



Source: Ofwat

Figure 3.16: Maturity repayment date - aviation



Source: Heathrow airport, Gatwick airport, CAA

For Heathrow airport, changes from a smooth profile may be more of a concern given the potential for investment around new runway capacity. If this coincides with a period with large refinancing requirements then this may create windfall gains/ losses depending on the

profiling assumed. The assumptions around refinancing will depend on the state of financial markets at the time. The context will determine the type of debt, tenor of debt and other characteristics of that debt. There is such uncertainty that this approach would not be feasible for estimating new debt costs in itself.

One of the Scottish TOs under Ofgem's RIIO T1 price control has a variant of the simple ten year trailing average approach to cost of debt indexation. Scottish Hydro Electric Transmission Limited (SHETL) use bespoke weightings based on their asset base additions. This was considered appropriate given the very large scale investment programme relative to their asset base.

This has led to significant differences in the early years of the RIIO T1 price control, as low rates and significant totex additions have led to greater weighting placed on these low yield years.

Table 3.1: Comparison of real cost of debt under Ofgem cost of debt indexation mechanisms

	2015/16	2016/17
GD1 and T1 (excl SHETL) – simple average	2.55%	2.38%
SHETL – bespoke weighting	2.17%	1.76%

Source: Ofgem Cost of Debt Indexation Model, 31 October 2015

Companies might be able to exert some control over the timing of debt in the short term in a a given window, but in the long run debt issuance should be dictated by long run capex profiles if companies maintain a similar level of gearing. In the water sector we have seen increasing levels of gearing not explained by capex profiles (for example, as indicated by the CMA (2015) in the Bristol Water determination).[50]

In the short-term, if there is a very large project requiring funding, there may be less control due to the requirement for substantial new finance. Further detail on controllability is considered as part of Annex A.

Summary

There are a number of factors that could drive finance structure and timing of debt. The timing of financing needs is obviously important, but even with a stable asset base there will be significant refinancing needs and decisions needing to be taken around use of equity and equity distributions. We therefore believe that firms exhibit a degree of control. This means that further analysis is required to understand whether to use actual or notional costs.

Where there is controllability on timing, it is unclear that this leads to better rates in practice. Upward sloping forward curves would indicate that it is better to issue debt earlier, as Gatwick did for the Q6 control, however in practice rates have moved down since then.

[50] CMA (2015) Bristol Water Final Determination, para 10.97, p315.

With a new runway, depending on the time period over which finance is required, the size of the programme may mean that there is limited controllability and the use of actual timing would be appropriate to reflect this in the short-term.

3.1.3. Should a notional timing approach use a simple average?

Why does this matter?

Use of a notional profile does not necessarily mean that the regulators should take a simple average of yields over a certain period. It is possible to weight different time periods if this better reflects the notional entity under such an approach.

There can be significant differences in the yields when taking a simple average over the trailing average period compared to use of a weighted average. The larger the difference from simple weights the weighted average is, the larger the potential difference. The SHETL case for 2016/17 under Ofgem's bespoke weighting system shows a difference of 62bps due to a greater proportion of debt being issued when rates have been at historical lows.

We are not proposing that individual timings are used as this would represent a significant change in regulatory policy in the sector and lead to further questions in terms of individual costs of capital.

Evidence

In terms of the trailing average assumptions, a regulator can use actual weights based on issuance from companies. The use of a notional approach assumes that debt will be issued in a certain pattern, though this does not necessarily need to be using the simple average shown below.

Table 3.2: Example of actual versus notional approach – indicative values

	Year t-5	Year t-4	Year t-3	Year t-2	Year t-1
Actual debt issued	90	70	50	30	10
Cost of Debt in year*	3.0%	2.8%	2.6%	2.4%	2.2%
Weight for actual	36%	28%	20%	12%	4%
Weight for notional	20%	20%	20%	20%	20%
Cost of embedded debt with actual weights					2.76%
Cost of embedded debt with notional weights					2.60%

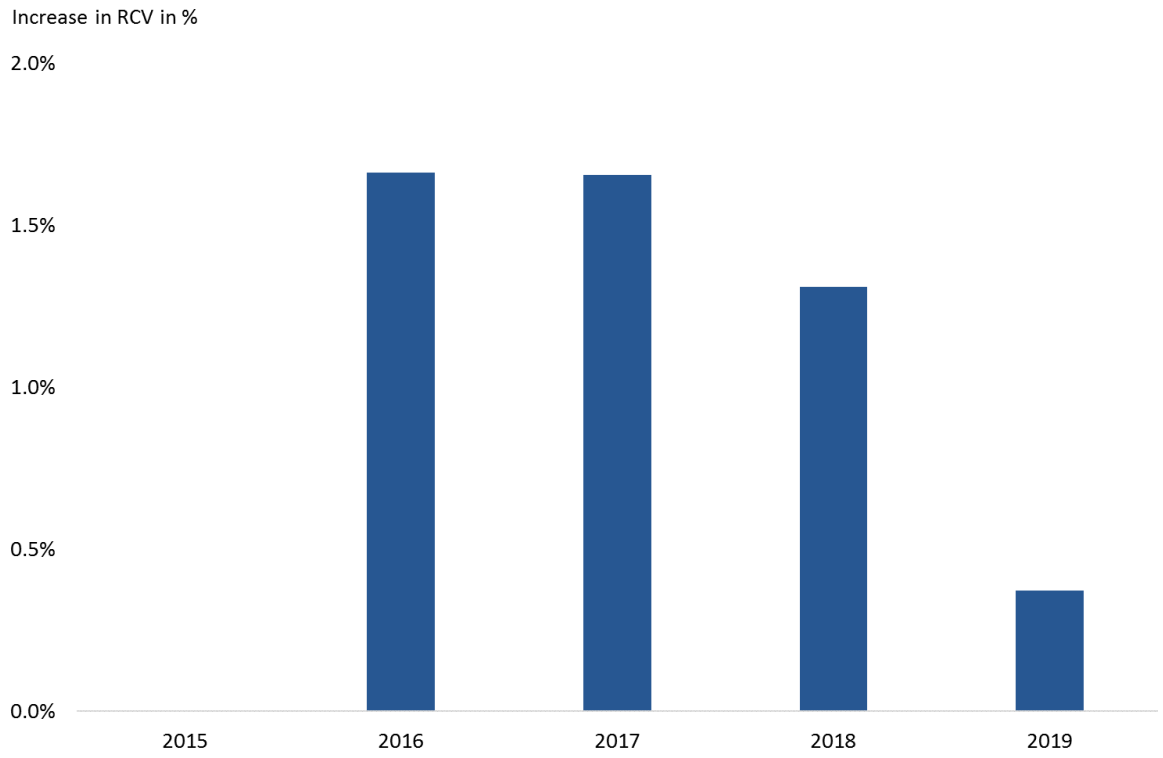
**note that this is based on an index rather than actual costs*

If we assume equal weighting for debt issued in each year for the notional entity, using this notional approach would give the simple average of the five years i.e. 2.60% i.e. multiplying the 'Cost of Debt in year' line by 'Weight for notional'.

If we take the weightings for our actual company in the example, due to placing greater weight on earlier years when the cost of debt was higher, the actual profile gives a 2.76% allowance i.e. multiplying the 'Cost of Debt in year' line by 'Weight for actual'.

The size of the assumed debt portfolio is a function of the size of the asset base. If we look at the water sector for PR14, this shows an increasing RCV. At constant gearing, this implies that there is an increasing amount of net debt (so there is refinancing plus incremental new debt). However, this RCV growth is relatively small compared to the size of the RCV, so in this case is unlikely to be a primary driver in the timing of debt issuance.

Figure 3.2: RCV growth over PR14



Source: Ofwat

Our proposed approach for profiling the trailing average uses a single debt RAB growth factor, rather than looking to manually derive different weightings for each year. This will capture the trend, but avoids some of the regulatory burden in doing more complex estimations based on actuals.

We provide the example of a ten year trailing average period and a five year price control period. We do not however set out what the cost of debt yield would be under this approach, we illustrate the potential difference in departing from the simple 10% weight applied for each year under a simple average where debt does not drop off.

- Column A relates to the year of the trailing average.
- Column B is based on the weights assumed for debt dropping off in such a case.

- Column C is based on debt RAB[51] growth of 4% per annum; the formula for deriving the weighting factor is estimated as: (1+x)^(n-1) where x is the debt RAB and n is the year number in our table.
- Column D is the result of multiplying Columns B and C.
- Column E represents the weighting for yields in that year that will be included in the embedded debt calculation, based on the value of the individual year in Column D, divided by the sum of the totals in Column D.

Table 3.3: Calculating weights for debt dropping off and profiling for asset base growth

Column A	Column B	Column C	Column D	Column E
Year within trailing average	Proportion of time included in index[52]	Debt RAB growth factor	Col B x Col C	Overall weighting in embedded debt cost
1	10%	1.00	0.10	1.07%
2	30%	1.04	0.31	3.33%
3	50%	1.08	0.54	5.76%
4	70%	1.12	0.79	8.39%
5	90%	1.17	1.05	11.22%
6	100%	1.22	1.22	12.97%
7	100%	1.27	1.27	13.49%
8	100%	1.32	1.32	14.02%
9	100%	1.37	1.37	14.59%
10	100%	1.42	1.42	15.17%
TOTALS			**9.38**	**100.0%**

This indicates that companies with high RAB growth will have issued more debt in recent years than indicated by the using a simple average. Under a simple average approach with debt not dropping off, Year 1, our least recent year, will be given 10% weight when the company would only have incurred 1% of it's debt in that year.[53] This is an issue in regulatory determinations where such an approach is taken, as where rates have been falling, customers have been overpaying.

[51] i.e. RAB x notional gearing

[52] The first year of data in the table would be present in our index for on average 0.5 years out of a 5.0 year price control, leading to 10% figure. Each subsequent year has a further year in the index, so an additional 20% weighting.

[53] The idea of debt dropping off relates to embedded debt maturing. This information is known at the start of the price control and so the cost of embedded debt can take this into account. As an example, if a company had two bonds active at the outset of the price control; one that expired in one year and the other that expired after the price control finished, the embedded debt cost should be set to reflect this.

Summary

We think that a simple average is appropriate where there has been a stable asset base over many years. Where rates have fallen and the asset base has been growing, a company's actual cost of debt will be lower than an allowance based on a simple average – as such, a weighted notional profile becomes appropriate if the difference is material.

In the Q6 final determination, the CAA noted that benefits of indexation would require a mechanism being in place for more than one price control and able to take into account lumpy capex expected after Q6.[54] We think that the weighted profile makes the mechanism more robust and could be applied for setting the cost of debt over a longer period. This would provide greater certainty around investment, which should be beneficial for customers.

3.2. Assessment against our criteria (Q1) – should there be a pass-through of costs or not?

3.2.1. Impact on customers

Level of bills

The impact on bills when comparing a notional approach to actual debt costs depends on what notional approach is chosen. Comparing the actual costs and our preferred notional benchmark in the water sector gives lower actual than notional costs, while in the aviation sector there is no consistent difference over time.

In the short-run, using actual costs will lead to a lower cost in the water sector if there are there are no adjustments to the notional index. However, this outperformance may be a function of firms being fully incentivised to outperform the index in the past as they retain all differences between the notional benchmark and their actual costs. In the medium to long-term, we would expect the costs to be higher from usijng actual costs due to weaker incentives.

Volatility of bills

Our analysis of actual and notional costs has shown that there is greater volatility in actual costs compared to our notional benchmark. This may be because the notional index used is broad, such that changes are smoothed, especially when applying an average over a long period of time. Actual debt costs are more volatile as with a smaller sample, greater weight is placed on any individual bond being issued or maturing.

With bill volatility, changes in the cost of debt need not necessarily lead to significant bill impacts. Volatility may be offset with other changes e.g. if RPI goes up, the real cost of debt should decrease. Also, if only on new debt, then the impact may not be significant. There are

[54] CAA (2013) Estimating the cost of capital: A technical appendix to the CAA's Final Proposals for Economic Regulation of Heathrow and Gatwick after April 2014.

also tools that a regulator could use to mitigate some of the volatility – for example, adjusting PAYG ratios to reduce the impact on bills.

Assessment

	Score – impact on customers
Pass-through	Medium
Notional approach	High

3.2.2. Incentives

Pass-through of costs creates no incentive for firms to reduce their cost of debt. A notional approach provides much stronger incentives as the firm receives a revenue based on a notional benchmark, while the firm pays out their own cost of debt. This exposes them to the full difference between actual costs and revenue based on notional costs, which acts as a very strong incentive when using a purely dependent or independent approach (for which we use for scoring purposes).

In practice we note that there will be impure measures used in practice. For example, a sector benchmark that uses actual or upper quartile costs will be closer to a pass-through. An iBoxx index will use some bonds from the sector, but be closer to a notional approach. The difference between these approaches will be less than the pure approaches noted above.

Assessment

	Score – incentives
Pass-through	Low
Notional approach	High

3.2.3. Financeability and investment

In recent price controls, outperformance on the cost of debt has been a key source of equity returns above the base cost of equity. It has therefore contributed to the financeability of companies by boosting financial ratios that influence debt ratings. However, a notional approach can be applied in ways that are challenging for companies or ways that are more generous.

However, use of pass-through costs should alleviate financeability concerns as the company is reimbursed for costs they incur on debt. Consequently debt holders can be more certain that they will earn returns because their revenues are, at least in part, underwritten by the cost pass-through mechanism.

Assessment

	Score – financeability and investment
Pass-through	High
Notional approach	Medium

3.2.4. Risk sharing

Pass-through costs lead to all risk being placed on customers rather than companies. If a company does not have the ability to manage costs then this is not an issue with respect to incentives as there is nothing that can be incentivised.

As set out in Annex A and earlier in this chapter, companies do exert some control over their costs and so it is appropriate to incentivise them to incur lower debt costs. We do not think that there are other benefits that would justify all risk sitting with customers.

It is clear that companies do not have full control over their debt costs – as such, a form of sharing, as happens with totex, may be appropriate. This issue is considered further in Chapter 5.

Assessment

	Score – risk sharing
Pass-through	Low
Notional approach	High

3.2.5. Regulatory principles

In the water sector, using cost pass-through would be more difficult than in aviation due to the number of companies (17) and having to establish costs for each of these.[55] This would be a departure from the approach of setting a single cost of capital for the industry. A single cost of capital leads to good companies outperforming the allowance and strengthens incentive to reduce debt costs. The lower debt costs observed can lead to customer benefits in the medium term.

In aviation, pass-through is less of a departure from the current approach and the notional entity is likely to be close to Heathrow given the absence of a broader range of comparators in GB. A cost pass-through approach therefore scores slightly better in aviation with one company than the water sector.

[55] This is a pure pass-through approach. It is possible that these could be done on an industry benchmark basis, which would be between a pass-through and notional approach.

Assessment

	Score – regulatory principles
Pass-through	Low (water), Medium (aviation)
Notional approach	High

3.2.6. Robustness to changes[56]

What is assumed for the behaviour of the notional entity depends on the circumstances faced, for example changes in financial markets. As this context changes over time, using actual costs is more robust as it picks up behavioural changes that a notional approach will not do (unless a sharing mechanism is introduced). In terms of internal changes (i.e. from changes to the regulatory regime), a notional approach might encounter greater difficulties if there are various changes that lead to the benchmark being representative only at certain times. However, we do not anticipate this being a major issue, especially as a regulator is likely to take into account these changes in its methodology, and a notional approach has worked for a number of regulators over the past three decades.

Assessment

	Score – robustness to changes
Pass-through	High
Notional approach	Medium

3.2.7. Conclusions and assessment

Our assessment of the choice here is summarised below. It is not simply adding up the scores however, as regulators will place different weights on these assessment criteria and make a holistic decision. As the CAA would be regulating only one or two companies, there are more arguments in favour of using actual costs than would be the case when regulating an industry of companies.

Table 3.4: Assessment of pass-through versus notional costs

	Pass-through	Notional
Impact on customers	Medium	High
Incentives	Low	High
Financeability and investment	High	Medium
Risk sharing	Low	High
Regulatory principles	Low (water), Medium (aviation)	High

[56] Robustness to changes relates to both market changes and regulatory changes.

	Pass-through	Notional
Robustness to changes	High	Medium

Pass-through scores slightly better than a notional approach on financeability and robustness to change. However, these are outweighed by the benefits of a notional approach.

The notional approach provides stronger incentives to incur efficient debt costs and so should be positive in terms of its impact on customers. The impact on customers may be the criteria which most weight is placed on given regulatory objectives. As firms have a degree of control over their debt costs, a notional approach scores better from a risk-sharing perspective and is more consistent with good regulatory principles.

3.3. Assessment against our criteria (Q2) – is a notional benchmark with an adjustment better than use of a narrower sector benchmark?

For this question, we include the potential for using a sector benchmark based on upper quartile performance as well as a sector average (noting that upper quartile relates to performance and therefore upper quartile will be a lower debt cost than the sector average). This question is relevant for the water sector, but less relevant in aviation where the need for adjustment is less clear and choices to use a broader industry benchmark do not exist.

This has similarities to our discussion of pass-through and notional costs under the first question, however these approaches are less pure versions of the approaches dealt with as part of that question.

3.3.1. Impact on customers

Level of bills

We have recommended that an adjustment is made to a benchmark e.g. iBoxx 10yr+ non-financial corporate indices to ensure that the cost represents an efficient cost of debt. This adjustment is not limited to the halo effect, for example it may include adjusting for more favourably priced foreign-denominated bonds or bank debt.

By making this adjustment we would not expect a persistent difference with an average of actual sector costs, assuming companies face strong incentives to incur efficient debt costs.[57] However, this may not eliminate all outperformance – for example, where a notional timing profile is assumed and companies issue date at favourable time periods, this may not be reflected in the adjustment and outperformance may exist.

[57] It is possible for the adjustment to be larger should the regulator wish to focus on upper quartile costs.

Volatility of bills

A broader notional index is likely to be slightly less volatile due to the larger number of observations compared to a narrower sector benchmark and with actual companies having floating rate debt (albeit in a smaller proportion) unlike a nominal bond benchmark.[58] This additional volatility is shown in Table 2.1.

Assessment

	Score – impact on customers
Notional benchmark w/adj	Medium
Sector costs (average)	Medium
Sector costs (upper quartile)	High

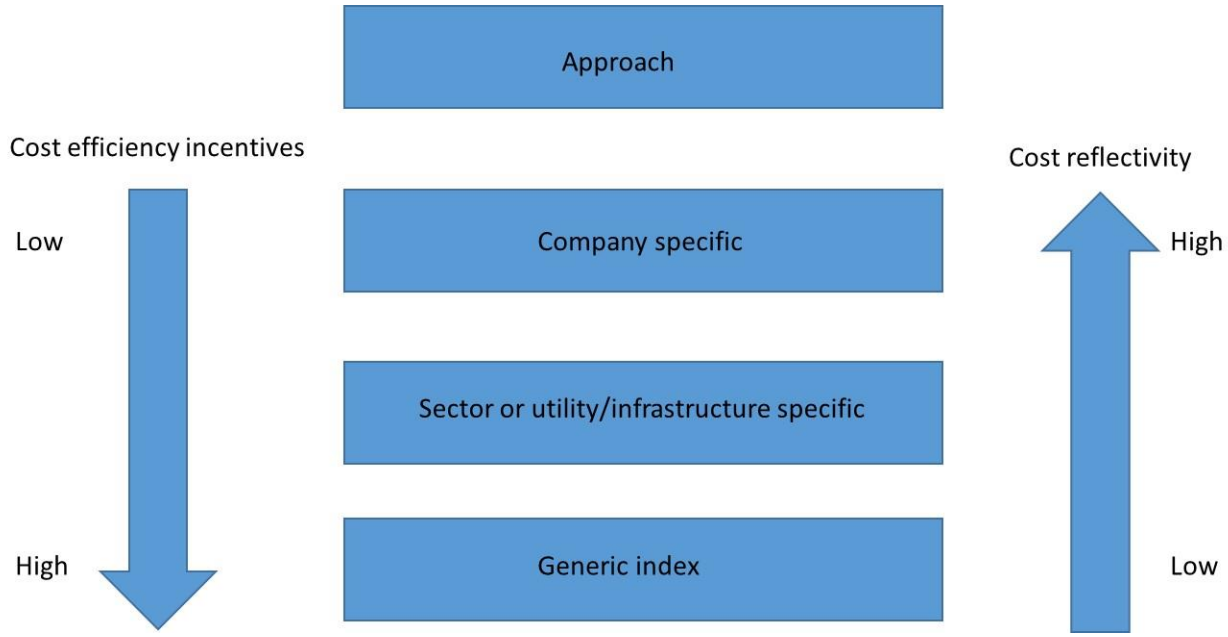
3.3.2. Incentives

An issue with the use of sector costs compared to using a broader benchmark relates to the weaker incentives from such an approach (albeit less weak than from comparing a pure actual approach and a pure notional approach). It may be that upper quartile is slightly better from an incentive position as not all debt contributes to the allowance.

These stronger incentives are important as the benefits can be transmitted to customers under a dynamic system; companies retain outperformance from strong incentives in the short term, but reveal efficient costs that allow lower prices to be charged to customers in the medium and long term. The extent to which this is an issue may depend on the number of companies in a sector. When regulating an industry with over ten companies, any one company has less ability to influence the index than an industry with two companies.

[58] For example, Moodys Water Industry Outlook shows that water companies have 94% fixed rate debt as of 31 March 2015.

Figure 3.3: Trade-off between cost reflectivity and cost efficiency incentives



Any regulator needs to decide what is most important, creating an incentive for efficient funding of the business or being cost reflective. Since the 1990s, and the move away from actual company data, regulators have acknowledged that efficiency incentives are important and implicitly that companies have sufficient control over their funding decisions that at least some aspects of the cost of debt should be considered controllable. However then is there the further impact of whether the benefits from the incentives get passed through to customers.

Assessment

	Score – incentives
Notional benchmark w/adj	High
Sector costs (average)	Medium
Sector costs (upper quartile)	Medium

3.3.3. Financeability and investment

Use of a notional benchmark with an adjustment is likely to be similar to the current approach in water from a financeability and investment position. This has led to outperformance on the cost of debt largely across the board; that would not be possible with a sector average approach. However, in our assessment we are comparing to what we think is an optimal (and attainable) form of the benchmark (rather than one with flaws).

A sector cost average that should be similar in terms of the level of the cost of debt should be similar. However, use of the upper quartile may be challenging as lots of companies will under-recover on their debt costs. The difference with this and a totex approach depends on whether firms can achieve this upper quartile level. In totex, different characteristics are

taken into account. With the cost of debt, a less established company may not be able to achieve the rates of a more established company and so this may be less applicable.

Assessment

	Score – financeability and investment
Notional benchmark w/adj	Medium
Sector costs (average)	Medium
Sector costs (upper quartile)	Low

3.3.4. Risk sharing

As with the discussion of pass-through, the more an allowance is based on actual costs, the less risk that is placed on companies, with the risk placed on customers instead. A broader benchmark therefore scores more highly from a risk transfer perspective.

Assessment

	Score – financeability and investment
Notional benchmark w/adj	High
Sector costs (average)	Medium
Sector costs (upper quartile)	Medium

3.3.5. Regulatory principles

A notional benchmark with an adjustment is consistent with regulatory best practice principles, e.g. transparency and predictability, and other price control determinations, however use of sector costs would not be entirely incompatible with those principles. It may be slightly more complex to focus on actual costs and to normalise for differences with sector costs, e.g. shorter term debt currently involves a lower yield but leads to refinancing risk. However, the value of the adjustment also requires calculating. This is just one consideration as part of broader regulatory considerations.

For network price controls where a number of companies are being regulated, determinations have typically involved placing primary weight on a notional company. For this consistency with regulatory precedent, we score the notional benchmark approach higher than approaches using actual sector costs.

Assessment

	Score – regulatory principles
Notional benchmark w/adj	High
Sector costs (average)	Medium

	Score – regulatory principles
Sector costs (upper quartile)	Medium

3.3.6. Robustness to changes

Notional costs should help ensure that the approach remains robust to changes in financial markets and the regulatory regime. Sector costs can be moved materially by firms obtaining favourable (or unfavourable) timing. A notional benchmark may be less appropriate if there are changes to the behaviour of the notional entity across a price control period. Due to this, a longer price control may suggest greater weight being placed on sector costs.

Assessment

	Score – robustness to changes
Notional benchmark w/adj	Medium
Sector costs (average)	Medium
Sector costs (upper quartile)	Medium

3.3.7. Conclusions and assessment

Our assessment of the choice here is summarised below.

Table 3.5: Assessment of notional benchmark with adjustment versus sector costs

	Notional w/adj	Sector costs (average)	Sector costs (upper quartile)
Impact on customers	Medium	Medium	High
Incentives	High	Medium	Medium
Financeability and investment	Medium	Medium	Low
Risk sharing	High	Medium	Medium
Regulatory principles	High	Medium	Medium
Robustness to changes	Medium	Medium	Medium

The notional approach (with an adjustment) appears to us to be more preferable because it is better from an incentives and risk sharing perspective, that should lead to positive outcomes for customers in the long-term if benefits can be transferred to customers. However if regulators place more weight on certain principles then this could lead to a different answer e.g. use of upper-quartile sector costs to reduce prices.

3.4. Assessment against our criteria (Q3) – should we use actual or notional timing?

This question is likely to be more relevant to the aviation sector given the number of companies involved and the principle of setting an industry cost of debt in the water sector (albeit with the potential for a small company premium).

3.4.1. Impact on customers

Level of bills

As shown earlier in this chapter, use of actual timing under our modelling would lead to a lower cost at present from using notional timing in both water and aviation sectors.

We have modelled the debt return component based on RABs at the outset of the current price control periods. However, this is just a snapshot and it is possible that a) any outperformance/ underperformance is driven by fortune, or b) outperformance is present due to stronger incentives in the past.

Approach	Annual bill (water)*	Passenger charge (Heathrow)*
Notional timing	£104.31	£5.26
Actual timing	£102.20	£5.21

**Contribution of allowed return to bill or charge, keeping the cost of equity and gearing assumptions constant. This did not include other building blocks forming part of the charge or bill.*

The actual timing profile for water companies reflects a period when companies were gearing up and therefore greater weight was placed on some years or very low rates. This leads to lower charges from using actual timing in the water sector at present.

While there may be short-run changes, in the long-run we would expect there should not be a large difference in the cost of debt from using actual or notional timing, and if anything, a notional approach should be better given the ability of a company to exert some control (even where limited), such as where there is a spike in the market cost of debt and firms are able to avoid issuing debt in that period. For example, if the peak of the global financial crisis (the year from September 2009) was excluded from a ten year trailing average to end-March 2016, the nominal average would be 5.1% rather than 5.3%. This may be possible only to a degree as it relies on the ability to avoid debt costs during this period.

Using actual debt costs for one period to capture a lower cost (before returning to notional timing) would not be appropriate as it may be seen as opportunistic behaviour that decreases confidence in the sector for investors in future. An alternative approach that would be more suitable would be to use a sharing mechanism (discussed in Chapter 5).

Volatility of bills

As with the use of notional costs rather than actual costs, the smooth nature of a moving trailing average would reduce volatility where periods are given a large weight and thus lead

to a step change in the cost of debt. For companies, the impact from an old bond maturing or new bond being issued can potentially lead to jumps in the allowance.

Assessment

	Score – impact on customers
Notional timing	High
Actual timing	Medium

3.4.2. Incentives

Approaches that place weight on the timing of actual debt issuance are poor from an incentives standpoint as the firm would be indifferent to when it raises debt if they know they will be fully compensated, although it may lead to higher costs for consumers. Where there are strong incentives, firms should incur lower costs that they retain in the short-term, but lead to lower costs for consumers in the medium and long term.

The exception to this would be where companies do not have control over the timing of their debt – this may be in the case of a new runway.

Assessment

	Score – incentives
Notional timing	High
Actual timing	Low

3.4.3. Financeability and investment

As with the notional versus actual costs question, actual timing should be better from a financeability perspective as firms do not bear the risk of divergence from the assumed notional profile and associated costs being different. Notional timing has not, however, appeared to have restricted investment where this has been used and where the notional approach is applied correctly, this should not lead to any undue financeability concerns.

Assessment

	Score – financeability and investment
Notional timing	Medium
Actual timing	High

3.4.4. Risk sharing

In this case, the risk is narrower than considering actual versus notional costs, but the allocation is the same under these two options:

- notional timing – the timing risk lies with the company as it gets a benchmark allowance and any deviation from it would be at the cost or benefit of the shareholders; and
- actual cost – the risk lies with customers as timing impacts are largely pass-through. The company does not face any timing risk.

The notional profiling of debt does not mean that companies are only going to be allowed to issue equal amounts each year. It can be adjusted for (uncontrollable) RAB growth, which companies need to undertake to comply with various quality requirements.

Assessment

	Score – risk sharing
Notional timing	High
Actual timing	Low

3.4.5. Regulatory principles

Approaches that require some use of non-publicly available data, e.g. actual timing of debt, are likely to be less accessible for the majority of stakeholders (other than the company in question). It also means that data verification from companies will be key. Similarly to the cost question, looking at 17 different company submissions on timing is more burdensome than setting a single profile.

Assessment

	Score – regulatory principles
Notional timing	High
Actual timing	Low

3.4.6. Robustness to changes

We find that robustness to regime changes is similar across the two alternatives as the standard deviation i.e. a measure of difference between actual and outturn costs remains relatively stable in our modelling. This is relevant as it demonstrates the impact on firms' revenues (and thus customer costs) in different states of the world.

The more stable the results, the more appropriate the approach would be when faced with external or industry changes (further information on our modelling is contained in Annex E).

We have decided to measure this using standard deviations across scenarios, detailed in the modelling annex. The table below shows the results for these two types of sensitivities.[59] We see that timing choices are not affected by changes in macroeconomic circumstances as allowances are fixed ex-ante. We also conclude that the choice is also only slightly sensitive to changes in the regime with actual timing resulting in lower sensitivities but still close to notional.

Figure 3.4: Sensitivity of approach to changes in interest rates or RAB growth

	Across macroeconomic sensitivities		Across regime scenarios	
	Water (£m)	Aviation (£m)	Water (£m)	Aviation (£m)
Notional timing	215.1	42.5	1,857	538
Actual timing	215.1	42.5	1,806	535

However, there are some large outliers, driven by the scenario of rapid RAB growth when this is not accounted for in the notional timing model.

Assessment

	Score – robustness to changes
Notional timing	Medium
Actual timing	High

3.4.7. Conclusions and assessment

Our assessment of the choice here is summarised below.

Table 3.6: Assessment of actual vs notional timing

	Notional timing	Actual timing
Impact on customers	High	Medium
Incentives	High	Low
Financeability and investment	Medium	High
Risk sharing	High	Low
Regulatory principles	High	Low
Robustness to changes	Medium	High

[59] Columns two and three show the standard deviation of the size of the gap between allowed and outturn return in various macroeconomic climate. This is the 5-year NPV of the difference between allowance return and outturn return. Outturn return changes with market rates scenarios but allowed return does not, thus resulting in fluctuations of the gap between the two. The size of the gap is different depending on how outturn rates are used in deriving the cost off debt, i.e. it is not affected for scenarios that use fixed allowance. Columns four and five show the standard deviation of the size of the allowance itself (in NPV terms) in a sample of regime scenarios – different RAB growth rates, choice of inflation (CPI or RPI), choice of price control length.

Stronger incentives from the use of notional timing in the water sector have contributed to outperformance against a benchmark. While this means that using actual costs leads to lower costs at present, this is not going to be the case in future as an actual timing approach removes these incentives.

Firms do have some degree of control on timing and as such, it is appropriate for them to bear these where the costs of customers facing the risk do not outweigh the benefits. Using actual timing does remove some risk from companies, which can be reflected in a lower cost of capital. When compared to indexation as an example, a key difference is related to control. Indexation reflects forecasting risk on market rates, so this is not in the control of the company. However, timing is in the control of the company in most cases.

The exception to this will be in the case of a new runway, where there are arguments to tie more closely the timing assumption with actuals given the scale of the financing need and the limited controllability that will be possible at least in the short-term.

4. COST OF DEBT INDEXATION

Summary

In the previous chapter we recommended that most weight should be placed on a notional benchmark. In this chapter we address whether a fixed allowance (as used at present in both sectors) or an approach that uses indexation would be appropriate. The indexation approaches we discuss are based on movements in our notional (iBoxx) benchmark indices. In the GB energy sector, what we term a 'full indexation' model is used. We analyse this and indexing only the cost of new debt (i.e. where a fixed allowance applies to embedded debt).

We find that forecasting a cost of new debt is very difficult. Errors lead to windfall gains and losses for customers and companies. By using an adjustment mechanism i.e. indexation, there are two methods for this to be applied; either using a forecast for setting interim revenues and replacing this once actual figures are known, or using only actual values (albeit with a lag). This approach is beneficial for equity investors who no longer face the forecasting risk where a forecast is used for setting a final allowance (forward curves have tended to have very weak predictive power, leading to large forecasting errors). The approach also has benefits for ensuring financial viability – this is especially key when trying to attract new investment, for example with new runway capacity. Firms do not need to be compensated for bearing forecasting risk any more, leading to an overall lower cost of capital faced by customers.

4.1. Pre-cursor questions

An indexation model is an option for sharing risk and variations in performance. There are different ways of implementing indexation, with respect to the types of risks that are shared and the degree of that sharing. We assess two pre-cursor questions in relation to indexation to either reach a definitive viewpoint or support our analysis on the issue:

- Can the regulator forecast new debt costs accurately? If a regulator can forecast new debt accurately, then there are reduced benefits from an indexation model and a fixed model may be considered to be most appropriate.
- How much control do companies have over meeting a fixed allowance under changing market conditions? If there is substantial controllability of changes in market rates or ways to hedge such changes, then it is also the case that there are reduced benefits from indexation.

4.1.1. Can a regulator forecast new debt accurately?

Why does it matter?

In forecasting the cost of new debt and movements in a benchmark index, there are market-derived estimates in forward curves that are typically used by regulators. However, as with other cost of capital parameters, how to utilise market evidence is an art rather than a science. The accuracy of a regulator's forecast indicates the size of the forecasting risk that is present (this sits with either the company, customer or a mixture of the two). A mechanism

like indexation that adjusts for movements in rates has a greater effect in terms of risk reduction where the forecast is not accurate.

Evidence

Forward curves have not been very accurate predictors of movements in debt yields. In the figure below, the blue solid line represents the outturn yield on UK ten year government debt. The grey dotted line represent expectations on future rates at different points in time. These have not been good predictors. For example, looking at UK ten-year government debt yields finds that current nominal yields are 250bps below what was implied by forward rates in mid-2013.

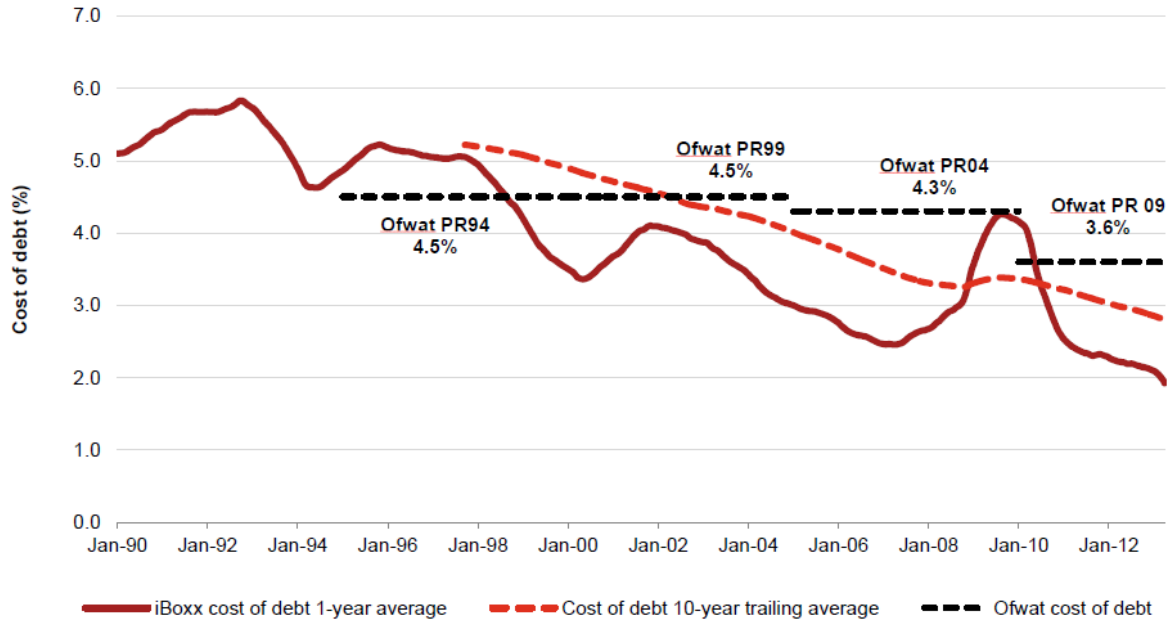
Figure 4.1: Forwards for UK ten year government debt

Source: Bloomberg

We find that the shape of the forward curve has remained relatively stable. This may be suggestive of the expected increase in yields reflecting a risk aversion/ insurance premium rather than true expectations about yields. If this is the case and regulators use these forward curves then customers will be paying a higher cost of new debt than would be implied by a risk-neutral best estimate of rates.

Outturn rates lower than forecast have been a feature of the cost of debt over recent price control determinations. The figure below illustrates this in comparing cost of debt yields to cost of debt allowances in water regulatory determinations.

Figure 4.2: Comparison of cost of debt and Ofwat cost of debt decisions



Source: PwC analysis, DataStream, Bank of England, Capital IQ, Ofwat

Source: PWC (2013) Cost of capital for PR14: Methodological considerations, p.35, Figure 6.5

For example, the allowances at PR04 and PR09 were roughly around the level of the 10-year trailing iBoxx (red dotted line) at the time of the determination. However, the iBoxx continued to drop, driving outturn debt costs below long-term averages. Such movement was not expected at the determination – neither based on the forward curves, nor based on historical averages.

Forward curves are market-derived. This means that the expectations fluctuate. From a regulatory perspective, large fluctuations in expectations can reduce certainty and predictability. An example of this volatility can be seen from considering the spot real cost of debt on a fortnightly basis for the three months between August and October 2015. There is a 48bp difference between the maximum cost of new debt assumption and the minimum cost of new debt scenario in our example.

Table 4.1: Real spot yields taken from different periods

Date	Real yield on iBoxx A and BBB 10yr+ index
03/08/15	1.07%
17/08/15	1.17%
01/09/15	1.34%
15/09/15	1.39%
29/09/15	1.55%
13/10/15	1.47%
27/10/15	1.39%

Date	Real yield on iBoxx A and BBB 10yr+ index
Maximum	1.55%
Minimum	1.07%
Mean	1.34%

Source: Markit iBoxx, Bank of England

Note: Uses 10 year breakeven inflation to deflate nominal yields

Given market fluctuations over the past ten years and a number of uncertainties in the calculation of the forward rates based on the lack of corporate curves data that is sufficiently robust, we consider that the confidence in accurately predicting interest rates is relatively low. In addition, due to volatility in forward estimates, an average of expectations may need to be used such that the figure used is not an outlier.

Recommendation

Forward curves do not appear to have great predictive power – this creates risks for whoever bears forecasting risk where there is a deviation between outturn values and forecast values. We therefore think there is rationale for further investigation of an indexation approach due to the size of potential benefits.

4.1.2. How much control do companies have over meeting a fixed allowance under changing market conditions?

Why does it matter?

In the previous pre-cursor question, we found that there was the scope for large differences between the expected cost of debt and the outturn cost of debt. However, if companies are able to control their new debt costs and thus mitigate this risk (see earlier discussion and Annex A), there will be less scope for windfall gains and losses (for both customers and companies). Even if debt costs do not turn out to be as forecast, if companies can manage their costs through either hedging, equity financing or other strategies, this would limit the impact of the forecasting error. For any element of the cost of debt allowance that is beyond the company's control, the regulator needs to consider who is best placed to bear the risk.

Evidence

With falling rates and outturn costs lower than a cost of debt allowance, this has worked in companies' favour. If rates had risen by more than expected, we might have seen companies react to manage the risk. Given that this has not happened in water or aviation over the past few price controls (as evidenced in Section 4.1.1), there is no evidence of how companies will react. Even when rates are falling, companies are still incentivised to beat the allowance, so they have been using some tools/strategies to reduce their costs. Below we present a few

examples of ways utilities and airports have hedged movements in interest rates. Further examples are discussed in Annex A.4.5.

Both the larger water companies and airport companies (specifically HAL) are users of the derivative markets (further discussion is included in Annex A). The only water companies that do not use derivatives are the smaller Water only Companies that have been established as whole business securitisations.[60]

Companies have also sought to manage their interest rate risk via the issuance of long term debt, with an average life of 10-20 years and by holding approximately 85% of that debt in either fixed rate or Index Linked. For example, Yorkshire Water has £1.3bn of index-linked derivatives (which is roughly 23% of its opening AMP6 RCV).

Similar treasury behaviour can be observed in airports - Gatwick Airport issued a £350m 20-year bond and set up a five-year revolving credit facility in March 2014 to cover refinancing the £300m capex facility from the Q5 programme and ongoing capital expenditure facilities, rather than issuing with a smooth profile over the Q6 period.

Recommendation

Given these examples and the evidence in Annex A, there is obviously a degree of control exhibited by a regulated entity considering that the debt relates to the company itself, but underlying market rate movements and industry-wide debt premium are not controllable and affect the rate faced by regulated companies. To remove forecasting interest rate risk requires removing this for both the upcoming price control period and for future price control decisions. As an example, interest rate risk for new debt in the next period can be addressed by issuing all debt at the start of the period. However, as the example with Gatwick will show, for the following price control period where rates have fallen to date, the cost of Gatwick's embedded debt in the Q6 determination would be higher than if they had issued debt smoothly over the period rather than all at the start.[61]

From our analysis in Annex A and above discussion, we do not think there is a cost-effective method available to completely remove interest rate risks from companies. The use of financial instruments could achieve partial mitigation of these risks, but do not remove these risks. By aiming up or applying headroom, this compensates for risk but does not remove it.

4.2. Assessment against our criteria

In this section, we assess the three options:

- Fixed allowance for both new and embedded;

[60] These have not required hedging due to the long term nature of their capital structures which were established purposefully to provide stability to their cost of debt over time.
[61] If rates increased, the costs of embedded debt would have been lower by issuing at the the start of the period.

- Fixed allowance for embedded and indexation for new debt (via end of period adjustment), i.e. partial indexation; and
- Full indexation, covering both new and embedded.

4.2.1. Impact on customers

Level of bills

The difference between setting a fixed allowance and indexation will depend on whether the outturn values are higher or lower than the forecast of those values. Over recent price controls, outturn values for the cost have been lower than expected at the time of the price control, often significantly lower than the allowance.

When rates fall below their expected value, indexation leads to reduced bills relative to a fixed allowance with no adjustment. When rates rise above their expected value, indexation leads to increased bills relative to a fixed allowance with no adjustment.

In theory, where indexation is used, this should remove the need for headroom to compensate for regulated firms bearing the risk of unanticipated movements in corporate debt yields (or transaction costs included for risk management e.g. swap costs). An indexation approach would lead to reduced bills for consumers where this is below the value of the fixed allowance plus headroom.

A reason for including headroom as part of a fixed allowance relates to investment incentives. Brealey and Franks (2009)[62] find that 90bps headroom i.e. adding 90bps to a regulator's best view of the cost of capital, is required in order to ensure that a zero-NPV project (i.e. the marginal project that should be accepted) is not incorrectly rejected.[63] The authors reference the 73bps of headroom being included on the Stansted Q5 price control decision. Lowering the threshold to ensure that three-quarters of projects are not wrongly rejected decreases the headroom required to 12bps.

Headroom can be either intentional, for reasons explained above, or unintentional. Where intentional, this can be through using higher values for parameters (implicit) or through aiming up on a base estimate (explicit). An example of unintentional headroom would be where forward curves are used in setting the cost of new debt, but these include a risk aversion premium.

It is not only outperformance that is taken into consideration. There is also the possibility of underperformance. For the RIIO ED1 price control, there were networks who the RIIO GD1 and T1 cost of debt mechanism would not fully compensate for their debt costs. An adjustment was made for all companies (via increasing the trailing average period) that had

[62] Brealey and Franks (2009) Indexation, investment and utility prices. Oxford Review of Economic Policy 2009, 25(3).

[63] This analysis is based on the overall cost of capital and so the paper discusses more than the risk of unanticipated movements in corporate bond yields, however the same principles apply for the cost of debt.

the effect of increasing the allowed cost of debt. This led to additional headroom for those who were already performing in line with or outperforming the benchmark index. In the CMA (2015) British Gas Trading Limited Final Determination, the Authority set out that closer matching of actual yields with the allowed cost of debt is in the long-term interests of consumers where this leads to a lower future cost of capital e.g. through a lower equity beta.

However, the lower cost of capital is at the discretion of the regulator. The extent of this depends on whether there was headroom in an allowance or not.

Volatility

The extent that bills change with an indexation approach depend on the movement in yields. Our modelling finds that there is a £4.54 per year per household impact from a 100bps change in the cost of new debt in the water sector (based on other Q6 parameters). In the aviation sector, a 100bps change in the cost of new debt leads to a £0.23 change in the tariff per passenger (see Annex E for calculations).

There is a range of evidence that shows that consumers value certainty. This is indicated by surveys and empirical evidence.[64] Where indexation uses annual changes, this will create within period volatility. In addition, if indexation leads to a higher proportion of floating rate debt, more weight on new debt could increase volatility.

The quoted survey evidence does however note that consumers prefer gradual rather than one-off changes, so if indexation with annual changes reduces the extent of step change volatility at the end of a price control this may be positive.

The volatility should be assessed in the context of bill movements. There will be annual changes stemming from revenue indexation to inflation and other changes e.g. ODIs, development capex adjustments. This could offset or exacerbate volatility, but shows that the price is not fixed in nominal terms.

In Section 3.2.1 we have also noted ways in which a regulator can mitigate volatility – as such we think that indexation approaches score more favourably than a fixed allowance approach in terms of the impact on customers.

Assessment

Approach	Score – impact on customers
Fixed allowance	Medium
Indexation of new debt only	Medium/High
Full indexation	Medium/High

[64] As per presentation on "Consumers benefits of moving from RPI to CPI indexation" Ofwat reviewed 60 reports on customer preferences with regard to bill volatility. For example, Bill Phasing Research for Anglian Water, Smart Billing research by Ofgem, and Customer preferences for bill profiles for Northumbrian Water.

4.2.2. Incentives

There are two aspects to incentives with respect to the use of an indexation approach or a fixed allowance approach; the incentives around the 'on the day' approach and the incentives around timing.

Companies are incentivised to beat the allowance where they retain outperformance. Under all approaches, the company keeps the difference between allowed and actual. The main difference between a fixed approach and an indexation approach would be the role of a company's own debt in an index. If this debt carries a large weight, issuing low cost debt can lead to benefits for the company, but also can reduce the level of the allowance (thus reducing the benefit). Under our choice of benchmark, a broader index keeps strong incentives.

The second aspect relates to timing. A criticism of the full indexation approach is that regulated companies may try to mimic the index to reduce the interest rate risk they face, rather than the level of interest rates they face. In the energy sector we have seen one company look to mimic the cost of debt index more closely (Northern Gas Networks) by issuing more frequently. However, as the index is comprised of an average of daily values, this mimicking is imperfect. If firms mimic the benchmark and firms have the ability to influence the benchmark through timing, this reduces short term outperformance. These benefits are then not revealed and cannot be passed onto customers in future.

We relate back to the counterfactual under a fixed allowance. Regulators have typically assumed a trailing average period using a simple average (for example, ten years) and then assumed the same tenor of debt in estimating the average cost of new debt over a price control period. With greater discretion for the regulator under a fixed allowance and to a lesser extent the indexation of new debt only, there are reduced risk benefits from mimicking the benchmark. Where regulators take the technically correct approach under a fixed allowance of allowing debt to drop off, we think there is little difference in terms of incentives around timing between the different cost of debt models. An indexation approach per se does not need to assume equal weights each year and for new debt can reflect actual timing if so chosen.

As referenced in the discussion on customer impact, incentives are broader than just debt. Indexation can permit more efficient investment decisions relative to a fixed allowance.

We do not think that the choice of indexation mechanisms or a fixed allowance creates a fundamental difference with respect to incentives that would be harmful to customers. There are other choices such as the choice of weighting, debt dropping off and the choice of a benchmark that do have an impact but are outside the question considered. As such we score the approaches the same on incentives.

Assessment

Approach	Score – incentives
Fixed allowance	High
Indexation of new debt only	High
Full indexation	Medium

4.2.3. Financeability and investment

Unanticipated movements in market rates can lead to windfall gains and losses under a fixed allowance approach. This could pose risks from the perspective of financeability in the case of losses. This may be particularly relevant for infrequent issuers like the WoCs, who have substantial amounts of long-term debt that would require refinancing, or in the case of a new runway when a forecast cost of debt is used. As such, indexation mitigates this risk of financeability issues.

In terms of the scale, at PR09, the difference arising through the use of indexation and the fixed allowance approach was estimated at £840m by the NAO. This could have potentially been the other way i.e. a £840m shortfall rather than a gain.

A regulator should also consider the potential size of any ex-post adjustments and whether that would pose any financeability constraints on companies within period. This is relevant for indexation of new debt only where the adjustment for outturn rates is made at the end of the price control.

Assessment

Approach	Score – financeability and investment
Fixed allowance	Medium
Indexation of new debt only	High
Full indexation	High

4.2.4. Risk sharing

Under a fixed allowance approach, customer charges include the expected cost of debt for the period (this payment equates to revenue for companies). Companies face the cost of outturn rates in the market. They therefore face the risk of differences between the forecast and outturn cost of new debt i.e. forecasting error, under a fixed allowance approach. This can be positive or negative.

An adjustment mechanism can transfer all or some of the risk of unanticipated market movements in the 'allowed index' from companies to customers. This may be through sharing e.g. 50:50 split, use of deadbands where companies bear some limited risk or general market risk e.g. indexation.

Indexation places the risk from differences between the forecast and outturn allowed cost of new debt on the customer rather than companies. Companies, through the timing of issues and hedging, have a degree of control to manage against forecast error. These mechanisms are however imperfect and it will not be possible to remove all forecasting risk. Companies still bear other risks relating to the cost of debt e.g. the difference between the allowed debt costs and actual debt costs that the company incurs.

The key question a regulator faces is whether there are benefits from this risk allocation. Where forecast rates are above outturn rates under a fixed allowance approach, customers end up paying more than they would under indexation (as per the PAC analysis for PR09). A key question is whether the forecast leads to symmetric risks to customers, or whether there would be other benefits from this risk allocation. Where regulators believe that either forecasts will err on the side of the company or that customers are better placed to handle risk, then some form of indexation or true-up is likely to be preferable to a fixed allowance.

Assessment

Approach	Score – risk sharing
Fixed allowance	High
Indexation of new debt only	Medium/ High
Full indexation	Medium

4.2.5. Regulatory principles

In terms of forecasting future rates, a fixed allowance does not provide any insurance against mis-forecasting. Headroom adjustments, or aiming up adjustments, can be a partial but one-sided solution to this problem. Indexation approaches are more flexible and track the benchmark index and therefore remove the risk of getting the cost of new debt wrong. The table below provides a few more examples of pros and cons of indexation from a regulatory perspective.

Counterparty	Pros of indexation	Cons of indexation
Regulator	• Windfall losses and gains from forecasting error are not consistent with good regulatory practice (First Economics in a GD17 WACC report found that this is inconsistent with NIAUR's statutory duties).[65] • Can lead to symmetry of risks given removing any need to compensate for uncertainty with indexation – PwC note this as being key in PR14 reports for Ofwat. • Infrequent issues (e.g. WoCs) with uncertainty over timing in the upcoming period can be more accurately reflected using an indexation approach compared to a fixed allowance. An example is the SHETL indexation model for RIIO-T1 where weights correspond to asset base additions.	• An adjustment to the baseline for new debt creates an additional regulatory burden. • A mechanistic approach is not necessarily fixed for more than one period and may reduce regulatory flexibility. • Having flexibility with timing e.g. the SHETL model, may introduce subjectivity if firms time debt to influence their capital structure rather than due to their required capex programme.

A mechanistic approach such as indexation has advantages in terms of transparency over an approach where discretion is used and a decision is subjective. However, this can come at the cost of rigidity, which may require adjustments at each price control e.g. Ofgem changing their approach to indexation for the RIIO-ED1 price control. Therefore, pre-determined rules about how and why adjustments can be made are useful to improve predictability (at least in a procedural sense).

Assessment

Approach	Score – regulatory principles
Fixed allowance	Medium
Indexation of new debt only	High
Full indexation	High

4.2.6. Robustness to changes

Robustness to change can be thought of in the sense of robustness both to internal regulatory regime changes and external macroeconomic changes. We have tested the impact of regime changes – such as various RAB growth rates, length of price control or CPI/RPI indexation – on the robustness of fixed versus indexation approaches. The results of this analysis are

[65] First Economics (2016) An Estimate of the GD17 Costs of Capital

contained within Annex E. We find that robustness to regime changes is similar across the options.

For external changes, our full indexation model is more robust to changes in market rates than a fixed allowance based on our modelling. The larger the deviation in rates, the greater the benefits from indexation. Full indexation is less robust where specific weights cannot be used for large investment that requires debt refinance compared to indexation of new debt only.

We have used standard deviation across various market rate assumption scenarios to measure the sensitivity of the allowed return. The table below shows the results of the robustness testing against market rate scenarios, i.e. sensitivities.[66] See Annex E for detailed assumptions.

Table 4.2: Robustness to macroeconomic changes

Package	Water (£m)	Aviation (£m)
Fixed allowance	215.1	42.5
Indexation of new debt only	0.0	0.0
Full indexation	99.8	14.9

Indexation of new debt only is most robust to changes in market rates as the ex-post adjustment allows for market movements to be reflected in prices in an exact manner. Fixed allowance is the least robust and would be least appropriate if market rates move from baseline expectations. Full indexation has some deviation as changes in market rates also affect assumptions about embedded debt as a function of our model. However, we note that these standard deviations are relatively small in relation to overall returns (they are based on a five-year allowance and the water number is an industry total).

We have previously noted that the debt tenor for financing a new runway may differ from what has been incurred to date. We have noted the potential for two different notional benchmark indices; one that reflects the historic debt tenor and another that reflects a different tenor for future i.e. new debt. The indexation of only new debt is a more flexible model and there would be potential issues from applying a full indexation approach under this method. For example, with the Ofgem RIIO ED1 changes to the cost of debt indexation mechanism, there was little discretion given a more mechanistic approach such that over the long-run, such as approach may not have as clear benefits in terms of robustness.

Out of the choices considered for setting the cost of debt, a new debt indexation model is most robust to changes in market rates. It is easier to reflect changes in investment programme under this approach and so the approach scores highly.

[66] This is the five-year NPV of the difference between allowance return and outturn return. Outturn return changes with market rates scenarios but allowed return does not, thus resulting in fluctuations of the gap between the two.

Assessment

Approach	Score – robustness to changes
Fixed allowance	Low/Medium
Indexation of new debt only	High
Full indexation	Medium

4.3. Conclusions and assessment

Our assessment of the choice here is summarised below.

Table 4.3: Assessment of fixed allowance vs full indexation

Criterion	Fixed approach	New debt indexation	Full indexation
Impact on customers	Medium	Medium/High	Medium/High
Incentives	High	High	Medium
Financeability and investment	Medium	High	High
Risk sharing	High	Medium/High	Medium
Regulatory principles	Medium	High	High
Robustness to changes	Low/Medium	High	Medium

Our assessment finds that both new debt indexation and full indexation lead to an improvement compared to a fixed approach. Where companies bear forecasting risk, they need to be remunerated for it; however, regulatory principles may suggest that options which remove or reduce forecasting risk may be more efficient for customers. If a regulator was to be offered a forecasting method that was perfectly accurate, they would choose this above the imperfect method used currently (even if this corresponds to a risk transfer). A perfectly accurate forecasting method does not exist, but indexation is very similar to perfect forecasting albeit with a time lag. However, the use of indexation does represent a transfer of this risk, which is why it scores less high on the risk sharing criterion.

There are a number of areas where indexation of new debt only is preferred to full indexation – for example, robustness to change and risk allocation. This leads us to conclude that a new debt indexation mechanism (using an ex-post adjustment) is the recommended model.

5. USE OF BENEFIT/COST SHARING MECHANISM

Summary

A benefit/cost sharing mechanism based on the difference between actual and allowed costs is an alternative or a potential complement to our recommendation of indexation in Chapter 4. This relies upon an accurate estimate of actual costs, normalised for changes that you wish to make e.g. assuming a certain tenor given a trade-off between lower cost and higher refinancing risk for shorter-term debt.

As we have introduced changes to the ex-ante approach with an adjustment to a notional benchmark and our indexation mechanism to deal with forecasting risk, we think that the scale of the difference between allowed and actual costs should be much lower under our recommended approach. This approach (covering our proposals in Chapters 2-3 and the technical changes in Part B of the report) reduces the benefits from the use of such a mechanism. The costs of using such an approach are with muted incentives (as observed in our discussion of actual and notional costs). This may mean that the mechanism may need to be removed in future to reduce costs borne by customers and adding such an approach (even if it leads to short-term savings due to outperformance on embedded debt) would not be in the long-term best interests of customers.

However, should the changes be rejected then a benefit/cost sharing mechanism would make more sense. The difficulty will be in setting an incentive strength. Where there are reasons to suggest that the differences are from uncontrollable factors, a low incentive strength leads to windfall gains and losses for the regulated company.

5.1. Pre-cursor questions

In order to use a benefit/cost sharing mechanism based on actual costs,[67] there needs to be the ability to accurately measure the actual costs – otherwise the mechanism is not feasible as the mechanism requires actual debt costs to estimate the size of any adjustment.

5.1.1. Can a regulator accurately measure actual costs?

Why does this matter?

The use of a benefit/cost sharing mechanism based on actual debt costs relies on being able to accurately estimate those actual costs. Given the scale of the returns from the cost of debt, we think that it is good regulatory practice to be aware of the exact costs facing companies even if this is not used.[68] With the use of different financial instruments, non-public debt instruments and complicated company structures, this may not be straightforward in practice. As discussed in Chapter 2, there are multiple measures of actual costs; some of which are based on public information and others that require private information. If the regulator gets the actual cost wrong then this will lead to windfall gains or losses from use of a benefit-cost sharing mechanism.

[67] There are different ways to model actual costs. In this sense, we refer to actual cash costs from a company.
[68] This may be achieved through introducing disclosure obligations on companies.

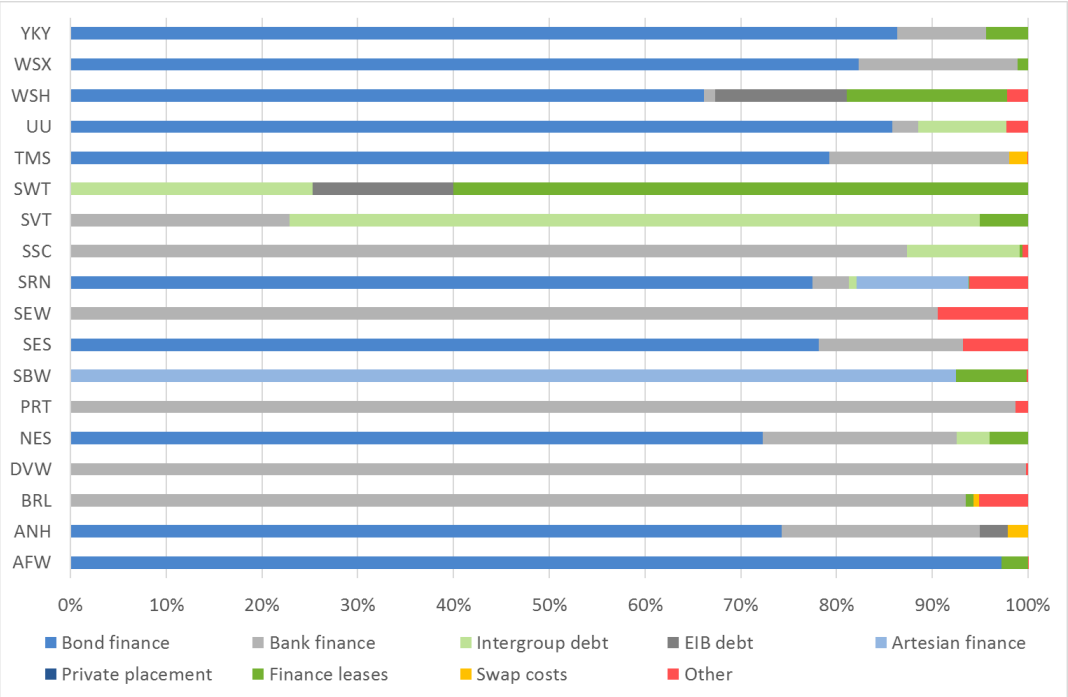
Evidence

Ofwat publishes information on the actual cost of debt as part of its monitoring of financial resilience.[69] Since the time of the last publication, more information has been gathered on these costs. The NAO under their report have published the water costs for companies over the PR09 price control and Moodys publish debt costs as part of their annual 'Industry Outlook' publications.

The information has typically differed in what has been reported by different sources, with gaps in the information provided – however this has not been required directly for the cost of debt itself as actual debt costs are not used in the water sector.

In the water sector, we find that a number of different financing sources are used. This would create a greater regulatory burden to understand all of these, especially given that many sources of debt finance do not release public information.

Figure 5.1: Debt cost split in the water sector (2014/15)



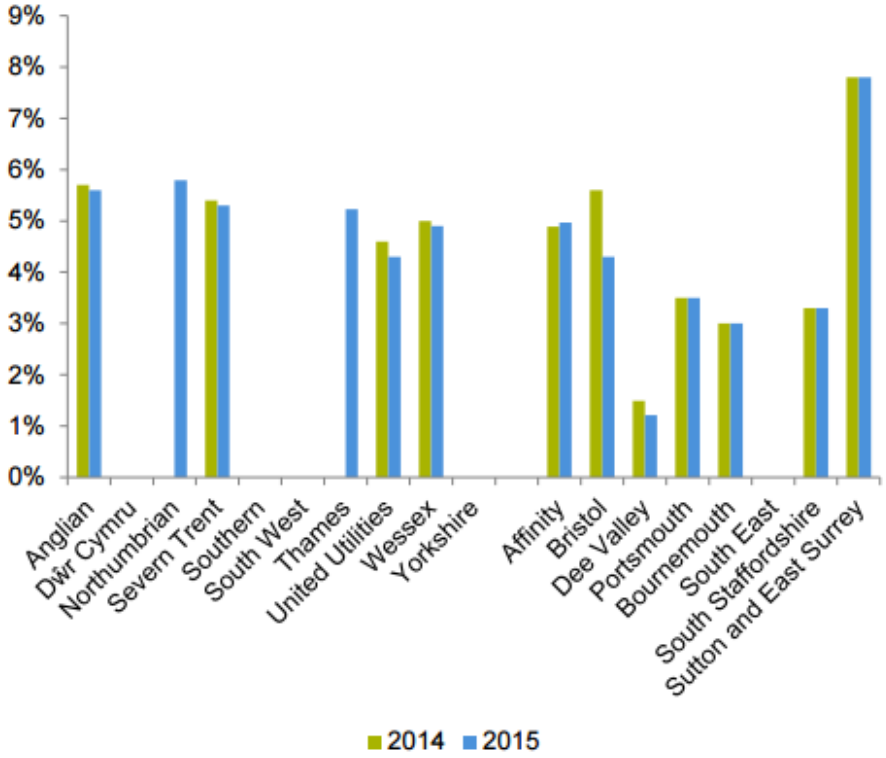
Source: Ofwat. Information is taken from statutory and regulatory accounts. 'Other' category includes items such as perpetual debenture stock, preference shares, interest accrual and fair value changes.

For Heathrow, the average cost of debt facilities is provided on an annual basis and to assess the costs places less burden on the regulator than for a sector with 17 companies.

We would recommend extending the approach on gathering detailed actual costs to PR19 – this will permit a greater range of choices and also allow more detail to be used as part of the cost of debt analysis. We would also recommend that the CAA gather more information to have comfort in the actual level of costs for Heathrow.

[69] Ofwat (2015) Monitoring Financial Resilience – A Snapshot

Figure 5.2: Fixed Nominal Costs for Water Companies



Source: Ofwat. Note that the gaps in the data are where the companies did not publish this data in their regulated accounts.

Recommendation

While Ofwat has taken steps to improve the quality of information on the cost of debt with its resilience reporting, there are measures of the cost of debt that do not necessarily concur e.g. comparing the Ofwat and Moody's information on actual debt costs. This may be because they are measuring different aspects e.g. Ofwat information is largely based on public bond debt information, while the Moodys data is their best estimate of the debt costs of the company including both public and private information. If Ofwat are to place greater weight on actual cost data, then measures should be defined and data should be gathered and appropriate assuance provided by companies.

In the aviation sector, there is confidence on debt costs prior to entering into swaps. Heathrow has a large portfolio of swaps and so these will have an impact on effective debt costs.

The degree of confidence depends on the nature of the information available – a nominal fixed rate public bond is going to be easier to assess than private floating rate debt with an associated swap. If Ofwat is able to continue the steps taken to provide greater transparency on actual costs, this does not preclude the use of actual costs in setting the cost of debt.

The same applies for the CAA; as they have placed more weight on actual costs, then the future approach would be an extension. However, the approach should be more

comprehensive in considering the full suite of debt costs rather than just GBP bonds. Otherwise this creates discrepancies where the GBP bonds are not a good proxy for other costs. This will require asking for information on the cost of bank facilities and financial derivatives and understanding the cashflows faced by the company. This information may not be independently verifiable, so would require the companies to provide accurate information.

5.2. Assessment against our criteria

We make our assessment following our proposed approach on the setting of a cost of debt allowance at the time of the determination and use of an indexation adjustment mechanism (see Chapters 3 and 4). These proposals include an ex-ante benchmark that we think will more accurately reflect debt costs following the use of an adjustment to a suitable index. In addition, our proposals remove forecasting risk from companies through the use of an indexation mechanism to account for changes in the cost of new debt. The underlying assumption for our approach is that a notional approach is used (this scores well from an efficiency incentive perspective). A benefit/cost sharing mechanism based on actual costs is a way to share benefits from the strong incentives of this proposed approach with customers.

5.2.1. Impact on customers

Level of bills

Under a symmetric benefit/cost sharing mechanism and recommendations that better reflect debt costs of an efficient entity with our notional benchmark, we do not think there should be an overall impact on bills from the introduction of such a mechanism. With the setting of a fixed allowance on the cost of new debt often including headroom (and historically being overestimated), the use of a benefit/cost sharing mechanism would be a way to prevent such an approach from being detrimental to customers. With indexation of new debt, this becomes less of a concern.

Given large differences between the cost of debt for companies, the impact of introducing such a mechanism is not constant i.e. there are distributional impacts between companies. While on average customers would face lower bills if actual costs are below the benchmark index, some customers would face higher bills and some lower.

Volatility

As a likely ex-post adjustment the volatility should be limited to a step change at the end of the price control, where there are a multitude of other factors inputting into the bill level. The volatility also depends on how strong the incentive is – a high incentive strength will increase the size of the adjustment and any volatility.

Assessment

	Score – impact on customers	
	With other proposed changes	*Without proposed changes*[70]
Sharing mechanism	Medium	High
No mechanism	High	Medium

5.2.2. Incentives

Under our notional approach and proposed indexation adjustment mechanism, the firm faces all the difference between actual and allowed costs (albeit with a revised allowance based on movements in benchmark costs). This is not the case with a benefit-cost sharing model where companies face only a proportion of the difference. These regulated companies face weaker incentives to incur as low a cost of debt as possible as they retain a lower proportion of the benefit (or loss). The impact on incentives from such a mechanism ultimately depends on how strong the incentive will be – if there is only a 5% sharing factor then this provides stronger incentives than a 50% sharing factor.

For the Bristol Water (2015) final determination, the CMA included support for Ofwat relying primarily on a notional approach for embedded debt, as this approach involves *"removing incentives to obfuscate actual debt costs through complex arrangements and capital structures.*[71]*"*

One issue with a mechanism is whether there should be an adjustment made for non-pricing features of debt.

A major issue would be relating to gearing. Companies that gear up will have a higher cost of debt and share these higher costs, but benefit in full from the substitution of debt in place of equity. This means that companies are incentivised to gear up. Customers facing higher costs and greater financeability risks is not a positive outcome.

A further example of non-price features of debt would be debt that is backed by collateral (this may be more relevant given higher levels of gearing). This may be cheaper than debt that is not backed by collateral. If there is cost sharing then firms may choose not to provide collateral and choose the option that is best for them, even if this is not the case for customers.

The same applies for other choices e.g. issuing in foreign denominated currencies. If swap costs are not accounted for then it may be that the sharing mechanism dissuades firms from issuing in other currencies even though it may be the best choice.

[70] Where we refer to 'Proposed changes' we mean in terms of the use of the indexation of new debt and making an adjustment to the notional benchmark index that permits greater cost reflectivity between the allowance and expected costs of the notional entity.
[71] CMA (2015) Bristol Water Final Determination, para 10.49, p304.

In order to preserve efficiency incentives, Ofwat and the CAA would need to be able to take into account and adjust for non-price impacts, which in practice is likely to be very hard to do. Benefit-cost sharing therefore looks as though it will not deliver the intended customer benefits given the incentive impacts.

Assessment

	Score – incentives	
	With other proposed changes	*Without proposed changes*
Sharing mechanism	Medium	Medium
No mechanism	High	High

5.2.3. Financeability and investment

The sharing of underperformance is a positive from a financeability perspective. However, sharing outperformance is less likely to be viewed positively as this has been a key source of returns for equity investors in recent years. With our new proposals though we would not expect there to be a significant difference, so in this case assign the same score.

Assessment

	Score – financeability and investment	
	With other proposed changes	*Without proposed changes*
Sharing mechanism	High	High
No mechanism	Medium	High

5.2.4. Risk sharing

Under a fixed notional allowance, regulated companies face the risk of movements in rates within the price control. Under an approach set using actual costs, the risk of movements are faced by customers. A benefit/cost sharing mechanism with a notional approach leads to a risk transfer to customers from regulated companies. The degree of this transfer depends on the strength of the incentive. For example, a highly geared company may incur higher debt costs, passing some of this cost onto customers with this being a financing risk transfer. Incentivising highly geared structures from introducing such a mechanism would be a significant issue as this impacts on financeability and costs in the longer term.

Assessment

	Score – risk sharing	
	With other proposed changes	*Without proposed changes*
Sharing mechanism	Medium	Medium

	Score – risk sharing	
No mechanism	High	Medium

5.2.5. Regulatory principles

If the benefit/cost sharing mechanism applied to only those costs that were uncontrollable, having a share of the actual costs would make more sense. However, in the presence of our indexation of new debt, the pain-gain share could lead to sharing of factors that are controllable. We would again try to bring this back to customer benefits if the positive incentive framework does not deliver a favourable outcome.

We have previously noted the difficulties with assessing the actual cost of debt, especially in the water sector. The use of a sharing mechanism could introduce scope for gaming and lead to increased complexity.

Assessment

	Score – regulatory principles	
	With other proposed changes	*Without proposed changes*
Sharing mechanism	Medium	Medium
No mechanism	High	Medium

5.2.6. Robustness to changes

As this reduces the difference between actual costs and the allowance, such an approach is robust in that there are reduced shortfalls/ gains when market rates change. There are similarities to the indexation models considered and this may help mitigate any changes in regulatory regimes that lead to differences over time.

Assessment

	Score – robustness to changes	
	With other proposed changes	*Without proposed changes*
Sharing mechanism	High	High
No mechanism	Medium	Medium

5.3. Conclusions and assessment

Table 5.1: Assessment of fixed allowance vs new debt indexation (with other proposed changes)

	Benefit/cost sharing	No sharing mechanism
Impact on customers	Medium	High
Incentives	Medium	High

	Benefit/cost sharing	No sharing mechanism
Financeability and investment	High	Medium
Risk sharing	Medium	High
Regulatory principles	Medium	High
Robustness to changes	High	Medium

With our proposed changes involving a more accurate ex ante estimate and indexation of new debt (with an ex-post true-up), there are net costs from introducing benefit/cost sharing. A key part of this relates to undermining cost of debt minimisation in the long term and practical difficulties in undertaking an analysis of actual costs. Debt is not a homogenous product, with many choices that affect shareholders. Introduction of such a mechanism can introduce distortion of pursuing an efficient strategy and could lead to customers paying more in the long-run if such gaming takes place.

If a benefit-cost sharing mechanism were to be introduced, we would suggest that this be limited in scope and with features that reflect the lack of certainty around this analysis:

- the adjustment relates only to the cases where debt is not controllable (e.g. where the halo effect is different to what was anticipated at the start of the price control) for consistency with our other decisions;
- a deadband is used such that movements of say less than 20bps are not subject to the sharing mechanism to account for small levels of volatility; and
- analysis is conducted on the appropriate sharing rate (a starting assumption may be 50:50 sharing).

Table 5.2: Assessment of fixed allowance vs new debt indexation (without other proposed changes)

	Benefit/cost sharing	No sharing mechanism
Impact on customers	High	Medium
Incentives	Medium	High
Financeability and investment	High	High
Risk sharing	Medium	Medium
Regulatory principles	Medium	Medium
Robustness to changes	High	Medium

There is more of an argument for the use of a benefit/cost sharing measure without our proposed changes. The size of forecasting error at recent price controls have been very material and without indexation of new debt there would be windfall gains or losses. The sharing mechanism would reduce the amount of the windfall gain or loss.

If such an approach were to be introduced, we would recommend that Ofwat or the CAA use a similar framework to address secondary issues, for example the choice of sharing rate.

SECTION B

Technical application of our approach

- In Section B, we look at individual questions related to the application of setting the cost of debt allowance.
- This follows on from our analysis in Section A looking at other fundamental questions relating to setting the cost of debt.
- The assessment criteria from Section A remains the basis for our evaluation.
- The questions are grouped by theme, with the seven themes (that represent our chapter headings) being as follows:

6. New/ Embedded Debt Split

Summary

We recommend that there should be an allowance for both new and embedded debt, with the split for new/embedded debt adjusted for changes in investment profile and the expected notional split. Where an adjustment is made for floating debt yields, it is appropriate to include the floating rate proportion assumed for the notional entity in assessing this split. This should be reflective of changes in notional gearing e.g. in case of runway capacity changing the notional assumption.

The split can have a significant difference where there are differences between the cost of new debt and cost of embedded debt. Where investment growth is high and rates are falling, placing too much weight on embedded debt would overestimate the cost of debt for the notional entity. We touch on associated questions in this section including the trailing average approach and forward curves on new debt. These are discussed in more depth in subsequent chapters.

Regulators typically set a cost of debt allowance that distinguishes between the cost of new debt and the cost of embedded debt. To get to the cost of debt allowance, weights need to be placed on these two different costs. Where there is not this separation, the approach will have an implicit split based on the assumptions made (for example, in the case of a full indexation model). If the difference between the cost of new debt and the cost of embedded debt is high, this policy choice can have a significant impact.

6.1. Summary of questions and options

Q1: Should the split be 100% new only?		
Yes	No	

Q2: Split as per simple moving average i.e. equal issues		
Yes	No	

Q3: Adjust for change in notional gearing?		
Yes	No	

Q4: Adjust for RCV/ RAB growth?		
Yes	No	

Q5: Adjust for floating rate debt?		
Yes	No	

Q6: Base on actual or notional (expected) split?		
Actual	Notional	

6.2. Background and issues

How does the split affect the overall allowance?

The new/ embedded debt split does not matter when the cost of new debt is equal to the cost of embedded debt. For the Q6 determination in aviation, the cost of new debt and the cost of embedded debt were close, such that this split chosen was less material.

As an example, if we take the iBoxx non-financial corporates ten year plus index for A and BBB rated bonds at the end of 2015, the real spot rate was 1.53% compared to a ten year trailing average of 2.36%. In our illustrative example below, we show the impact of the choice using the spot rate as a proxy for the cost of new debt and the ten year trailing average as a proxy for the cost of embedded debt.[72]

Table 6.1: Illustrative impact of new/ embedded debt split on the overall allowance

Real	0% new debt	25% new debt	50% new debt	75% new debt	100% new debt
Allowed Cost of Debt	2.36%	2.15%	1.95%	1.74%	1.53%

Split as per simple moving average

With this term, we mean taking the approach that assumes a rolling refinancing of debt in equal proportions with a consistent tenor.

In the example below, we use a five year price control period starting in 2015/16 with a ten year tenor of debt and associated ten year average. This shows that the new/embedded debt split works out at around 25%/75% under these assumptions.

Table 6.2: Estimating the new/embedded debt split using a simple moving average approach

Time	Debt RCV (RCV x gearing)	New debt issued (pre 2015/16)	New debt (post-2015/16)	Existing debt (pre-2015/16)	Annual split (end year)	Annual split (mid-year)
2005/06	60	6	-	-	-	-
2006/07	60	6	-	-	-	-
2007/08	60	6	-	-	-	-
2008/09	60	6	-	-	-	-
2009/10	60	6	-	-	-	-
2010/11	60	6	-	-	-	-
2011/12	60	6	-	-	-	-
2012/13	60	6	-	-	-	-
2013/14	60	6	-	-	-	-

[72] The calculation of the effective cost of debt is (Wo x Co) + (Wn x Cn), where Wo is the weight of embedded debt, Co is the cost of embedded debt, where Wn is the weight of new debt and Cn the cost of new debt.

Time	Debt RCV (RCV x gearing)	New debt issued (pre 2015/16)	New debt (post-2015/16)	Existing debt (pre-2015/16)	Annual split (end year)	Annual split (mid-year)
2014/15	60	6	-	-	-	-
2015/16	60	0	6	54	10%	5%
2016/17	60	0	12	48	20%	15%
2017/18	60	0	18	42	30%	25%
2018/19	60	0	24	36	40%	35%
2019/20	60	0	30	30	50%	45%
Weight for new debt on average across price control						**25%**[73]

On average over the price control period, the weight for new debt is 25% under this simple moving average approach.[74] However, this includes the simplifying assumption of a constant RCV and constant (notional) gearing.

Adjustment for notional gearing

The following is an example that includes an increase in the notional gearing assumption for the price control period. We have assumed that all additional debt is issued in the first year of the price control, however in practice this may be more smoothed.

Table 6.3: Estimating the new/embedded debt split with changes for notional gearing

Time	Debt RCV (RCV x gearing)	New debt issued	New debt (post-2015/16)	Existing debt (pre-2015/16)	Annual split (end year)	Annual split (mid-year)
2005/06	60	6	-	-	-	-
2006/07	60	6	-	-	-	-
2007/08	60	6	-	-	-	-
2008/09	60	6	-	-	-	-
2009/10	60	6	-	-	-	-
2010/11	60	6	-	-	-	-
2011/12	60	6	-	-	-	-
2012/13	60	6	-	-	-	-
2013/14	60	6	-	-	-	-
2014/15	60	6	-	-	-	-
2015/16	65	0	11	54	17%	9%
2016/17	65	0	17	48	26%	19%

[73] This is the average weight across the price control based on the split at mid-year.
[74] We think it is appropriate to take the simplified assumption that debt is spread evenly across the year.

Time	Debt RCV (RCV x gearing)	New debt issued	New debt (post-2015/16)	Existing debt (pre-2015/16)	Annual split (end year)	Annual split (mid-year)
2017/18	65	0	23	42	35%	29%
2018/19	65	0	29	36	45%	39%
2019/20	65	0	35	30	54%	50%
Weight for new debt on average across price control						**29%**[75]

In this case, the new/ embedded debt split has changed from 25%/75% to 29%/71% due to the increase in the notional gearing assumption. A similar approach would be taken when there is a growing asset base, as there is more debt being issued than the refinancing in each year and the weight on new debt therefore increases.

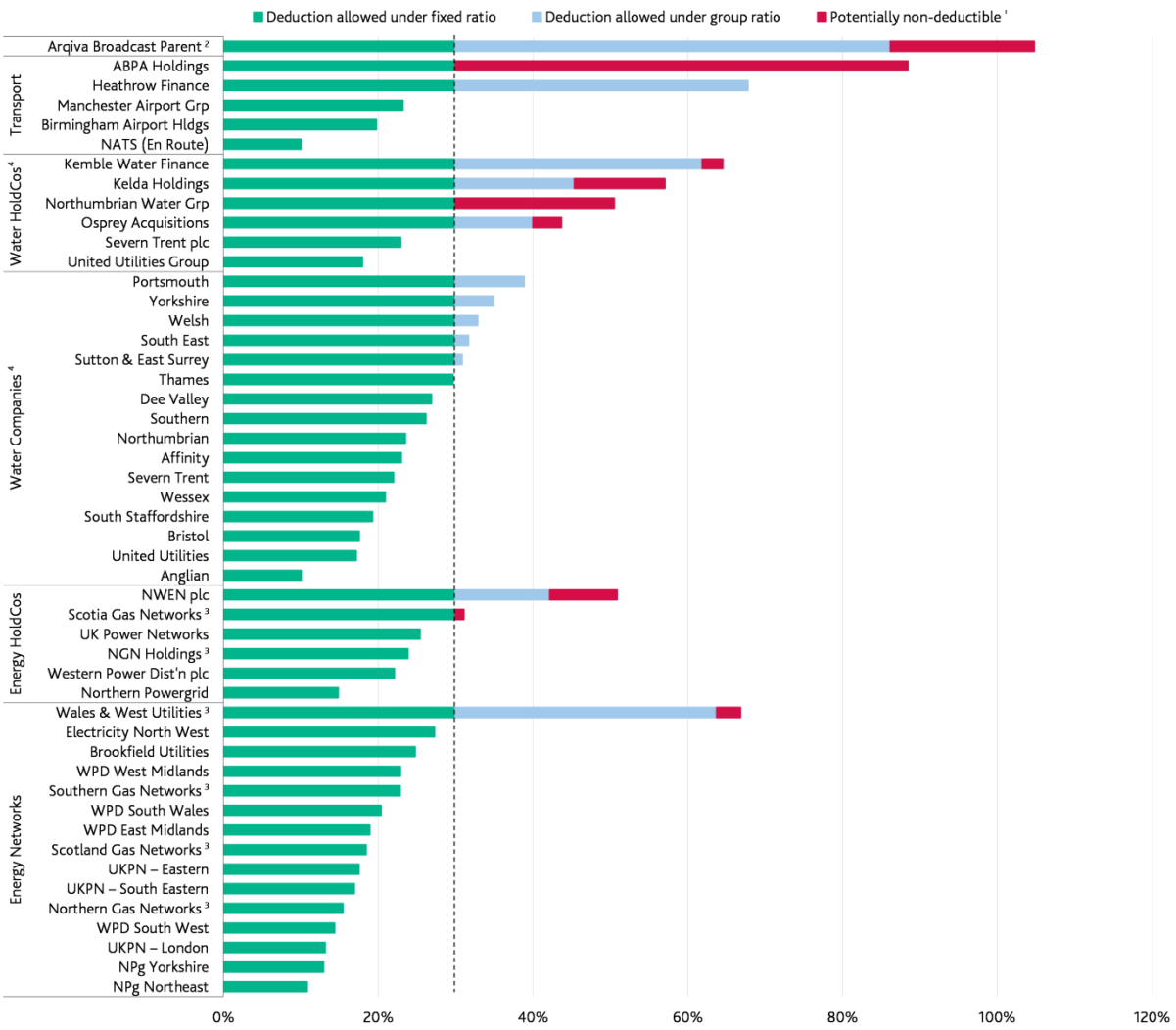
Changes in tax deductibility rules and impact on gearing/ new debt

A factor that may affect the level of new debt is the legislative change to restrict companies' ability to reduce taxes by offsetting interest against income. If this led to companies looking to adopt a less leveraged structure, this could lead to less new debt being issued and a greater proportion of embedded debt forming the allowance.

The UK Budget in March 2016 announced the implementation of the OECD's 'Base Erosion and Profit Shifting' (BEPS) package. The impact of this will be to increase the tax bills of highly geared domestic issuers, especially those with shareholder loans, according to Moody's analysis.[76] The estimates of the credit rating agency found that a quarter of infrastructure and regulated utility holding companies would lose some interest deductions. In terms of particular companies, Moody's have produced the below figure.

[75] This is the average weight across the price control based on the split at mid-year.
[76] Moodys (2016) UK BEPS rules: Limit on interest deductibility could affect highly leveraged issuers

Figure 6.1: Impact of tax changes on UK infrastructure companies



Source: Moody's

6.3. Questions and options

Question and option	Discussion
1 Should the split be 100% new only?	
a) Yes	• Should consider new debt only if the basis for pricing is the efficient cost of a new entrant in the sector (who is assumed to have no embedded debt) • Looking at the marginal cost of debt avoids a distortion of incentives (where decisions made on overall debt (i.e. new + embedded) rather than marginal debt (new only)) • There may be downstream investment/ entry decisions based on the price e.g. unbundling in telecoms (see BT v Ofcom CAT case June 2012) - allocative efficiency arguments led to CAT ruling in Ofcom's favour of using new debt only • A focus on new debt would provide a lower price to consumers at present based on the declining yields over time (although not necessarily the case in future) • An approach with no embedded debt is used by regulators e.g. Ofcom, CER (Ireland) and several Australian regulators e.g. QCA. • Focus on new debt may be prescribed by rules out of a regulators control e.g. EU rules in telecommunications
b) No	• Trailing average approach better aligns actual and allowed debt costs • Trailing average approach is consistent with recovery of historic costs promotes efficient investment decisions by regulated entity • Basing an allowance on new debt could lead to firms looking to refinance every price control – this would lead to refinancing risk and increased pricing due to executing these deals at the same time (based on the amount of debt in regulated sectors) • Using new debt only will lead to greater volatility of bills over time, with step changes between price controls • Using a cost of new debt only does not ensure financeability of efficiently financed entities as prudently incurred embedded debt costs are not compensated • New debt only is inconsistent with majority of UK regulatory precedent and threatens the Aaa credit rating of the regulatory approach in the water sector if there is such a fundamental change made that no longer compensates embedded debt • CER and Ofcom both use trailing averages in estimating the cost of new debt (with no allowance for embedded debt); so their approach is more akin to a blended cost of debt in our view • Australia use of the new debt only approach is in part due to relatively small size of debt markets and some regulators e.g. AER, are moving away from an 'on the day approach' i.e. taking a short trailing average immediately

Question and option	Discussion
	preceding the price control towards the use of a trailing average approach (see Annex H)
Decision principle	Where a regulator has a financing duty, there has typically been an allowance for embedded debt. Changes in policy in this area have tended to be minimal due to the risks of damaging investor perceptions of risk in the sector.
Recommendation Ofwat & CAA	We do not think that it is appropriate to assume 100% new debt and ignore embedded debt costs that have been efficiently incurred. These are mature sectors with long-term financing requirements where a cost of new debt only would not be appropriate.
2 Split as per simple moving average	
a) Yes	• This represents a simple and transparent approach, with the underlying assumptions on debt tenor being easily understood • There will be relatively stable bills across price control periods given the majority of weight is placed on embedded debt • Consistent with UK regulatory precedent to use a simple moving average as the starting point for establishing a split • At PR14, Ofwat state in their risk and reward guidance that the average split of new and embedded debt for the price control is 28%:72% for WaSCs and 23%:77% for WoCs, relatively close to the 75% assumption from a simple moving average approach
b) No	• The simplistic split does not reflect changes to investment programme e.g. larger investment in future, so may overcompensate/ undercompensate the notional company • Nominal growth in debt means a regulator risks overestimating the embedded proportion if a simple moving average is used based on a stable real RAB • One company at PR14 proposed a 6% weight for new debt, given its investment programme and capital structure
Decision principle	A simple approach is a useful starting point and where expected new debt costs are approximate to the outturn of this approach would be valid. However, for companies with extreme investment programmes/ need for debt, this simplified approach is likely to be unreflective of efficient financing costs.
Recommendation Ofwat & CAA	The simple moving average should be the starting point, but other adjustments may typically be necessary, especially where there are changes in the size of the investment programme e.g. new airport capacity expansion.
3 Adjust for change in notional gearing	
a) Yes	• An adjustment is consistent with theoretical model of debt costs • Water sector has seen increase over time for both actual and notional gearing, so debt levels are not fixed

Question and option	Discussion
b) No	• Gearing may be reflective of what has already happened and not affect the proportion of new and embedded debt split going forward • Greater simplicity if do not adjust – otherwise you need to assume when the additional debt comes in e.g. at start of price control, or smoothed over it • The setting of a notional gearing figure may reflect adjustments made for the purposes of financeability, not necessarily what the expected level of gearing would be in practice – making an adjustment where this is the case would not be appropriate • Ofwat has previously increased notional gearing and not taken this into account when setting the notional split between new and embedded debt, so such a change at this point in time would not be time consistent
Decision principle	We have seen reduced notional gearing assumptions used for financeability where firms have large capital programmes, for example the Scottish TOs under RIIO T1. No decision has been made on gearing for the forthcoming price controls and we do not comment on the setting of notional gearing, but if there has been an expected change in the efficient level of gearing then it would appropriate to reflect this in the weight of new debt.
Recommendation Ofwat & CAA	If there is a change in notional gearing, it is appropriate to place greater or lesser weight on new debt; greater weight where there is an increase in gearing and vice-versa. The exception is where the notional gearing reflects past behaviour, in which case this would not change the weighting.
4 Adjust for RCV/ RAB growth	
a) Yes	• More reflective of debt profile for notional entity to adjust for growth • Makes sense to provide greater weighting on new debt costs for larger capex programme • Ofgem RIIO T1 SHETL model uses bespoke weightings to achieve this effect, due to significant asset base growth
b) No	• Greater simplicity and less contentious to not adjust • The degree of RCV/ RAB growth is a forecast and may be unrepresentative of actual debt costs • RCV/ RAB growth will differ based on depreciation policy – this is independent of what a company does for debt issuance
Decision principle	It does make sense (for financeability and the allowance being reflective of efficient costs) to take into account changes in the size of the debt financing requirement. The new-embedded debt split is a useful lever to accomplish this.
Recommendation Ofwat & CAA	Where there are significant changes in investment programmes, an adjustment would be appropriate i.e. greater weight on new debt with a larger investment programme. However where there are less material

Question and option	Discussion
	changes in investment then it may be more straightforward not to make an adjustment.
5 Adjust for floating rate debt	
a) Yes	• Inappropriate to reflect embedded debt costs if these costs are no longer representative of the costs faced • CAA made adjustment for floating rate debt as part of Q6 determination
b) No	• The notional company may not be assumed to have floating rate debt, especially where a fixed allowance is set • Floating rate debt still has a premium attached to it, so including this as new debt may not be reflective of actual costs • The size of an adjustment may be contentious and difficult to capture
Decision principle	The use of floating rate debt still involves paying a premium over the base rate e.g. LIBOR, so a regulator will need to consider whether the debt premium has changed or not. If a regulator considers that floating rate debt is consistent with behaviour of the notional efficient company then this proportion should be taken into account when setting the split.
Recommendation Ofwat & CAA	We would recommend that no adjustment is made for floating rate debt as we have not taken into account floating rate debt when setting our pricing benchmark.
6 Base on actual (expected) split	
a) Yes	• More reflective of costs expected to be incurred if focus on actual rather than notional • Reduces financeability risk if better match actual costs • Can take into account growth in size of index linked debt over the period if based on actual split expected for the price control
b) No	• Consistent with theory around setting the cost of debt for a notional entity if do not use actual levels • Expenditure profile is typically smoothed, but in practice see greater expenditure at end of price controls, so actual split may overestimate debt proportions • Greater simplicity and transparency if a regulator focuses on the notional, especially where there are a large number of companies in the sector • Avoids gaming incentives if use the notional entity
Decision principle	It may be appropriate to look at actual investment programmes when determining the split, but looking at actual levels of gearing lead to complexity and leads to scope for gaming. There is a trade-off between accuracy and simplicity when you consider whether to set this at the industry or individual company level.
Recommendation Ofwat	Given the number of companies in the sector, we would recommend that Ofwat continues to rely on the notional entity.

Question and option	Discussion
Recommendation CAA	We recommend that a focus on the notional entity is retained to avoid potential gaming incentives from use of actual (and uncertainty over actual growth), with a cross-check to actual values - though the regulation of a single company means the line between actual and notional may become blurred.

6.4. Summary

6.4.1. High level overview of approach

- Cost of debt allowance should include both embedded and new debt.
- A simple trailing average approach gives a starting point for estimating the split.
- This should then be adjusted for RCV/RAB growth and floating rate debt.
- If no adjustment is made in terms of debt costs for floating rate debt, no adjustment should be made here for consistency.

6.4.2. Changes from current approach

Our proposals are largely consistent with the current approach both the water and aviation sectors.

At the Q6 determination, a small adjustment was made for floating rate debt - we do not think that this should be made where no adjustment is made for floating rate debt yields.

7. Forward Curves and New Debt

Summary

Forward curves are the best available method for estimating new debt costs in the next price control period (theory suggests that with efficient markets and risk neutral investors, forward curves should be the best estimate of what interest rates will be in future), however as noted these do not have strong predictive power (hence our proposal for indexing new debt to reflect outturn values). Even with indexation of new debt, we still require an ex ante forecast for new debt, which is where forward curves come in.

We recommend retaining gilts, but using index-linked rather than nominal bonds to match the real cost of debt that has been estimated. The tenor for the forward curve should match the assumption for the debt tenor of the benchmark index. Over the long-term we expect corporate bonds yields to rise and fall in line with government bond yields, so suggest that this should be the starting point unless clear evidence can be presented why this is incorrect. These forward curves should be profiled for the application of rates and for expected investment, not just on one day.

Forward curves are part of a UK regulator's typical approach to setting the cost of new debt. These are used to estimate the expected cost of debt of new debt over the forthcoming price control period, as theory dictates that these market-derived estimates reflect best estimates of the future in efficient markets.

7.1. Summary of questions and options

Q1: Should forward curves be used?		
Yes	No – historical average	No – spot rate only

Q2: Basis for forward curves		
Gilts	Swap curve	

Q3: Forward curves – Nominal or real?	
Nominal	Real

Q4: Which forward curves tenor is appropriate?		
Overnight/base rate	10 yrs	20 yrs

Q5: Link between corporate and government bonds		
Matching (1 for 1)	Multiple (e.g. 0.8x)	

Q6: Use latest forward curves only		
Yes	No	

Q7: Profile for forward curves – application of future rates		
Mid-period uplift	Simple future	Weighted future

Q8: Profile for forward curves – base on expected investment		
Yes	No	

7.2. Background and issues

Forward curves and adjustment mechanisms

The use of forward curves when using an adjustment mechanism depends on the nature of the adjustment mechanism.

Indexation with periodic adjustments

Under an indexation model where the allowance is set for the year ahead based on outturn data up to that point, forward curves are not used. This is because this form of indexation removes the need for forecasting by updating the cost of debt allowance based on movements in yields.

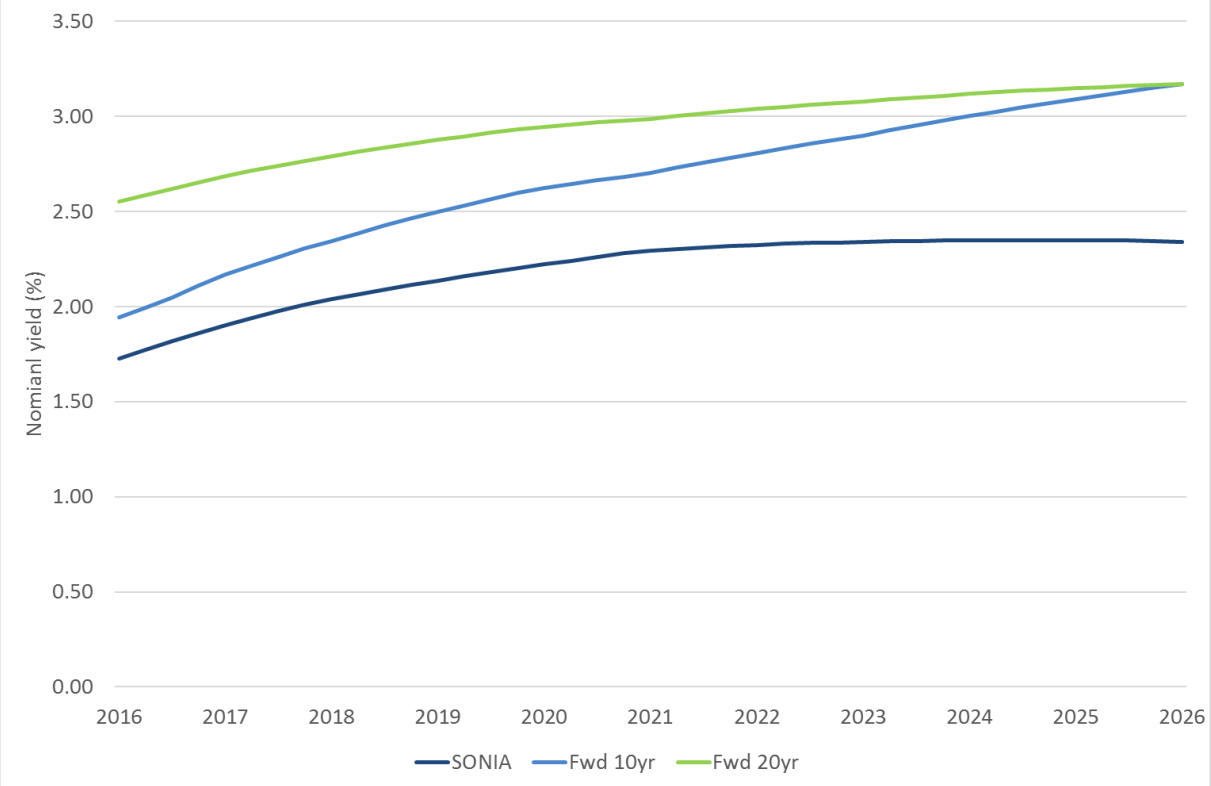
Ex-post adjustment

However, with ex-post adjustment there is the need to come up with an original baseline to act as an interim allowance. This should ideally be as accurate as possible to reduce the need for any further adjustment. Under this approach, the setting of the cost of new debt looks similar to the setting of a fixed allowance, however with subsequent adjustments based on outturn values.

Outcomes using different forward curves

The choice of different forward curves can have a significant impact on the assumed cost of new debt. In the figure below, we illustrate the differences from the use of alternative indices.

Figure 7.1: Forward curve representations from different indices (as of 1 January 2016)



Source: Bloomberg. Note: Sterling Over Night Index Average (SONIA) is an overnight rate.

Nominal or real forward curves

There is a choice over which forward curve assumptions are used when using gilts and whether those forwards are for nominal gilts or index-linked gilts. Ofcom in their 2016 business connectivity market review draft statement use forward curves on index-linked gilts.[77] The CMA on their 2015 Bristol Water appeal determination appear to use index-linked forwards.[78] It is our understanding that in advising both Ofwat and CAA at PR14 and Q6 respectively, PwC have used nominal forward rates.[79] Where there are stable inflation expectations these rates may be broadly similar, but a choice needs to be made when this is not the case, as at present.

Table 7.1: Underlying data for interpolating forward rates on gilts

As of 31/03/16	10yr yields	20yr yields
Nominal gilts	+1.42%	+2.14%
Index-linked gilts	-1.00%	-0.91%

Source: Bloomberg

What is the implied ten year in ten years' time for gilts? We do this by interpolating the yield i.e. with the ten year forward and twenty year forward, we can estimate a ten year rate in ten years' time.[80]

- Nominal gilts = +2.87% (i.e. increase of 145bps)
- Index-linked gilts = -0.82% (i.e. increase of 18bps)

There is a significant difference between the use of nominal gilts for estimating future rates and the use of index-linked i.e. real gilts. This will reflect views on inflation i.e. breakeven inflation.

Do forward curves exist for corporate debt?

Forward curves do not exist in the same way for corporate debt as they do for government debt. This has led to regulators using forwards on gilts where forward curves are used. However, where you are able to plot a yield curve, it is possible to interpolate forward rate implications from this as we have done with gilts.

Table 7.2: Underlying data for interpolating forward rates on corporate bonds

As of 31/03/15	10yr yields	20yr yields
UK A rated corporates	+2.38%	+3.36%

[77] Ofcom (2016) Business Connectivity Market Review: Annex 30, p.64
[78] CMA (2015) Bristol Water appeal determination, p.319
[79] PwC (2013) Estimating the cost of capital in Q6 for Heathrow, Gatwick and Stansted, April 2013, p.33
[80] For example on nominal debt costs, we can work on the implied ten year rate in ten years (denoting this as x) using (1+2.14%)^20 = (1+1.41%)^10 * (1+x)^10

As of 31/03/15	10yr yields	20yr yields
UK BBB rated corporates	+2.84%	+3.59%

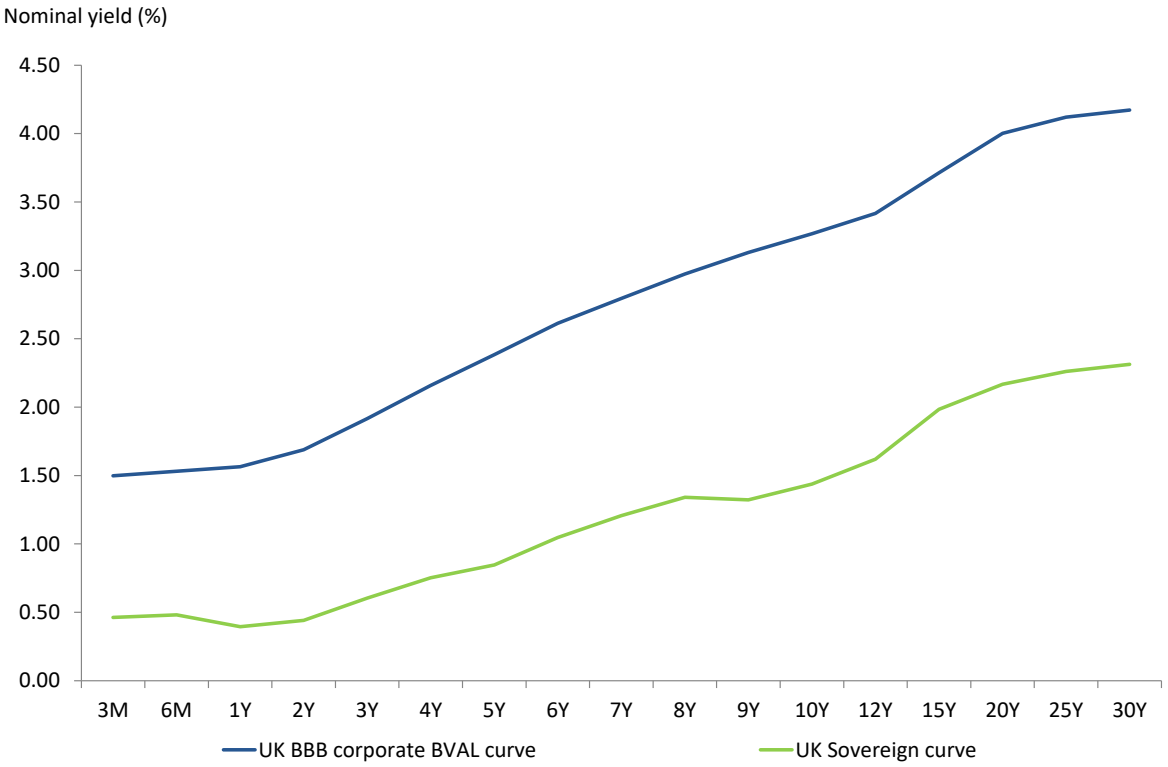
Source: Bloomberg

What is the implied ten year in ten years' time for gilts?

- A rated corporates = 4.35% (i.e. increase of 197bps)
- BBB rated corporates = 4.35% (i.e. increase of 151bps)

The debt premium typically increases with tenor as investors demand a greater risk premium on corporates relative to gilts. Therefore, corporate debt forwards are less representative of expectations because cash is tied up in the long-term instrument. This is demonstrated in the figure below as the debt premium rises from around 100 bps in the short end of the curve, to around 200 bps in the long end.

Figure 7.2: UK sovereign curve and BBB corporate curve.

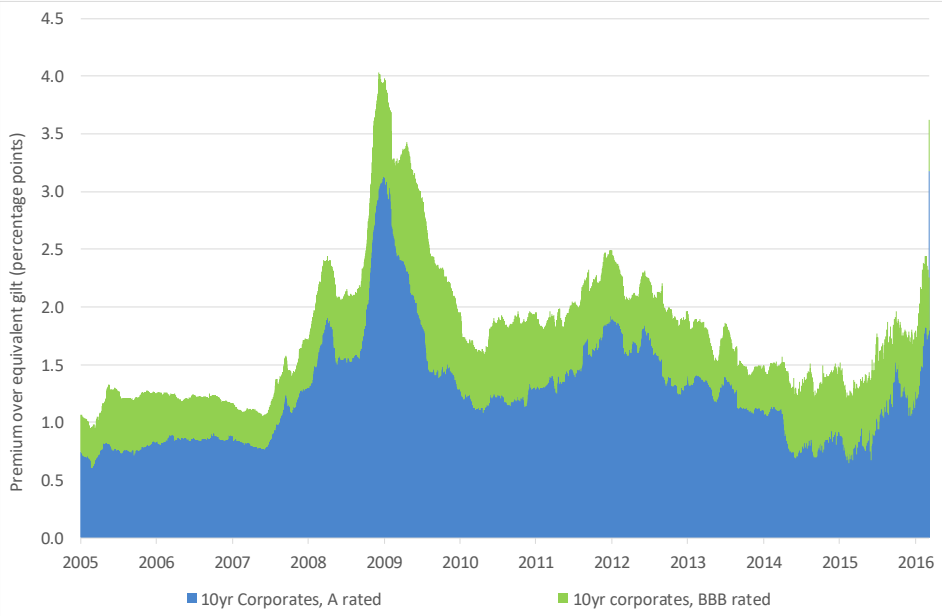


Source: Bloomberg. As of 1 April 2016. Note: BVAL is a corporate composite index developed by Bloomberg.

Relationship between risk-free rate and corporate yields

In the figure below we show how the debt premium has moved over time, looking at both ten year and 20 year corporate debt.

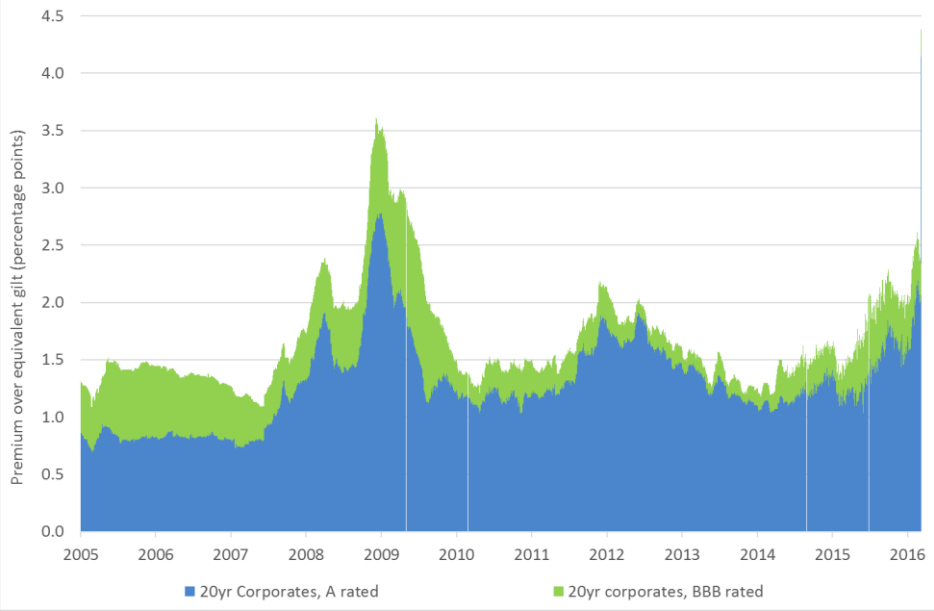
Figure 7.3: Debt premium for ten year corporate debt



Source: Bloomberg

For ten year corporate debt, the difference between A and BBB debt varies significantly over time. This means that where a government bond forward is used, even if this is accurate, it is unlikely to capture the future changes in the debt premium.

Figure 7.4: Debt premium for 20 year corporate debt



Source: Bloomberg

Showing a longer tenor demonstrates that the differential between A and BBB rated debt changes over time, as does the size of the debt premium relative to ten year bonds. When trying to estimate forward curves, there are a number of moving parts and even if a regulator was able to correctly estimate the risk-free rate and the debt premium for ten year corporate BBB debt, these movements may be very difficult than those faced by a regulated company that has 20 year debt and an A rating.

Use of 0.8x multiple at PR14 and Q6

The approach used by PwC in advising on both PR14 and Q6 involved the use of a regression coefficient of 0.8 to apply to difference in expected corporate debt yields by the mid-point of the upcoming price controls.

This was based on regression analysis conducted to determine the relationship between yields on corporate and government debt.

Application of forward adjustments

We have provided three options for how forward curves can be used to derive an allowance. These are:

- Mid-period uplift
- Simple future average
- Weighted future average

An example can help illustrate what we mean by these terms. Assume that the spot real cost of debt is 2.0% at the time of the determination. The forward curve used is purely illustrative.

Table 7.3: Example of application using forward curves

Current = 2.0%	Year t+1	Year t+2	Year t+3	Year t+4	Year t+5
Forward minus spot	+40bps	+60bps	+80bps	+80bps	+90bps
Implied cost of debt	2.40%	2.60%	2.80%	2.80%	2.90%
Weight (simple future)	1/5	1/5	1/5	1/5	1/5
Weight (weighted future)	5/15	4/15	3/15	2/15	1/15

- A mid-period uplift looks at Year 3 and the 80bps increase to get a 2.80% cost of new debt.
- The simple future average approach takes an average over the five years. This gives a cost of new debt of 2.70% i.e. multiplying 'Implied cost of debt' by 'Weight (simple future)'.
- The weighted future average approach is based on debt taken out in the first year of the price control being faced by the company for five years, debt in the second year faced for four years etc. This weighted approach gives a figure of 2.62% for the cost of new debt i.e. multiplying 'Implied cost of debt' by 'Weight (weighted future)'.

7.3. Questions and options

Question and option	Discussion
1 Should forward curves be used	
a) Yes	• Forward curves reflect market expectations and rates faced in reality by companies • Including forward curves within setting a cost of new debt gives firms the ability to hedge future movements in yields • An assumption of mean reversion or stable rates would be required to adopt the other approaches – these do not appear valid • Regulatory precedent in the UK, in particular for both Ofwat and CAA, indicates that this approach has been used
b) No – historic only	• Forward curves do not exist in the same form as gilts for corporates and have very little predictive power if history is used as a guide • Historic averages are transparent and provide predictability for investors • Ofcom regulatory precedent is an example of using historic averages for new debt
c) No – spot rate only	• On the day rate has been used in Australian precedent to reflect ability to enter into swaps • Forward curves build in a risk premium, so the current price may be most reflective of future expectations
Decision principle	In the absence of updating the allowance, forward curves represent the best market derived expectations of yields in a forthcoming price control. We think that this may be more reflective of costs that will be incurred than taking the spot rate alone, with historic averages providing a useful reference point.
Recommendation Ofwat & CAA	We recommend that both Ofwat and the CAA continue to use forward curves where setting a fixed allowance. Where indexation of new debt on an annual basis is used, the forward curves do not have an impact.
2 Basis for forward curves	
a) Gilts	• It is potentially easier to execute swap forwards with gilt forwards • Use of gilts represents actual financial instruments rather than theoretical construct as with implied debt forwards • Risk-free rate forecasts use gilt forwards, so consistency in approach to use for debt • Pricing of swaps is often on a bilateral basis rather than the outcome of market interactions • Gilts have predominantly been used in UK regulatory precedent • More liquid and transparent market
b) Swaps curve	• The debt market is more firmly tied to swap rates, so logical to use this rather than gilts

Question and option	Discussion
	• Use of swaps represents actual financial instruments rather than theoretical construct as with implied debt forwards
c) Debt forwards	• Most direct linkage to corporate debt costs and can be constructed from debt indices
Decision principle	Gilt forwards may be a more transparent and liquid market than swaps, however the swaps market is more closely tied to rates market participants would refer to. Regulatory precedent would point to retaining gilt forwards as the basis for forward curves.
Recommendation Ofwat & CAA	We advocate retaining gilt forwards to estimate future corporate debt yields. If this created residual risks that would be removed from the use of swaps then this may be an option.
3 Forward curves – nominal or real	
a) Nominal	• Estimate nominal cost of debt prior to deflating, so nominal may be the correct basis • Inflation on nominal bond will be based on inflation expectations over term of debt, not just on price control term ahead
b) Real	• Setting a real cost of debt, so inflation expectations are already accounted for • CMA used real gilts in Bristol Water 2015 decision to represent index-linked debt and for forwards
Decision principle	Both nominal and real forward curves can be used to reflect the type of debt issued; nominal for nominal debt, real for index-linked debt. A weighted approach could be assumed, but this would lead to additional complexity. Index-linked gilts are based on RPI inflation, as is the current index for uplifting the asset base. If this should change to CPI or CPI(H) and there is no market for this, this would point to use of nominal forward curves.
Recommendation Ofwat & CAA	We recommend that where the forward curves are sufficiently liquid, real forward rates are used by the regulators, cross-checked against nominal forward rates. If the approach changes from RPI, then nominal forward rates will be required to be used.
4 Which forward curve tenor is appropriate	
a) Overnight/ base rate	• In the CMA 2015 Bristol Water determination, future expectations in changes to the base rate have been used in one of their two approaches • Firms may be able to hedge based on short-term products
b) 10yr	• Ofwat/ CAA used this tenor for most recent determinations (Q6 and PR14) • Ten year tenor is typical for regulatory determinations in the UK • Use of a longer tenor may build in risk premium and overestimate the expected cost of new debt

Question and option	Discussion
c) 20yr	• This forward tenor would be broadly consistent with our benchmark tenor if we use a 10yr+ composite index • CMA use this forward tenor with a spread added to a 20yr gilt for the Bristol Water 2015 determination
Decision principle	This decision depends on the assumed tenor of debt and what is assumed to be the appropriate reference rate. If you are to issue nominal fixed rate debt with no derivatives, a gilt forward to match the assumed tenor would be appropriate. However if you assume bank debt or swaps, then this is typically priced off a shorter term product e.g. LIBOR.
Recommendation Ofwat & CAA	Forwards on the base rate may not go out for the full price control period or be based on a smaller sample when they do. As such, we recommend use of the 10yr or 20yr tenors – this depends on the assumption for the tenor of our benchmark index; where the 10-15yr index is used, we would recommend looking at 10yr forwards - where the 10yr+ index is used, we would recommend looking at 20yr forwards.
5 Link between corporate and govt bonds	
a) Matching (i.e. 1 for 1)	• Greater simplicity from assuming a constant spread on the cost of corporate debt • CMA precedent for Bristol Water 2015 determination uses this assumption • Historic relationships used in estimating a multiple may not be reflective of the future – these are used for new debt only • Assuming a multiple other than one would suggest that rates would cross over at a certain point, which is theoretically implausible
b) Multiple (e.g. 0.8x)	• Ofwat/ CAA precedent in most recent determinations is based on analysis of movements • Debt premium is not fixed in practice • Quantitative Easing (QE) may indicate that movement in gilts will be greater than for corporate debt, if you assume that rates will move upwards and the programme had depressed yields on gilts more than corporate debt • Forwards typically point to increases in rates – this may reflect a risk premium and so assuming a coefficient of 1.0 or above may overestimate future expected costs.
Decision principle	The limited predictive power of forward curves suggests that taking too precise a link between the bonds may be at a spurious level of accuracy. A simple matching should be assumed unless there is clear and robust evidence to illustrate why this should not be the case going forward.[81]

[81] The difficulty in establishing this relationship supports our recommendation to use ex post adjustments, such that this approach does not lead to windfall gains and losses.

Question and option	Discussion
Recommendation Ofwat & CAA	We recommend utilising a simple matching relationship between movements in corporate and government bonds in the absence of evidence of a different relationship.
6 Use latest available forward curve only	
a) Yes	• More reflective of pricing information and rate expectations to focus on the most recent data point • Avoids distorting incentives if use latest figure only
b) No	• Reduced volatility if take an average of forward curves rather than the latest spot value • Use of a spot curve may create an issue if have a multiple stage determination process and rates increase for firms not subject to enhanced status • PwC at PR14 looked at a three month average to confirm that this was consistent with the spot rate • CMA Bristol Water 2015 precedent looked at a trailing average for future expectations • Australian approach to setting a cost of debt allowance typically will take a 28-45 day trailing average
Decision principle	Looking at the latest forward curve only can lead to very high volatility. Considering a trailing average alongside this, as per the CMA precedent, would look to strike the appropriate balance between reflective price signals and stability.
Recommendation Ofwat & CAA	The volatility of using the spot rate only indicates to us that a trailing average of future expectations best achieves regulatory aims – a period between one month and three months would appear appropriate.
7 Profile for forward curves – application of future rates	
a) Mid-period uplift	• Simplistic approach that was used as part of both Q6 and PR14 determinations (with the degree of confidence in the predictive power being low)
b) Simple future	• Reduced complexity compared to using weightings • More reflective of expected costs over a period than using a mid-period uplift
c) Weighted future	• Most accurate in representing the expected cost of debt in the next price control period • As forward curves typically point to rises in rates, such an approach should reduce the cost to consumers
Decision principle	There is a trade-off between accuracy and complexity. As long as this can be set out clearly, we prefer an approach that leads to accuracy as several mistakes in application can lead to significant windfall losses or gains. The additional resourcing to estimate this is minimal.

Question and option	Discussion
Recommendation Ofwat & CAA	We recommend the use of a weighted future i.e. taking into account the expected issuance and corresponding rate in each year of the price control.
8 Profile for forward curves – base on expected investment	
a) Yes	• More reflective of debt costs looking to be incurred by the notional entity
b) No	• Less complex and aligned with regulatory precedent
Decision principle	This question includes the trade-off of accuracy versus complexity. As with previous decisions, where there is little additional complexity and benefits in terms of accuracy we recommend making such a change.
Recommendation Ofwat & CAA	We recommend basing forward curves on expected investment where this is not stable over time.

7.4. Summary

7.4.1. High level overview of approach

- A short term (1-3 month) average of forward curves should be used to set the cost of debt.
- The forward curves should be based on long-term index-linked gilts, with no adjustment made for changes between corporate and government debt costs unless there is forward-looking evidence on why this may not be the case.
- The forward curves should give expectations for each year of the price control, with a weighted future average taken for the cost of new debt.
- The profile for new debt cost weights should be based on the investment programme - placing more weight on later years where the asset base is growing.

7.4.2. Changes from current approach

The approach taken on forward curves was the same at the PR14 and Q6 determinations.

Our proposals include four changes to the use of forward curves for estimating the cost of new debt:

- Using real rather than nominal forward curves.
- Using a 1.0x multiple between corporate and government debt yields (not 0.8x).
- Using a weighted average of forward expectations (not the mid-point).
- Using a weighted profile to reflect expected investment over the price control.

8. Trailing Averages - Embedded Debt

Summary

For estimating the cost of embedded debt, we recommend that debt is assumed to mature/ drop-off during the price control. This means that less weight is placed on older embedded debt under a notional approach as it should be assumed to drop off.

When debt yields are falling, failure to take account for debt dropping off will over-compensate companies at the expense of consumers. While a relatively technical point, this is a key consideration and can lead to a significant difference between a fixed allowance that does not take this into account and an indexation approach that implicitly assumes this debt drops off. If the price control was extended in length, the impact of this choice would become even greater.

The use of a trailing average period that matches the length of the trailing average period to the assumed tenor of debt would be most consistent and is our provisional recommendation. In the water sector, this means using a 20 year trailing average to match the 10yr+ tenor (as this is c.20 years in tenor), while a ten year trailing average in aviation approximately matches the 10-15yr tenor assumed. Longer term trailing averages have only recently become available for our favoured iBoxx indices (starting in 1998) and so this may indicate that the question has not been tested and further analysis on this question would make sense.

We have proposed that an allowance is made for embedded debt, the proportion is which is determined by estimation of the new/embedded debt split.

8.1. Summary of questions and options

Q1: Does debt drop off the trailing average		
Yes	No	

Q2: Type of trailing average		
Fixed	Varying	Price control length

Q3: Length of trailing average period		
10yrs	15yrs	20yrs

8.2. Background and issues

Does embedded debt drop off within the trailing average?

An approach typically used by UK regulators is to use a trailing average at the start of the price control as the embedded debt allowance. This ignores that the embedded debt allowance should reflect the average cost of embedded debt over the price control period, not just on Day 1 of the price control. Debt, in particular, older debt, should be assumed to 'drop off' during the price control.

Under Ofgem's indexation model, embedded debt drops off each year due to use of a rolling trailing average. This approach would look at what embedded debt (i.e. debt issued prior to the price control) was still active for each year of the price control. A cost of embedded debt could be estimated at the start of the price control period under such an indexation regime to understand the fixed equivalent.

Table 8.1: Example of simple and weighted allowance with ten year debt for a five year price control

	Spot cost of debt	Included in Yr t+1	Included in Yr t+2	Included in Yr t+3	Included in Yr t+4	Included in Yr t+5	Years included	Weight (not drop off)	Weight (drop off)[82]
t-10	4.0%	½	-	-	-	-	0.5	10%	1.33%
t-9	3.9%	✓	½	-	-	-	1.5	10%	4.00%
t-8	3.8%	✓	✓	½	-	-	2.5	10%	6.67%
t-7	3.7%	✓	✓	✓	½	-	3.5	10%	9.33%
t-6	3.6%	✓	✓	✓	✓	½	4.5	10%	12.00%
t-5	3.5%	✓	✓	✓	✓	✓	5.0	10%	13.33%
t-4	3.4%	✓	✓	✓	✓	✓	5.0	10%	13.33%
t-3	3.3%	✓	✓	✓	✓	✓	5.0	10%	13.33%
t-2	3.2%	✓	✓	✓	✓	✓	5.0	10%	13.33%
t-1	3.1%	✓	✓	✓	✓	✓	5.0	10%	13.33%
Cost of embedded debt where debt does not drop off								3.55%	
Cost of embedded debt where debt does drop off								3.43%	

To get the embedded cost of debt we multiply the annual cost of debt by the appropriate weight. Where debt does not drop off, there is equal weighting for each year (the penultimate column). This gives a cost of embedded debt of 3.55% in our example.

With debt dropping off, we get a cost of embedded debt of 3.43% in our illustrative example rather than 3.55% when debt does not drop off. This uses the weights in the right-most column. This is because more historic years with higher rates drop off due to assumptions on debt within the price control.

What is the impact of changing the length of the trailing average period today?

We look at the impact of changing the trailing average for composite indices currently used by Ofwat and CAA. The indices are only available since 1998, so we do not have a 20 year average to include - however, this would be possible prior to the PR19 and H7 price controls.

[82] This is based on the years in which this is included; estimated based on the years included for that particular year divided by the total number of years included.

Table 8.2: Impact of trailing average choice - nominal yield (%)

Index	10yr	12.5yr	15yr
Non-fin corporates 10yr+ A and BBB	5.34%	5.42%	5.58%
Non-fin corporates 10-15yr A and BBB	5.26%	5.35%	5.53%

Source: iBoxx

What is the expected impact of changing the length of the trailing average period for the next price control?

Given that debt yields have trended downwards over time, we would expect that using a longer trailing average period would increase the cost of debt currently. However, using a longer trailing average would mean that the (seemingly) low real cost of debt rates today remain in the embedded debt estimate for longer and so in the long-term we would expect this to even itself out more.

In the table below, we show the impact of choosing a ten year trailing average with ten year breakeven inflation compared to a twenty year trailing average (TA) with twenty year breakeven inflation (BE). We assume that the current real yield (as of 1 June 2016) remains going forward, with our estimate made for 1 April 2019, the expected start date for PR19.

Table 8.3: Impact of trailing average choice - real yield (%) expected as of 1 April 2019

Index	10yr TA, 10yr BE – debt doesn't drop off	20yr TA, 20yr BE – debt doesn't drop off	20yr TA, 20yr BE – debt drops off
Non-fin corporates 10yr+ A and BBB	1.70%	2.23%	1.96%

Source: iBoxx, Bank of England[83]

The 1.70% column represents an indicative (unadjusted) cost of embedded debt for PR19 under the current approach (i.e. ten year trailing average and ten year breakeven inflation) and these assumptions. This rises to 2.23%, over 50bps if you extend the trailing average to 20 years with 20 year breakeven inflation, if you assume that embedded debt does not drop off. If you assume that debt does drop off, this figure falls to 1.96%.

Use of a weighted average profiling to place less weight on more historical periods would also be expected to reduce the allowance. The approach to using weighted profiling for a trailing average was set out in Section 3.1.3, and in particular, Table 3.3. We recommend using such an approach.

[83] Using ten year inflation with a twenty year trailing average would give an allowance of 2.53%, 30bps above the result using the longer breakeven inflation term.

8.3. Questions and options

Question and option	Discussion
1 Does debt drop off the trailing average?	
a) Yes	• More accurate for the notional entity's assumed debt cost when a regulator places greater weight on more recent evidence • Under indexation, trailing average is akin to a weighted approach and thus consistent with Ofgem methodology • Greater time independency of decision making if you assume that embedded debt does drop off (exact timing of decision should not matter under such a model – it does if debt does not drop off)
b) No	• Easier for calculation purposes if assume that debt doesn't drop off • This represents the typical approach used in regulatory precedent
Decision principle	Having embedded debt drop off places more weight on recent issues and assumes that embedded debt issued further back matures (and may or may not be refinanced) over the upcoming price control. The calculation leads to limited additional burden and such an approach is more reflective of debt costs.
Recommendation Ofwat & CAA	The most accurate estimate of a notional entity's debt costs is found by assuming that embedded debt does drop off the trailing average. We recommend that this approach is adopted by both regulators.
2 Type of trailing average	
a) Fixed length	• Consistent with UK regulatory precedent to take a set trailing average period • Simple and transparent to take a fixed length trailing average • Moody's comment on Ofgem's use of trombone decision to amend the index for the DNOs so soon after its implementation in other determinations is a credit negative – due to the regulatory uncertainty this created • Larger sample sizes/ more robust data exists for more recent data
b) Varying e.g. trombone	• Can potentially better reflect actual debt profiles from varying the length of the trailing average period
c) Price control length	• One-shot theoretical model for the cost of capital implies the same term of debt as price control length; consistency would imply a five year trailing average to match the current length of the price control.
Decision principle	Unless tenor bands are used, a fixed approach would appear to be the most appropriate approach to take due to the familiarity and consistency with other assumptions.
Recommendation Ofwat	A fixed trailing average approach is our recommended approach. A fixed length trailing average larger than the length of a price control would be consistent with a number of UK regulatory determinations.

Question and option	Discussion
Recommendation CAA	A fixed trailing average approach of around ten years would appear to be appropriate for the CAA.
3 Length of trailing average	
a) 10yr	• Where the debt tenor is assumed to be close to ten years, the assumption of a ten year trailing average is consistent with the approach on tenor • As yields have fallen over time, a shorter trailing average period (at present) is likely to reduce bills • There may be better data availability for most recent time horizons • Ofwat and CAA regulatory precedent has tended to look at a ten year trailing average period • Ofgem at DPCR5 make an argument that equity stakes in a number of the DNOs had been sold since issuing long-term debt in the mid-1990s – where this is more expensive, this is already reflected in the price paid on equity and so increasing the trailing average length would be inappropriate
b) 15yr	• If the assumed tenor for debt is around 15 years then this may be appropriate
c) 20yr	• If the assumed tenor for debt is around 20 years then this leads to internal consistency • Ofgem RIIO ED1 model extends to a twenty year trailing average; expect this to apply for RIIO GD2 and T2 determinations (however no guidance has been provided) • Data will be available to use such an approach
Decision principle	It is important to ensure that the assumptions made are consistent. The assumption that a firm issues twenty year debt with the trailing average for embedded debt costs only covering ten years would be inconsistent.
Recommendation Ofwat	It was not possible to use a 20yr trailing average at PR14 due to the unavailability of data. However, going forward we propose that the use of a 20yr trailing average is more consistent with the 10yr+ iBoxx composite index we recommend and is supported by recent Ofgem precedent.
Recommendation CAA	We propose that with our 10-15yr index for debt tenor, the use of a 10yr trailing average period is consistent.

8.4. Summary

8.4.1. High-level overview of approach

- A fixed trailing average should be used with debt dropping off from the trailing average for embedded debt over the price control rather than taking the trailing average for embedded debt at the start of the price control.
- This is based on the use of a notional benchmark, so the drop-off would be consistent e.g. with a 20 year trailing average, debt issued 15-20 years ago would not be included when calculating the average cost of embedded debt.

8.4.2. Changes from current approach

- Where a notional approach is taken, this should reflect the debt issuance profile of a notional entity i.e. reflecting changes in capital required from asset base growth.
- For the water sector, the length of the trailing average should be extended to 20 years to better match the assumed debt tenor. In aviation, we recommend a trailing average of ten years.
- The higher (short term) cost from using a longer trailing average will be offset by the use of longer breakeven inflation, the profiling of the trailing average and debt dropping off over the price control period.
- For embedded debt costs, we recommend that embedded debt does drop-off the trailing average.
- A weighted profile for embedded debt is a further difference in approach, as both regulators had used simple averages previously.

9. TRANSACTION COSTS

Summary

It is appropriate to allow for transaction costs in a regulatory allowance, as these costs would be incurred by a notionally efficient company. We think that the allowance for transaction costs should include an allowance for issue costs and an adjustment for cash costs (albeit a small proportion). It is important to make sure that the assumptions underlying an allowance for transaction costs are consistent with what is assumed when considering the interest costs of the company. For example, our approach does not assume the need for the use of derivatives, so no allowance is made for these.

For small company costs, the onus should be placed on companies to make the case for any premia and provide evidence about the need for a different approach. These costs do have a significant impact potentially, so the level of these costs needs to be addressed with more detail.

The interest paid on debt is not the entire cost that a debt issuer faces. There are unavoidable transaction costs associated with these financings. Given falling interest costs these transaction costs make up a greater proportion of the overall cost of debt and with multi-billion asset base in both water and aviation, even a small allowance has a material financial impact.

9.1. Summary of questions and options

Q1: Transaction costs faced?		
Issue costs	Pre-funding	Swaps and derivatives

Q2: Should an explicit allowance be made?		
Yes	No	

Q3: Different treatment of small companies?		
Yes	No	

Q4: Should this be on both new and embedded debt?		
Yes	No – new only	

Q5: Do costs change with assumed tenor?		
Yes	No	

Q6: Should there be other costs e.g. illiquidity premia?		
Yes	No	

9.2. Background and issues

What is a new issue premium?

This is the premium on yield that the issuer may have to offer in order to be able to attract investors to these bonds rather than other bonds that are already been traded in the secondary market. This can be estimated by comparing the yield at the time of the issue to trades in secondary markets for bonds of the same risk and maturity.

An example of a regulator who has considered this issue in depth comes from Australia, with the Australian Energy Regulator (AER) in their determination for South Australia Power Networks.[84] The AER rejected an allowance for new issue premia for two reasons:

- They were unsatisfied that the benchmark efficient entity would face a new issue premium as part of its efficient financing costs.
- Empirical evidence on the size of the new issue premium was inconclusive and applicability of the evidence limited.

In a UK setting, regulators have not included an explicit allowance for new issue premium as far as we are aware.

What are pre-funding costs?

Pre-funding costs include both the cost of carry, as well as revolving credit facilities.

The cost of carry is when a firm raises more money than is immediately required. The issue was discussed at PR14, with smaller WoCs noting that the costs were pronounced as the issuance needs to be of sufficient size and their financing needs are not as high.[85]

The magnitude of this loss corresponds to the difference between the cost paid for this amount and the amount received as a deposit until the capital is deployed. Ofwat's consultants at PR14, PwC, noted that the CMA had allowed for these costs as part of their determination for Bristol Water in 2010.

No explicit allowance was made for the cost of carry due to the offsetting of benefits from companies issuing short-term floating rate debt that Ofwat had not separately adjusted for by referring solely to longer term borrowing costs.

The difference between the short-term deposit rate and the nominal cost of debt was estimated to be similar for WaSCs and WoCs. Based on this difference applied to the proportion of cash relative to total debt costs (approximately 5%), the impact of this was estimated at 14bps.

[84] AER (2015) Preliminary decision on SAPN revenues 2015-2020, Annex 3 Rate of Return
[85] PwC (2014) Company Specific Adjustments to the WACC: A review of company representations, December 2014.

This may be trickier to estimate in practice than in theory as it depends on whether the borrower is assumed to deploy excess cash by leaving it in a short-term deposit. If the borrower has expensive working capital facilities, the additional cash can be used to reduce the carry. This would be the opportunity benefit of the cash amount.

It is important that this reflect notional costs, as companies with more covenanted structures tend to adopt more conservative strategies as a result of these covenants, that wouldn't be the case for the notionally efficient company.

What is the cost of entering into swaps?

Swaps are bespoke products so there is no singular price for the derivative. Where the use of a swap is seen as being consistent with efficient financing, an allowance to cover the transaction costs of these may be allowed.

While UK regulators have tended not to assume the use of swaps explicitly, there is international precedent of an allowance of swap costs being included, for example in Australia and New Zealand. The New Zealand Commerce Commission (NZCC) found that interest rate swaps were used extensively by companies in order to shorten their effective interest rate periods on the risk-free rate part of debt.[86] This led to pricing benefits due to the shape of the yield curve but leaves the company exposed to changes in rates when refinancing was required. No firm had an average effective terms for the risk free rate component in excess of five years, even where the average tenor of the original debt issued was often longer. The greater debt premium on longer-term debt cannot be economically removed according to the regulator through swaps.

For their telecommunications final pricing principle determination, the NZCC allowed eight basis points for the costs of executing two swaps.[87] This is based on a fixed rate to floating rate swap, then swapping back from a floating rate to a fixed rate (albeit with a different tenor).

Issuance costs for bank finance

Issuance costs exist for both bank finance and bond finance. In discussing the issue at PR14, issuance costs were estimated as being higher for bank finance than comparable costs for debt raised by WoCs.[88] PwC interviews with banks indicated that arrangement fees could be around 50bps, or 10bps amortised over five years. Commitment fees were estimated as a similar amount. However, bank finance represented only a small portion of total debt, such that a 10bps assumption on an overall basis remained appropriate.

[86] New Zealand Commerce Commission (2010) Input Methodologies Reason Paper
[87] New Zealand Commerce Commission (2015) Cost of Capital for UCLL and UBA Pricing Reviews, p.30.
[88] PwC (2014) Company Specific Adjustments to the WACC: A review of company representations, December 2014.

Issuance costs for regulated bonds

The PR14 documentation included information on issuance costs around Artesian Finance. This was estimated as being 6bps on an amortised basis.[89]

Individual bonds can also provide information on issuance costs. Thames Water has indicated (non-amortised) total issuance costs of 1.24% on its £500m bond issued in July 2014.[90] This is just one example, but in assessing issuance costs, a range of evidence should be sought.

Illiquidity premium

For the GD17 price control, NIAUR, the Northern Ireland Utility Regulator, included an allowance of 40bps for what they deemed the illiquidity premium on Northern Irish bonds relative to GB comparators. This could be seen as relating to a benchmark adjustment or through an explicit fee as per the aforementioned regulatory precedent.

Gross debt vs Net debt

The issue of gross debt versus net debt is most frequently seen in the context of discussions on equity beta and has an impact when you look to de-lever and re-lever the beta. Net debt itself is gross debt minus cash and short-term cash equivalents.

This issue can have an implication with respect to cash holdings on debt as well as the assumption on cash holdings can affect the value of the allowed return.[91] Where an amount has not been added to the RAB, the cost of the associated finance will not be compensated. Care must be taken to ensure that the cash holdings, if deemed consistent with behaviour of an efficiently financed notional entity, are not already being compensated for, and if not, what the appropriate allowance would be.

[89] PwC (2014) Company Specific Adjustments to the WACC: A review of company representations, December 2014.
[90] Thames Water (2015) Thames OPCO Prospectus June 2015, p377
[91] RAB x cost of capital

9.3. Questions and options

Question and option	Discussion
1 What transaction costs are faced	
a) Issue costs	• The cost of debt is not just the coupon cost alone, so an allowance for these additional costs are more representative of overall debt expenses • Issuance costs cover legal, bank and rating agency fees • Issue costs have typically been Included in regulatory precedent, whether explicit or implicit (e.g. Ofgem offset from halo and transaction costs)
b) Pre-funding (+ issue costs)	• There is a time lag in achieving financing, so need to consider pre-funding costs as part of an efficient firm's cost • Liquidity is key for credit rating agencies, a licence requirement in the water sector and part of corporate governance code • Thames Tideway Tunnel settlement includes a liquidity allowance for pre-funding • Makes sense to pre-fund if treasury can achieve economies of scale with larger debt values and attract more visibility • Regulatory precedent e.g. CMA for Bristol Water 2015, has more recently included an allowance for cash holdings
c) Swaps and derivatives (+ issue costs + pre-funding)	• If swaps are assumed for the notionally efficient company, the regulator should include the costs of entering into these swaps as an allowance • Equates to a price for certainty/ insurance • NZ and Australian precedent generally allows costs for swaps, taking note of the number of swaps that need to be entered into
Decision principle	Standard regulatory precedent includes an allowance for issuance costs. Where there are further costs that would be incurred by assumptions made on other questions, it would be appropriate to include an allowance for those transaction costs. Evidence should be sought on the costs incurred and care taken to ensure that there is not double counting.
Recommendation Ofwat & CAA	We think that it remains appropriate to include an allowance for issue costs and related fees. The allowance for swaps costs depends on the assumptions around financial management – our starting position would be that under our proposed approach no allowance is required for swap costs as we have not assumed their use as part of the efficient financing strategy of our notional entity. Pre-funding depends on what is assumed the notional entity does – a small allowance for this may be considered appropriate where this can be justified.
2 Should an explicit allowance be made	
a) Yes	• Issuance costs can be a significant expense for a company

Question and option	Discussion
	• Some costs are fixed, so the level of the allowance depends on the tenor of debt • CMA in Bristol Water 2015 determination give an allowance for both issue costs (10bps) and cash holding costs (10-20bps) • The iBoxx index looks at secondary yields so does not include an allowance in its yield estimates
b) No	• If there is headroom implicit within the representative index, it may be appropriate to assume that these offset rather than adjust down and back up again • Use of derivatives may be to reduce shareholder risk to below what is assumed in the regulatory package, so an allowance is not required for these purposes (although in practice it is not possible to differentiate reasons for behaviour)
Decision principle	Where there is no headroom in an allowance that can be argued to be an implicit allowance, there should be an additional allowance made for transaction costs incurred in efficient management of risks. This is consistent with the CMA's latest position on the topic.
Recommendation Ofwat & CAA	We think that an explicit allowance should be made. Even where this requires an adjustment to a benchmark index and the addition of the costs separately, we think this provides greater clarity of the approach (or at least stating that there are two offsetting adjustments). We recommend that evidence is sought on the level of these costs as this has typically been relatively opaque.
3 Different treatment of small companies	
a) Yes	• Discussion of the notional entity does not consider whether there is a single or multiple notional entities – it appears reasonable to assume that firms with different characteristics will act in different ways • There is a theoretical and practical underpinning that would justify a small company premium, in particular an inability to benefit from economies of scale due to the size of their debt • Small companies may be less able to hedge and bear risk than their larger peers – in the water sector we have seen minimal use of derivatives by WoCs • Recognised in regulatory precedent from both Ofwat and the CMA that the costs from a small company may be different • There are benefits to consumers from having a larger number of companies due to the benefits from comparative assessment • The CMA in Bristol Water 2015 determination included a small company premium • CAA include 5bps for smaller issuance size and less frequent issuance for GAL

Question and option	Discussion
b) No	• Larger company size may be efficient and therefore it may not be prudent for consumers to compensate firms for inefficient sizing • Additional allowance will lead to increased costs for consumers • Ofwat at PR14 find that issuance costs on Artesian finance (a large source of WoC debt) shows cost of only 6bps – this is not materially different to WaSC costs (further information is contained in Annex B)
Decision principle	Where there is robust evidence to show there are higher transaction costs for a different type of company, consistent with the notional entity, it would be appropriate to include a different allowance.
Recommendation Ofwat	We think that it remains appropriate for Ofwat to assess the small company premium for the price control on its merits.
Recommendation CAA	The issue of a small company premium is less relevant in aviation than it is in water. However, there may be a question around whether the transaction costs should be different between Heathrow and Gatwick. Our provisional conclusion would be that the size of Gatwick should not lead to materially different costs, though we would require further evidence to be definitive on this.
4 Should this be on both new and embedded debt	
a) Yes	• If costs are amortised over the term of the debt (i.e. spread over the life of the debt) then an allowance should be on both new and embedded debt • Derivatives such as inflation swapping out of nominal debt typically last the length of the price control
b) No – new only	• If costs are amortised over the price control period, i.e. assumed to be incurred in full in a five year period, rather than the tenor of the debt, then it would be unnecessary to include an allowance for embedded debt • It is not necessarily the case that the same value should apply for new and embedded debt as these costs change over time • Hedging for future movements in rates may be more relevant for new debt where rates are unknown
Decision principle	The overall level of costs should be the same whether an allowance is made for both new and embedded debt costs, or a larger allowance is made for new debt costs only. Care should be taken in interpreting precedent to understand where the costs are allowed.
Recommendation Ofwat & CAA	Care should be taken to ensure that the transaction costs included as an allowance are reflective of the tenor assumed for costs. Our view is that there should be an allowance for both new and embedded debt costs, though this is not necessarily the same value.
5 Do costs change with assumed tenor	
a) Yes	• There will be fixed costs irrespective of tenor of debt e.g. legal fees

Question and option	Discussion
	• New Zealand Commerce Commission approach assumes costs are fixed and thus are spread over the term of the debt • Assuming that costs reduce with longer tenor will offset the impact of selecting a longer debt tenor when faced with an upwards sloping yield curve
b) No	• Costs may be amortised over price control by the regulator, so this decision would be independent of debt tenor • Issuance of short-term debt wouldn't be cost effective if costs faced were fixed and amortised over the term of the debt
Decision principle	Transaction costs are neither entirely fixed (independent of tenor) nor entirely variable with tenor. There should be an adjustment for tenor of debt.
Recommendation Ofwat & CAA	We recommend that Ofwat and CAA do consider what transaction costs are fixed and which are variable in order to derive an accurate estimate for the costs a notional entity would face. The presence of fixed costs would dictate that the assumed tenor is a relevant consideration.
6 Should there by other costs e.g. illiquidity premium, new issue premium	
a) Yes	• There is an illiquidity premium included in NIAUR's GD17 draft determination • Ofgem found that the New Issue Premiums did exist (i.e. companies had to offer slightly higher yields to attract investors), but this is captured implicitly (along with other fees)
b) No	• Illiquidity and new issue premia are typically not a feature of the majority of UK regulatory determinations • It is not in the interest of consumers to include a further allowance • When compare water company yields at issue to benchmark, implicitly takes into account any new issue premium
Decision principle	It is important that any benchmark chosen is representative of costs faced. Where there are additional costs not captured, these should be additional to any allowance. Where evidence is presented and considered to be robust, an allowance for these costs should be allowed.
Recommendation Ofwat & CAA	Some bonds/ debt from regulated companies will be more liquid than others. This is not necessarily a concern if investors invest to match the profile of their liabilities and so the lower liquidity is not a concern. We think that this is likely to be reflected in the interest rate and that no additional allowance, which would be to the detriment of customers, should be included.

9.4. Summary

9.4.1. High level overview of approach

- It is appropriate to include an allowance for issue costs for both new and embedded debt (unless costs are amortised over the price control).
- We think that it is appropriate to assume that the notional entity will have some cash holdings and to compensate for these costs.
- UK regulators have typically not included fees for swaps and derivatives - this depends on what the regulator assumes efficient financial behaviour from the notional entity.

9.4.2. Changes from current approach

- Our proposals are largely consistent with the current approach in both the water and aviation sectors – though we recommend that an allowance is made for cash holding costs (this is likely to be relatively small in quantum).

10. Treatment of Inflation

Summary

In terms of deflation for embedded debt, we recommend the use of breakeven inflation, again matching the tenor of the assumed debt for consistency. This gives a known inflation estimate for embedded debt and then the latest breakeven inflation forecast is used in deriving a real yield. Using real forward curves should take into account the expected change in inflation and build in expectations going forward. We propose that the adjustment for new debt is made on a real cost of new debt basis i.e. using outturn breakeven inflation rates (rather than outturn inflation values per se). This more mechanistic application should reduce uncertainty over the nature of the inflation estimate, however a more mechanistic application precludes using other forecasts. We suggest that other inflation estimates are used as a cross-check.

If there is a move to CPI or CPI(H), as proposed by Ofwat for PR19, in the absence of CPI inflation expectations, we recommend that a proxy for CPI inflation expectations is formed by RPI breakeven inflation and the size of the expected wedge between CPI and RPI. There can then be a correction for the actual size of the wedge if this differential turns out to be incorrect, however this may not be required.

Ofwat and the CAA currently set the cost of capital in real terms, whereas the majority of evidence reviewed is in nominal terms. Therefore, the use and treatment of inflation is an important consideration when determining the cost of debt allowance. In this section we discuss the relevant issues and recommend a preferred treatment of inflation.

Our proposed ex-post adjustment mechanism does mean that the inflation forecast is only used in setting an interim allowance. The adjustment will be based on real debt yields, therefore the need for accurate inflation forecasts is largely removed. However, there is still a key role for inflation as nominal yields are deflated by inflation.

As we have proposed an approach for indexation that does not require forecasts (however, the use of breakeven inflation does not in itself presume the use of other inflation forecasts), we consider everything on an embedded basis – in this sense, we mean at the time of the adjustment rather than referring to debt issued prior to or post the start of the price control.

10.1. Summary of questions and options

Q1: Deflation embedded - RPI			
Breakeven inflation	Swap implied inflation	Forecast inflation	Ex-post inflation adj

Q2: Term of breakeven inflation and swap implied inflation			
10yr	20yr	Price control length	

Q3: Deflation embedded - CPI			
Forecast	Expected RPI – wedge	CPI target	Ex-post inflation adj

10.2. Background and issues

Ofwat position on revenue indexation

In May 2016, as part of their Water2020 publications, Ofwat published a statement on their proposed treatment of inflation for future price controls.[92] The proposal is to switch revenue indexation to CPI or CPIH (henceforth referred to as CPI/H to indicate either measure) from PR19. RPI inflation had been used in price controls since 1994.

For the cost of capital, a nominal measure will be published, alongside both CPI/H and RPI based costs of capital.[93] The current UK financial market is based off RPI inflation – as such, in moving to CPI/H indexation, Ofwat will make an assumption of the given size of the 'wedge' between RPI and CPI inflation. There will be an ex post true up for the RPI component (50% of the 2020 RCV) of RCV indexation between forecast and actual RPI, but there is no anticipated adjustment for forecast error or differences in the size of the RPI/ CPI wedge.

The approach will be NPV-neutral and will bring about greater legitimacy according to Ofwat. The use of CPI/H is also expected to be less volatile than from RPI-based revenue indexation. Ofwat analysis has found CPI inflation to be a less volatile measure of inflation than RPI inflation in the UK. An assessment of the standard deviation of CPI and RPI inflation showed 1.1% for CPI and 1.4% for RPI over the 1998-2015 period.[94]

What is the CPI-RPI wedge

In the absence of CPI-linked financial instruments, one way to calculate inflation where CPI is used would be to reference RPI-linked financial instruments and remove the expected difference between CPI and RPI.

Due to the way in which they are calculated, over the long-term RPI tends to be higher than CPI inflation. The CPI-RPI wedge represents the size of the expected difference between CPI and RPI inflation when CPI inflation is around the Bank of England's 2.0% target.

The table below shows different estimates of the size of this wedge.

Table 10.1: Estimates of the CPI-RPI wedge

Source	Long run CPI-RPI wedge estimate
Moody's (2016)	130bps
Office for Budgetary Responsibility (2015)	100bps
Pension Protection Fund (2015)	110bps

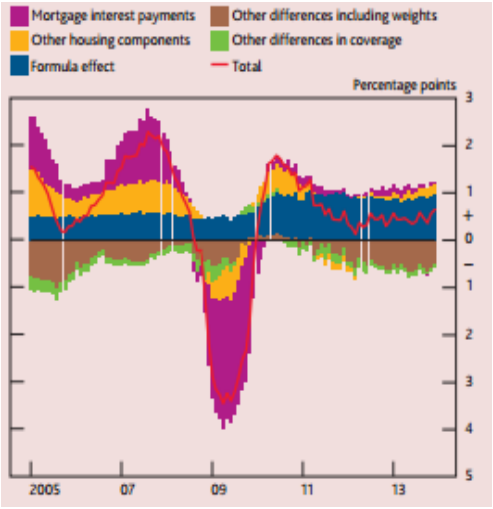
[92] Ofwat (2016) Water 2020: Our Regulatory approach for water and wastewater services in England and Wales.
[93] Quoting both nominal and real yields provides greater transparency. However, this may cause confusion if the approach for estimating a nominal cost of capital parameter is done using a different approach to estimating a real cost of capital parameter.
[94] Ofwat (2016) RPI to CPI – Benefits for Consumers

Source	Long run CPI-RPI wedge estimate
Bank of England (2014)	130bps

Source: Moody's

The historic CPI-RPI wedge is not constant over time. The below figure demonstrates how this has changed and why this has changed. Further information can be found in the documents published by Ofwat.[95]

Figure 10.1: Contributions to the CPI-RPI wedge



Source: Bank of England

Review of UK consumer price statistics

In a 2015 review of UK consumer price statistics led by Paul Johnson, Director of the Institute for Fiscal Studies, found that RPI had statistical flaws, is not consistent with international standards and thus is consequently not a good measure of inflation.[96] The flaw relates to the use of the Carli formula – this issue led to an increase in the expected size of the CPI-RPI wedge on a forward-looking basis.

A key finding from the Johnson Review was the following statement:

"Government and regulators should move towards ending the use of the RPI as soon as practicable and, where they decide to keep using it, the Authority should ask them to set out clearly and publicly their reasons for doing so."

The Johnson Review found that CPI was an appropriate measure, but that CPI with owner occupiers' housing costs (CPIH) should represent the government's main measure of inflation. The CPIH measure had been introduced in March 2013. CPIH subsequently lost its status as a national statistic in 2014 after issues emerged regarding the data for the owner occupiers' cost estimation.

[95] Oxera (2016) Future indexation of future price controls in the water sector.
[96] Paul Johnson (2015) UK Consumer Price Statistics – A Review

In March 2016, the UK Statistics Authority (UKSA) set out their expectations for the development of the CPI(H) index to the ONS. The National Statistician stated that CPI(H) should become the ONS' recommended measure of assessing consumer price inflation. In an ONS strategy document they indicated that they will address the recommendations put forward by the UKSA by summer 2019.[97]

What is breakeven inflation

Breakeven inflation refers to the difference between the yield on a nominal fixed-rate bond and the yield on an index-linked bond of the same tenor. This is typically based on the government bond data. Index-linked gilts are typically used in estimating the risk-free rate in regulatory determinations.

Table 10.2: Illustrative example of estimating breakeven inflation

	Yield
Yield on ten year nominal bond	4.0%
Yield on ten year index-linked bond	1.5%
Ten year breakeven inflation	2.5%[98]

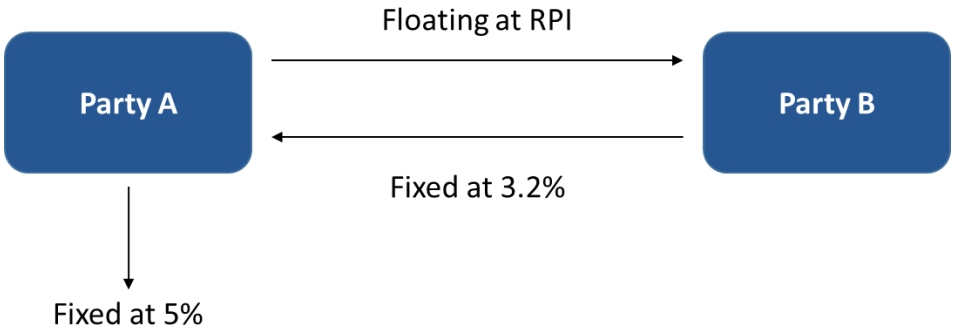
What is an inflation swap

An inflation swap is a form of financial derivative (see Annex A for further details on financial derivatives). One party exchanges a fixed cashflow in exchange for receiving a variable cashflow, in this case based on RPI inflation for a set period of time.

An example is where a firm wishes to have their costs linked to RPI inflation. To achieve this the firm has the choice of issuing nominal debt at 5.0% plus a swap or index-linked debt at RPI+2.0% (this is illustrative). In the example below, a party is better off from using nominal debt plus a swap than by issuing index-linked debt (ceteris paribus, ignoring transaction costs) because they face a net cost of RPI+1.8%.

[97] Ofwat (2016) Water2020: Our regulatory approach for water and wastewater services in England and Wales, section 3.3.3.

[98] This is the same to one decimal place when you use an additive approach or when you use the Fisher equation. The latter would be our preference.



IPART, the New South Wales multi-sector regulator has used swap-implied inflation estimates in the absence of robust breakeven inflation estimates as part of their cost of capital methodology (with the government no longer issuing index-linked debt).[99]

Short-term and long-term inflation measures

A consideration when assessing inflation is the difference between inflation over the length of the price control period and inflation over the life of a bond. This leaves a choice over whether there should be an inflation estimation made for expected inflation during the upcoming price control or estimated for the longer-term to match the length of debt for network sectors with long-term financing needs.

Pricing of instruments is based on investors' expectation over the length of their investment. Therefore when comparing the yields on a twenty year nominal bond and a twenty year index-linked bond, the difference in pricing will reflect expected inflation over the twenty year period. Using a longer term estimate for inflation should mean consistency of pricing between nominal and index-linked products, greater stability and consistency with recent UK regulatory precedent. However, such an approach can lead to companies bearing the difference in inflation in the short-term.

Inflation risk premium

Traded market prices reflect the level of risk aversion of market participants. An example of this is on inflation risk, where risk averse investors would prefer a certain cashflow to an uncertain cashflow with the same expected value. In order to compensate for uncertainty, investors require a risk premium. Both breakeven inflation and swaps are market-derived estimates of inflation, so will implicitly contain an inflation risk premium.

At PR14, Ofwat and their advisors included an inflation risk premium of 30bps in their estimate of inflation.[100]

[99] IPART (2009) Adjusting for inflation in deriving the cost of capital, May 2009.
[100] PwC (2014) Updated evidence on the WACC for PR14, December 2014

Conversely, Ofgem find that the inflation risk premium on breakeven inflation (i.e. nominal minus index-linked yields) is offset by a liquidity risk premium in index-linked gilt (ILG) yields (fundamental to the calculation of breakeven inflation)[101]:

'Ofgem acknowledges that breakeven inflation rates implicitly include an inflation risk premium. Ofgem considers that the premium does not have a material impact as it is offset by a liquidity risk premium included in the yields of ILGs. The liquidity premium compensates holders of ILGs for the relatively lower levels of liquidity in the ILG market than the conventional (that is nominal) government bond market.'

In the case of swaps there is a counterparty risk premium that can also distort the estimate of implied inflation. Conceptually, counterparty risk is a form of illiquidity since if the counterparty fails, liquidity will fall to zero.

It is important to be careful over what is included in the price paid by debt issuers and what this means for any adjustment for setting a cost of real debt.

Why does our approach not require an explicit forecast of inflation for new debt?

We have proposed an ex-post adjustment for the notional benchmark on the cost of new debt. This would work by comparing the forecast real cost of new debt with the outturn real cost of new debt. Therefore an inflation forecast is only required to reach an interim allowance.

The approach we apply with forward curves i.e. adding implied movements in real debt yields to a real cost of debt, means that no explicit forecast of inflation is required. The implied inflation is equal to the deflator used in arriving at a real cost of debt prior to the application of forward curves. In our recommendation, this is breakeven inflation. This is an outturn value for breakeven inflation rather than an estimate – this should remove any forecasting error stemming from inflation.

CPI-based financial market

The UK Debt Management Office (DMO) is an executive body of the UK Treasury that manages UK gilt issuance. In 2010, the government announced CPI as the basis for the statutory minimum revaluation and indexation of occupational pension schemes. This had knock-on effects with private companies following suit. A consultation by the DMO followed in 2011.[102] This affects the preferred choice and type of hedging instruments used to manage liabilities. The DMO stated that it would consider issuing CPI-linked gilts based on the depth and suitability of investor appetite (RPI has been the basis for index-linked gilt issuance).

[101] FTI Consulting, advising Ofgem (2012) Cost of capital study for the RIIO-GD1 and T1 price controls, p131.
[102] DMO (2011) CPI-linked gilts: A Consultation Document

In 2015, DMO minutes indicated that there was a growing need for CPI linked gilts as the increasing linkage with CPI in the pensions industry led to a need to hedge future obligations.[103] However, there were concerns by the DMO regarding fragmentation of the market should both CPI and RPI linked gilts exist.

Choice of different inflation measures

We provide information of the value of different inflation measures in the table below. As the inflation level increases, the real cost of debt decreases.

Table 10.3: Impact of choices on inflation

Index	Spot (31/12/15)	1yr average	5yr average	10yr average
10yr breakeven inflation	2.36%	2.52%	2.80%	2.84%
20yr breakeven inflation	3.09%	3.11%	3.17%	3.23%
10yr swap-implied inflation	2.00%	1.88%	2.43%	3.47%
20yr swap-implied inflation	2.20%	2.12%	2.93%	3.71%

Source: Bloomberg, Bank of England

There is a premium over time that reflects higher assumptions for 20 year relative to 10 year inflation. 20 year breakeven inflation has remained relatively stable over time, though there are significant differences to swap-implied inflation.

[103] Investments and Pensions Europe (2015) UK Debt Management Office concedes 'growing case' for CPI issuance, 27 January 2015.

10.3. Questions and options

Question and option	Discussion
1 Deflation measure for embedded debt – RPI basis	
a) Breakeven inflation	• Reflects market expectations and used in Ofgem RIIO cost of debt indexation model • Consistent with approach taken on the real risk-free rate • Use of breakeven inflation would be consistent with the value difference between issuing real and nominal debt • Data is available on a daily basis, transparent and easily sourced • Inflation risk premium on nominal gilts is offset by illiquidity premium on index-linked gilts • Forecasts are not reflective of actual behaviour and there is no incentives on this being a correct assessment • Both Heathrow and water companies have large index-linked exposure • Swap implied inflation as an alternative approach is particularly volatile
b) Swap implied inflation	• Swaps reflects the value of inflation that can be used in derivatives and companies to reduce exposure • Long-dated index-linked gilts may be distorted according to CMA determinations e.g. CMA NIE 2014 determination, which in turns distorts breakeven inflation as an estimate of inflation
c) Forecast	• Forecast may be most accurate as there is no risk premia added, as is the case per financial instruments • UK regulatory precedent has used inflation forecasts within determinations, such as those produced by the OBR and Bank of England
Decision principle	Breakeven inflation ensures consistent treatment between nominal and IL debt, as well as providing a transparent and robust data source. Forecasts can be used to ensure that risk premia are not leading to misleading estimates of inflation. It may be possible to deduct a risk premium from market estimates if confidence can be had to making such an adjustment.
Recommendation Ofwat & CAA	We think that breakeven inflation appears the appropriate approach to deflate historic nominal yields, however we recommend that other inflation forecasts are used to check that there are not distortions impacting on breakeven inflation estimates.
2 Term for breakeven inflation and swap implied inflation measures	
a) 10yr	• Consistent with UK regulatory precedent to date, including Ofwat, CAA and Ofgem • Reflective of embedded inflation estimates where 10yr debt is being issued
b) 20yr	• This will be reflective of inflation estimates where 20yr debt is being issued

Question and option	Discussion
	• Use of 10yr in regulatory precedent may reflect that 20 years of data has not been available until now for the iBoxx indices themselves
c) Length of price control	• The CMA in the Bristol Water (2014) determination used five-year RPI estimates to take into account the length of the price control • The cost of capital is set for the length of the period and revenue indexation is provided over the same period
Decision principle	The choice of term for breakeven inflation or swap implied inflation should reflect the inflation assumption embedded within the choice of nominal debt tenor. The longer tenor is more reliable and minimises regulatory uncertainty, plus reflects the pricing faced on debt issuance. When looking at the risk-free rate plus debt premium, using a consistent tenor avoids the need for adjustments that may lead to errors in estimation.[104]
Recommendation Ofwat	We have assumed approximately 20yr nominal debt yields from the iBoxx 10yr+ index, with a 20yr trailing average. For methodological consistency we would propose using 20yr breakeven inflation.
Recommendation CAA	We have assumed approximately 10-15yr nominal debt yields with a ten year trailing average. For consistency, we would propose using 10yr breakeven inflation.
3 Deflation measure for embedded debt – CPI basis	
a) Target	• If credible as a target then simple and clear approach
b) Forecast	• Target is not necessarily a forecast as other considerations not just inflation • RPI-CPI wedge unclear and changing over time • Consistent with some precedent
c) RPI minus wedge	• May give consistency of approach if using RPI elsewhere in the determination • Forecasts may not go far enough out in time
Decision principle	The approach assumed should revenue indexation be based on CPI inflation would be consistent with what is assumed for remaining in an RPI world. As such we think that retaining the approach proposed under RPI i.e. breakeven inflation, then removing a CPI-RPI wedge would be the right approach.
Recommendation Ofwat & CAA	We think that the same approach as proposed for RPI should be used, with the only difference being the removal of the CPI-RPI wedge from this estimate.

[104] For example, where longer dated index-linked gilts are used for estimating the risk-free rate, this includes a longer estimate of inflation. If the cost of debt uses a shorter inflation assumption to match the length of the price control, a risk free rate plus debt premium approach becomes more difficult.

10.4. Summary

10.4.1. High level overview of approach

- The compensation for inflation in the cost of debt depends on the debt instrument considered.
- For nominal rate debt, deflating nominal yields by breakeven inflation should leave a company indifferent between nominal and index-linked debt.
- The pricing of index-linked debt relative to nominal debt is based on historic breakeven inflation.
- Firms have used nominal debt and swaps to achieve inflation exposure – the pricing will be dependent on swap implied inflation.
- We recommend the use of breakeven inflation for deflating embedded debt.
- Where CPI or CPI(H) is used for revenue indexation rather than RPI, the same approach should be assumed - however with a CPI-RPI wedge removed.

10.4.2. Changes from current approach

- Our use of a real cost of debt together with a real forward curve removes the need to estimate inflation for the price control period in setting a forecast.
- The use of an ex-post adjustment mechanism will reduce the impact of changes in breakeven inflation over the price control period.

11. Adjustment Mechanisms: General Features

Summary

In Section A we discussed different adjustment mechanisms, proposing the use of indexation of new debt with an ex-post log up (with revenues adjusted the next period). This is assumed to be in full for movements of the notional benchmark at the level of the cost of debt.

We do not propose this should be dependent on meeting a criteria or limited through a cap and floor. In this section we set out our belief that it is best to index the cost of new debt rather than the entirety of debt or adjust at the RoRE level. Our approach is consistent in not choosing to place weight on actual debt costs due to differences in non-price characteristics and impacts on incentives. It may be in future that this could be extended to be combined with menu regulation if this is used on total costs, however this would be particularly complex and not something that we investigate further within this report.

The timing of the cashflows does not necessarily need to be at the end of the price control (especially if the price control is longer). An end of period adjustment would reduce volatility within period and is our preferred choice, but both approaches should be NPV-equivalent.

Regulators can set a fixed allowance on the cost of debt, with firms facing the difference between their costs and the allowance (i.e. baseline) until prices are reset at the next price control determination. Adjustment mechanisms involve changes to this ex ante setting. This may be in adjusting the baseline after the price control has started or through a sharing of the difference between allowed and outturn.

11.1. Summary of questions and options

Q1: Adjustment dependent on meeting criteria? e.g. threshold		
Yes	No	

Q2: Limits to an adjustment mechanism e.g. cap and floor		
Yes	No	

Q3: Adjustment at what level?		
Cost of Debt (all)	Cost of Debt (new)	RoRE

Q4: Adjustment to actual or notional level		
To actual level	To notional level	

Q5: Setting the sharing factor		
As per efficiency level	Fixed level	Cost of Debt menu

Q6: Timing of adjustments			
Periodic adjustment	Ex-post log up (fast)	Ex-post log up (slow)	Materiality threshold

11.2. Background and issues

Benchmarking to actual costs or notional costs

This section concerns whether an adjustment (either within period or ex-post) is based on an ex-ante allowance and a company's actual costs, or an ex-ante allowance and changes in a notional entity's costs.

As an example, the Ofgem indexation approach uses benchmarking to notional costs, as the allowance is adjusted to reflect changes in the iBoxx composite indices. Actual debt costs would involve knowing the costs of a regulated entity's debt finance. This may be trickier in practice than it sounds as different financial instruments used that have different levels of complexity than may be assumed when looking at the notional entity. The CMA determination on the British Gas appeal at RIIO-ED1 stated that Ofgem were not able to review the individual debt positions of DNOs.[105]

Water sector companies and Heathrow airport have used a range of derivatives where limited information in the public domain on the effective cost of debt for regulated companies after derivatives are accounted for.

Application of indexation ex-post versus within-period adjustments

We have proposed two different methods for treating any adjustment. This may be done through within-period adjustments or on an ex-post basis. We discuss how this would work with respect to adjustments related to movements in the notional benchmark index.

Within-period adjustments

These periodic adjustments continue to be based on actual data from our benchmark index, therefore the allowance operates with a slight time lag. This application would be consistent with Ofgem's cost of debt indexation model, whereby the allowance for a financial year is based on data up to the end of October in the previous financial year e.g. the allowance for 2015/16 is based on the iBoxx index up to 31 October 2014. The allowance for 2016/17 is then based on the iBoxx index up to 31 October 2015.

Ex-post adjustment

As the ex-post adjustment looks back at the difference between the ex-ante allowance and outturn, there are no such issues with timing of data. However, there is more of an issue with the timing of cashflows, especially if the adjustment takes place at the end of the price control rather than after each year.

[105] CMA (2015) British Gas Appeal Final Determination, para 8.37.

Logging up or within-period adjustments

The choice of logging up (i.e. ex-post adjustment) or within period adjustment depends on what the index itself is set to look like. If you broadly expect mean reversion by the end of the period and significant volatility, ex-post adjustment could be beneficial. If you assume stable changes over time, periodic, e.g. annual, adjustments could be preferable.

In the figure below, we use two states of the world where the cost of debt yields move in different ways to illustrate why you might wish to index within period or ex-post.

Figure 11.1: Illustrative examples of movements in the market cost of debt

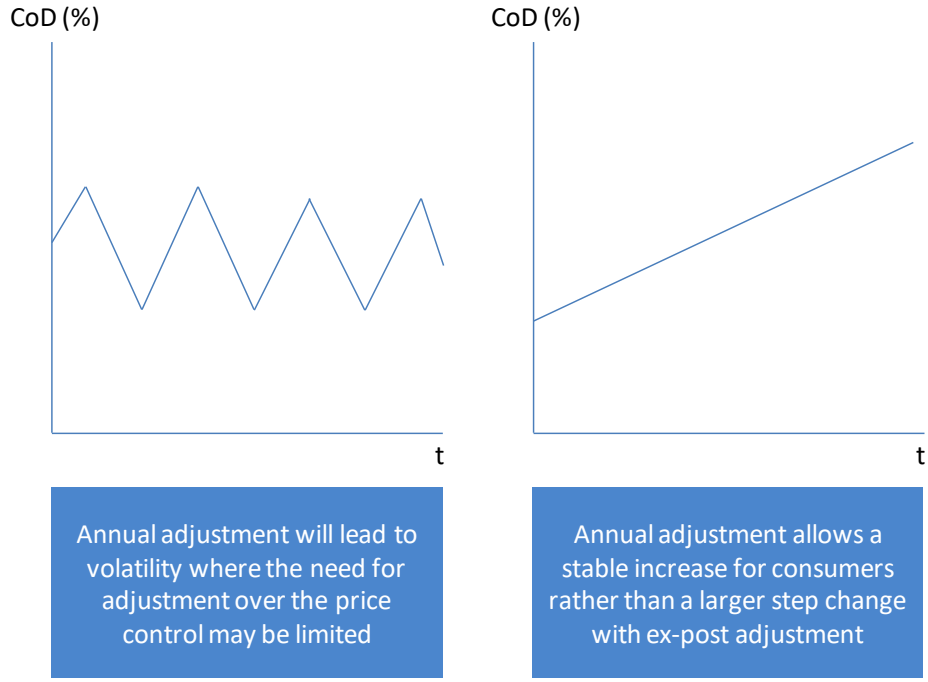
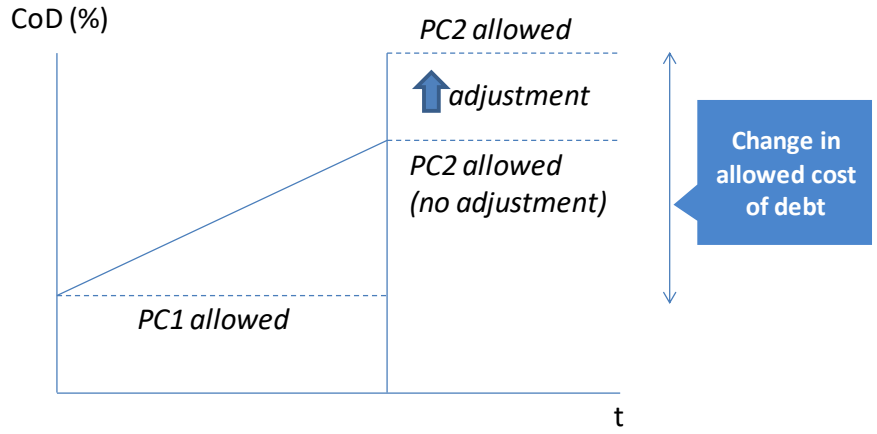


Figure 11.2: Implication of ex-post adjustment



What is RoRE?

The Return on Regulatory Equity (RoRE) is a measure that captures the effective return to an equity investor for overall performance under a price control. Ofwat publishes their expectations on RoRE outcomes at the outset of the price control.

Cost of debt outperformance is one aspect of RoRE. For example, if a company has an allowed cost of equity of 6.0% with two-thirds gearing, a 1% outperformance on the cost of debt leads to a 2% RoRE benefit (i.e. increasing overall RoRE to 8.0%).[106]

What is headroom?

Headroom refers to the allowance set above the expected outturn value. This can be both explicit and implicit.

- Explicit – a regulator can look at evidence and then 'aim up' on that evidence. This may be due to perceptions of asymmetric risk of getting the allowance wrong (i.e. the cost of underestimating the cost of capital is greater than the cost of overestimating the cost of capital). This may be in the cost of debt allowance itself or with the selection of a point estimate on the cost of capital above the mid-point.
- Implicit – this is where there the market evidence points to a higher figure than expected due to risk aversion of investors. Risk premia e.g. term premium and inflation risk premium, would be an example of implicit headroom.

Where the companies face less interest rate risk, there are arguments to reduce headroom.

What is menu regulation?

Menu regulation is where a company is presented with a choice of regulatory contracts. This has typically been used for expenditure, for example Ofwat's Totex menu from PR14 and Ofgem's IQI mechanism. This aims to bring about a truth-telling incentive to mitigate information asymmetries, whereby the company is best off financially from submitting a true cost estimate ex-ante, and then reducing expenditure as far as possible within the price control itself. The approach has not been used to our knowledge on the cost of debt, but conceptually it is possible to imagine such a mechanism.

Adjustment mechanisms in regulatory settings

There are a number of adjustment mechanisms that have been used in regulatory and commercial settlements. One example is the Ofgem cost of debt indexation approach that we provide more details on in Chapter 9. We provide an example of different mechanisms below:

Ofwat price controls

Ofwat's Interim Determination of K (IDoK) regime allows for a re-opener on allowed revenues if certain criteria are met. This has typically not covered the cost of debt.

Ofwat Thames Tideway Tunnel

[106]RoRE adjustment = CoD out- or under-performance x (debt proportion/ equity proportion)

In Annex G we provide details on the adjustment mechanism on the cost of debt for the Thames Tideway Tunnel. This involves tiers, whereby the adjustment varies based on the extent of deviations between expected and outturn costs.

CER (Irish energy regulator)

CER included a mid-term review of the cost of capital for electricity networks under its PR3 determination. For the PC3 determinations for Bord Gais Networks, the CER used a trigger mechanism whereby the cost of capital was updated annually. The basis for the change was movements in rates on government bonds.

Australian regulatory precedent

A number of regulators in Australia have recently moved to applying annual updating of the cost of debt allowance. This includes the Australian Energy Regulator, Economic and Regulatory Authority of Western Australia and the Essential Services Commission of South Australia.[107]

Adjustments set ex-ante and ex-post clawback

While not an example of adjustment on the cost of debt, the example of NIAUR and Phoenix Natural Gas shows that it is not good regulatory practice to clawback revenues when a mechanism was not specified prior to a price control.

The UK Competition Commission (CC) concluded that there were insufficient grounds to retrospectively remove accrued outperformance, unless in the case of miscalculation.

Example of an adjustment mechanism – WaterShare

An example of an adjustment mechanism is the WaterShare framework introduced by Pennon Group, whereby gains are shared with customers.

It is our understanding that the mechanism works by sharing in full any differences in the cost of new debt assumed at the start of the price control period and the outturn value based on the notional benchmark for the industry rather than actual performance. This involves 100% sharing of this difference.

In this sense, the WaterShare mechanism is similar to our option of a full ex-post adjustment on new debt on a notional basis. The financing risk for a notionally geared company in RoRE terms under the WaterShare mechanism equates to 0.3% penalty and a 0.5% reward.[108]

[107] Further detail on these changes can be found in a CEPA publication for the New Zealand Commerce Commission: CEPA (2015) International Comparison of Regulatory Precedent on the Weighted Average Cost of Capital.

[108] Southern Water (2015) Final Determination Investor Briefing.

11.3. Questions and options

Question and option	Discussion
1 Adjustment dependent on meeting criteria e.g. threshold	
a) Yes	• Avoids making considerations to a spurious degree of accuracy • Costs of implementing adjustment may impose regulatory burden that outweigh potential benefits • Thames Tideway Tunnel applies this approach for cost of debt adjustments
b) No	• Using thresholds creates significant knife-edge effects i.e. where the marginal incentive strength jumps significantly around a single point • Subjectivity in how you set the threshold levels • Greater simplicity and transparency from no adjustment
Decision principle	Thresholds are consistent with greater proportionality in approach, however the knife-edge effects from this approach and the subjectivity in setting the threshold level means that caution should apply when considering such a threshold.
Recommendation Ofwat & CAA	We recommend that thresholds should not be used for our adjustment mechanism.
2 Limits to an adjustment mechanism e.g. cap and floor	
a) Yes	• There are better ways of treating extreme cases than through the WACC/ cost of debt • Avoids financeability concerns or very large increases in bills • Avoids large scale bill volatility if limit potential changes
b) No	• Limits may lead to distorted incentives once outside these bounds • Similar knife-edge effects exist at the margins • More transparent and predictable to not apply a limit
Decision principle	Limits to an adjustment provide protections for both consumers with volatility and companies on financeability, however the approach suffers from the incentive and subjectivity drawbacks linked to thresholds.
Recommendation Ofwat & CAA	We recommend that there should be no limits for the adjustment mechanism.
3 Adjustment at what level: Cost of Debt or RoRE	
a) Cost of Debt (all)	• Avoids complexities and interactions with other price control elements to focus on the cost of debt • Leads to equal treatment of companies on debt costs • Looking at new debt only could lead to sub-optimal incentives on behaviour e.g. issuing debt at very end of price control

Question and option	Discussion
b) Cost of Debt (new)	• More straightforward to look at new debt costs only and avoid historic differences • PPP/ PFI projects have typically included refinancing sharing factors (e.g. 50/50 split); more akin to new debt although project finance example. • Relationship between benchmark and actual has changed over time, so more appropriate to look at new debt only
c) RoRE	• Idea of ex-post adjustment to debt is consistent with some analyst expectations and assumed in proposals for sharing at PR14 e.g. Pennon 'WaterShare' scheme • RoRE looks at overall returns and may be more reflective to consider this level from a financeability perspective
Decision principle	Adjustments at the RoRE level take a more holistic assessment of returns, but involve interactions e.g. totex savings may be shared twice under such a regime. A RoRE level adjustment is likely to be compatible with indexation, while a further cost of debt adjustment is unlikely with indexation.
Recommendation Ofwat & CAA	As an adjustment mechanism would be a new introduction in both sectors, we recommend that for simplicity and clarity purposes the adjustment is limited to the cost of new debt.
4 Adjustment to actual or notional levels	
a) To actual level	• Focus on direct level of debt costs observed in the sector – practical rather than independent approach • Notional adjusted level is akin to indexation that has been previously rejected by Ofwat and CAA
b) To notional adjusted level	• Better incentive properties if a companies' own debt is not used as a baseline • More simplicity and transparency to focus on a notional benchmark • There are issues with adjustment to actual level calculations due to different credit ratings and levels of gearing relative to a notional entity • Understanding actual debt costs (including bank debt and derivatives) will create a large regulatory burden and may need to spend effort in ensuring that the information provided is correct
Decision principle	Benchmarking to actual level is challenging in terms of making a consistent assessment across an industry (and reliance on a number of companies being regulated). An adjustment at the notional level would appear to be more appropriate. We do note that certain companies have regularly outperformed the cost of embedded debt assumption – following our proposals, there will be winners and losers; however we think that this is a function of having strong incentives on financial outperformance; muting these would not appear to be appropriate.

Question and option	Discussion
Recommendation Ofwat	We think that it would not be appropriate to adjust to the notional level due to the difficulties in obtaining actual costs for the industry and adjusting for different characteristics e.g. level of gearing.
Recommendation CAA	The regulatory burden of making an adjustment to actual costs is lesser in aviation than in the water sector. However, we recommend that an adjustment is made to the notional level to avoid negative incentive effects.
5 Setting the sharing factor	
a) As per efficiency incentive strength	• Removes some of the incentive to pad expenditure estimates in broader menu regulation if the regulated entity expects financing outperformance
b) Fixed level	• Reduced complexity and minimise interactions with other elements of the control if set this independently of the efficiency incentive strength • Cost of Debt menu would be complex and lacking in regulatory precedent, plus a smaller informational asymmetry exists
c) Cost of Debt menu	• Menu for new debt takes into account uncertainty and may be possible to reduce an information asymmetry
Decision principle	A Cost of Debt menu is unprecedented and is complex. In addition its use may be incomparable with totex due to different levels of control. Using the efficiency sharing strength for these adjustments provides a similar challenge for implementation for a newly introduced adjustment mechanism.
Recommendation Ofwat & CAA	In the near term a fixed level approach would appear to be the chosen option for both regulators, though a cost of debt menu or factor that interacts with the efficiency incentive strength may be interesting options for the future.
6 Timing of adjustments	
a) Periodic adjustments e.g. annual updating	• Better for financeability to reduce the size of any shortfall/ surplus through more frequent adjustments • If there is no mean reversion then this approach does not create unnecessary volatility • Making changing within period could potentially reduce the step change experienced at the end of a price control (though there are many other determinants)
b) Ex-post log up (to RAB)	• Less regulatory burden by making the adjustment at one point in time • No additional bill volatility between years occurs if make the adjustment ex-post rather than periodically • If mean reversion is likely, then would wish to choose this approach that reduces the within year 'noise'
c) Ex-post log up (revenue adjustment)	• If an ex-post adjustment is made through the RAB, this RAB becomes even less reflective of the true value of assets • Could mirror capitalisation split to partially adjust revenues

Question and option	Discussion
d) Materiality threshold	• Avoids making small adjustments that causes larger costs than the financial impact if you include a materiality threshold
Decision principle	The size of the impact on bill volatility and financeability will dictate whether a periodic adjustment or ex-post logging up are appropriate. These options appear more appropriate than a materiality threshold as it provides greater certainty and direction for company treasury. As the chance of mean reversion and amount of noise increases, the ex-post logging up becomes more preferable. If the price control length increased there would be a greater argument for periodic adjustments.
Recommendation Ofwat & CAA	Our view is that an ex-post adjustment is preferable to within period adjustments for five year price controls. Any adjustment amount can be smoothed over time to reduce bill volatility.

11.4. Summary

11.4.1. High level overview of approach

- Our proposed approach is not dependent on being above a threshold, nor limited in its magnitude e.g. cap and floor. We propose that any adjustment mechanism should be based on the cost of new debt and movements in a benchmark index. This means that the adjustment is not based on actual debt costs. The adjustment factor is proposed to be a fixed level.

11.4.2. Changes from current approach

- There is no adjustment mechanism approach used in either the water or aviation sectors at the moment. The use of this would represent a change to the current approach.

12. Adjustment Mechanisms: Indexation

Summary

In this chapter we set out choices relating to ex-post adjustment mechanisms relating to indexation, following our proposals to use a (symmetric) indexation of new debt approach with an adjustment at the end of the price control from differences in what was assumed for new debt and outturn values.

We provide further details on the merits of indexation, referencing the PR14 determination, and the likely outcomes from using different approaches. This chapter concludes Section B of our report.

Indexation is one form of adjustment mechanism where the cost of debt allowance is updated based on movements in an underlying index.[109] Ofgem have used indexation on the cost of debt for their RIIO controls, however there are a number of choices that means that this is simply one of many possible implementations of an indexation approach.

12.1. Summary of questions and options

Q1: Indexation of risk-free rate only		
Yes	No	

Q2: Indexation of debt premium only		
Yes	No	

Q3: Symmetrical indexation or not?		
Yes	No	

Q4: Timing of updating the allowance e.g. logging up		
Periodic adj	Ex-post logging up	Materiality threshold

12.2. Background and issues

Outcomes from indexation versus fixed allowance

It is important to note that where a fixed allowance represents the best estimate for the cost of debt and risks are symmetric (i.e. equal likelihood of falls and rises), the expected allowance under indexation matches that under a fixed allowance. The key difference lies in when the approaches are not equivalent. This can be justified as the regulated firm is compensated for

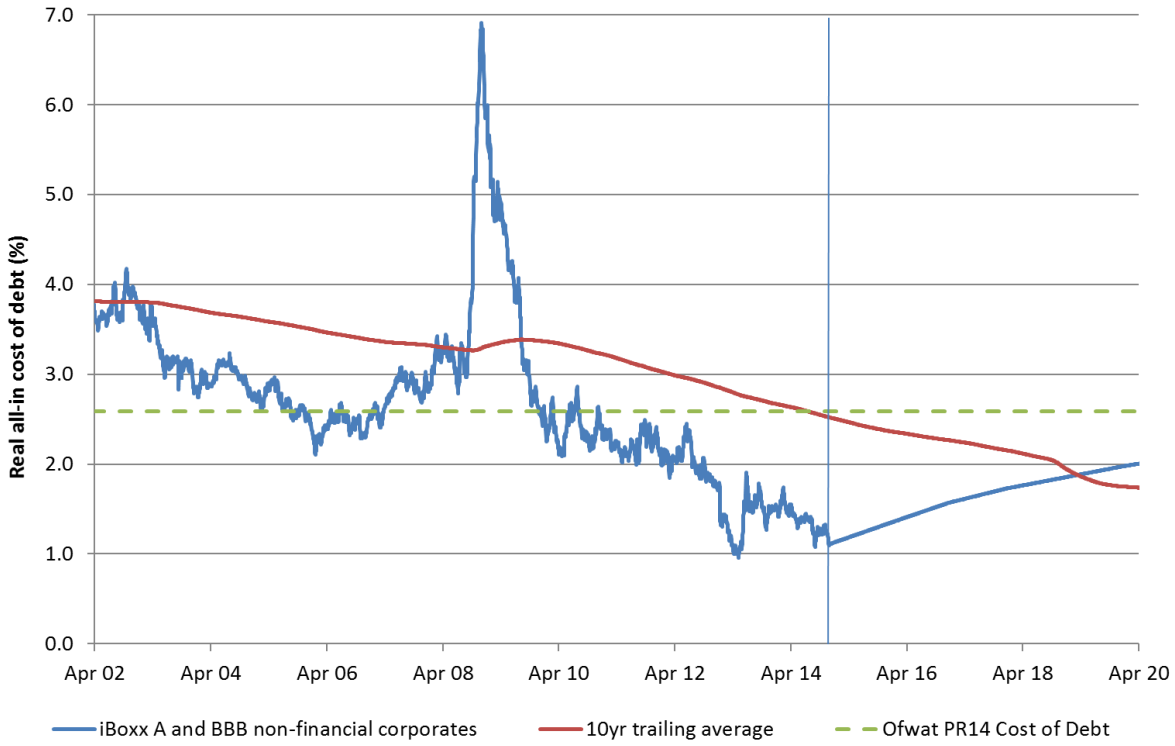
[109] Indexation also refers to the uplifting of the asset base by inflation in a price control setting, however in this setting we are referring to updating of the allowance on the cost of debt.

bearing the risk of forecasting error. This can be material and affect the financeability of a regulated entity.

We can look at PR14 for an example of a fixed approach and compare this to a model that uses indexation. The PR14 cost of debt was 2.59% real. This represented the lowest fixed allowance cost of debt that had been set by UK regulators (excluding Network Rail, a company backed by government guarantee).

The Ofgem RIIO-GD1 and T1 indexation models involved a rolling ten year average being taken for the iBoxx A and BBB rated non-financial corporate indices of 10yr+ tenor. These are consistent with what Ofwat used at PR14. We have shown forward curves that are based on ten year nominal forwards for reference, as again we want to ensure consistency with Ofwat's PR14 approach. These point to increase in yields of c.90bps over PR14. At December 2014, the chart below shows what would be expected under such an indexation model for the PR14 regulatory period.

Figure 12.1: Expected cost of debt under ten year rolling indexation model at PR14 determination



Source: Markit iBoxx, Bloomberg. Estimated based on data at 1 December 2014.

The average of the ten year rolling average over PR14, as estimated in December 2014, was 2.13% in real terms. Based on an updated estimate at 1 June 2016, the expected value over PR14 is now 2.08% real. This is 51bps below the PR14 allowance.

We do not propose the full indexation model as the correct approach, nor favour the use of a ten year trailing average. However, this difference, whether seen as compensating firms for bearing forecasting risk or noted as headroom, is observed where a fixed allowance is set. Using indexation should lead to consumers paying lower bills in the medium term.

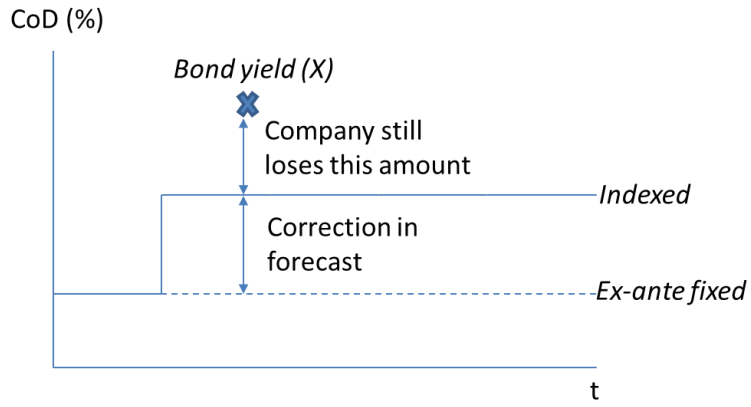
Indexation and incentivisation

Where indexation is based upon movements in a notional index, the company is still incentivised to outperform the cost of debt allowance as they bear any deviations from this in full. The company is fully incentivised to get as low a debt cost as possible whether the allowance is updated or not.

This is because the allowed revenue is independent of the level of cost. Companies will want to reduce the cost to the lowest level possible as there will not be any offsetting change in the revenue based on their actual costs.

Indexation should reduce the size of the company gains or losses; this is through a correcting of forecasting error. If forecasting was accurate then there would be no difference between a fixed allowance model and an indexation or adjustment model – as such the incentive properties are the same.

In the diagram below we illustrate the case where the benchmark cost of debt (e.g. iBoxx index) has risen by more than expected (the ex-ante fixed allowance would be the dotted blue line). Under an indexation model, the allowance is updated to reflect this movement in the notional benchmark (the solid blue line). The cross represents a company bond issue. The loss observed on that bond is smaller than it would be under the ex-ante fixed allowance. The cost is the same but the revenue has increased to reflect the change in the market. The firm would still be best off from reducing the cost to as low as possible – this is independent of revenue.



If the adjustment is based on actual debt costs, then there would be issues with incentive properties as the revenues are dependent on costs incurred, but these are not present where the approach used is based on movements in a baseline.

Indexation of risk-free rate, debt premium or all-in cost of debt

The all-in cost of debt is estimated as the risk-free rate plus the debt premium. As the risk-free rate and cost of debt is published, it is possible to estimate a debt premium.

It is possible to index the cost of debt on an all-in basis as per the Ofgem approach, but it is also possible to index one of the component parts if a regulator chooses. For example, the

cost of debt allowance may assume a constant debt premium but index the risk-free rate over time.

What can you expect regarding changes in the cost of new debt?

We do not make predictions over what will happen to the cost of debt. Commentators on financial markets (include regulators) have not predicted the declining yields observed over the last fifteen or so years (with the exception of the global financial crisis). However, past evidence may give some illustration of the potential sizes of future movements.

Analysis by Brealey and Franks (2009)[110] looked at 29 price control decisions between 1993-2009 for six different regulators in the UK, USA and Sweden. Looking at the risk-free rate, the authors find the following changes in the yield of government bonds over a five year period:

Table 12.1: Magnitude of yield changes over five-year periods

	Mean	Maximum
UK	1.33%	6.06%
USA	1.21%	7.51%
Sweden	1.31%	5.17%

Source: Brealey and Franks (2009)

The authors find that in around half of cases, the change in the risk-free rate is less than 0.5 percentage points over five years. However, in 3% of cases the change over five years exceeds 5.0 percentage points.

On the cost of debt, the analysis is limited to the USA and the time series data extends back to 1919. In a quarter of five-year periods the change in Baa rated bond yields is less than 0.5 percentage points, with 5% of the cases the yield on Baa rated bonds exceed 5.0 percentage points over a five year period.

Volatility of prices in general

Variation in prices from cost of debt indexation should be in context of other pricing impacts. A key change in prices stems from inflation indexation, with RPI currently the basis for this uplifting of revenues.

Both the CAA and Ofwat have introduced annual changes in prices in their most recent price controls. The CAA annual adjustment is based on development capex levels. For Ofwat this includes the use of output delivery incentives (ODIs).

Approach to indexation for RIIO ED1 – the 'trombone'

The 'trombone' terminology used by Ofgem for the RIIO ED1 (2015-23) determinations refers to the use of a variable trailing average period as part of their cost of debt indexation

[110] Brealey and Franks (2009) Indexation, investment and utility prices

methodology. Under the RIIO GD1 and RIIO T1 price controls that started in 2013, the trailing average had been fixed at a rolling ten year trailing average. The change was to ensure that efficient debt costs for networks were compensated – a couple of the DNOs had issued long term debt in the mid-1990s when corporate debt yields were significantly more elevated than at the outset of the RIIO ED1 price control.

Under the trombone mechanism, the length of the trailing average period extends by one year every year from an initial ten years to 20 years by 2025. This does not include Western Power Distribution Limited, who retain a simple ten year trailing average approach.

We assume that the RIIO-GD2 and T2 decisions could use a 20 year trailing average assumption.

Ability of customers to deal with volatility

When looking at the ability of customers to deal with volatility, the issue is not necessarily the same for the water and aviation sectors due to industry structure. In water, the impact on bills is direct whereas in aviation the effect on consumers is more indirect, materialising through the role of airlines.

For the Q6 determination, a user group (British Airways) were supportive of indexation of the cost of debt, noting that they have the capacity to take on changes in price from annual updating.

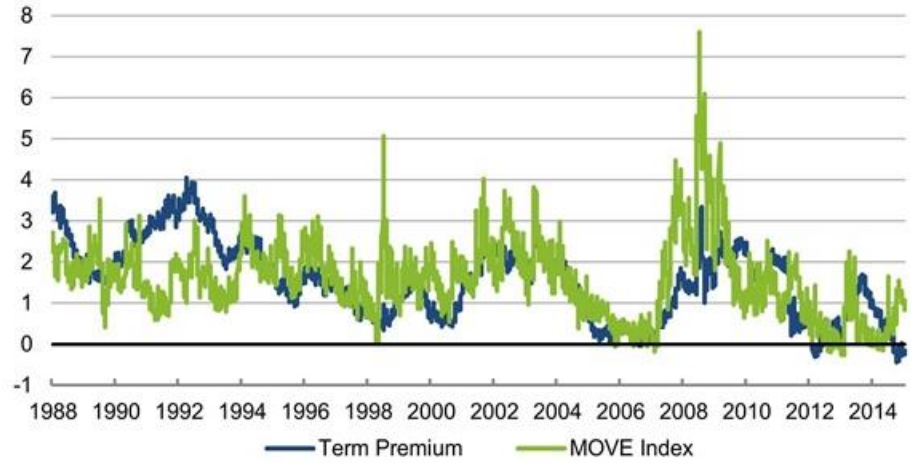
Valuation of certainty

Interest rates

The term premium corresponds to the additional return that is required to invest in longer term securities rather than short term ones. This can be seen by viewing an upwards sloping yield curve. The term premium increases with risk aversion. However there is no consensus on the appropriate method on how to capture the term premium component of yields. The figure below is based on an attempt to quantify the term premium by Ben Bernanke (albeit in a US context).[111]

[111] Bernanke (2015) Why are interest rates so low, part 4: term premium - blog on www.brookings.edu, 13 April 2015

Figure 12.2: Term premium and bond market volatility (%)[112]



Source: FRBNY, BoA MOVE Index, Brookings Institute

This is one indication of how investors value risk. This would be relevant when assessing whether customers should pay a higher fixed amount or a variable amount that is lower on average.

Inflation

The value of certainty can be seen on inflation. Similarly in a US context, Grishchenko and Huang (2012) found ten year inflation risk premium of 14-19bps over the 2004-08 period.[113]

Survey evidence

A number of surveys undertaken by regulators show that people prefer certainty. Where the expected value is the same, there is clear preference for stability rather than volatility.

[112] The MOVE index is like the VIX index in equities in illustrating bond volatility

[113] Grishchenko and Huang (2012) Inflation Risk Premium: Evidence from the TIPS market

12.3. Questions and options

Question and option	Discussion
1 Indexation of risk-free rate only	
a) Yes	• Firms have floating rate debt and indexation permits hedging of the risk-free rate • The risk-free rate is typically more volatile than the debt premium, therefore indexation of the risk-free rate only captures much of the source of any difference • The risk-free rate is not controllable by companies, but there is greater control over the debt premium level • Irish regulatory precedent from CER has in practice indexed the risk-free rate on a cost of capital basis
b) No	• The All-In Cost of Debt may not change e.g. with a fall in the risk-free rate perfectly offset by movements in the debt premium, yet this would lead to the allowance changing • The risk-free rate may be able to be hedged, so this would make it unnecessary to index • Indexing the risk-free rate for debt may necessitate a different approach in estimating the risk-free rate for the cost of equity
Decision principle	Indexation should be at the all-in cost of debt level due to the potential for the allowance to change when debt costs remain the same, unless you expect the notional company to hedge one component of the cost of debt only.
Recommendation Ofwat & CAA	We recommend that where indexation is used, it would be most appropriate to do this at the overall cost of debt level.
2 Indexation of debt premium only	
a) Yes	• Debt premium cannot be hedged, so need to include changes in the allowance when this varies • Should not lead to as much volatility as the all-in cost of debt
b) No	• Inappropriate to index one component and not another when calculated as a premium on top of that • Firms may have some degree of control over the level of the debt premium • All-In Cost of Debt may not change e.g. with fall in risk-free rate perfectly offset by movements in the debt premium, yet would lead to the allowance changing
Decision principle	Indexation should be at the all-in cost of debt level due to the potential for the allowance to change when debt costs remain the same, unless you expect the notional company to hedge one component of the cost of debt only.

Question and option	Discussion
Recommendation Ofwat & CAA	We recommend that where indexation is used, it would be most appropriate to do this at the overall cost of debt level.
3 Symmetrical indexation or not (i.e. equal treatment of rate increase and decreases)	
a) Yes	• Other sharing factors are symmetric and reflects balance of risks • An asymmetric adjustment mechanism may lead to offsetting increases in the baseline that ultimately do not benefit consumers as envisaged • At PR14, PwC, Ofwat's advisors, indicated that symmetric risk was a key principle when setting the cost of debt
b) No	• If affordability is the main concern, then a regulator may wish to apply asymmetric indexation (although there will be a trade-off with the cost of equity) • RoRE mechanisms proposed by companies for PR14 are sharing of rewards for upside returns only • There may be other mechanisms to support firms with largely decreased returns yet nothing to control excess profits
Decision principle	An asymmetry of risk may lead to unconscious increases in the baseline to compensate for the additional risks. Symmetrical adjustments would appear to be more appropriate in case where a regulator are concerned about the impact on consumers and a financing duty.
Recommendation Ofwat & CAA	We think that estimating the most accurate view of the baseline and applying symmetric treatment of rate increases and decreases is the correct principle to apply for indexation.
4 Timing of updating the allowance (indexation only)	
a) Periodic adjustment	• Better for financeability to have more regular updates for the allowance • Provides predictability for next price control • Better able to hedge if have predictable updates • Reduced bill volatility from one price control to the next
b) Logging up	• Less regulatory burden • Reduced bill volatility within a price control
c) Materiality threshold	• Avoids making small adjustments that causes larger costs than the financial impact
Decision principle	The size of the impact on bill volatility and financeability will dictate whether a periodic adjustment or ex-post logging up are appropriate. These options appear more appropriate than a materiality threshold as it provides greater certainty. As the chance of mean reversion and amount of noise increases, the ex-post logging up becomes more preferable. If the price control length increased there would be a greater argument for periodic adjustments.

Question and option	Discussion
Recommendation Ofwat	Our view is that an ex-post adjustment is preferable to within period adjustments for five year price controls. Any adjustment amount can be smoothed over time to reduce bill volatility.
Recommendation CAA	Ex-post adjustment still appears appropriate for the aviation sector – however there is both a smaller absolute and proportional impact on the cost faced by the end user, users are one-off and there are likely to be fewer concerns around smoothing, therefore annual adjustment is an appropriate alternative. This is especially true given the market power assessments and potential for the form of regulation to change for different airports.

12.4. Summary

12.4.1. High level overview of approach

- Any indexation should be at the overall cost of debt level (i.e. not risk-free rate plus debt premium) and symmetric, with no indexation applied for embedded debt.
- The timing for indexation adjustments should be an ex-post (end of price control) adjustment for a five year price control.
- There is a greater case in aviation however, with the market power assessments to use annual adjustments.

12.4.2. Changes from current approach

- There is no adjustment mechanism approach used in either the water or aviation sectors at the moment. The use of this would represent a change to the current approach.

13. RECOMMENDATIONS AND CONCLUSIONS

13.1. High-level overview of framework for the cost of debt

Our framework involves the following principles:

- **Use of notional costs and notional timing**. Costs should not be set on a pass-through basis and instead use notional indices with an adjustment. We think that there are iBoxx indices that should be representative of the notional entity once the adjustment is made. This can be crossed checked to sector costs. An exception to the timing choice would be where there is no control and regards are had to actual timing.
- **Indexation of the cost of new debt**. We propose that there is an adjustment at the end of the price control for movements in our notional benchmark over the price control period compared to what was set out at the outset. An alternative would be to make annual adjustments rather than wait until the end of the period – this is likely to be more feasible with aviation than with the water sector.
- **No benefit/cost sharing mechanism.** Given the proposed changes we do not suggest the use of an additional benefit/cost sharing mechanism: the changes to the ex-ante benchmark and the ex-post adjustment for movements in new debt should lead to a significant reduction in the size of any variation between allowed and actual. The use of a mechanism may distort behaviour and mutes incentives on firms to incur efficient debt costs. Under our approach, this revealing of information leads to customer benefits in the medium term. If the regulator can have confidence in actual costs and does not adopt these changes, a mechanism (likely with use of a deadband) could be utilised.

13.2. Methodological questions relating to deriving a benchmark

The table below provides a summary of our findings from Chapters 6-12 of the report, relating to more detailed technical questions rather than the overall framework.

Table 13.1: Description of proposed approach

Chapter	Overview of proposed approach	Difference to current approach
New and embedded debt split (6)	• Cost of debt allowance should include separate allowances for both embedded and new debt. • A simple moving average approach gives a starting point for estimating the split. • This should then be adjusted for RCV/RAB growth. • If no adjustment is made in the cost of debt allowance for different yields on	Our proposals are largely consistent with the current approach both the water and aviation sectors. At the Q6 determination, a small adjustment was made for floating rate debt - we do not think that this should be made.

Chapter	Overview of proposed approach	Difference to current approach
	floating rate debt, no adjustment should be made to the new/embedded debt split in order to be consistent.	
Forward curves and new debt (7)	• A short term (1-3 month) average of forward curves should be used to set the cost of debt. • The forward curves should be based on long-term index-linked gilts, with no adjustment made for changes between corporate and government debt costs. • The forward curves should give expectations for each year of the price control, with a weighted future average taken for the cost of new debt. • The profile for new debt cost weights should be based on the investment programme - placing more weight on later years where the asset base is growing.	The approach taken on forward curves was the same at the PR14 and Q6 determinations. Our proposals include four changes to the use of forward curves for estimating the cost of new debt: • Using real rather than nominal forward curves. • Using a 1.0x multiple between corporate and government debt yields (not 0.8x). • Using a weighted average of forward expectations (not the mid-point). • Using a weighted profile to reflect expected investment over the price control.
Trailing averages - embedded debt (8)	• A fixed trailing average should be used with debt dropping off from the trailing average for embedded debt over the price control rather than taking the trailing average for embedded debt at the start of the price control. • Where a notional approach is taken, this should reflect the debt issuance profile of a notional entity i.e. reflecting changes in capital required from asset base growth. • For the water sector, the length of the trailing average should be extended to 20 years to better match the assumed debt tenor. • The impact of a longer trailing average period will be offset by both the profiling of the trailing average and debt dropping off over the price control period.	• For embedded debt costs, we recommend that embedded debt does drop-off the trailing average. • A weighted profile for embedded debt is a further difference in approach, as both regulators had used simple averages previously. • The length of the trailing average period in the water sector should be extended to 20 years.

Chapter	Overview of proposed approach	Difference to current approach
	• In aviation, we recommend a trailing average of ten years to reflect the tenor of debt.	
Transaction costs (9)	• It is appropriate to include an allowance for issue costs for both new and embedded debt (unless costs are amortised over the price control). • We think that it is appropriate to assume that the notional entity will have some cash holdings and to compensate for these costs. • UK regulators have typically not included fees for swaps and derivatives - this depends on what the regulator assumes efficient financial behaviour from the notional entity.	Our proposals are largely consistent with the current approach both the water and aviation sectors – though we recommend that an allowance is made for cash holding costs (this is likely to be relatively small in quantum).
Treatment of inflation (10)	• The compensation for inflation in the cost of debt depends on the debt instrument considered. • For nominal rate debt, deflating nominal yields by forecast inflation would remove inflation risk. • The pricing of index-linked debt relative to nominal debt is based on historic breakeven inflation. • Firms have used nominal debt and swaps to achieve inflation exposure – the pricing will be dependent on swap implied inflation. • We recommend the use of breakeven inflation for deflating embedded debt as this provides consistency between nominal and index-linked debt. • Where CPI or CPI(H) is used instead of RPI, this should be compensated for based on the estimated wedge between the two over time.	We apply real forwards to a real cost of debt (as implied by breakeven inflation). As such, no forecast is required for inflation for the cost of debt calculation. The use of our ex-post adjustment mechanism also means that the implied inflation from this ex-ante forecast is only material in setting an interim allowance.
Adjustment mechanisms: overall level (11)	• Our proposed approach is not dependent on being above a threshold, nor limited in its magnitude e.g. cap and floor. • We propose that any adjustment mechanism should be based on the cost	There is no adjustment mechanism approach used in either the water or aviation sectors at the moment. The use of this would represent a change to the current approach.

Chapter	Overview of proposed approach	Difference to current approach
	of new debt and movements in a benchmark index. This means that the adjustment is not based on actual debt costs. • The adjustment factor is proposed to be at a fixed level should this be applied.	
Adjustment mechanisms: indexation (12)	• Any indexation should be at the overall cost of debt level and symmetric, with no indexation applied for embedded debt. • The timing for indexation adjustments should be an ex-post (end of price control) adjustment for a five year price control. • There is a greater case in aviation however, with the market power assessments, to use annual adjustments.	There is no adjustment mechanism approach used in either the water or aviation sectors at the moment. The use of this would represent a change to the current approach.

13.3. Implementing our proposed approach

Embedded debt - water

The general framework for embedded debt costs remains very similar to the current approach, as per the PR14 decision. This does not involve a mechanistic approach, as there is some flexibility to make decisions to better reflect the debt costs faced by our notional entity.

A key question will be how the size of the adjustment is set at each price control. There would be a risk that the approach is not seen as transparent if the size of the adjustment is perceived to be discretionary. Publication of the proposed approach to setting the size of this adjustment may help alleviate concerns and following regulatory best practice should be sufficient to mean this is not an issue.

Embedded debt – aviation

The proposed approach involves a greater degree of change than for water, but still relies on setting a fixed allowance for embedded debt. The main difference is the use of a notional timing assumption for embedded debt rather than relying on actual timing of issuance. We think that this is sub-optimal from incentivising the timing of debt, where there is some control of timing from the regulated entity. The change in methodology will lead to greater compatibility between the approach used by Ofwat and the CAA.

Cost of new debt – water and aviation

Our proposed change to the setting of the cost of new debt involves an ex-post adjustment based on how the outturn values of our notional benchmark index have differed from what was expected at the start of the price control. This removes forecasting risk from companies, that we think is to the benefit of both companies and consumers – the extent to which these benefits are allocated to customers will depend on other regulatory assumptions e.g. the setting of the asset beta.

How will this work in practice?

- *Step 1: Ex-ante setting of cost of new debt baseline*

As this adjustment is done ex-post, we require a forecast of the expected cost of debt. While this does not affect the overall returns from debt over the price control, it does affect the size of any adjustment required and has implications for the timing of cashflows.

This forecast of our expected cost of debt is similar to the approach currently taken by both regulators, in that the cost of new debt relies upon recent corporate debt yields and forwards on government debt. There are some changes in how we think these should be applied relative to the current approach e.g. use of different forward curves, but the general framework here remains the same.

- *Ex-post adjustment for the cost of new debt*

We are proposing an adjustment based on the difference between the actual yields from our benchmark index and the ex-ante estimate derived in step 1. This is a mechanistic adjustment based on evidence rather than requiring a discretionary review.

To calculate the principal for the cost of new debt i.e. the amount which you multiply by the cost of new debt, we multiply the expected RAB (/RCV) by the level of notional gearing, then multiply this by the proportion of new debt in the cost of debt i.e. the new/embedded debt split.

- *Alternative approach – adjustment in arrears*

Under a full indexation model, it is possible to make the adjustments in the same format at Ofgem i.e. in arrears. There is a technical issue with returns not being NPV-equivalent as applying last year's cost of debt to the current RAB, but this in itself does not preclude such an approach from being taken. We however favour the use of indexation of new debt only.

Net Present Value adjustment

When making our adjustment, this should be NPV-neutral. In order to achieve this, a question remains around whether this should be compensated at the cost of debt, cost of capital or even cost of equity. This may differ where there is an over-recovery or an under-recovery.

Our starting point would be that the cost of capital would be the correct measure as this is used elsewhere in the price control by Ofwat to make NPV-neutral adjustments, though

further analysis may be required over the appropriateness of this for both secotrs (including a legal review of terms within current licences).

This question was considered in the case of Ofcom's re-determination of disputes following BT's charges for Ethernet services.[114]

How is the ex-post adjustment made?

There are three ways in which the adjustment could be made:

- through an NPV-neutral RCV/RAB adjustment;
- through a revenue adjustment over the next price control; or
- through a blend of the two approaches.

Our view is that it would be more appropriate to come through as 'fast money' in the next price control rather than being added or subtracted from the asset base. This is better from an intergenerational equity perspective.

What happens if the expected RAB/RCV differs from actual?

The value of our cashflow adjustment for new debt is based on the expected profile over the period - we do not propose making an adjustment based on the actual profiles. As such this risk is borne by the companies. However, we understand that NPV adjustments to totex in the water sector are based on actual expenditure and so the regulator may choose to adopt a different approach.

13.4. How may this change in future?

The proposed approach is not necessarily fixed forever. While we have tried to make our approach robust to future changes in the sectors and in financial markets, the focus on the notional entity means that there may be changes in the approach to setting the allowance to better reflected expected debt costs.

We note that the decision principle is not changing, but the recommendation changes in response to the context faced by the regulator.

A change in the notional entity could lead to a change in the following items:

- Debt tenor (and length of trailing average);
- Credit rating;
- Benchmark composite index; and
- Debt types considered (including different debt denominations).

[114] http://stakeholders.ofcom.org.uk/enforcement/competition-bulletins/open-cases/all-open-cases/cw_01149/

Changes in the regulatory settlement may also be relevant considerations:

- Where the basis for uplifting the asset base changes, this will have an impact on the choice of inflation measure used to deflate nominal yields.
- Where a longer price control period is used, cashflow adjustments may be applied earlier than the end of the price control period due to financeability implications.

Debt costs are fundamentally tied to the scale of the investment programme. Changes in the investment programme will therefore have an impact on the cost of debt. We do not think that this changes our approach e.g. continuing to use a notional approach, however we may wish to profile the weights for different years more to reflect likely debt costs.

13.5. Variations on our proposed approach

Adjustment mechanisms

A key feature of our recommendation is the ex-post adjustment mechanism for new debt. Under our proposed approach, we recommend that this is a full adjustment with no triggers nor cap and floor mechanisms. However, if a regulator places more weight on one criterion that assumed, e.g. volatility, this may lead to a different application of our adjustment mechanism, either as a transitional step or as enduring policy. This would be an improvement on the current fixed allowance approach, but in our view would not be optimal.

Individual profiling

Our profiling for embedded debt uses weightings based on notional profiles of investment growth. Where a company has experienced different levels of growth (and different levels of debt growth) this may lead them to have a higher or lower cost of debt than assumed.

We would propose making this decision on an industry level, but using individual profiling may be a further alternative that could be applied.

13.6. Impact on regulated entities

Risk changes based on our proposals

Our proposals do not fundamentally change the risk profile faced by regulated water companies. The main difference is the removal of forecasting risk on new debt costs.

In aviation, airports will face more risk on the timing of investments as we propose to place more weight on notional timing for embedded debt rather than actual timing. However, there is also the removal of forecasting risk.

Companies who have outperformed or underperformed

In an ideal world, consumers would like to see companies share in outperformance, but face the full costs of any underperformance. However this asymmetry of risk creates issues around

incentivisation. We do not recommend that an adjustment is made on actual debt costs, nor that a discretionary review is imposed at the end of a price control.

In addition, the use of our ex-post adjustment mechanism using the notional benchmark for new debt means that the size of any windfall gains or losses for regulated entities should be vastly reduced,[115] as this has been a key source of outperformance.

13.7. Other considerations

Does this address the NAO and PAC comments on the water sector?

The ex-post adjustment mechanism proposed would have led to the benefits the NAO envisaged through an indexation mechanism - in effect, our adjustment mechanism can be thought of as indexation of new debt, albeit with a different timing of cashflows.

However, this mechanism can lead to paying higher charges some of the time - if the ex-ante allowance is set as accurately as possible, in theory the chance of a positive adjustment should be equal to the chance of a negative adjustment. Compared to a fixed allowance though, we would expect the approach to be beneficial overall for customers as companies should require a lower cost of capital with reduced risk.

Impact on cost of equity

The focus of our report is on the cost of debt. However, in removing forecasting risk for debt investors in regulated firms, there should be reduced risk for equity investors in terms of variability of cashflows. However, we have noted that headroom had been used in setting a fixed allowance, such that their expected return may in fact fall due to the removal of this headroom.

The cost of equity and cost of debt should be thought of together. As the CMA noted in the British Gas 2015 determination, they would have expected the cost of equity to fall to reflect the de-risking of debt costs as part of RIIO ED1. We would expect the same to be true with our recommended approach on the cost of debt.

This is an input into our assessment tables in the first part of this report - if actual rather than notional timing was used for companies, this reduces risk on regulated companies and so we would expect to see a lower equity beta relative to where a notional approach is used.

[115] Measured using ex-ante forecasts for an index and ex-post outturn values.

14. New Runway Capacity and the Cost of Debt

14.1. Introduction

We have set out recommendations for setting the cost of debt under price control regulation with decision principles used to ensure that our approach is appropriate in future scenarios. In our view, the recommendations are compatible with integrating the development of new runway capacity in price control determinations, if the CAA choose to use such a framework.[116]

We note that if project finance is assumed (i.e. a non-recourse financial structure whereby the project revenues and costs relate to a financing vehicle for the project alone), this leads to a very different answer to that if corporate finance is used. This is because project finance is tied to a single vehicle, with debt locked in at the outset. Regulatory finance involves ongoing financing and so the structure for setting the cost of debt has to make more assumptions than in the project finance case. Examples in Annex H provide details on the use of project finance settlements in regulatory and commercial decisions.

In our recommendations we proposed that an adjustment mechanism should be used and that our preferred option was to index the cost of new debt only based on movements for a notional benchmark (in the case of airports, the iBoxx GBP non-financial corporate 10-15yr A and BBB rated indices). For airports, there exists a greater case for using full indexation than in the water sector due to different impacts on charges and regulatory objectives.

The CAA framework for capex involves a pass through of actual capex costs (subject to governance arrangements) as it is seen to be more difficult to estimate capex and the timing of this capex, especially given the absence of other industry comparators. The approach has also tended to be less intrusive and there are moves towards a lighter touch regulatory model.

We noted that new capacity expansion was likely to lead to a regulated airport having very limited control over timing due to the scale of the investment programme and that it was not necessary to assume a simple average for issuance where a weighted average may be more representative of expected and actual timing.

In this chapter we include illustrative modelling on five different approaches to the cost of debt:

- Fixed allowance;
- Indexing new debt with expected timing;
- Indexing new debt with actual timing;
- Full indexation with expected timing; and
- Full indexation with actual timing.

[116] Rather than a competitive tendering model or separate treatment of this investment.

The timing differences relate to whether the adjustment takes into account what was expected at the time of the determination or what happened in terms of when debt was issued. For example, an expectation could be that debt is issued in equal amounts each year as this represents the best estimate of the regulator at the time. However, it may be that in practice the additional debt is back-loaded; use of actual timing would take into account this profiling and place greater weight on debt costs in these years. Such an approach reduces risk on companies from timing choices.

14.2. Understanding the impact of our choices

Methodology

We set out the assumptions underlying our impact modelling in this chapter.

- Outstanding debt: we assume that a regulated airport has £100 of outstanding debt at the start of the price control, made up of £10 of debt issued each year across the previous ten years. The embedded debt cost at the start of the period is 5.26%, based on a ten year trailing average of the iBoxx non-financial corporate A and BBB rated 10-15yr indices (a simple average yield from the two indices).[117]
- Debt tenor: both existing debt and new debt has a ten year tenor.
- Refinancing: any maturing debt is refinanced with new debt.
- Requirement for new debt: if no new additional debt is required, there is the need to refinance the maturing debt – some of our cases assume no additional debt is required, while others do include this.
- Actual cost of debt: the costs faced by the regulated airport are assumed to be equal to the values of the iBoxx benchmark index referenced above, with no underperformance or outperformance.
- Expected future movements in rates: we assume that forward rates indicate that yields are expected to remain at current levels (3.58% - the average of the iBoxx benchmark index for 2015) going forward.
- Actual future movements in rates: rates do not necessarily match what was expected – where this differs, we include a statement of this.
- Allowed cost of debt: under a fixed allowance, there is no headroom included. With indexation of new debt only, we assume that an adjustment is made at the time, however it may be that the adjustment is made at the end of a price control period rather than annually.

[117] We use annual average yields within calendar years for the purpose of this analysis.

- Time horizon: we focus on a five year time horizon initially, but extend this to ten years in our final case to show how it may operate over multiple price controls.
- Data tables: the first two rows show the quantum of new debt that is expected (in GBP), while the last two rows show the cost of debt (derived from our index) in those years (in %).
- Asset base: this starts at £15bn in our indicative modelling. This increases in proportion to the new debt amount – for example, where there is £10 of new debt issued (relative to £100 in the counterfactual), the asset base is assumed to have increased by 10% (i.e. an additional £1.5bn in this case). The figure we used for our modelling is shown in the bottom line of the data table.
- Monetised impact: we provide a simplified illustration of the financial impact of different choices on the cost of debt over the overall life of our modelling, based on the asset base multiplied by an assumed 60% gearing multiplied by the cost of debt in each case. We have rounded the results to the nearest £10m. These are illustrative figures and do not represent the outturn scenario with new capacity expansion, but provide an indication of the approximate scale of such decisions.

Changes in market rates - baseline

Case 1: Status Quo

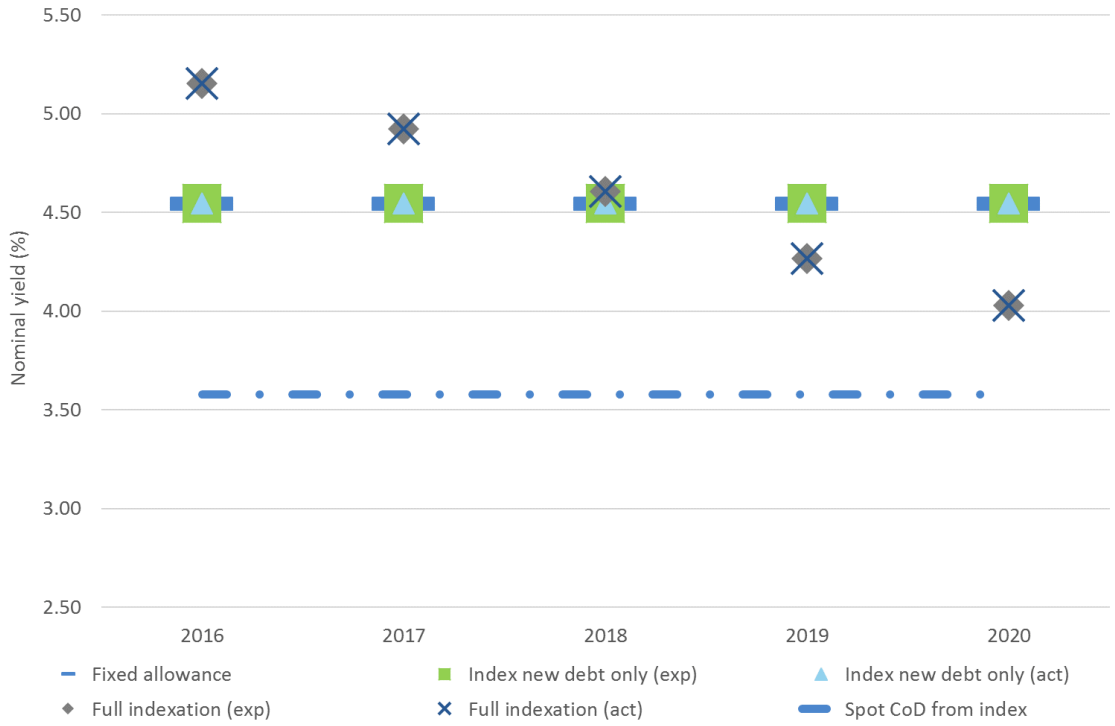
Table 14.1: Assumptions for Case 1

	2016	2017	2018	2019	2020
New debt – expected	0	0	0	0	0
New debt – actual	0	0	0	0	0
Spot CoD from index – expected	3.58	3.58	3.58	3.58	3.58
Spot CoD from index – actual	3.58	3.58	3.58	3.58	3.58
Asset base (GBPm)	15,000	15,000	15,000	15,000	15,000

In the chart, we show how the allowed cost of debt would be set under different approaches for a five year price control where the profile of debt and debt costs match what was expected. The actual cost of debt in each year for the company under this analysis is equivalent to the figure produced by the full indexation model using actual timings.

The base case has an allowance that is going to be equivalent to the actual cost of debt in our modelling as the expected cost of debt and the expected volume match the actual values.

Figure 14.1: Case 1 modelling results



Unsurprisingly, where amounts and costs of debt are as expected, the models end up being equivalent under our modelling. In practice, we might expect to see a fixed allowance include a degree of headroom, taking this above indexation of new debt only. Full indexation is more profiled and does reflect the actual cost of debt of the company in each year.

Table 14.2: Indicative monetary impact – Case 1

Methodology	Debt return over period (GBPm)
Fixed allowance	2050
Index new debt only (expected weight)	2050
Index new debt only (outturn weight)	2050
Index all debt (expected weight)	2070
Index all debt (actual weight)	2070

In this case, there is a relatively minor difference in our results between cases. The slightly higher cost from indexation of all debt may be a function of timing assumptions in our calculation rather than any inherent difference.

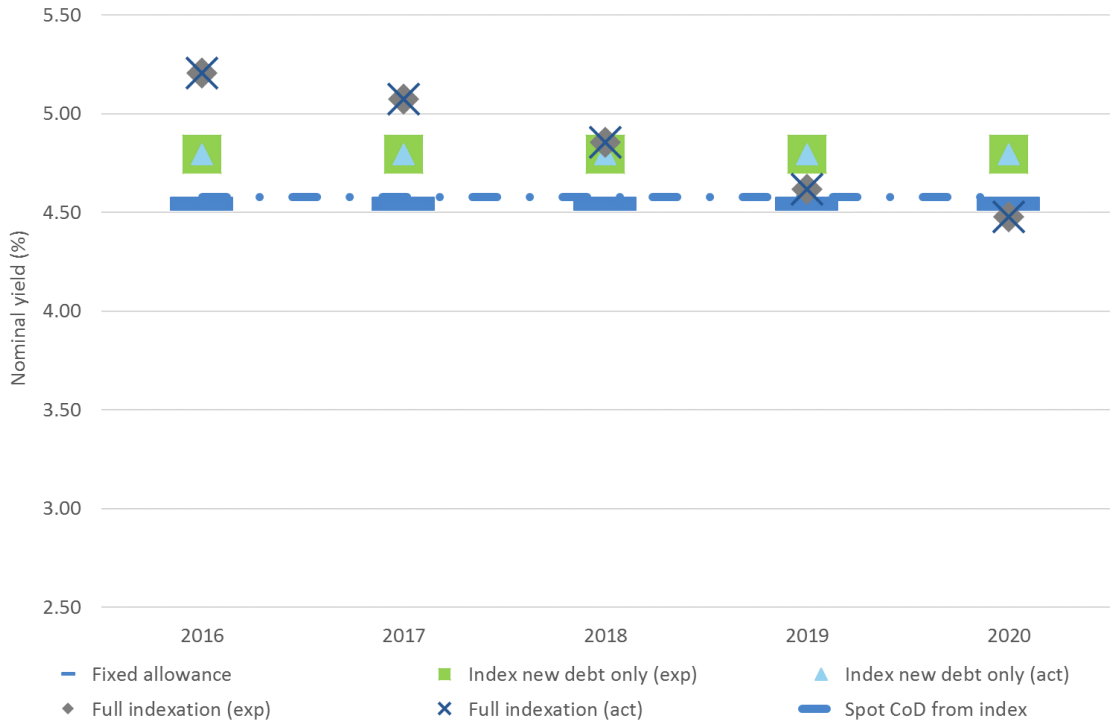
Case 2: Step up in rates (+100bps)

Table 14.3: Assumptions for Case 2

	2016	2017	2018	2019	2020
New debt – expected	0	0	0	0	0
New debt – actual	0	0	0	0	0

	2016	2017	2018	2019	2020
Spot CoD from index – expected	3.58	3.58	3.58	3.58	3.58
Spot CoD from index – actual	4.58	4.58	4.58	4.58	4.58
Asset base (GBPm)	15,000	15,000	15,000	15,000	15,000

Figure 14.2: Case 2 modelling results



In this case, rates have stepped up immediately. Use of a fixed allowance approach at the time of the determination would lead to a lower cost of debt than under approaches that adjust for outturn values.

Table 14.4: Indicative monetary impact – Case 2

Methodology	Debt return over period (GBPm)
Fixed allowance	2050
Index new debt only (expected weight)	2160
Index new debt only (outturn weight)	2160
Index all debt (expected weight)	2180
Index all debt (actual weight)	2180

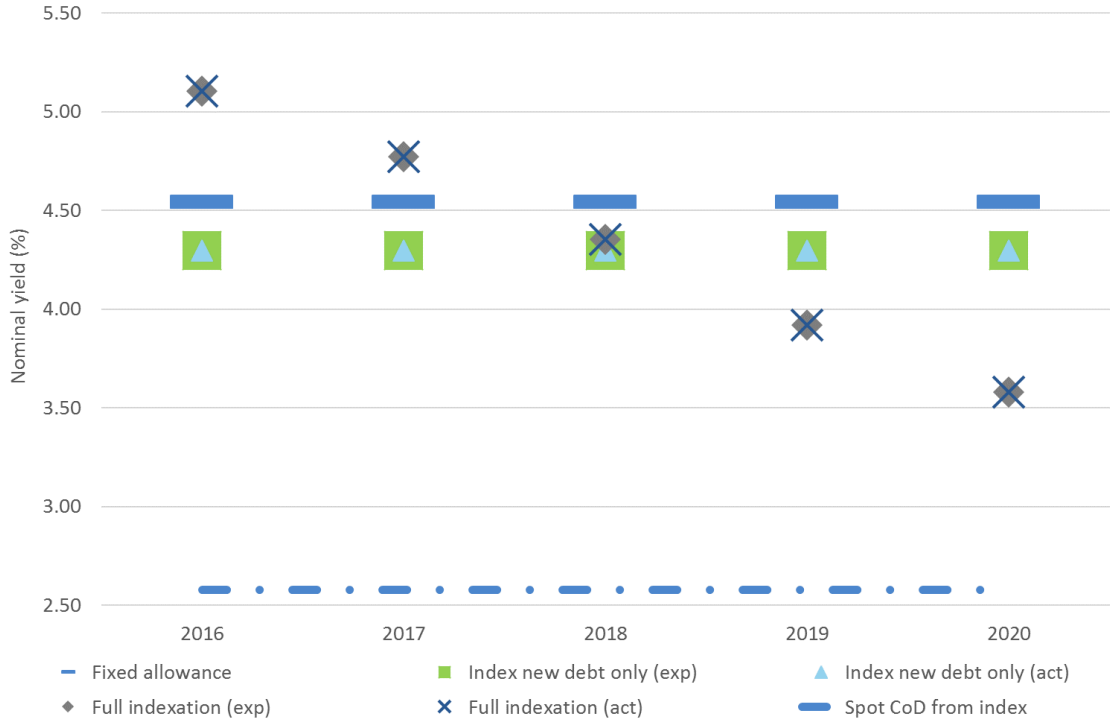
A fixed allowance where rates rise would give a shortfall in the allowance of c.£130m over the five-year period on the debt return.

Case 3: Step down in rates (-100bps)

Table 14.5: Assumptions for Case 3

	2016	2017	2018	2019	2020
New debt – expected	0	0	0	0	0
New debt – actual	0	0	0	0	0
Spot CoD from index – expected	3.58	3.58	3.58	3.58	3.58
Spot CoD from index – actual	2.58	2.58	2.58	2.58	2.58
Asset base (GBPm)	15,000	15,000	15,000	15,000	15,000

Figure 14.3: Case 3 modelling results



In this case, the opposite applies relative to Case 2. As rates have fallen over time, the full indexation approach falls c.150bps in the time period. This does lead to more volatility between years than a fixed approach, however there would be less of a one-off change between price controls.

Table 14.6: Indicative monetary impact – Case 3

Methodology	Debt return over period (GBPm)
Fixed allowance	2050
Index new debt only (expected weight)	1930
Index new debt only (outturn weight)	1930
Index all debt (expected weight)	1960
Index all debt (actual weight)	1960

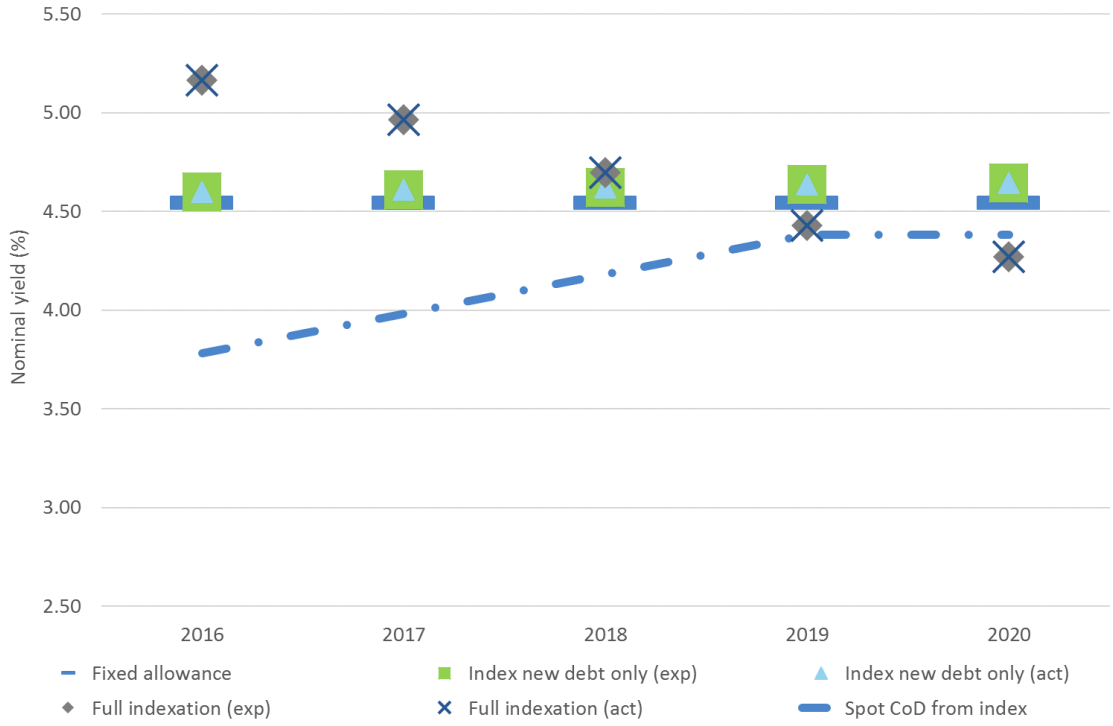
In the case of rates falling, a fixed allowance would overcompensate the regulated company by c.£90m over five years.

Case 4: Steady rise in rates (+20bps p.a.)

Table 14.7: Assumptions for Case 4

	2016	2017	2018	2019	2020
New debt – expected	0	0	0	0	0
New debt – actual	0	0	0	0	0
Spot CoD from index – expected	3.58	3.58	3.58	3.58	3.58
Spot CoD from index – actual	3.78	3.98	4.18	4.38	4.58
Asset base (GBPm)	15,000	15,000	15,000	15,000	15,000

Figure 14.4: Case 4 modelling results



As rates have risen above expected, adjustment mechanism approaches lead to a higher cost of debt. This happens more gradually than the step change case in Case 1. In this case, a fixed allowance approach leaves the notional entity with a shortfall of revenue to cover its debt payments.

Table 14.8: Indicative monetary impact – Case 4

Methodology	Debt return over period (GBPm)
Fixed allowance	2050
Index new debt only (expected weight)	2080

Methodology	Debt return over period (GBPm)
Index new debt only (outturn weight)	2080
Index all debt (expected weight)	2120
Index all debt (actual weight)	2120

As with Case 2, a fixed allowance leads to a shortfall when rates have risen more than expected. In this case, the magnitude is less than Case 2 as the rise has been slower.

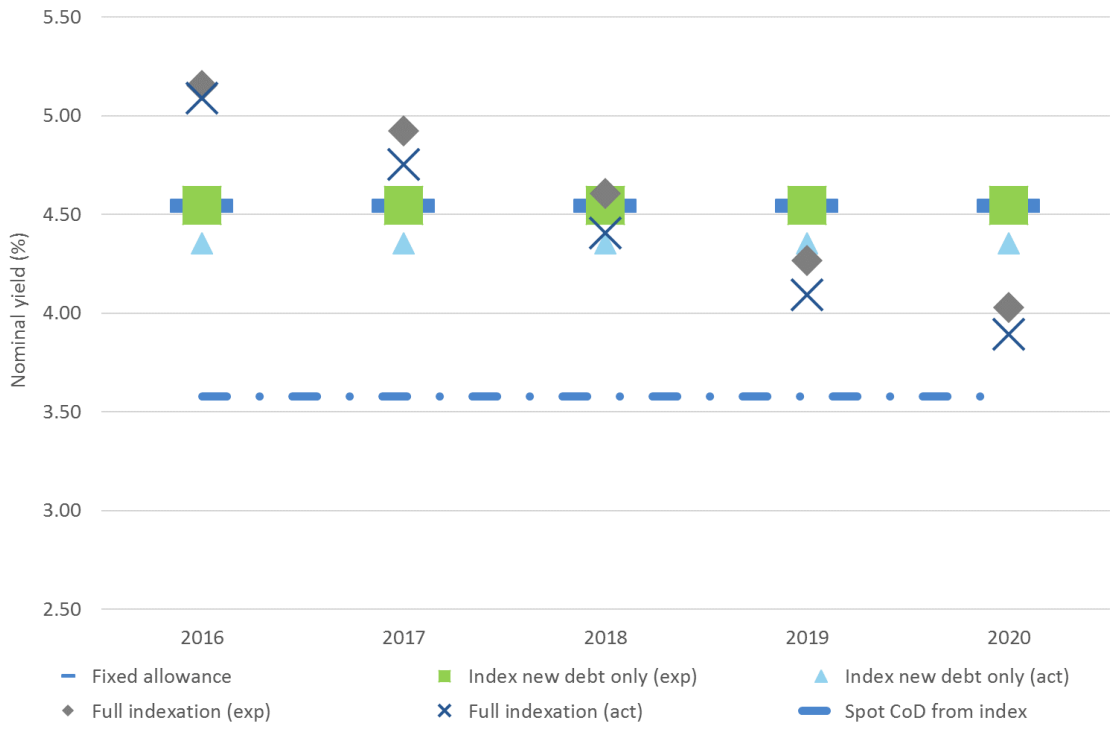
Changes in capex – baseline

Case 5: Additional capex

Table 14.9: Assumptions for Case 5

	2016	2017	2018	2019	2020
New debt – expected	0	0	0	0	0
New debt – actual	10	10	10	10	10
Spot CoD from index – expected	3.58	3.58	3.58	3.58	3.58
Spot CoD from index – actual	3.58	3.58	3.58	3.58	3.58
Asset base (GBPm)	16,500	18,000	19,500	21,000	22,5000

Figure 14.5: Case 5 modelling results



Note: the fixed allowance is equivalent to the indexation of new debt only (expected) line.

In this case, we have kept rates constant to demonstrate the impact of different volumes. More debt is issued each year than was expected and greater weight placed on years with

rates below the trailing average lead to a decrease in the allowed cost of debt when taking account of actual volumes. With a pass-through of actual capex in aviation, the airport is incentivised to indicate a lower future investment programme to place more weight on higher cost embedded debt. However, this is offset by other considerations should the cost be much higher than expected.

Table 14.10: Indicative monetary impact – Case 5

Methodology	Debt return over period (GBPm)
Fixed allowance	2660
Index new debt only (expected weight)	2660
Index new debt only (outturn weight)	2550
Index all debt (expected weight)	2660
Index all debt (actual weight)	2570

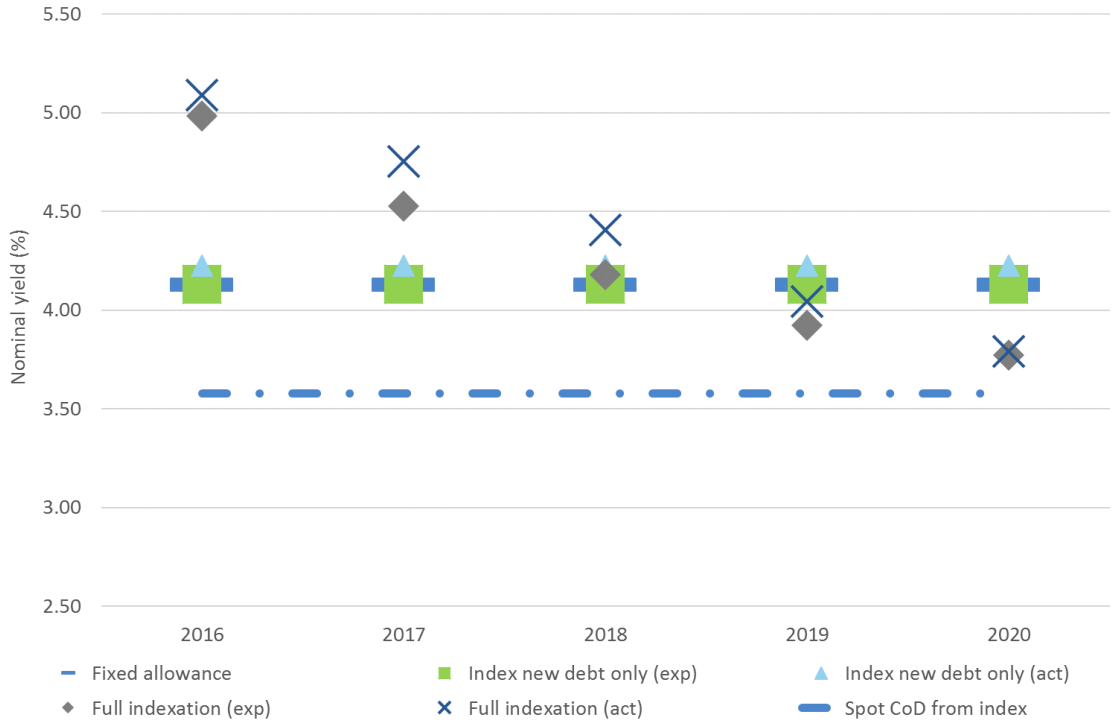
The difference in returns stems from differences in expected weightings. In our modelling, we assume that the RAB is based on actual additions rather than expected. As more debt has been added (at lower rates than embedded debt), this brings the required return down. Where this is not accounted for (i.e. using expected weights), there will be over-recovery in this case.

Case 6: Different capex timing

Table 14.11: Assumptions for Case 6

	2016	2017	2018	2019	2020
New debt – expected	30	30	30	30	30
New debt – actual	10	10	10	60	60
Spot CoD from index – expected	3.58	3.58	3.58	3.58	3.58
Spot CoD from index – actual	3.58	3.58	3.58	3.58	3.58
Asset base (GBPm)	16,500	18,000	19,5000	28,500	37,500

Figure 14.6: Case 6 modelling results



In this case, the total new debt issued remains the same but it is more backloaded. Given the timing delay (and rates remaining constant), in the absence of an adjustment mechanism, the allowed cost of debt would not sufficiently compensate firms. As the cost of new debt is as expected, indexation of new debt only using expected investment and a fixed allowance approach give equivalent cost of debt allowances under this modelling.

Table 14.12: Indicative monetary impact – Case 6

Methodology	Debt return over period (GBPm)
Fixed allowance	2970
Index new debt only (expected weight)	2970
Index new debt only (outturn weight)	3040
Index all debt (expected weight)	2990
Index all debt (actual weight)	3080

The profile of capex has changed and this leads to higher actual costs in this case. The final line represents the companies' actual costs and so a fixed allowance leads to a shortfall of c.£110m.

Combined changes

In our first six cases, we have focussed on individual changes, either in the quantum of debt issued or the costs for this. This is to demonstrate the impacts. However, in practice it is likely that these will not be perfect for either quantum or cost. In this case, we provide an extreme case to illustrate a potential impact from combined changes.

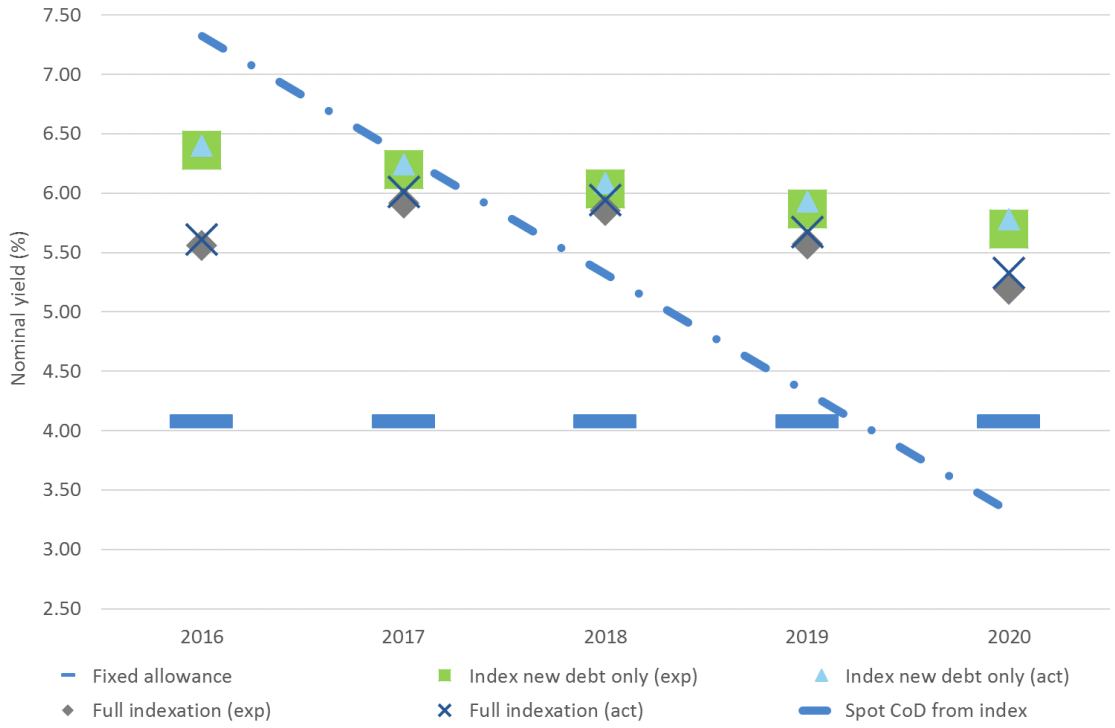
Case 7: Extreme case

Table 14.13: Assumptions for Case 7

	2016	2017	2018	2019	2020
New debt – expected	30	35	40	45	50
New debt – actual	40	40	40	40	40
Spot CoD from index – expected	3.58	3.58	3.58	3.58	3.58
Spot CoD from index – actual	7.32	6.32	5.32	4.32	3.32
Asset base (GBPm)	21,000	27,000	33,000	39,000	45,000

Note: the 7.32% represents the figure in 2008 to demonstrate a possible high debt cost scenario.

Figure 14.7: Case 7 modelling results



We have shown what would happen when there is a large investment programme and rates have changed.

Table 14.14: Indicative monetary impact – Case 7

Methodology	Debt return over period (GBPm)
Fixed allowance	4040
Index new debt only (expected weight)	5910
Index new debt only (outturn weight)	5970
Index all debt (expected weight)	5520
Index all debt (actual weight)	5620

This is a more extreme example, however, with a very large capex programme the debt return under a fixed allowance is significantly below what would be required (over £1.5bn difference).

14.3. Compatibility with other approaches

We have modelled the impact on allowed debt costs for a five year price control, however it is possible to utilise a longer time period. We use a ten year period to illustrate how this could work, however the principle would hold for extending the debt index, for example to 20 years – we compare this to a regulatory allowance set for two separate price controls.

Case 8: Ten year model

Table 14.15: Assumptions for Case 8

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
New debt – expected	0	10	20	30	40	40	40	30	20	10
New debt – actual	0	10	20	30	40	40	40	30	20	10
Spot CoD from index – expected	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
Spot CoD from index – actual	3.78	3.98	4.18	3.98	3.78	3.58	3.38	3.18	3.38	3.58
Asset base (GBPm)	15,000	16,500	19,500	24,000	30,000	36,000	42,000	46,500	49,500	51,000

Figure 14.8: Case 8 modelling results

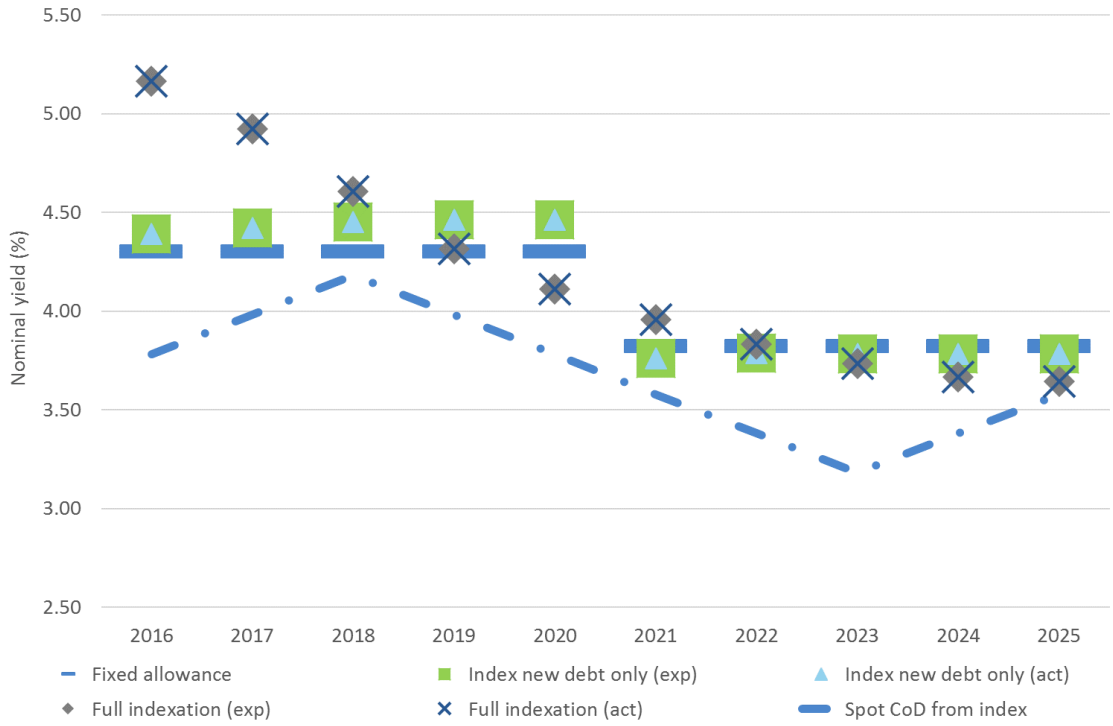


Table 14.16: Indicative monetary impact – Case 7

Methodology	Debt return over period (GBPm)
Fixed allowance	7870
Index new debt only (expected weight)	7900
Index new debt only (outturn weight)	7900
Index all debt (expected weight)	7920
Index all debt (actual weight)	7920

In this case, where rates are on average as expected, and debt additions match what is expected there are relatively small differences (£5m p.a.) between a fixed allowance and actual debt costs.

14.4. Implications

With respect to a new runway, this analysis highlights a number of issues:

- If a fixed allowance approach is used and rates move as expected, the allowed cost of debt under both approaches is the same (we have assumed no aiming up in our modelling), as per Case 1.
- Where rates do not move in line with expectations, this leads to differences in these approaches – where rates are higher than expected, indexing new debt supports financeability of the regulated airport, but leads to customers paying more, as per Cases 2-4.

- Where the level of capex differs from expected, this can lead to material differences between the allowed and actual cost of debt, as per Case 5. Even where the overall level of investment over a price control remains equivalent, the profile of timing can lead to significant differences where the size of the investment programme is relatively large, as per Case 6.
- An extreme case would create financeability issues (if limited to debt revenues) for our notional entity if a fixed approach were to be used, as per Case 7.
- A full indexation approach does lead to annual changes in the cost of debt that looks unnecessary when considering a single price control. However, should the CAA wish to move to a longer price control or commit to an approach over the longer term, the full indexation approach avoids step changes between price periods.

14.5. Recommendations

It is even more important with new capacity expansion and very large investment programmes that an adjustment mechanism is introduced. If the form of regulation is a price control as at present, we believe that indexation of new debt or full indexation options are improvements on a fixed allowance.

In terms of profiling, with significant investment that varies over time, a simple average is not appropriate. We would recommend that weights are based on issuance or changes in asset base growth. Precedent for this comes from the RIIO T1 price control and the bespoke weightings used by Ofgem in the cost of debt indexation model used for SHETL, where the network had a very large investment programme relative to their asset base (£4.0bn of capex over eight years against a starting RAB of £681m (2009/10 prices)).

This removes incentives on timing, but for a project of this size, we would expect that control on timing would be limited and so it would not be detrimental to adopt such an approach. We think this delivers benefits to customers as regulators do not need to compensate firms for this risk – which would be high with investment of the scale of a runway – and could reflect the reduced risk in the cost of equity. From a company perspective, the approach is more robust to changes in financial markets and should support financeability.

Application

Should the CAA wish to adopt a full indexation approach, to adjust for timing of debt issuance and the cost of new debt may introduce complexity given the current regulatory framework.This is because the asset base is not subject to an annual reconciliation, as is the case for the Ofgem cost of debt indexation model.

As the CAA does not have this, it could be that annual adjustments cover movements in rates using an expected profile, with a true-up at the end of the regulatory period to take into account differences between actual and expected profiles. An alternative approach could be

to make the adjustment to the asset base rather than through adjusting revenues. If the CAA introduced annual reconcilitions then there would be greater flexibility possible with the application of adjustment mechanisms on the cost of debt.

ANNEXES

Additional information

- In this section, we provide detailed analysis that we link back to in the main body of the report.
- The annexes cover:
  - Understanding corporate treasury (Annex A)
  - Developments in financial markets (Annex B)
  - History of regulation in water and aviation (Annex C)
  - Does one size fit all (Annex D)
  - Modelling allowances and outturn (Annex E)
  - Assessment criteria (Annex F)
  - Current approach to setting the cost of debt in the water and aviation sectors (Annex G)
  - Other regulators' approaches to setting the cost of debt (Annex H)
  - What makes a good benchmark index (Annex I)

ANNEX A WHAT CAN CORPORATE TREASURY CONTROL?

Introduction

As noted in the main report, an important consideration is that of controllability. Controllability includes the cost itself and the risks around the cost. In principle, incentives should only be created for those costs where companies have a sufficient degree of control for the incentive to be meaningful. Even if controllability does not exist that does not necessarily mean that the company should not take some risk associated with the costs – that is a separate question linked to risk allocation and which stakeholder is best placed to handle the risk.

When thinking about controllability there are several aspects that need to be considered. When determining if the cost of debt is controllable an evaluation of the following is needed:

- Timing – how much control over when the debt is issued does the company have?
- Size – how much choice over the amount of debt being raised does the company have?
- Form – what type of debt is being raised?
- Cost – how much control over the cost of debt being raised does the company have?

Many of these questions are linked to the choice between debt and equity and how companies use these two forms of finance.

Answering these questions can be done in a variety of ways. In this annex we consider evidence from a range of perspectives.

Structure

This annex supports the discussion within the main report on to what extent companies are exposed to risks under different regulatory approaches to the cost of debt. As noted, it is not purely the cost level that company treasurers consider; it is the risk around that cost. We consider the issue of controllability and risk allocation from four different perspectives:

- Background and concepts
    - What is hedging?
- A Regulatory Perspective
    - What is the notional company?
    - Evaluating risk allocation
    - Risk allocation within other price control elements
    - Risk allocation in non-regulated sectors
- A Company Perspective: theory

- How to hedge a real spot rate
- How to hedge a price control
- Debt issuance and hedging strategies for regulated utilities
- Regulatory precedent timescales

- A Company Perspective: in practice
  - Why might firms not undertake hedges?
  - Why might firms err from 100% index-linked debt?
  - Why do some firms prefer swaps to index-linked debt?
  - Examples of regulated company activities

A.1. BACKGROUND

A.1.1. What is hedging?

Before we go into detail on controllability and manageability of risk, it is important to set out what is being referred to when hedging is discussed. This has two elements:

- financial hedging; and
- economic hedging.

In addition it may be useful to distinguish between perfect and imperfect hedging. Perfect hedging removes all risk whereas imperfect hedging leads to partial risk mitigation.

Financial hedging

Financial hedging corresponds to the use of financial instruments to guard against risk. In a cost of debt sense, the hedge will generally correspond to certain cashflow/ revenue streams. The value of financial derivatives, such as future contracts, forward contracts, options and swaps, are derived from the value of some underlying asset. Parties with opposing objectives and market expectations will form counterparties to the derivate contract that pays out based on a pre-specified movement in the value of the underlying asset over a given period of time. In this way, derivatives can remove certain risk exposures that companies face to underlying asset movements, i.e. inflation, interest rates, or currencies.

A swap involves the exchange of one stream of payments for another and could be of the following form, among others:

- Interest rate swap.
- Currency swap.
- Inflation swaps.

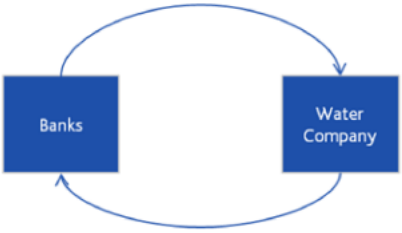
There are transaction costs associated with these swaps and other issues that we discuss later within the annex.

An example of the functioning of an inflation swap is shown in the diagram below.[118]

Inflation-Linked Swaps with fixed rate receiving legs - highly sensitive to short-dated end of the inflation curve

Fixed leg:

The company recieves a fixed (nominal) interest rate from the bank



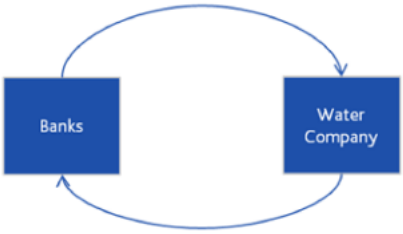
Inflation leg:

The water company pays a fixed (real) interest rate on the RPI increasing notional + the accretion amount either in instalments or at maturity.

Inflation-Linked Swaps with floating rate receiving legs - highly sensitive to shift in interest rate and short-dated end of the inflation curve

Floating leg:

The company recieves a floating interest rate (e.g. LIBOR 6M) + a margin from the bank



Inflation leg:

The water company pays a fixed (real) interest rate on the RPI increasing notional + the accretion amount either in instalments or at maturity.

Source: Moody's

Economic hedging

Economic hedging is a broader concept whereby uncertainty of a revenue stream can be removed. For example, where a fixed allowance is set there is a certain revenue stream.

[118] Moodys (2015) Yorkshire Water: Issuer in depth report, 13 April 2015

A.2. A REGULATORY PERSPECTIVE

A.2.1. Evaluating risk allocation

Understanding the level of risk

The first stage in reviewing risk is to understand the risk itself:

- What is the impact of the risk?
- What are the size of those risks?
- Are there interdependencies to other risks?

Impact of the risk

In terms of the cost of debt, the risk we are focused on is the change in market rates, only to the extent that this impacts on costs faced by consumers or companies. Market rates will be changing all the time and any company will have interest rate and other hedging policies that will try to manage the risk as much as possible for the company.

Size of the risk

An example of the size of the impact is contained in the PAC analysis of PR09 in the water sector, finding a c.£170m average annual impact of market movements in the cost of debt. Indexation would have involved customers paying companies £170m p.a. less, but the potential size does not have a limit.

Interdependencies to other risks

The cost of debt risk extends to shareholders as debt is recovered first in the case of default. If there is greater risk that companies will be unable to meet their debt obligations, this implies greater risk for equity investors (who in turn will demand a higher return).

Managing and mitigating risks

The second stage is to look to minimise or mitigate against those risks, such that the overall outcome is optimal. An example in a regulatory setting is biddable indexation, as introduced by Ofgem for the Offshore Transmission Owner (OFTO) regime. The OFTO regime relates to the competitive tendering of transmission assets linking offshore wind farms with the onshore network.

Biddable indexation allows the bidder to choose the proportion of revenues that are linked to RPI inflation. The inflation assumption used to compare the tenders for the third tender round (TR3) was ten year breakeven inflation.

The premise is that by making a regulatory policy choice, there can be better overall outcomes for consumers and suppliers. This is achieved by making a better match between revenues and costs such that (welfare reducing) transaction costs do not need to be incurred for the use of financial derivatives. Financing costs represent a significant proportion of the

underlying cost base in a highly geared structure, so the type of debt has implications for matching the costs and benefits.

Similar issues have been discussed in considering longer price control periods, with the analysis around the length of regulatory period looking to achieve the greatest benefit overall.

Allocating risks

Once these stages have been completed, it is appropriate to look at allocating those risks resulting from a regulatory determination. There are decision parameters that can guide us on whether risks should be retained by the public sector or transferred to the private entity. These are:

- can we control the risk better ourselves?
- is it cost effective to transfer the risk to others?
- is the likely outcome material?

We cover these points within this annex.

Regulatory considerations

As with many of our questions in the main report, the answer to the views on risk allocation may depend on the regulatory objectives. For example, if there is a financing duty, there may be a greater concern around risks placed on the regulated entity compared to one that is solely consumer-centric.

The financial derivatives we discuss within this annex can be complex and may reduce transparency in the sector.

A.2.2. Risk allocation within price control elements

Inflation (RPI) indexation

An argument raised in a paper by Brealey and Franks (2009) references that output prices are uplifted by inflation. Variations in wage costs and some materials costs is seen to justify this linkage, given that these costs are out of the control of the regulated supplier. However, how does controllability of wage costs differ to interest rate costs?

Incentive strength on totex

A further example from price controls is on totex (or capex and opex components). Where an ex-ante allowance is set, the incentive strength faced by the regulated entity is typically less than 100%.

The reason why this is the case may reflect issues around controllability, but can also reflect the uncertainty around setting the baseline. Where there is less certainty around the baseline,

there typically is a reduced incentive strength set to try to avoid companies having windfall gains and losses.

With cost of debt indexation, firms still bear deviations to the index, however the updating may be thought of as ongoing corrections to the baseline to facilitate the high powered incentive strength on debt costs.

Pass-through items

Certain items e.g. business rates and licence fees, have tended to be treated as cost pass-through by regulators as the company has no control and thus there is no benefit from incentivising them to act in a certain way.

A.2.3. Risk allocation in non-regulated sectors

Diversified and non-diversified risk

One argument put forward on risk allocation is that investors in a company typically have a diversified portfolio and thus are not exposed to systemic risk, whereas consumers may be considered to be undiversified and are thus more exposed to movements in rates.

Elasticity of demand

The purpose of regulation is to mimic outcomes in competitive markets. When considering risk allocation, a comparison to non-regulated sectors may be useful for this purpose. The extent to which consumers bear changes in costs will depend on the pricing behaviour of the entity, which a notional efficient entity would base on the price elasticity of demand. The price elasticity of demand for certain regulated goods would be very low due to their essential nature. To what extent should we take this into account?

A.3. A COMPANY PERSPECTIVE: IN THEORY

A.3.1. How to hedge a real spot rate

There are three main ways in which a company can hedge a real spot rate:

- Issue floating rate debt; or
- Issue an index-linked bond; or
- Issue a bond with a nominal coupon (and interest rate swap).

Issuing floating rate debt might be considered to be not hedging at all. However, there is a relationship between nominal rates and inflation, and generally rates are higher when inflation is higher, so this approach will provide a natural hedge. Given that normally the yield curve slopes upwards and due to the inverse relationship between yields and bond prices, floating rate bonds protect the investor from future rate increases, and shift the burden to the issuer. This means that the yield on the bond will be cheaper for the company, albeit with a high degree of risk associated with moves in real interest rates.

The second option is to issue an index-linked bond. Standard terms normally involve a fixed nominal coupon, with the principal part of the bond increased in line with the increase in the RPI. Sterling index-linked bond issuance in recent years has been dominated by the UK government, along with utilities and banks, with £281.3bn bonds issued over the 10 years to end 2015 remaining outstanding.

The third option is to issue a nominal bond, and at the same time to enter into a swap agreement. Inflation swaps are typically “zero coupon” based on a notional principal amount. This means that no cash flows are exchanged between the parties until the end of the swap contract, at which time one party receives the increase in the RPI over the period, and the other party receives a fixed amount which was agreed at the beginning of the contract (the breakeven rate). Swaps are traded OTC rather than on an exchange, although the increasing regulation of derivative financial instruments means that increasingly trades are cleared through standardised platforms.

Issuance of a nominal bond combined with an inflation swap will provide the same cash outcome at the end of the term as issuance of an inflation linked bond of the same term. The advantage of the use of swaps is it is much easier to sculpt the structure of cash flows to meet the liabilities of the company undertaking the transaction than for an index-linked bond. Offsetting this is the fact that the company will bear counterparty risk of the issuer of the swap contract, and depending on the movement in inflation during the term of the swap may have to make margin calls.

A.3.2. How to hedge a price control

Companies do not typically raise debt in one lump sum at the beginning of a price control, but are likely to issue debt over time.

If the cost of debt is annually updated:

- The company would issue new inflation linked debt each year at the prevailing rate, with tenors matching the approach to tenor used by the regulator; or
- The company would issue new nominal bonds and swaps each year, with the bonds and swaps matching the tenor used by the regulator.

In contrast, if the cost of debt is fixed at the start of the price control period two ways in which the hedge can be achieved are:

- Issue index-linked debt at the start of the price control to reflect all the likely debt requirements. The excess cash raised would be invested in inflation bonds / swaps maturing progressively through the price control to match the anticipated use of funds.
- Plan to issue new bonds at the time that they are needed. At the same time, the company enters into forward swap agreements. Forward swaps are swaps with a future starting date, so could cover the last 4, 3, 2, or 1 year of a price control period (or longer periods with a delayed start). Forward swaps can be agreed to lock in the forward nominal interest rate at the time of expected future capex needs, and a separate forward inflation swap entered into to hedge the inflation component of the nominal interest rate. The forward swaps entered into could be structured to match the future capital investment needs.
- Plan to issue new bonds at the time that they are needed. At the same time, the company enters into "swaption" agreements.[119] A swaption is an option (a right, but not an obligation) to enter into a swap agreement at some point in the future. A hedging strategy would be to buy swaptions on nominal interest rates, and associated inflation swaptions the net effect of which is to give the company an option to enter into a fixed real interest rate at various dates in the future.

The first option of these is the simplest, and involves the company holding significant excess debt. The alternative is to enter into swap agreements, or if more flexibility over when the capital requirements is needed, swaption agreements. In the event that capex can be delayed or deferred, swaptions can be left to expire or sold.

In practice, companies are likely to enter into a combination of these strategies, although the transaction costs of some options mean they are used less, with accounting treatment under

[119] We understand that the transaction costs and complexity of doing this largely prohibits companies from using these.

IFRS for derivatives means that companies have incentives to ensure that swaps are related to specific financings. While investors can and do arbitrage between the two markets, there are periods when each of the strategies leads to lower cost financing depending on market dynamics.

A.3.3. Debt issuance and hedging strategies for regulated utilities

There is a strong incentive for regulated utilities to issue Index linked debt, given the indexation of their RAB and therefore by definition their cashflow.

In theory there should be no difference between the cost of an index linked bond and a nominal bond. The yield on the nominal bond will be higher than the inflation linked bond with the difference being the expected inflation during the period. On the assumption that inflation outcomes equal the expectations the total funding cost will be identical. A similar argument can be made for floating rate debt vs fixed rate debt, the fixed rate represents the market expectation of the cumulative path of the short term rate and so over the long run there should be no difference.

In practice, markets do not follow the forward curves. Short term rates are a reflection of a present situation. Looking forward investors and issuers must make a judgement on the path of rates. As there is an uncertainty, future rates are likely to over-predict short term rates, to compensate investors for taking a longer term view (and compensate for the additional risk premium). This is not always the case, and situations can arise, particularly if rates are high, when investors over buy longer duration assets, as this is the best way to benefit from falling rates due to the enhanced duration. Issuers are willing to pay a premium for locking term rates as this gives them greater predictability over their interest rates costs.

Exactly the same dynamic exists in the index linked market. The difference between the nominal and indexed linked bond represents break-even inflation. Arguably this should be static as this is a target that universally central banks seek to maintain. However we see break-even inflation levels also ebb and flow as one moves through the economic cycle. It is important to recognise that the market is by definition only an equilibrium point where the ratio of buyers and sellers is matched. Therefore regardless of the objectives of policy makers, if the volumes of buyers or sellers changes, the equilibrium price between them will also move.

For the treasurers of a utility company there is a secondary challenge, namely attracting investors to their debt. This will change depending on the issuers rating. In general the regulated utilities have settled on leverage ratios that have granted them A to BBB+ type ratings. It represents the point at which they have been able to maximise the number of investors willing to buy their debt and therefore minimise their issuance costs. As leverage levels rise, ratings decline and the premium demanded by investors to hold all of the company's debt rises. Therefore there is an optimal leverage level which maximises the amount of debt that can be used (minimising the use of equity), at an efficient price. The

situation is different for a group like Network Rail, that historically issued with a benefit from a Government Guarantee who have somewhat greater market flexibility than a traditional corporate group. Network Rail can take greater refinancing risk than a traditional corporate due to the AAA rating. Corporates have an opposing challenge, requiring careful management of refinancing risk.

This explains why the regulated utility sector has relatively high levels of index linked debt. It both represents the lowest risk position relative to their regulatory settlement, but also reduces their refinancing risk. In one instrument, the corporate has a RAB neutral position.

A.3.4. Regulatory precedent timescales

Utilities are subject to a regulatory cycle. While there is a benefit from a corporate planning process of a medium term regulatory cycle, from a financing perspective this model creates two key challenges.

- How is embedded debt treated
- How future debt costs are estimated

These in turn impact the choices made by the Corporate Treasurers.

Companies will seek to manage their debt relative to their regulators' benchmark and to manage the liquidity of the company prudently including financial covenants that their investors impose through their financings, with deviations representing a view on interest rates or inflation.

For new debt, corporates can hedge their interest rate risk based on how the regulator determines the new benchmark at the next price control.

Scenario A: Allowance is Fixed at the time of the regulatory settlement e.g. for five years

While in theory forwards predict future rates and there should be no difference between hedging annually and hedging once every 5 years, in practice a premium is charged for the forward hedges. This is complicated by volume. As the overall RAB of a particular sector rises with both inflation and capex plans during a regulatory cycle, the quantum of interest rate risk that needs to be hedged in the market by all of the underlying utilities simultaneously rises. As a result, unsurprisingly at the point of a regulatory review the underlying markets can deviate significantly from their norms simply due to the hedging activity. This was very notable in the case of the last Network Rail review in 2014, where despite a period of increased economic uncertainty and messaging from the Bank of England Governor that interest rates would not be increased, the Gilts market curve steepened by over 10 basis points as in excess of £20bn of hedges were executed in a period of 2 months.

While Network Rail is somewhat unique in the size of its RAB from a corporate perspective, it is not the size of a single entity that is critical, but rather the size of the entire sectoral RAB that is being determined at any single point of time that is key.

Lastly we would note that there is one part of the funding cost that cannot be pre-hedged efficiently, the corporate issuance spread over the risk free rate. As a result of this corporates will rightly seek a cushion in their regulatory settlement to protect them from changes in corporate spreads, particularly spikes in periods of increased market uncertainty. Such events were particularly acute during the financial crisis. The challenge with that event is that now regulators are under pressure to provide for such black swan events for ever into the future, theoretically adding a perpetual cost of the crisis to the consumers. The only way to hedge such a risk is to pre-fund, but that is simply not efficient for a 5 year regulatory settlement.

Scenario B: Allowance is fixed with an annual update

This model is arguably the most logical adaptation of the 5 year model. It separates the regulatory cycle, which remains on a 5 year cycle from the debt cost cycle. Companies act as they would have done previously, but the hedging challenges are divided by 5. The benefit is however greater because the market prices forward starting swaps within a year significantly more efficiently than a 5 year forward starting swap. Lastly the companies are protected from any accounting vagaries that can occur within a hedging period from the mark to market of forward starting swaps.

Furthermore with a 1 year model a company can eliminate a greater proportion of the risk by pre-funding. This removes the risk of credit spreads widening. Companies can also take a view 6-12 months forward on whether full hedging is required, allowing a smoothing of any hedging spikes in the market and a more orderly execution of risk.

Annual indexation can be further improved if it is based on rolling averages as opposed to a single spot rate. The rolling average encourages companies to spread their issuance and hedging over a year and thus creates the minimum amount of market distortion.

Scenario C: Allowance is fixed with ex-post adjustment

This model is arguably very similar to Scenario A, but provides the corporates from some protection in the event that interest costs were significantly different to those predicted at the time of the settlement. The challenge here is knowing how much to adjust by. Markets move even intra-daily and as with the negotiation at the time of a settlement, now a new element of uncertainty is added, over which a negotiation must take place. Without a very clear definition of the model used to make any adjustment, it is not clear to us that companies operate any differently to the status quo under a traditional settlement (scenario A).

A.4. A COMPANY PERSPECTIVE: IN PRACTICE

A.4.1. Why might firms not undertake hedges?

While a number of regulated firms do enter into a variety of hedges, we are not aware of any company in a price control that has perfectly hedged themselves such that they bear no

exposure to movements in market rates over the price control (unless there is no debt to be issued in the forthcoming period).

Inability to hedge both the cost of new debt and the cost of embedded debt

When a firm hedges, there is little value to hedging the cost of new debt if this creates future issues with respect to embedded debt. For example, with a fixed allowance on new debt, one potential strategy would be to issue all your debt on day one. However, when the price control passes and a simple average is assumed on embedded debt, the company is then exposed to changes that may have occurred within the period.

Risk aversion/ risk neutrality

The idea of a swap is that an uncertain cashflow is exchanged for a certain cashflow. The pricing is based on the relative valuations of certainty from different parties. It may be that the price of obtaining certainty (i.e. the swap contract price), is above the value placed on certainty, depending on the expected mean and distribution of the uncertain index. The forward curve for longer tenor will include measures of uncertainty premia, in which case this figure may be greater than the expected value. Where the regulated entity is no more risk averse than the market as a whole, swaps would be unlikely.

Capacity and liquidity of the swap markets

A further question is whether it is feasible to assume that the swap market is of a sufficient size to allow firms to enter into swaps at the start of a price control period given a fixed allowance. The debt proportion of the asset base in the water sector is over £35bn and swaps involving such a quantum in GBP markets may come at a pricing premium where available.

Ability to hedge perfectly

Based on what can be hedged, it may be that the regulated entity does not have the ability to hedge perfectly. This may be in terms of removing risk to cost of debt movements or in terms of relative to an allowance.

If only the risk-free rate can be hedged, what is the value of entering into an imperfect hedge? Where the cost of debt moves in line with the risk-free rate, there is greater value in doing this, whereas if you assume that the risk-free rate and debt premium move in offsetting directions then there will be less value in hedging.

Minimum sizing

The smaller companies have been less active in the derivatives market. This may reflect the smaller quanta of debt to begin with, but it could relate to minimum sizing of debt instruments or efficiency of pricing.

Collateral obligations

Entering into swaps require the posting of capital. The new financial regulations e.g. Basel III and Solvency II, have led to larger collateral requirements on the part of counterparties to the swap (especially if the counterparty is a financial institution) and the cost of providing this capital may be prohibitive for companies to justify the benefits of the swaps.

Cashflow impacts

Moody's review of inflation swaps suggests that the cashflow benefits are less than those from issuing index-linked bonds, due to cashflow profiling issues. It may be that companies have chosen to issue index-linked debt (where able) rather than enter into swaps as this leads to greater net benefits.

Uncertainty on future price control decisions

Uncertainty over future policy may lead to fewer swaps being entered into. For example, where a trailing average period is assumed for embedded debt there will be an incentive on companies to try to mirror the composition of the index. Even if the assumption for new debt is that there is a fixed allowance as companies can hedge, the benefits of entering into swaps is reduced if companies spread out their debt issuance over the regulatory period.

Subordination of senior debt holders

Swaps may get paid out in full or partially before senior debt in the event of default, in which case there are risks for senior debt holders that they may become subordinated and large mark-to-market payments are a particular concern.

Covenants on debt

We understand that under certain debt financings e.g. Artesian finance bonds, there are restrictions on swaps that can be entered into. This may relate to the point above regarding subordination of senior debt holders.

Pass-through counterparty risk

Rating agencies monitor the counterparty risk being passed through with derivatives. If a counterparty such as a bank is downgraded, this may lead to either terminating the swap position (potentially with a large mark-to-market impact) or leaving the hedge in place and face any knock-on impact to the company's own credit risk.

A.4.2. Why do corporates err from 100% index-linked debt?

Debt issuance premiums can be higher in IL debt, as investors charge an issuer for the increased credit risk of a structure where the principal is getting larger on an annual basis. This is no different to the fact that a credit curve is not flat. The duration of an IL bond

is longer than the duration of a nominal bond and so logically an investor should charge an issuer a higher spread for an IL bond vs a nominal bond as debt premium rises with tenor. This tends to be exaggerated by the fact that demand is greatest for IL debt at the long end of the curve[120] (where credit spreads are widest) with benefits from the backdating of cashflows.

Logically therefore a treasurer seeking to efficiently finance a company will balance both the ratio of IL to nominal debt and the maturity profile of their debt, generally seeking the most stable debt position. Debt profiles also change with capex. If capex is not even, then there will be periods where new debt issuance will rise. In turn this will generally extend the average maturity profile of a corporates' debt. However with each passing year the remaining debt maturity will reduce. In contrast the underlying asset life may remain stable, due to careful maintenance. This will require the company to issue new debt of an even longer duration to offset the maturity decline of their historical outstanding debt.

Into this matrix we must factor a company's regulatory settlement. These are constructed ex-ante, generally on a 5 year cycle. A corporate treasurer must therefore make a case for their expected cost of debt in the next 5 years and then work to finance themselves during that window, optimally for their shareholders, at a lower cost than their regulatory settlement.

In light of this, the decisions made of what instrument to issue at any particular point in time is by definition dynamic. Generally the primary focus for a Treasurer will be to minimise refinancing risk, in the broader context of maintaining adequate liquidity and managing their financial risks prudently. These considerations will establish the optimal maturity for a new financing. With the maturity range chosen, then it is generally an easy decision as to whether it is more efficient to issue a new IL bond or a nominal bond. If the market favours a nominal bond in a particular maturity, then a company can choose to overlay an inflation swap or take the inflation risk. This decision will generally reflect the available implied break-even inflation rate. If an issuer believes that the market is over predicting future inflation, (nominal rates are very high relative to IL rates) then there is a benefit of hedging to IL. If the converse is the case, then the benefit of nominal debt is greater.

Overlaying these decisions is a credit situation. The swaps by definition create contingent liabilities whose mark-to-market rises and falls with the evolution of the underlying market. Therefore if you have a situation where in general swap banks are over exposed to a particular corporate sector due to market to market values, then the banks will charge the issuer a premium for entering into a swap. This is perhaps at an extreme at the moment, due to the extended period of reduced interest rates in the UK, where all swaps to hedge fix interest rates have a negative mark to market. These can be very significant in the case of a nominal bond swapped to IL, due to the duration mismatch between a nominal bond and an IL bond of similar maturities.

[120] Long-dated debt

Corporate Treasurers thus triangulate between maturity needs, relative investor demand at a maturity for IL debt vs nominal and their outstanding swap positions and hence swap market access, in order to decide what debt to issue in a particular moment in time. Note that they also must take into consideration the accounting treatment of any hedges. In general IL hedges do not secure hedge account treatment. Thus even if prudent and an efficient course of action, the CFO may not be comfortable with the P&L volatility introduced from the strategy.

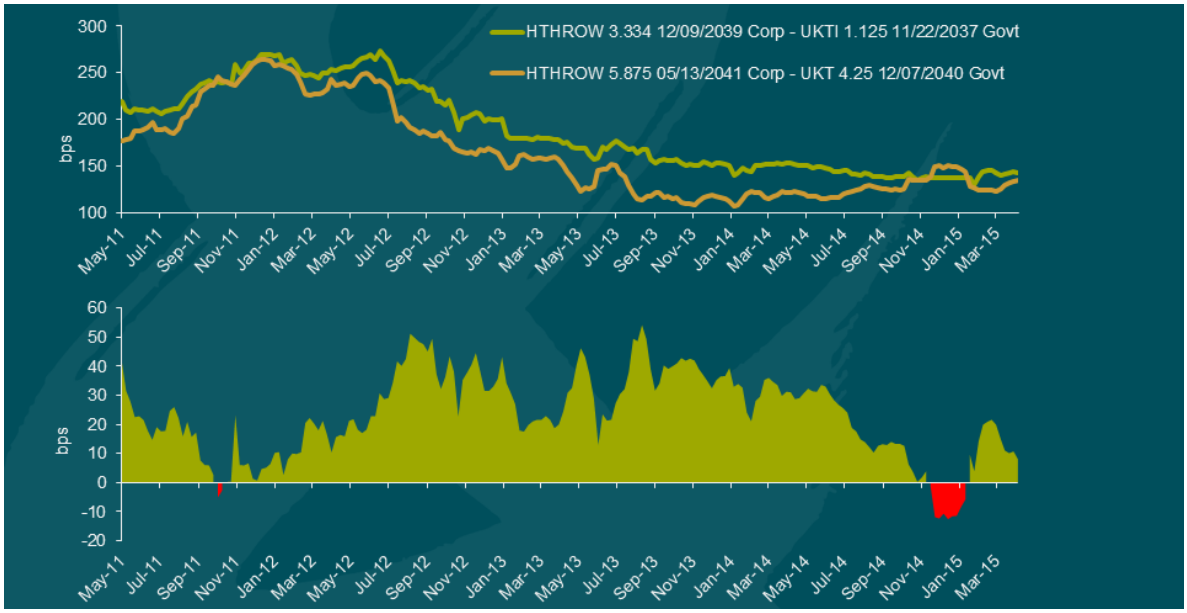
A.4.3. Why do some firms prefer swaps to index-linked debt?

We have observed the case, for example from Heathrow, where a choice has been made to reduce inflation exposure through matching inflation exposure on debt to the inflation uplift on the asset base. The issuance of index-linked debt directly is one method to do this, but it is also possible to issue nominal debt then enter into an inflation swap to get a similar outcome (albeit with different characteristics and counterparties).

Why might this be the case? One explanation is that the spread on index-linked debt is typically larger than a comparable spread on nominal debt. Others include the difference in implied inflation breakeven rates between the swap and index-linked bond market. Thirdly, the lack of liquidity in the index-linked bond market makes execution easier in the nominal bond market.

The figure below indicates the relative pricing difference between a Heathrow 2039 index-linked bond and a 2041 nominal bond.

Figure A.1: Nominal credit spread and index-linked credit spread on Heathrow bonds



Source: M&G Investments, Bloomberg, as of 10 April 2015

The article from which the above analysis is sourced mentions a rule of thumb that index-linked debt is typically 25bps higher than for nominal debt.[121]

This rule of thumb reflected reality for debt issued by High Speed Rail Finance in February 2013. The £610m nominal bond was at a 150bps spread over the gilt, while the £150m index-linked gilt came in at 175bps over the gilt.

Why might this be the case?

- M&G Investments note that the primary driver of this difference is the relative illiquidity of index-linked corporate bonds compared to nominal corporate bonds. This is with a smaller issue size, a more limited pool of investors, with funds more typically investing in nominal rather than index-linked debt.
- Another factor cited is that index-linked gilts carry greater loss given default risk (the default risk itself is the same when considering the same company). For the index-linked bond, inflation is accrued in the bond size. However when a default occurs, the claim is equivalent to the par value – this creates additional risk for index-linked debt holders.
- Further secondary factors, such as inflation expectations will have an impact. Where inflation is volatile, the benefit provided by index-linked bonds may reduce the size of this differential.

The pricing may also depend on where in the yield curve you are and any associated fees that need to be considered.

[121] Bond Vigilantes (2015) What are index-linked corporate bonds telling us at the moment? 16 April 2015

A.4.4. Hedging Strategies in the waater and airport sectors

In the main, both the water companies and airport companies (specifically Heathrow) are sophisticated users of the derivative markets. The only companies that do not use derivatives are the smaller WoCs that have been established as whole business securitisations. These have not required hedging due to the long term nature of their capital structures which were established purposefully to provide stability to their cost of debt over time.

The primary use of derivatives has been to convert fixed rate sterling debt into Index linked debt. The rationale for this is twofold:

1. It ensures stability in the debt to RAB ratio
2. It reduces interest cover ratios, as the inflation component of the debt cost now passes through the balance sheet, but not the interest line.

Derivatives have also been used to convert non Sterling debt to Sterling and floating rate loans to fixed or inflation linked.

There is no evidence of derivatives being used for speculative purposes, but rather as a way to compensate for shifts in demand in the underlying capital markets, which have meant that companies have not been able to secure their optimal debt position from direct issuance alone.

From the data that we have been given it does not appear that companies are forward hedging their interest rate exposure at the time of each regulatory settlement. This observation merits further investigation as it may be that such hedging is occurring, but is not visible when looking backwards or that companies have not felt the need to protect themselves given the progressive decline in real interest rates have meant that such a strategy would historically have resulted in higher interest costs and volatility in the companies' P&L statements. This position may change if the interest rate cycle were to change.

Increased use of IL Swaps since 2008

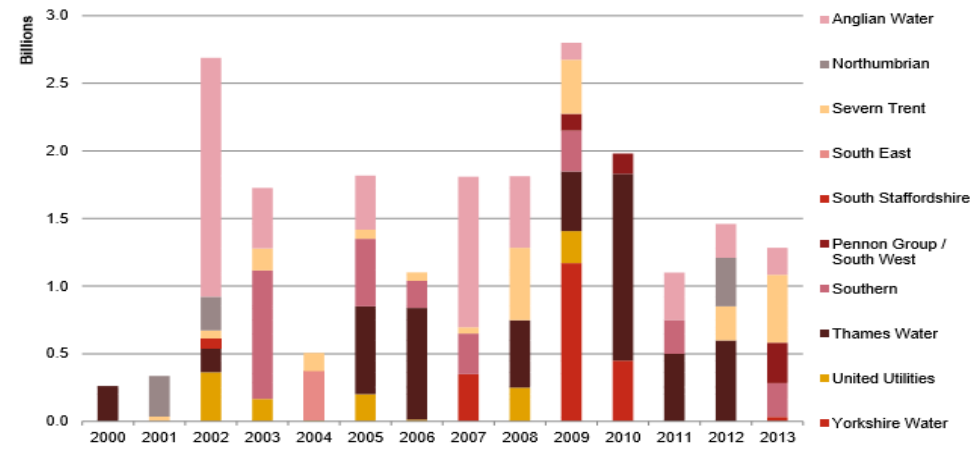
As observed by Moody's in their report of February 2012 on the use of swaps in the regulated utility sector prior to 2008, regulated utilities were substantial issuers in the IL debt markets. The pace of issuance has declined substantially since 2008, with issuers opting to access the nominal markets and convert their exposure to index linked via the derivative markets. To some degree simply looking at the raw issuance numbers by year fails to capture the true picture, as the stock of IL debt issued pre-2008 continues to rise annually with the IL accretion, therefore if a company was to maintain a stable nominal to IL debt ratio over time, it would appear as if it were issuing more nominal debt as the IL debt increase is embedded in the initial security. Furthermore, IL debt is generally issued with a long tenor, therefore there has been no need to refinance IL debt even that issued in the 1990's, while nominal debt issued with a maturity of approximately 10 years has been rolled over.

However, it is undoubtedly the case that demand for longer dated IL debt from the corporate sector declined after the financial crash and companies have favoured the use of the derivative markets to secure their optimal exposure, this is perhaps best evidenced by the new build groups such as the OFTOs which did not have any legacy issuance to consider and generally funded with nominal bonds swapped into Index-Linked.

Managing Regulatory Settlement Rate Risk

It is our observation that in the main the companies have sought to manage their interest rate risk via the issuance of long term debt, with an average life of 10-20 years and by holding approximately 85% of that debt in either fixed rate or Index Linked. There does not appear to be evidence of a general trend of issuance bunching around the cycle of the regulatory settlements, with issuance peaks tending to be caused by particular choices or needs at an individual company which tend to skew the trend for the sector in any single year. Note Anglian Water in 2002 and Yorkshire Water in 2009.

Figure 2.3 Water industry corporate bond issuance (2000-2013)



Source: Capital IQ and PwC analysis. Data is for year to June in 2013.

This is typical of the corporate strategy for A/BBB rated companies and contrasts with that of higher rated groups such as Network Rail. The latter has the benefit of perpetual market access and with a low cost of debt a negligible cost of carry of debt vs cash on the balance

sheet. This is not the case for a standard utility, where the pre-issuance of debt has a substantial cost due to the credit spread for the issued bond vs bank deposit rates. This may also reflect the observation by the companies that their regulator does take into account the cost of embedded debt, therefore an expectation that a smoothing will occur of debt costs over time.

In the response to questioning it does not appear that companies are using pre-hedging to fix their maturing debt or new capex debt costs at the time of a regulatory settlement. The reasons for this would require further analysis, but our expectation is that companies have generally found the cost benefit of such actions to favour inaction. The reasons for this could be a combination of:

- Progressively declining interest rates which have made such strategies loss making
- A lack of willingness to take the mark-to-market volatility of such hedges through the P&L prior to the issuance of the corresponding debt instrument
- Concern that investors would view such actions as speculative
- A desire to conserve swap lines for more strategic usage such as the execution of cross currency or index linked swaps.
- More volatile credit markets, which mean that Treasurers cannot be certain of when they can issue and variable capex plans which means that they do not have certainty over when they will need to issue
- Declining risk free rates vs credit spreads. The only way to hedge the credit spread of a bond is to issue it. As credit spreads become an increasingly large percentage of the overall cost of a bond due to the exceptionally low level of risk free rates (which can be hedged). The value of hedging the risk free rate becomes of increasingly limited value. This is not the case with an issuer such as Network Rail whose cost of debt is much more closely aligned to the risk free rate due to its guarantee structure.

It is likely that companies would take a slightly different perspective in the event that they had a very substantial capex programme relative to their RAB. At this point the cost of debt, like the cost of raw materials would become a significant risk factor and depending on the agreed strategy of risk share with their regulator the cost-benefit of a hedging strategy would change.

A.4.5. Hedging strategies in the energy sector

Ofgem, the GB energy regulator, has adopted a cost of debt indexation model. This involves use of an iBoxx GBP non-financial 10yr+ corporate bond index with a ten year trailing average period for RIIO GD1 and T1 (2013-21), and an increasing trailing average index for RIIO ED1 (2015-23) from 10 years at the outset of the control and increasing to up to 20 years.

We have initial evidence on firms' hedging strategies following the move to cost of debt indexation. At the overall level we have found no definitive evidence whether firms have chosen to mimic the characteristics of the indexation mechanism at the industry level.

Northern Gas Networks (NGN) is the only example we are aware of for a network that has chosen to adopt an interest hedging strategy that has chosen to gradually reduce the risk of mismatch between its actual cost of debt and the regulatory cost of debt. The company are regulated under the RIIO GD1 price control i.e. with a ten year trailing average.

Based on a March 2016 Presentation to Bondholders by NGN, more than half of the company debt is included in RIIO Hedging Strategies. £700m of NGN debt reverted to floating rate at the start of RIIO GD1. With this figure, NGN have chosen to issue tranches of £17.5m with quarterly tranches from 3 months to 10 years. This represents Phase 1 of the strategy.

Under Phase 2, as each tranche of the hedge matures, it is re-fixed for 10 years. With EIB loans also being fixed for ten years, the outcome will be that 10% of debt is re-fixed annually. This will more closely track the timing assumed in the RIIO GD1 cost of debt indexation model, though there will be a mismatch as the strategy is on a quarterly basis, where the indexation mechanism uses daily data. Despite this, NGN found that 'The inherent timing risk has been managed successfully as the average rate on the ten-year swaps executed in each year has been lower than the market average for that year.'

In summary, NGN state that 'the RIIO hedging strategy continues to deliver correlation with the regulatory cost of debt allowance and is expected to deliver significant outperformance over the price control period as a whole.'

A.4.6. Other examples of regulated company activities

We provide examples of behaviour to show that different decisions have been made by different regulated firms. There is no one answer that equates to efficient financing.

Gatwick Airport

Rather than smooth issuance over the Q6 period, Gatwick Airport issued a £350m twenty year bond and set up a five-year revolving credit facility in March 2014 to cover financing of their takeover loan and ongoing capital expenditure facilities.

Yorkshire Water

Yorkshire Water have a significant derivatives portfolio with the notional value of their index-linked derivatives being £1.3bn, equivalent to 23% of the opening AMP6 RCV. In March 2015, they were downgraded by Moodys to Baa2 from Baa1, with the rating agency noting that the company had been '*pressured by its significant derivatives portfolio and the material*

deterioration in the mark-to-market (MTM) of that derivatives portfolio.[122]' The negative MTM value of the inflation swaps in April 2015 stood at £1.5bn.

An issue with the swaps are that they are of very long tenor, with swaps extending out to the 2050s and 2060s, meaning that they have comparably high costs of debt locked in for a long period of time.

Some of the swaps have break clauses associated with them, potentially requiring payment of the MTM value. The Moody's analysis indicates that the removal of the break clauses in the near term should be possible, but will come at the cost of higher interest costs (and thus a higher negative MTM value).

The fair value of the inflation swap derivative portfolio at end- 2014 is 32% of the AMP6 opening RCV. This is higher than most water companies, but is comparable with Southern Water (37%).

Welsh Water

Dwr Cymru Welsh Water is owned by Glas Cymru. An interesting feature of the company is that it is a company limited by guarantee and thus has no shareholders.[123] This structure is not typical in the utilities space, but will be an interesting consideration with respect to any pain-gain sharing mechanisms that could be introduced.

National Grid

In May 2010, National Grid announced a £3.2bn rights issue (i.e. increasing equity investment) to maintain their credit rating and finance their capital expenditure going forward. This shows that debt is not the only path to achieving financing.

Spark Infrastructure

Spark Infrastructure is an entity listed on the Australian Stock Exchange. Its main operating assets are: a 49% stake in SA Power Networks (electricity distribution in South Australia); a 49% stake in Victoria Power Networks (which owns the electricity distribution networks in Victoria, Citipower and Powercor), and since December 2015 a 15.01% stake in Transgrid (electricity transmission in New South Wales). In addition, it has a 12.3% economic exposure to DUET, another Australian listed entity with interests in Australian infrastructure businesses.

Spark Infrastructure has been established as a "stapled security", a structure common in Australian infrastructure. The security comprises units in a trust combined with a loan note which cannot be traded separately. As Australia operates an imputation tax system, under which shareholder receive a franking credit for corporate tax paid, this structure has a limited

[122] Moodys (2015) Yorkshire Water: Issuer in depth review, 13 April 2015

[123] A Company Limited by Guarantee instead has members who guarantee to pay a small amount where the company is wound up.

net impact on Australian shareholders, but creates a tax saving to foreign shareholders who do not benefit from franking credits.

For the purposes of this study, the important lessons from Spark is the debt policy that has been operated in the asset companies.

SA Power Networks

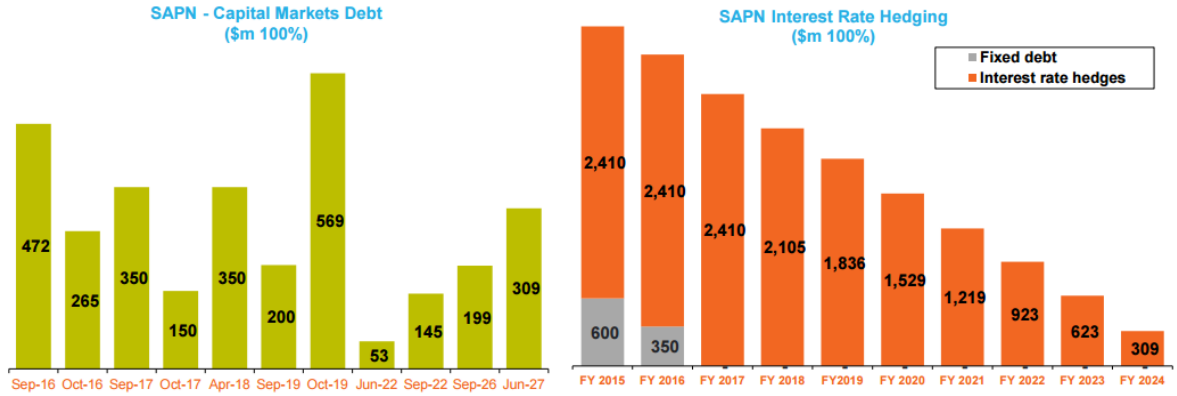
SA Power networks, along with other electricity network companies in Australia is regulated by the Australian Energy Regulator (AER). Regulation is set using a CPI-X style of regulation, and a new price cap period began in July 2015, with the final determination published in October 2015.[124] As at 1 July 2015, the RAB of SA Power Networks was $3.8bn. The cost of debt for this determination was set using the AER's rate of return guideline.[125] The new method incorporates a 10 year trailing average estimate of the cost of debt, with notional new debt receiving an allowance related to the average return on 10-year debt for S&P BBB+ rated entities taken out in the previous 10 years.

In response to this determination, SA Power networks has taken out $2.41bn of interest rate swaps with a range of tenors. The proportion of debt with fixed interest rates reduces over 2016-17 as existing debt matures. In the following years, the amount of outstanding debt hedged through the swap mechanism will progressively reduce.

The effect of these swaps is to provide an effective hedge for the company from interest rate movements. The hedge will not be perfect, because the volume of debt used in the weighted calculation of the cost of debt will be different from the hedged volume, but this debt strategy provides an approach to limiting the impact of changing debt costs on equity returns. This contrasts with the previous hedging approach when hedges were taken out at the start of the price control to reflect the on the day rate that was allowed.

Spark has indicated that Victoria Power Networks, another group asset, is transitioning to a similar financial policy.

Figure A.1: SA Power Network Debt Hedging



[124] AER (2015). Final decision. SA Power Networks determination 2015-16 to 2019-20. October 2015.
[125] AER (2013). Rate of return guidelines.

Source: Spark Infrastructure, March 2016.

Conclusion

The evidence presented in this annex illustrates the fact that companies have a significant level of control over many aspects of the cost of debt. In fact, in most circumstances the only element that companies have no control over is the risk-free rate element of the cost of debt, every other aspect they have some degree of control over. There are, however, circumstances when this does not hold. For example, companies have much less control over the timing and size of debt issues linked to major new infrastructure, such as the planned new runway in the South East of England.

Consequently in most circumstances we would expect a regulator to ensure that the company is incentivised to take efficient decisions around most aspects of the cost of debt.

ANNEX B DEVELOPMENTS IN FINANCIAL MARKETS

In this annex we provide context to the regulatory decisions discussed in the main report. It is important that any such decisions are not made in isolation from the financial markets in which the regulated companies operate in. This annex covers the following topics:

- Overview of debt markets
    - Demand and supply dynamics
    - Pricing of bank debt versus bond debt
    - Availability of EIB funds
    - Monoline insurers and the use of Artesian finance
    - Sterling bond markets
- Changes in debt markets
    - Capital reallocation
    - Drop-off in UK bond markets
    - Increased opportunities in the private market
    - Role of international markets
    - Use of derivatives market and index-linked debt
    - Compression of risk premia
    - Shortening of debt tenors
- Changes in financial regulations
    - Banking - Basel III
    - Insurance - Solvency II
- Type of investors
    - Equity investors
    - Debt investors

B.1. Overview of debt markets

Demand and supply dynamics

The last three years on the international debt markets have seen a general easing of credit conditions with good access to debt, whether it is in the bank or bond or private placement markets.

Institutional investors in the public bond market have continued to have strong appetite for corporate debt to get a yield pickup from Government bonds. Even though issuance in the public Sterling bond markets has dropped off significantly in the last 18 months (see below) this is more a function of limited supply of issuers and attractive opportunities to issue in other currency bond markets (e.g. Euros).

The non-public market has continued to evolve and deepen with the advent of new entrants into the market - mainly unlisted infrastructure debt funds as well as broadening of the traditional buyers of sterling credit. In January 2015, 31 unlisted infrastructure debt funds were raising funds globally with a total target capital of US$22.7bn (over double the amount five years previously and up from 20 funds with a target value of US$15bn in Jan 2014).[126] Relevant names in the UK market include IFM, Blackrock and UBS infrastructure Debt Fund. In addition, the larger UK based Insurance companies and Pension fund managers in the credit markets have built up infrastructure teams (such as Prudential/M&G, Standard Life, Legal and General, Aviva, Allianz). They have allocated specific funds to the infrastructure sector over and above their broad credit portfolios.

Liquidity in the bank market in the conventional maturities has improved significantly for well rated credits in low risk sectors such as the essential regulated infrastructure sectors which has allowed for some improvement in pricing and terms although some of these gains were pared back in the last 6 months on the back of uncertainties more generally in the macro environment. Some of the Japanese lenders who have been very active in the regulated sectors, and even dominant in the longer infrastructure sector markets and were seen to chase pricing down, with the bottom probably achieved in Summer 2015 have been less aggressive on pricing: negative interest rates in Japan, the late adoption of Basel III regulatory capital provisions and the more cautious outlook has meant margins over Libor have risen 50-60bp since then.

Pricing of bank debt versus bond debt

For PR14, PwC in advising Ofwat, noted that WoCs had typically used more bank debt than WaSCs, with bond finance unlikely in AMP6. However, they noted that including an assumption for bank debt for a notional WoC may not be in the interest of customers.[127]

[126] Preqin 2014 Investors Report
[127] PwC (2014) Company Specific Adjustments to the Cost of Capital

The bank floating debt spreads over Libor for WaSCs were estimated as being 70bps based on interviews or 90bps based on business plan submissions. The spread over Libor for WoCs both at the time of the analysis and historically was estimated at 110bps.

Based on Ofwat's RPI assumption, the real cost of this debt at the time of the determination was -1.0% (based on a nominal cost of debt of +1.8%). This indicated that there may have been benefits from entering into shorter term bank finance.

From our own interviews and research, compared to the PR14 analysis the average five year pricing is considered to be broadly the same/ a little tighter for a WaSC in the area of 50bp, with an additional premium of 30-40bp for a WOC which is line with further yield compression across the markets.

Availability of EIB funds

The EIB has Euro 9 billion outstanding to the sector and this is all to the 10 WaSCs. The high exposure definitely means they follow the sector closely and in particular are watching the liberalisation changes closely to see how they will change the risk profile. This and the move from RPI to CPI may lead to a change in lending appetite. The broad consultative approach to change is welcomed.

The WaSCs continue to benefit from eligibility for lending (environmental considerations) and the EIB continues to lend high volumes by historical standards. Last year it lent €7 billion equivalent to UK borrowers and the Juncker plan creates the opportunity for subordinated/ mezz funding structures to catalyse new infrastructure investment. For example, In April 2016, the EIB provided a £500m 18 yr loan to United Utilities, to finance investment under the AMP6 regulatory period. This takes investment from the EIB in the UK water sector to £12.6bn since 1976 . over and above the core lending business.

Overall exposure to the UK water sector depended somewhat on particular counterparties and so was case by case, but with no immediate concerns.

Recent EIB lending

The EIB has provided a substantial amount of financing to UK infrastructure in recent years. For example, since 2011 it has committed over £30bn to various projects in energy, transport, water, telecoms and non-infrastructure sectors. In water, EIB has provided over £3.2bn to a range of companies, as summarised in the table below.

Table B.1: EIB lending to the UK water and sewerage sector

Company	Signature Date	Amount (£m)
Northumbrian Water and Wastewater	01/10/2015	204
Southern Water and Wastewater	16/07/2015	143
South West Water and Wastewater	18/05/2015	179
United Utilities	31/03/2015	344

Company	Signature Date	Amount (£m)
Severn Trent	26/02/2015	725
Welsh Water	17/11/2015	293
United Utilities	19/12/2013	600
Anglian Water	18/12/2013	300
Northumbrian Water	11/12/2013	120
Wessex Water	04/12/2013	240
Northumbrian Water	08/04/2013	59
	Total	**3,208**

Source: EIB (2016); CEPA analysis. Numbers have been rounded.

EIB has also been widely quoted as committing £1bn of the £4.2bn financing requirement for the Thames Tideway Tunnel project, indicating its commitment to the sector.

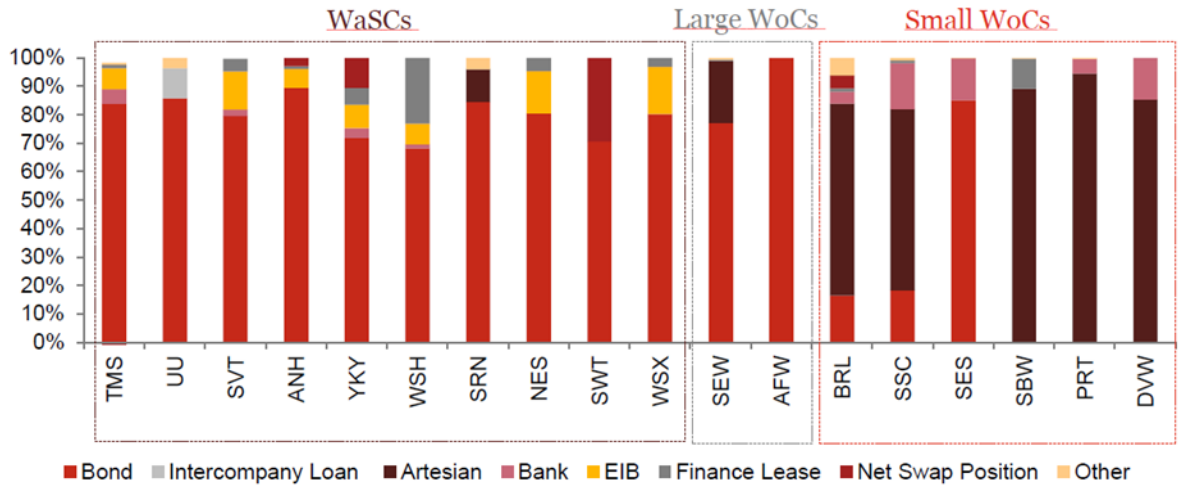
In aviation, EIB has been less active (with the environmental considerations less positive). However it lent £440m during BAA's re-financing in 2008. Since then, EIB's financing to the sector has been limited.

According to the Airports Commission (2015), there could be scope for EIB to support the proposed runway expansion in the London area, although this is likely to require considerable political support from the UK government during negotiations with EIB.

Monoline insurers and the use of the Artesian Finance

Prior to Artesian Finance, smaller water companies in the UK were unable to access the public index-linked bond to finance investments. This was because the size of their borrowings were too small for a public bond issue and because their credit quality was low for a long index-linked financing, In 2002 Royal Bank of Scotland (RBS) created the Artesian Finance facility, a special purpose vehicle that helped pool £500m of smaller water-only company lending in order to lower their debt financing costs. The SPV in turn is guaranteed by monoline insurers, which allows it to benefit from the high credit ratings AAA. Artesian Finance's issuance was guaranteed by Financial Security Assurance (FSA), a leading monoline insurer that covered the principal and interest on the bonds provided. These guarantees allowed the companies more cost effective borrowing through creating a market benchmark size and a credit quality, both of which allowed for cost effective index-linked financing. for debt to have maturities of over 30 years, which would not have been possible if the smaller companies were issuing bonds directly. The figure below provides a basic overview of Artesian Finance being used by WoCs.

Figure B.1: Use of Artesian Finance by Water Only Companies (as at March 2013)

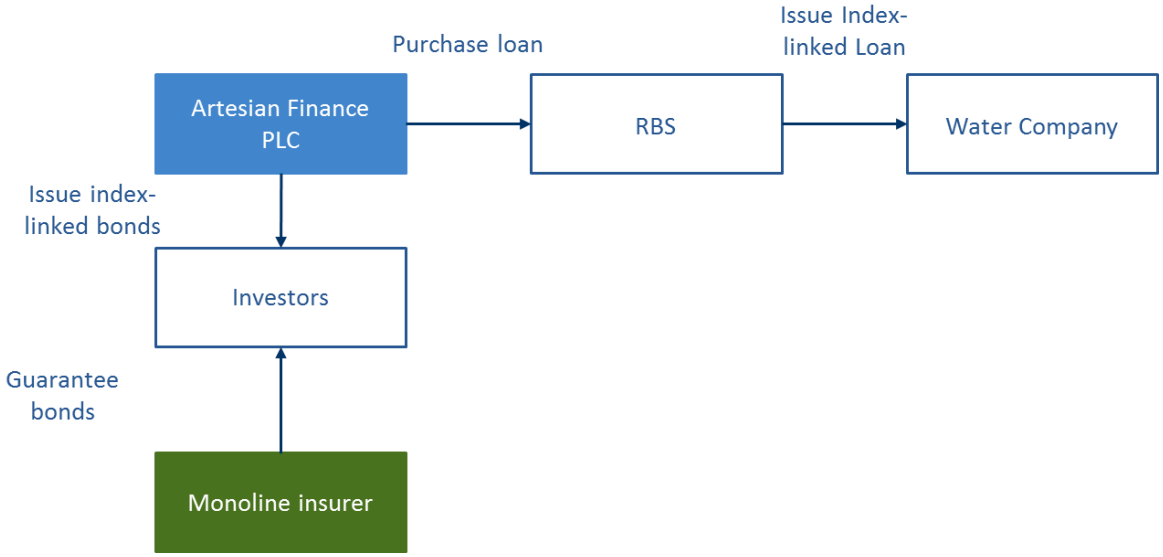


Source: PwC (2014)

Artesian Finance has supported a considerable amount of smaller water-only companies' (WoCs') debt, while larger water and sewerage companies (WaSCs) have financed most of their debt by issuing their own bonds, as indicated in the figure below.

However the last issuance under this facility was in 2005. In 2007 the monoline insurance market for new issuance virtually stopped on everything except the US municipal market. This was due to significant losses in the US real estate/ Mortgage- backed market which then brought the whole model into question. Assured Guaranty which is active in the US municipal market does have limited business in the infrastructure sector in Europe, but the investor perception of the credit quality and the broadening of the market, has meant this is not seen generally as a cost effective financing option any more.

Figure B.2: Overview of Artesian Finance

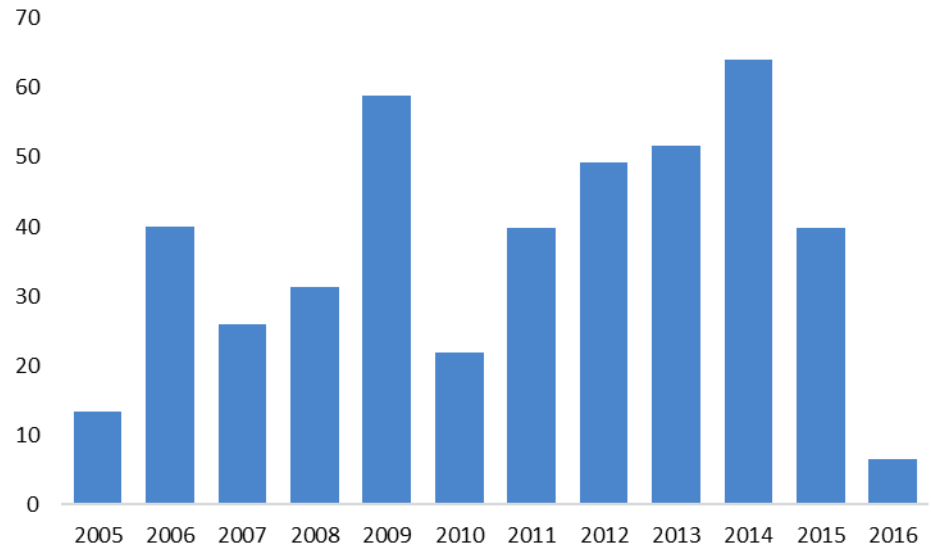


Source: RBS; CEPA analysis.

Sterling bond markets

The total issuance in the sterling-denominated nominal corporate bond market for non-financial companies is provided in the figure below.

Figure B.1: Corporate GBP bond market (excluding financials) - £bn nominal



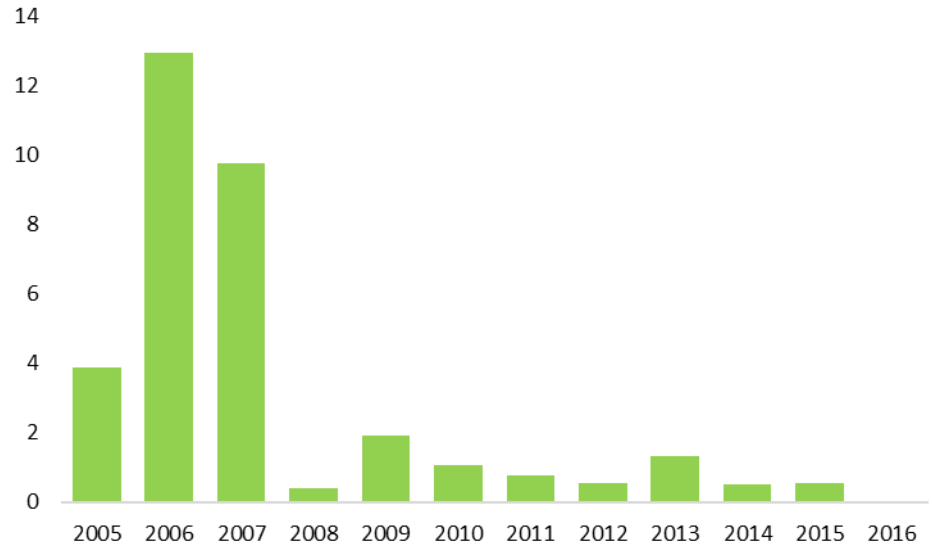
Source: Bloomberg (2016); CEPA analysis. 2016 figures include all issuances up until March 10th 2016.

As shown in the figure, the size of the corporate bond market was at high levels of issuance in 2014 at nearly £64bn for the whole year, before falling in 2015 to £39.8bn. Within this, water sector bond new issuance made up 6% in 2013, the highest proportion of total bonds for the period, while for other years the size of bond new issuance was much lower at 1.3% in 2014 and 1.5% in 2015.

The interesting question is why has the volume in the public market fallen off so significantly and does it have any implications for access to long term finance for regulated companies.

A summary of the size of the index-linked bond market is provided below. This market which has always been a small component of the overall sterling bond market again shows much higher levels of issuance in 2013 than in the following years.

Figure B.2: Corporate GBP bond market (excluding financials) - £bn index-linked



Source: Bloomberg (2016); CEPA analysis. 2016 figures include all issuance up until March 10th 2016.

Although the size of the index-linked market is lower, a large proportion of the bonds that have been index-linked have been provided by water utilities. For example, in 2013 and 2015 water companies accounted for more than 26% and nearly 40% of all bonds issued in these years respectively, although in 2014 no water companies issued index-linked bonds.

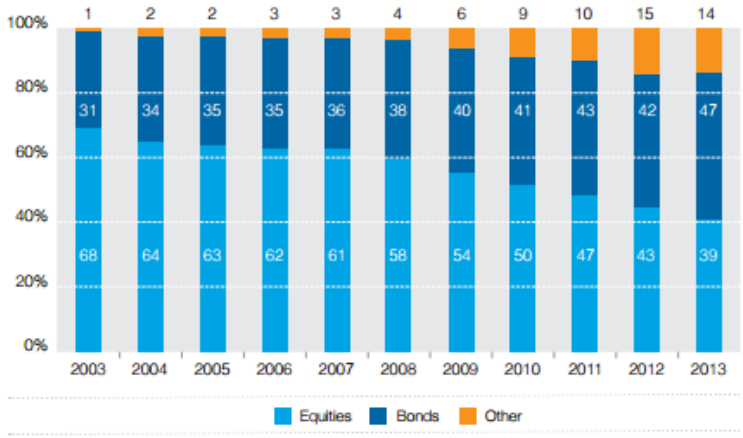
B.2. Changes in debt markets

Capital reallocation since 2008

The financial market volatility and uncertainty since the financial crisis led investors to shift assets away from riskier assets into safer assets such as government bonds. This has contributed to the very low yields on government debt (both nominal and index-linked). With QE exacerbating the decline in yields (potentially by as much as 100bps according to Bank of England research), investors have tended to search for yield with more attractive risk-reward profiles.

We have also seen pension funds, historically with a greater focus on equity investment, switch to larger holdings in debt.

Figure B.1: Assset allocation for UK pension schemes



Source: Macquarie, Mercer 2013 asset allocation survey

Drop-off in fixed rate sterling bond markets

Whilst the drop off in volume may look concerning, it is important to understand some of the backdrop. The volume in public issuance has been affected by a mixture of:

- Less supply of issuers rather than lack of demand because of more favourable issuing conditions in the medium maturities in other markets such as the EURO bond market;
- UK borrowers were active in the long end of the market in previous years to lock in falling interest rates;
- possibly less corporate activity and investment than in previous years.
- The rise of significant bilateral financing opportunities with UK institutions and infra bond funds.

The only other issue to be aware in the water sector is that the sector has been an active issuer since privatisation in the Euro-sterling market. Some market participants commented that investors are 'quite full' on exposure and whilst not an immediate issue, may limit further

appetite for water borrowings in the future. It also seems that the investors have limits on overall owning company names. So where an investor has holdings in more than one water company, or indeed, more than one UK regulated company (any sector), these will be aggregated for assessing exposure limits.

The lower volumes in the index-linked market are a mixture of:

- More attractive opportunities at times to raise index linked liabilities via nominal financing and using the swap market rather than issuing direct.
- Active issuers such as Network Rail, an active user of the index linked market stopped issuing bonds in later 2013 once it had been reclassified to the public sector; and PFI related borrowers were reduced in a declining amount of new PFI closings
- For lower credit issuers, the absence of the monoline credit continued to make the public market less accessible although some of this was taken up by bilateral private placements where the institutional investors were comfortable with the risk profile e.g. Aviva provided index-linked financing for the OFTO, Westermost Rough, which closed in January 16.

Increased opportunities in the 'private market'

The private institutional market, whereby one means an institutional investor or small group of institutional investors lend directly to the borrower on a bilateral set of terms and conditions has become an increasing option for borrowers as new infrastructure teams have been set up by existing traditional investors but where the teams have separate allocations and have the credit analytical skills to resource more credit investment, as well as the rise of new infrastructure debt funds. Some of the latter may tend to look for more complicated credits than the water sector provides e.g. Allianz tends to focus on greenfield opportunities. In addition, the large US institutions such as Met Life which have been based in London to offer sterling based private placements have been more active recently.

The implications of this change in the market which has been evolving significantly in the last 3-5 years is that borrowers now have a realistic alternative option alongside public bond and bank financings as part of their overall borrowing programme. In addition, whilst the smaller water only companies do not have access to the public market vis the Artesian vehicle, it would seem a more realistic possibility for them to access amounts of financing up to £100m via the private market than previously.

Therefore whilst the public market has looked less active, the opportunities for issuers has been strong. The ability to meet an investor's obligations may also be positive for issuers in being able to achieve more favourable yields.

Role for international markets

These are open to the WASCS and Airport operators and can be useful in providing alternative sources of finance of sterling (after swaps) or better cost of finance than issuing sterling direct.

Heathrow was an active use of the markets in previous years (e.g. accessing the US144a market) to reduce its needs from the sterling market which it was in danger of overusing if it had not diversified in this way. In more recent years, if you look at its borrowing strategy, it has continued to use the international markets, but less of the big public benchmark issues, but smaller targeted financings e.g. in Swiss francs, Norwegian Kroner and Canadian dollars. It also issued a sterling index-linked private placement into the UK private placement market.

Use of the derivatives market and index-linked debt

Using the international markets also requires cross currency swaps, which as the financing gets longer, uses increasing amounts of regulatory capital which the banks need to charge. Borrowers need to take this into account not only in the credit charges but the use of available bank lines.

The implementation of Basel III and other regulatory changes has made a significant difference to the way banks charge for entering into swaps. These rules have also led to the use of collateral requirements or break clauses as a way of limiting bank exposure and what they need to charge.

There is strong demand for index-linked debt which is increasingly unmet due to a reduction in issuance. This unmet demand has been met synthetically - with borrowers entering into index-linked swaps with banks who have entered into 'back-to-back' swaps with sources of demand such as pension funds.[128] However these swaps may be on less favourable terms than historically both in terms of increased costs and features that reduce the long-term inflation hedging features e.g. mandatory break rights.

Macquarie (2014) have indicated that their analysis indicates demand of approximately £4bn per annum, with a significant proportion in water utilities.

Banking – Basel III

The Basel III regulations were established in September 2010 by 27 member countries of the Basel Committee on Banking Supervision to improve the resilience of individual banks and the financial system to global shocks. In particular, the regulations included imposing a number of capital and liquidity requirements on banks, such as:

- Banks are required to hold a minimum of 4.5% of common equity as a proportion of risk weighted assets increasing from the previous 2%. In addition to this 4.5%, banks have

[128] Macquarie (2014) Inflation Linked Infrastructure Debt, March 2014

been required to hold an additional 1.5% of common equity as a proportion of risk-weighted assets.

- A mandatory 'capital conservation buffer' is also required from 2019, which is equivalent to 2.5% of risk-weighted assets.
- A discretionary 'countercyclical buffer', in which national regulators can require up to 2.5% during times of high credit growth.
- Minimum liquidity coverage ratio requirements of 60% in 2015, rising to 100% in 2019.[129]

In addition to the above, institutions determined as global systematically important financial institutions (SIFIs) are also required to have higher loss absorbency capacity, given the risks they pose to the financial system.

Such measures have led to a reassessment of pricing of derivatives and transaction costs including capital charges have increased as a result. In addition, the use of breaks in the swaps and collateral have become more prevalent.

Insurance – Solvency II

Solvency II is an EU directive to ensure that insurance companies hold a sufficient amount of capital to reduce the risk of insolvency in the event of adverse events. This directive places additional capital requirements on insurers holding long-dated assets and/or those with low credit ratings. Solvency II came into effect in January 2016, after being pushed back several times.

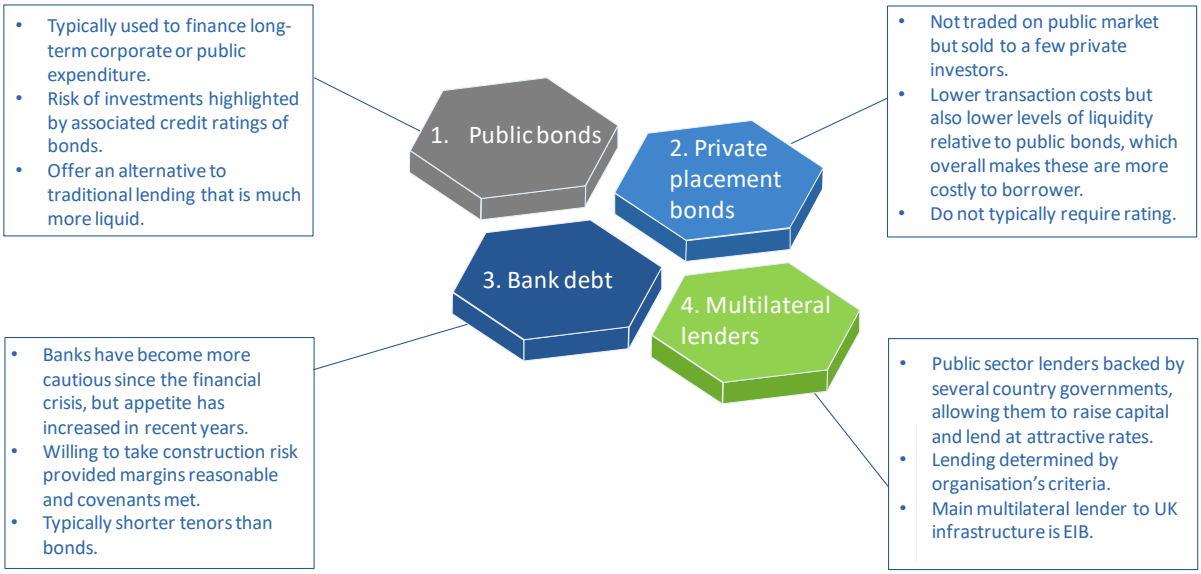
Solvency requirements in the EU previously only covered insurance risk. In addition to this, Solvency II covers market (e.g. fluctuations in the value of insurer's investments), credit (e.g. when financing obligations are not met) and operational (e.g. malpractice) risk.

Given that insurers have traditionally invested in long-term infrastructure assets, Solvency II is likely to result in the cost of debt increasing for these types of assets, as these measures will incentivise lenders to concentrate on shorter term assets.

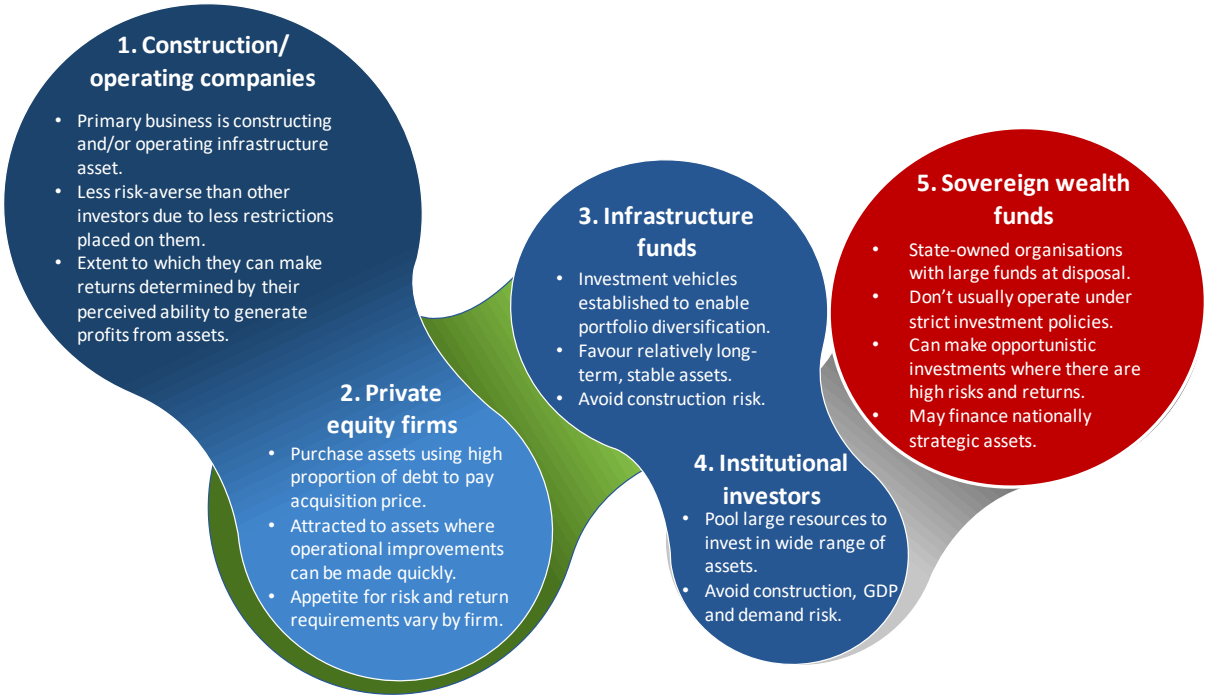
[129] The liquidity coverage ratio is calculated by dividing the value of high quality liquid assets by total net liquidity outflows over 30 days.

B.3. Types of investor in infrastructure[130]

Debt investors



Equity investors



[130] Based on Airports Commission Sources of Finance publication.

ANNEX C HISTORY OF REGULATION IN WATER AND AVIATION

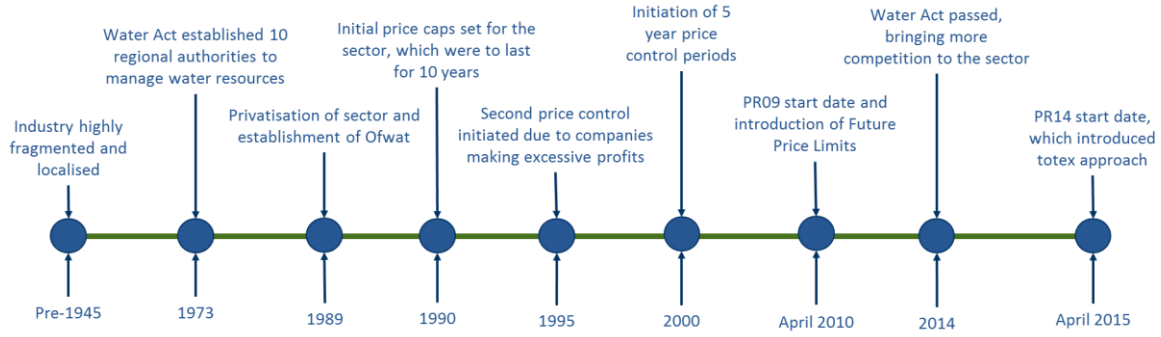
In this section, we include information on both the water & sewerage and aviation sectors. This covers the history of price controls, the current price control and potential future developments.

C.1. Water & Sewerage

C.1.1. History

As shown in our timeline below, the water and sewerage industry in England and Wales has undergone dramatic change over the past 40 years, which has included the privatisation of the sector and since then several changes and revisions to the way in which the sector is regulated.

Figure C.1: Timeline of developments in the water and sewerage sector



Source: CEPA.

As shown in the figure, Ofwat was initially established in 1989 when regional water authorities were privatised to oversee economic regulation of the sector, although the initial price limits were set by the Secretary of State for the Environment and the Secretary of State for Wales for water and sewerage companies in Wales. This would provide a price cap to services in the industry for a ten year period from April 1990. However, in 1995 a second price review was initiated due to the excessive profits that were being made in the industry. This second price limit was also meant to last for ten years, but by 1998 it had become clear that this was an inappropriate length. Since 2000, therefore, price limits have been set for 5 years.

Apart from this however, price controls up to the PR09 price review have remained broadly similar. They have all been based on the 'RPI-X' method used to reduce prices and encourage increased efficiency, similar to that used in gas distribution for example. However, due to the fact a significant amount of capital investment was needed to counter previous underinvestment and to reach EU standards, water prices instead were required to increase. Thus the mechanism for the water and sewerage industry was commonly known as 'RPI+K'.

Ofwat's Future Price Limits (FPL) project to update the industry's regulatory framework preceded the PR14 determination. The FPL framework set out a statement of principles initially in terms of their approach to regulation. These principles led to Ofwat deciding on a

new framework to adopt for the PR14 price control, which involved a more outcome drive process (which has included moving to a totex-approach to regulation) with greater engagement with consumers and separation of different elements within the sector moving forward. The Water Act 2014 also sits alongside the new price control determination in moving towards greater competition in the sector.

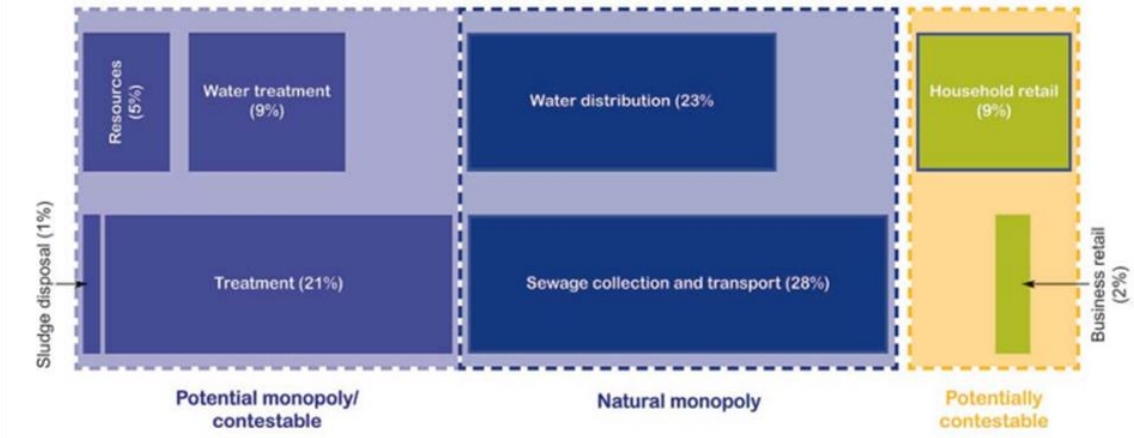
The current project is Water2020, looking at how Ofwat will approach the PR19 determination.

C.1.2. Sector characteristics

At the time of privatisation, as well as the 10 regional water and sewerage authorities, there were 29 smaller, water only companies, which are also subject to the same regulation. Over the years, there have been a number of mergers, consolidating the industry into 10 water and sewerage companies and 8 further water only companies at the time of PR14, each with a regional monopoly for its respective services. Ofwat also regulates the five locally appointed companies that are also able to provide water or sewerage services in a defined area to ensure their consumers would be no worse off than under the regional monopolist.

The figure below sets out the value chain for the water and sewerage sector

Figure C.2: Water value chain by revenues



Source: Ofwat (2013)[131]

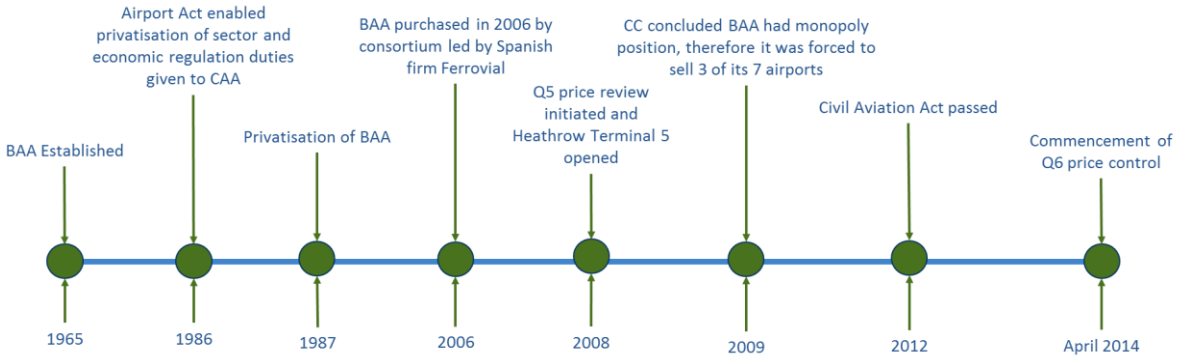
[131] Observations on the regulation of the Water Sector, Jonson Cox, 5 March 2013

C.2. Aviation

C.2.1. History

As shown in our timeline below, the British Airport Authority (BAA) was established in 1965 after the passing into law of the Airport Authority Act to take control of the three state controlled airports surrounding London – Heathrow, Gatwick and Stansted. BAA later also took control of several other UK airports, including Aberdeen, Edinburgh, Glasgow and Southampton.

Figure C.3: Timeline of selected developments in UK aviation sector



Source: CEPA.

At the time BAA became a private company in 1987, the CAA was given authority to economically regulate designated airports. The airports whose charges are regulated depends on their market power assessment. This test involves considering whether an airport exerts singificant market power. This test changed materially with the Civil Aviation Act (2012). Heathrow and Gatwick did not face this test individually as they were designated as a system, however their airport charges have been regulated since the first Quinquennium (Q1) after privatisation.

Each price control prior to the Q6 determination has lasted for 5 years, with the exception of Q5. This was extended a year, with negotiated settlements at Heathrow and Gatwick, in order to accommodate a reassessment of market power (there was also an additional year extension for the London airports for Q2 in 1999)

Prior to 2009, Stansted and Manchester airports were also judged to have market power. The period 2008-09 was used as an extension to Q5 to decide whether or not the form of regulation was still required. It was found that Manchester airport by then faced sufficient regional competition to warrant de-designation, but regulation at Stansted continued. However, a further assessment in 2012-2014 determined Stansted did not meet the threshold of the new tests and was therefore not included in the current price control, Q6. Q6 is the first price control to take place under the new regulatory regime as described by the Civil Aviation Act, 2012. The market power assessment does not necessitate that price controls need to be used, rather than the CAA will issue the airport with a licence. This may or may not have price control conditions attached to it.

C.2.2. Sector characteristics

Unlike the three major London airports, Manchester was never under the control of the state or BAA. It is instead owned by the Manchester Airport Group (MAG), the majority of which is owned by the Manchester councils. The Competition Commission published a report in 2009 which concluded BAA held a monopoly position due to the extent of its airport ownership. As a result, BAA was forced to sell three of the seven UK airports it controlled at the time. This resulted in MAG taking ownership of Stansted, while Gatwick is now owned and operated by Gatwick Airport Limited.

ANNEX D DOES ONE SIZE FIT ALL?

D.1. Tailoring a decision to characteristics and objectives

It is possible that one size does not fit all. We consider this for water versus aviation and then within water itself.

Aviation versus Water sector

The CAA has to regulate one company, while Ofwat is regulating 17 companies. By default, tailoring the approach in aviation is more feasible and less burdensome than in water. The decision framework we use should provide Ofwat and the CAA the flexibility to tailor the approach to some extent. We have also modelled the impact of each approach on the industry revenue separately for water and Heathrow, which allows the regulators to make their separate decisions.

Water and Sewerage Companies

The water sector is also very diverse. It comprises of 10 WaSCs and 8 WoCs (one of the WoCs, Bournemouth Water is owned and thus financed by Pennon who also owns South West Water). WaSCs are generally larger than WoCs, with a few exceptions and have historically have more access to bond markets. Therefore, an approach appropriate for the WaSCs may not necessarily be fully transferrable to the WoCs. This is a question for Ofwat but to facilitate the decision, we have modelled a typical WoC and a typical WaSC in addition to modelling industry level results.

Water only Companies

WoCs have historically received a debt premium uplift on the WaSC allowance. However, this does not apply to every WoC as some are larger and have a more flexible borrowing structure and market access than others. At PR14, two companies were deemed to have higher transaction costs than the industry, which were allowed. Small WoCs also have a significant proportion of debt from Artesian financing on their balance sheets.

D.2. Adjustments to the cost of debt for small company premia

Allowances for small company premia on the cost of debt

In PR14 the regulator has allowed for a higher cost of debt for small WoCs[132] and adjusted the industry notional cost of debt benchmark by 25bps for these firms. They concluded that small WoCs pay a premium of around 26bps on average on their Artesian Finance compared to an equivalent WaSC bond financing benchmark. Moreover, due to the small company size bond issuances have been rare but through limited evidence they find WoC bonds have an average

[132] Small WOCS are defined as Bristol, South Staffordshire Cambridge, Sutton & East Surrey, Bournemouth Water, Portsmouth and Dee Valley.

interest rate premium of approx. 30bps. WoCs typically use more bank debt and interviews with commercial banks shows that small firms face bank costs of around 20-40bps above WaSC bank costs. Issuance costs of 10bps are concluded to be sufficient even for small WoCs. Large WoCs were not granted an uplift in cost of debt in PR14.

Adjustments to cost of debt are not new in price reviews. In PR09 large WoCs got 10bps extra allowance for their cost of debt while the small WoCs received 40bps. In PR04 Ofwat even distinguished further and segmented WOCS into large, medium-sized, small and very small. Large WOCS then received a cost of debt 10bps above WaSCs, whereas medium-sized, small and very small got allowances of 30, 40, and 50bps respectively.

What was the evidence for and against a small company premium?

The arguments for and against uplifts in both the cost of debt and equity do not vary widely across companies. In general, the companies make four main arguments for an uplift in the cost of debt. First, they argue that WoCs face higher actual cost of embedded debt relative to the notional cost of debt set out in Ofwat's Risk and Reward Guidance. Moreover, they argue they are at a cost disadvantage when issuing bonds due to their smaller size. Third, WoCs make the case that the range of debt financing sources available to them is smaller and bank financing may be the only recourse for them. Last, they argue they face higher issuance costs.

To illustrate: "Bristol cites Oxera's report which attributes higher debt costs to company size. Smaller size both restricts the number of sources of funding available and creates inefficiencies, relative to larger debt issuances, such as liquidity premia and issuance costs. Bristol also asserts that there is a need for longer-term financing for smaller companies as they access debt markets less frequently."

PwC, on behalf of Ofwat, assessed all these arguments and puts forward the following arguments alongside their recommendations for a 25bps for small WoCs. First, they reject the small WoCs' suggestions that Ofwat should use the actual embedded debt cost. In their methodology review PwC conclude that a notional capital structure and efficient cost of debt benchmarks should form the basis of the allowed cost of capital. Moving towards actually structures and costs could reduce incentives to seek efficient financing. They also argue that firms should manage their finance risk through the timing of the debt issuances and nature of debt instruments and therefore bear the timing risks and gains or losses from out/underperformance relative to industry benchmarks themselves.

PwC do, however, consider is the fact that WoCs potentially have a significantly different debt structure than WaSCs and hence incur a different cost of debt. From their analysis they conclude that small WoCs more often rely on Artesian debt finance (a special-purpose vehicle set up by RBS). Given that public data on this type of financing is limited Ofwat clarified with each water company what their borrowing cost were. The responses revealed that the structure and cost of debt differs between companies. Some companies reported borrowings that were structure similar to a conventional, whereas others received proceeds larger than

the principal loan value generating a premium. The relevant metric used for calculating cost of debt was the effective rate of interest in relation to the proceeds received, equivalent to a gross redemption yield to maturity. When comparing this to Ofwat's real embedded cost of debt assumption the average spread between the cost of Artesian loans and WaSC financing is estimated to be 26bps.

Moreover, the limited bond issuances by WoCs show some evidence on whether these bonds require higher yields compared to WaSC bonds. For small WoCs there are three instances in which the bond market was accessed. The spreads for these bonds vary but on average the WOC spreads are 30 bps above that of the WaSCs.

Last, the cost of bank debt is considered which account for 9% of overall WOC financing compared to 1% for WaSCs. Looking at business plan submissions, the typical bank floating debt costs are estimated to be approximately 110bps plus LIBOR. For WaSCs the spread is approximately 90bps, a difference of 20bps. Additionally, Ofwat request debt pricing information from commercial banks from which they conclude the spread of WaSC bank debt compared to WOC bank debt is around 40bps.

Subsequently, cost of new debt and the WoCs' financing mix is considered. Unfortunately, no available data for traded yields on small WOC bonds is available and hence possible analysis is limited. However, PwC conclude that bond financing is not likely to be a source of new debt for WoCs over the price review period. This implies that smaller water only companies are solely reliant on bank debt. Although over-reliance on bank financing is not suitable for the whole industry, given the cheaper nature of bond finance and higher refinancing risks from shorter maturities, the low interest rate environment means short-term bank debt is likely to remain below the notional cost of debt benchmark. There are however additional risks related to the shorter maturity of bank debt and thus additional refinancing and interest rate risk. Moreover, a split of financing sources for different company types could introduce uncertainty for future determinations. Therefore, PwC do not recommend that much weight is placed on the discount that exists at present.

As previously mentioned PwC conclude that small WoCs typically have a different financing mix compared to WaSCs. Determining the additional allowance for small WoCs is therefore dependent on how much importance is placed of different financing structure in determining the notional financing mix used in the review. PwC concludes that assuming that WoCs are financing like WaSC is unsatisfactory. They therefore make no assumptions on the financing mix and compare financing costs on a like-for-like basis. After accounting for one outlier observation they arrive at a best estimate uplift of 25 bps.

In terms of issuance costs Ofwat's risk and reward guidance allowed a 10bps premium. Most WoCs have argued they require higher premia as some of these costs are fixed and thus proportionally larger when their issuance is smaller. PwC acknowledge that conceptually this argument is valid. However, they argue that WaSCs issue bonds of various sized and therefore inefficiencies are likely small. They pose that if the inefficiencies were large the WaSCs would

issue debt more consistently in large tranches. Moreover, they assess the issuance costs from Artesian debt as this is the WoCs biggest source of debt financing. They conclude that issuance cost amount to approx. 6bps per annum and hence conclude no additional uplift for issuance costs is appropriate.

D.3. Conclusions

Differences between companies on the cost of debt are inevitable as no company is the same. This in itself does not dictate that there should be separate allowances for different companies as this could be incompatible with incentive regulation.

Ofwat's approach has taken an evidence-based assessment of differences between companies based on their characteristics and natural limitations. This decision will assess the benefits and costs of a small company premium against Ofwat's regulatory objectives. We think this appears to be a robust approach to addressing the issue and may need to be revisited during the upcoming price control given potential M&A activity.

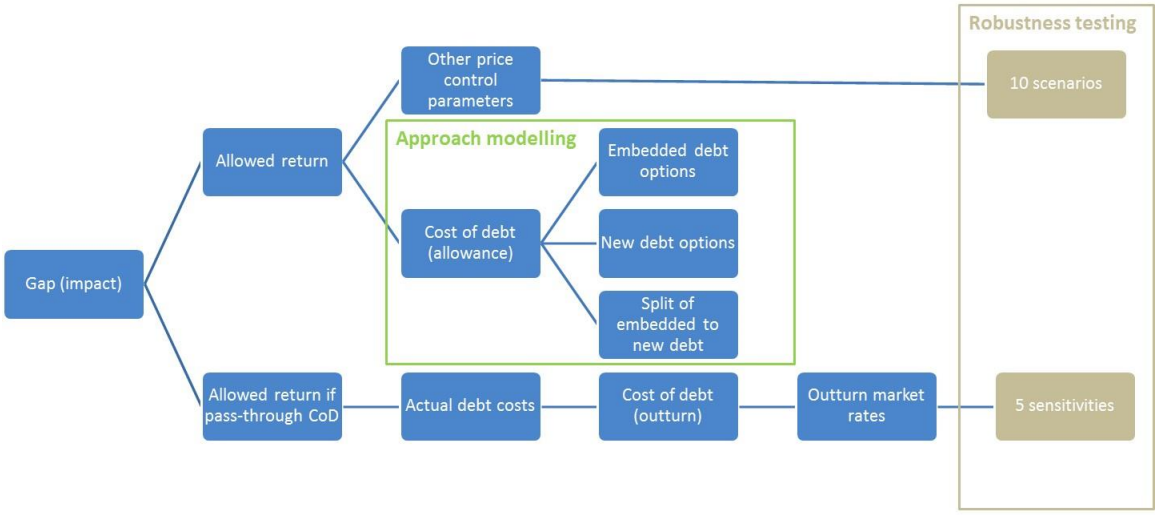
An investor in regulated entities will compare the risks and returns in one sector to risks and returns in another. Obviously an airport will have different features than a water company, as well as operate under a different regulatory regime, so the cost of capital is unlikely to be the same. Ensuring investment across sectors means that the cost of debt set in each sector should be reflective of the risk profile to avoid a 'winners and losers' situation.

ANNEX E MODELLING ALLOWANCES AND OUTTURN

In this section we describe the simplified model we have created and how we have used it to inform our conclusions. We note that the model is illustrative and the baseline is indicative rather than a precise estimate of the status quo.

E.1. Model description

An overview of the model structure is described below.



Allowed cost of debt

The basic functionality of the model is that it calculates the cost of debt allowance based on a number of parameter choices. The controls refer to the benchmark and to the use of the benchmark. In the modelling presented in this paper, we have set the model out as follows. We note that the model functionality allows for other combinations of the parameter choices to be tested.

Fundamentals

- All-in cost of debt
- Mix between embedded and new debt allowance
- 5-year price control
- RPI indexation
- RAB growth scenarios as per PR14 and Q6 assumptions

Benchmark

- iBoxx non-financials index (daily data)
- BBB/A credit rating
- 10year+
- Deflation of nominal yields uses breakdeven RPI
- Benchmark for 2016-2025 is based on forward curves
- Forward curves (of IL gilts, quarterly data): the bps increase in real gilts is transfered to the iBoxx (real) one for one (multiplier = 1)

New debt

- Benchmark x assumed amount of debt issued in each year x weight of year in average
- Benchmark is based on forward rates only
- Assumed amount of debt issued in each year is driven by RAB growth and refinancing needs
- Weight of year in average reflects debt coming in to the average (e.g. debt issued in year 5 is in the average only once)

Embedded debt

- Benchmark x assumed amount of debt issued in each year x weight of year in average
- The weight of year in average reflects debt drop-off (e.g. debt issued 10 years ago only stays in the average for one year as it is assumed to mature)

Ratio of new to embedded (not relevant for full indexation)

- Reflects assumed RAB growth (historical and forward-lookin) and refinancing needs
- Changes if the future RAB growth scenario changes

Full indexation

- 10-year trailing average of the benchmark index

Cost of debt allowance

- Cost of new debt x proportion of new debt + cost of embedded debt x (1-proportion of new debt) OR
- Cost of debt from full indexation calculation

Allowed return

This cost of debt allowance is then plugged into a simplified financial model that derives the return. It uses a constant assumption for the cost of equity and gearing (based on PR14 and Q6 determinations) to derive the allowed WACC and multiplies it by the average RAB. The average RAB itself is derived by starting with an opening RAB assumption (rounded figure from PR14 and Q6) and applies the average annual growth to it (same as the assumptions used to calculate the split of new and embedded debt described above).

Outturn model

The model also calculates an outturn cost of debt. This assumes:

- The cost of embedded debt is the same as for the notionally profiled company.
- The cost of new debt moves with the market movements (not company specific costs).
- In the baseline scenario the outturn market movements are the same as the forward rates (see diagram above).

The outturn cost of debt is then plugged into a financial model similar to the one used to derive the allowance. All is done on a 5-year NPV basis.

Model outputs

The allowed return is then subtracted from the outturn return. This give the amount by which the ex-ante allowance would be too generous or too low.

The model also calculates the NPV of the allowance over the price control.

Robustness controls

The model also simulates various scenarios and sensitivities other than the baseline.

- RAB growth scenarios (5): the user can select from a predetermined set of growth scenarios which feeds through the model – split of embedded/new debt; profiling of new debt.
- Length of price control (2): the user can select either 5 or 8 year price control. The allowances and the average are done over a longer period of time.
- Deflation measures (2): the user can choose between RPI and CPI. For CPI, the base case control is set to use CPI forecasts historically (OBR). This affects the benchmark derivation.
- Market rates from 2016-2025 (5): the user can choose from a predetermined list of annual adjustments to the forward rates. This feeds through to outturn cost of debt calculations and to allowances under an indexation approach.

E.2. Assessment framework - scenarios

The scenarios are an important part of the framework as they allow us to estimate the impact (cost/ benefit) on consumers/companies of adopting different approaches. As industries evolve, we consider a range of scenarios to test the robustness of the assessment results to industry changes. Although the most relevant assessment is against the status quo, we have developed several other scenarios to capture potential changes in the regulatory regime or investment programmes.

E.2.1. Changes to investment programme (RAB growth)

Both Ofwat and CAA are currently developing their approach to regulation in the next price controls and both face some potential new developments. For CAA, a key unknown is the new runway capacity, which may lead to substantial investment requirements in the sector. In water, given the recent financial close of Thames Tideway Tunnel, there are not large anticipated large projects to be undertaken in the near future. However, companies have ongoing capex programmes and given the potential for the value chain split, some capex projects may be taken off company balance sheets in the future. We therefore consider that running several RAB growth scenarios (related to investment requirements) is useful for robustness testing.

Scenario	Assumptions
Status quo	3% annual growth for water and 5% annual growth for aviation (from Opening RAB
No growth	0% growth from Opening RAB
Growing	10% annual increase
Declining	5% annual decrease
One-off investment	50% growth in year 2, no growth following

E.2.2. Changes to regulatory regime

Two other potential changes in the industry are:

- Longer price control
- Indexation using CPI inflation

Longer price control

Ofgem has recently moved to an eight-year price control and other regulators are considering it as well. We note that this paper does not assess the costs/benefits of a longer price control but only tests the impact of such a shift on the industry return for each of the options. The selected alternative length that we test is 8 years. The difference in modelling here mainly relates to the timing of ex-post adjustments and the ratio of embedded to new debt

Indexation using CPI inflation

At PR14 Ofwat indexed RCV and revenue by RPI inflation. Since then Ofwat has published a consultation on a shift from RPI to CPI indexation. Although this may be the status quo at the next price control, we do not use it as the BAU case because this change may have led to a different settlement at PR14 that we cannot replicate in the revenue model. However, we test it as a scenario and note that it is highly applicable to water and less so for Heathrow although the CAA is considering it but is at a much earlier stage. As we calculate real WACC allowances, the impact of this scenario is through the deflation of nominal yields.

Once we have run these scenarios, we have multiple outcomes for each approach. We then take the standard deviation across those outcomes for each approach. It shows us how wide the spectrum of possible results can be. It is then worth comparing the standard deviations of each approach against the standard deviations of other approaches. Low standard deviations reflect relatively stable or unresponsive approaches and higher standard deviations (in relative terms) reflect more responsive or unstable approaches.

E.3. Assessment framework - sensitivities

The scenario tests only provide a view of what the allowed return is (paid by consumers) regardless of where rates go. One of the NAO/PAC criticisms was based on a comparison of the allowance versus the outturn cost of debt faced by companies on a notional basis. Therefore it is useful to consider the impact on consumers and companies – i.e. the benefit – with respect to outturn costs in our forward-looking analysis. We note that as the analysis is ex-ante on costs in the future, so there is uncertainty as to what rates will be (unlike in the NAO analysis that was based on outturn rates).

The impact on consumers/companies of each option from the BAU scenario is calculated as the industry level allowed return estimated for AMP6 at PR14 minus the industry level of return derived by substituting the allowed cost of debt with the outturn cost of debt. This mainly relates to new debt as the embedded debt cost is not affected by changes in the future rates.

We test five sensitivities all related to the movement in underlying rates:

- Stable;
- Steady increase in rates;
- Sudden increase in rates;
- Steady decrease in rates; and
- Sudden fall.

The stable rates form our baseline. We note that although we test the impact of all these sensitivities, they are likely to have different probabilities. Although we do not assign explicit probabilities, we can deduce that as the current markets rates are at an industry low, further

decreases are less likely than increases and therefore results that come out of the increase sensitivities (and the baseline) are likely to be more instrumental in the assessment than the decrease sensitivities.

The table below summarises the sensitivities we test.

Sensitivity	Assumptions
Stable (Baseline)	Outturn to date and forward curves as at PR14/Q6 for benchmark
Steady increase	Stable + 5bps increase that accumulates to +45bps by 2025
Sudden increase	Stable + 100bps increase in year 2 of current price control that is sustained to the end
Steady decrease	Stable - 5bps decrease that accumulates to -45bps by 2025
Sudden decrease	Stable - 50bps decrease in year 2 of current price control that is sustained to the end

The sensitivity analysis would therefore show the volatility of the impact on consumers of various outturn scenarios, yielding a £m benefit or cost to consumers (which can be interpreted as a cost/benefit for companies). Sensitivity analysis results feed into the assessment of the criterion relating robustness to external changes. Once we have run all the five sensitivities for each cost of debt approach, we then take the standard deviation of these results to measure how much the results vary. This give us one standard deviation per approach. Then we compare the standard deviations for each approach. Higher standard deviation means that the approach is more sensitive and lower standard deviations mean that the approach is more stable regardless of where rates go.

E.4. Estimating monetary impact

In the main text, we have included an estimate for changes in market rates on the revenues of companies. We provide the calculations for these within this sub-section.

Table E.1: Quantifying the cost of debt in bill terms for Water customers

Statistic	Figure	Notes
Average annual HH bill	£396	Based on NAO estimate for 2014/15
Water bill as % of HH spending	2.3%	Based on NAO estimates for 2013/14
Real cost of debt PR14	2.59%	Real, excluding small company premium
Notional gearing PR14	62.5%	
RCV PR14 opening	£64bn	Approximate combined RCV
Annual allowed debt return	£1,036m	RCV x gearing x cost of debt
Number of households	22m	Based on NAO estimate
Cost of debt contribution to HH bill	£47	Debt return/ number of households
Cost of debt proportion of HH bill	12%	Contribution/ household bill

Statistic	Figure	Notes
Cost of debt proportion of HH spending	0.28%	Water bill as % of HH spending x Cost of debt proportion of HH bill
New/ embedded debt split	25% new	As per PR14 new debt proportion
Cost of new debt proportion of HH spending	0.07%	Cost of debt proportion of HH spending x new debt proportion
Impact of 100bps change in cost of new debt on annual bill	£4.54	1% x weight new x gearing x RCV / number of households

Table E.2: Quantifying the cost of debt in bill terms for Heathrow customers

Statistic	Figure	Notes
Average tariff per passenger	£21	Based on Q6 forecast
Real cost of debt Q6	3.20%	Based on Q6 allowance
Notional gearing Q6	60.0%	Based on Q6 allowance
Opening RAB 2015	£15bn	Based on Q6 allowance
Annual allowed debt return	£288m	RAB x gearing x cost of debt
Number of passengers (annual)	72m	Based on Q6 allowance
Cost of debt contribution to passenger cost	£4.00	Debt return from airport charges/ number of passengers
Cost of debt proportion of charge	18%	Contribution/ passenger tariff
New/ embedded debt split	30% new	Based on Q6 allowance
Cost of new debt contribution to charge	£1.32	Cost of debt contribution of charge x new debt proportion
Cost of new debt proportion of charge	5.6%	Contribution of new debt/ passenger tariff
Impact of 100bps change in cost of new debt on passenger charge	+£0.38	1% x weight new x gearing x RAB x revenue from charges/ number of households

ANNEX F ASSESSMENT CRITERIA

F.1. Assessment criterion 1: Impact on customers

A key duty of Ofwat and the CAA is the protection of consumers. Therefore, this is one of our assessment criteria and we have broken in down into two main categories.

- Level of bills
    - *Short-term*. It is clear that in the short-term that lower bills are a positive for consumers and when looking at the level of bill, this is the primary consideration.
    - *Long-term*. In the longer term, policy choices that led to lower shorter term bills may be detrimental to consumers overall. An example would be where isolating consumers from risk leads to higher risk perceptions with respect to regulated entities and consequently higher returns are required. This may push up the cost of capital for consumers in the future. An alternative example would be where a lower cost of capital or particular allocation of risk leads to underinvestment relative to an optimal level.
    - *Intergenerational equity*. The idea of intergenerational equity may be relevant to the cost of debt allowance if you are moving payments from one period to another.
- Volatility of bills
    - *Within price control*. Volatility of bills is typically considered with respect to the bill changes within price control. Smoothing has often been used based on consumers' preference for stable bills when paying the same level of cost.
    - *Future price controls*. Consumer research has also indicated that consumers prefer gradual adjustments over time compared to a step change when paying the same amount overall. Not allowing adjustments within a price control period can lead to larger changes for the following price control, especially if rates have continued in the same direction.
    - *Quantum of volatility.* The ability of parties to deal with volatility depends on the absolute difference to the expected or current value. For example, an adjustment of a few pounds a year is likely to be sufficiently less detrimental/ more manageable than a change of thousands of pounds a year.

It is certainly possible that these two sub-criteria could work in opposite directions, i.e. indexation may result in lower bills in times of low market rates but it also shifts market volatility risk to customers. The answer will touch on issues of controllability and risk allocation. More detailed discussion is included within Annex A.

F.2. Assessment criterion 2: Incentives

One of the key goals of incentive regulation is to create mechanisms that incentivise efficient financing. Regulators' duties on efficiency relates to the cost of debt in two ways:

- Incentivisation of efficient financing
    - *Ability to control.* A principle in regulation is that you should not place incentives on something that cannot be controlled. On the flip side of this, if a company is able to control the cost of debt then it is important that they are incentivised to do so. This is why a pass-through of actual costs has not been adopted in UK regulation, as it has weak incentive properties, though we note that in the US this approach is more common as regimes place greater weight on investment incentives. Controllability does not differ across approaches and is therefore not an explicit sub-criterion.
    - *Timing*. One aspect of efficient timing relates to the timing of finance and is far from a straightforward question. An example may be long-term debt issued by electricity distribution companies in the mid-1990s with what seemed at the time to be efficient debt costs. However, since then rates have fallen and the embedded debt costs appear high. This is not a reason to call the decision inefficient as this may not have been predictable, but timing is certainly a relevant dimension.
    - *Cost*. The more typically used dimension of efficient finance relates to pricing and whether the cost of debt is efficient relevant to similar comparators or a benchmark index. It is unlikely that a firm can fully control the cost of debt, as financial markets and the opportunity cost of funding a regulated entity with respect to other investments will drive demand.

F.3. Assessment criterion 3: Financeability and investment

In terms of investors, we split the considerations down into both concerns for debt investors and equity investors. Equity investors are compensated after debt holders have been paid; as such there is a knock-on impact.

- Debt investors
    - *Level of returns*. Debt investors care primarily about the return of their capital. Where the allowed returns do not compensate the firm sufficiently for their debt costs, debt investors lose out. This requires equity investors taking lower returns or making equity injections in order to meet debt obligations.
    - *Windfall gains and losses*. If the cost is uncontrollable, there is a range of potential outcomes between revenues and costs. Investors care about the scope of this divergence as this affects the ability to meet debt obligations. Where there is a greater potential scope for difference, this would suggest greater risk. A worsening to credit metrics may worsen the credit rating, which in turn leads to higher debt costs.
    - *Predictability of the regulatory regime*. Regulated entities tend to issue debt with relatively long tenors. This means that the debt held by a company spans more than one price control treatment. Firms care about recovery of costs in the current price control, as well as future price controls so expectations of future behaviour matter. Where there is greater risk of not meeting obligations, the price of debt would increase.
- Equity investors
    - *Financeability and financial resilience*. Where debt obligations cannot be met from the cost of debt allowance, this has implications for equity investors. This may be in the form of reduced returns in the short run (either in capital accumulation or dividends) or in more severe cases, requires the injection of further equity to meet the financing deficit. Regulators may have duties to ensure financeability (Ofwat also have a new resilience duty) and the cost of debt allowance will feed into this.
    - *Dividend payments*. A cost of debt allowance may be set to ensure compensation in the longer term that leaves short term differences in revenues and allowances. For equity investors, it may be that where the returns are in excess of costs, the profits can be paid out as dividends. These equity holders are not necessarily the same over time and the price may build in future expectations of the allowed cost of debt.

As noted previously, striking a balance between investors and consumers is a key task for the regulator in setting the cost of debt allowance.

F.4. Assessment criteria 4: Risk sharing

A question closely related to the idea of efficiency incentives is the appropriate risk allocation. We discuss within the main report the idea of controllability and how this relates to both incentives and sharing of risk.

- Appropriate risk allocation
    - *Which parties is risk allocated to?* In considering risk allocation, the industry hierarchy will have an effect on the answer. For example, the airlines as consumer groups will lead to a different dynamic to the water sector. On the company side, there will be both debt investors and equity investors to consider.
    - *What risks are faced?* The issue is more complex and nuanced than whether a company can better manage risk than consumers. The nature of risk, the impact of risk and the cost effectiveness of risk transfers are all relevant considerations.

Annex A of this report looks in greater detail at the question of risk allocation and this is a principle that underlies many of our recommendations hereafter.

F.5. Assessment criterion 5: Regulatory principles

We assess our options against good regulatory practice principles such as:

- Transparency
    - Transparency relates to clarity over both the approach and the tools to undertake the approach. Where there is the use of high levels of discretion and an unclear methodology, the approach would score badly for this purpose.

- Predictability
    - Predictability provides greater certainty over the approach the regulator will take in forthcoming determinations. A mechanistic approach may score higher under this criterion if it is credible; if the approach is not robust and a mechanistic approach may need to be changed in future, then a mechanistic approach is not necessarily good. It should be noted that an approach can be predictable even if it leads to different answers over time, as parties can understand the implications from repeating the methodology.
- Regulatory burden
    - Regulatory burden relates to both the required actions from the regulator itself and the burden that a regulator places on a regulated company. An approach that requires more frequent intervention and has a greater scope will increase regulatory burden. However, even if an approach is not adopted it may be that the data is collected anyhow for other purposes e.g. monitoring, such that this does not create an additional burden. Regulators' moves to more 'proportional' regulation may lead to greater weight being placed on this sub-criterion.
- Time consistency
    - Time consistency corresponds to a regulatory commitment to stick to an approach. An example of this may be in using a trailing average to set a regulatory allowance, with the idea being that in the medium term this should provide compensation to an efficiently financed notional entity. Firms may benefit in the short-term due to falling yields (and thus spot rates below the trailing average), but if the regulator changes this approach when the spot rate moves above the trailing average, then this creates issues with time consistency. This is similar to the idea of predictability.

These sub-criteria are important considerations, but primarily point to the importance of clear communication from regulators on the approach assumed and the rationale for making the choices that were made.

F.6. Assessment criterion 6: Robustness to change

The approach to setting the allowed cost of debt needs not only to be appropriate for the current industry and market circumstances but it also needs to be robust to any foreseeable or unforeseeable changes. As the industry changes or the market rates move, the impact of each option would differ, i.e. the benefits/costs to consumers of that option do not stay constant. We therefore assess the options against:

- Robustness to regulatory regime changes
    - There are a number of decision parameters under the control of the regulator. We cannot predict all these potential changes, but in our analysis will consider changes that have been discussed (if not implemented) by a number of regulators domestically. There is something of a chicken and egg scenario that exists here however, as the change to the regulatory regime would need to take into account the interdependencies and effects on other price control parameters.
    - Examples of this may be the move towards CPI indexation from RPI indexation or the potential for longer price controls. The decisions we arrive at are dependent on context, so if an approach is limited in its suitability, we think it prudent of the regulator to set out how the approach on the cost of debt would change if these parameters were to change as well.
- Robustness to external changes
    - A review of previous regulatory determinations (and market commentary) will provide a number of examples where rates have been assumed to be at a low with rates expected to move in only one direction. Any approach should be robust to both increases and decreases in yields (or stable yields), so we look to ensure that changes in rates do not create too much of an issue.
    - Other external changes that we consider are changing investment programmes. This may be for a sustained increase or decrease in the size of the investment programme, or alternatively a one-off large project that requires significant finance. Any approach must be tested to ensure that it is consistent with these changes, and not just where the investment programme is stable over time.

We have created a model to assist with this evaluation and to illustrate the implications of different approaches, that we cover later within this report.

ANNEX G CURRENT APPROACH TO SETTING THE COST OF DEBT

This annex describes the current and past approaches to setting the cost of debt in water and aviation.

G.1. Description of current approach to the cost of debt in water and aviation

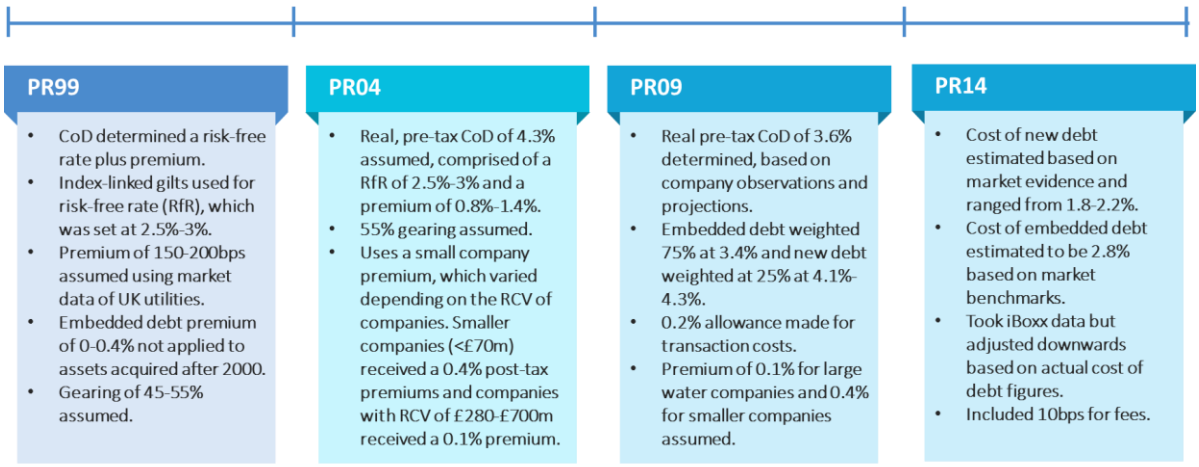
Description of approach to setting the cost of debt

	Water (Ofwat)	Aviation (CAA)
Background		
Length of price control	5 years	5 years for Heathrow
No of companies regulated	18 regulated regional monopolies - 10 WaSCs and 8 WoCs.	2 companies regulated under a price cap: Heathrow and Gatwick. Heathrow is the only one fully regulated.
Overall cost of debt framework		
Target credit rating	Comfortable investment grade credit e.g. A/BBB	BBB+ to A-
RfR + Debt Premium or All-In	All-In	All-In
New / embedded split	25/75	50/50
Cost of embedded debt		
Actual regulated company or notional company	Notional	Actual
Benchmark composite index used?	Yes	No
- Currency	GBP	n/a
- Credit rating	A and BBB	n/a
- Term of debt	10yr+	n/a
- Grouping	Non-financial corporates	n/a
- Deflation measure	OBR RPI expectations	n/a
- Provider	iBoxx	n/a
Benchmarked against individual bonds?	No	No
- Bonds considered	n/a	n/a
Transaction costs allowed for embedded debt	10bps (all companies) + 15bps (two WoCs only)	15bps debt arrange and commitment fees
Trailing average period	10yr	n/a
Indexed allowance?	No	No
Cost of new debt		

	Water (Ofwat)	Aviation (CAA)
Actual or notional company	Notional	Actual Heathrow characteristics
Benchmark composite index used?	Yes	Yes
- Currency	GBP	GBP
- Credit rating	BBB to A	BBB to A
- Term of debt	10yr+	10-15 years
- Grouping	Non-financial corporates	UK Corporate bonds
- Deflation measure	OBR RPI expectations	RPI
- Provider	iBoxx	BoAML and iBoxx
Benchmarked against individual bonds?	No	No
- Bonds considered	n/a	n/a
Transaction costs allowed for new debt	10bps (all companies) + 15bps (two WoCs only)	0 bps for new issuance
Use of forward curves?	Yes	Yes
- Which forward curves	10yr UK Govt bonds	10yr UK Govt bonds
- Assumptions in translating into a debt cost	0.8x the predicted change in government bond (gilt) rates impact for corporate bond yields.	0.8x the predicted change in government bond (gilt) rates impact for corporate bond yields.
Indexed allowance?	No	No

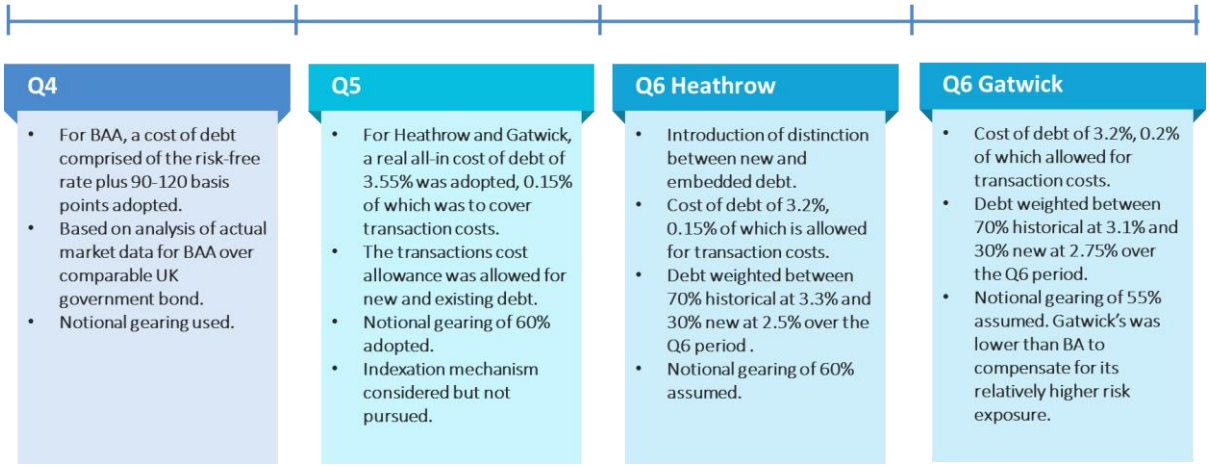
G.2. Evolution of the approach (water sector)

The figure below shows how the cost of debt has changed over time in the water sector.



G.3. Evolution of the approach (aviation sector)

The figure below shows how the cost of debt has changed over time in the aviation sector.



ANNEX H OTHER REGULATORS' APPROACHES TO THE COST OF DEBT

This Annex presents a summary of the approaches to the cost of debt taken by other regulators and the CMA. It also includes examples of setting the cost of debt following a bidding process.

H.1. Key examples

Recent key regulatory examples include:

- Ofgem for RIIO-T1, RIIO-GD1, and RIIO-ED1;
- ORR for CP5; and
- Ofcom for BT leased line.

Table H.1: Description of approach to setting the cost of debt

	RIIO (Ofgem)	CP5 (ORR)	BT (Ofcom)
Background			
Length of price control	8 years	5 years	3 years
No of companies regulated	RIIO-ED1: 14 DNOs RIIO-GD1: 8 GDNs RIIO-T1: 4 TOs (3 electricity and 1 gas)	One, Network Rail	One, BT
Overall framework			
Target credit rating	A3/Baa1 based on Moody's rating methodology A/BBB based on other credit rating methodology	A3/A- to Baa1/BBB+	BBB
RfR + Debt Premium or All-In	All-in	RfR + Debt Premium	RfR + Debt Premium
New / embedded split	Trailing average of bond yield	25/75	100/0
Cost of embedded debt			
Actual regulated company or notional company	Notional	Notional + adjustment for actual	n/a as no embedded debt allowance
Benchmark composite index used?	Yes	Yes	

	RIIO (Ofgem)	CP5 (ORR)	BT (Ofcom)
- Currency	GBP	GBP	
- Credit rating	A/BBB	A and BBB	
- Term of debt	10+ year bond daily yields	10 years +	
- Grouping	Non-financial corporate	Non-financial corporate	
- Deflation measure	Ten-year breakeven inflation	Ten-year breakeven inflation	
- Provider	IBoxx	iBoxx and Bloomberg data	
Benchmarked against individual bonds?	No	No	
- Bonds considered	n/a	n/a	
Transaction costs allowed for embedded debt	No, assume included in index	No	
Trailing average period	10 years	10 years	
Indexed allowance?	Yes	No	
Cost of new debt			
Actual or notional company	Notional	Notional + adjustment for actual	Actual
Benchmark composite index used?	Yes	Yes	n/a
- Currency	GBP	GBP	n/a
- Credit rating	A/BBB	A and BBB	n/a
- Term of debt	10+ year	10 years	n/a
- Grouping	Non-financial corporate	Non-financial	n/a
- Deflation measure	Ten-year breakeven inflation	Ten-year break-even inflation	n/a
- Provider	iBoxx	iBoxx	n/a
Benchmarked against	No	Yes	Yes

	RIIO (Ofgem)	CP5 (ORR)	BT (Ofcom)
individual bonds?			
- Bonds considered	n/a	High Speed 1 bond	Bonds with similar (BBB) credit ratings
Transaction costs allowed for new debt	No (halo effect)	No	No
Use of forward curves?	No	Yes	No
- Which forward curves	n/a	Equivalent tenor of gilt	n/a
- Assumptions in translating into a debt cost	n/a	n/a	n/a
Indexed allowance?	Yes	No	No

Changes for RIIO-ED1

The introduction of the trombone is designed to limit investor risk and improve financeability. Ofgem argues that trailing average periods that extend trombone like from a fixed starting point until they reach about 20 years provided the lowest sensitivity to interest rates. Fixed trailing average periods would expose investors to more uncertainty.[133]

A trombone index starting with a trailing average period of 10 years would slightly under-provide for DNOs' forecast cost of debt before taking account of any headroom in the 'halo effect'.

H.2. CMA determinations

There have been several CMA referrals that have involved a determination/review of the cost of capital, including the approach to the cost of debt:

- Bristol Water (2015);
- British Gas referral of RIIO-ED1 (2015) – in which the CMA supported Ofgem's approach;
- NIE transmission and distribution (2014)
- Bristol Water (2010);
- Stansted Airport (2008); and

[133] Ofgem (2014) DD, Financial Issues, para. 2.42

- Heathrow and Gatwick (2007).

Below we summarise the CMA's approach to each of the determinations.

Table H.1: Summary of CMA approach in regulatory determinations

	Bristol Water 2015[134]	NIE 2014[135]	Bristol Water 2010[136]
Background			
Length of price control	5 years	5 years	5 years
No of companies regulated	One, Bristol Water	One, Northern Ireland Electricity Ltd (NIE T&D)	One, Bristol Water
Overall framework			
Target credit rating	A and BBB	BBB+ and BBB-	A–/A3
RfR + Debt Premium or All-In	All-in	All in	All-In
New / embedded split	25/ 75	10/ 90	50/ 50
Cost of embedded debt			
Actual or notional company	Notional	Actual	Actual
Benchmark composite index used?	Yes	n/a	n/a
- Currency	GBP	n/a	n/a
- Credit rating	A and BBB	n/a	n/a
- Term of debt	Ten-year	n/a	n/a
- Grouping	Non-financials	n/a	n/a
- Deflation measure	Medium-term measure of RPI	n/a	n/a
- Provider	iBoxx	n/a	n/a
Benchmarked against individual bonds?	Yes	Yes	n/a

[134] https://assets.digital.cabinet-office.gov.uk/media/56279924ed915d194b000001/Bristol_Water_plc_final_determination.pdf

[135] https://assets.digital.cabinet-office.gov.uk/media/535a5768ed915d0fdb000003/NIE_Final_determination.pdf

[136] http://webarchive.nationalarchives.gov.uk/20111202195250/http://competition-commission.org.uk/rep_pub/reports/2010/fulltext/558_final_report.pdf

	Bristol Water 2015[134]	NIE 2014[135]	Bristol Water 2010[136]
- Bonds considered	WaSC bonds	Bonds issued by GB electricity distribution companies	n/a
Transaction costs allowed for embedded debt	Yes	No	n/a
Trailing average period	Yes	No	n/a
Indexed allowance?	No	No	n/a
Cost of new debt			
Actual or notional company	Notional	Actual	Notional
Benchmark composite index used?	Yes[137]	No	Yes
- Currency	GBP	n/a	
- Credit rating	A and BBB	n/a	A and BBB
- Term of debt	10yr+	n/a	All maturities
- Grouping	n/a	n/a	n/a
- Deflation measure	Ten-year RPI	n/a	RPI inflation rate
- Provider	iBoxx	n/a	iBoxx
Benchmarked against individual bonds?	Yes	Yes	Yes
- Bonds considered	20-year forward gilt rates estimated averages over the past 12 months	GB and Irish electricity network bonds	Recent nominal fixed-rate debt issuance by utilities (including water companies)
Transaction costs allowed for new debt	Yes	Yes	Yes
Use of forward curves?	Yes	No	Yes
- Which forward curves	20-year forward gilt rates	n/a	Expected trends in interest rates (nominal and real)
- Assumptions in translating into a debt cost	n/a	Summary of CC assumptions on the cost of new debt	No

137 https://assets.digital.cabinet-office.gov.uk/media/56279924ed915d194b000001/Bristol_Water_plc_final_determination.pdf p 319

	Bristol Water 2015[134]	NIE 2014[135]	Bristol Water 2010[136]
		Benchmark gilt yield 3.60 Spread 1.65 Implied coupon 5.25 RPI inflation rate 3.25 Real interest rate* 1.94 Total 2.14	
Indexed allowance?	No	No	No

Stansted Airport 2008[138]

The cost of debt is generally estimated directly using empirical evidence. The CMA considered the cost of embedded debt and new debt.

- The cost of new debt was estimated using secondary market yields for debt with A and BBB credit ratings.
- For the cost of embedded debt, the CMA looked at actual cost of debt of BAA. It considered the rates that BAA locked into prior to its acquisition by ADI Ltd in 2006.

As regard the split between embedded and new debt, the CMA took the value of fixed-rate debt which it allocated pro rata to Heathrow, Gatwick and Stansted. It then took into account the forecast increase in the value of the respective RABs over Q5 as well as the average fixed-rate debt-to-RAB ratio during Q5.

The CMA also considered fees and concluded that an allowance for the ongoing commitment, agency and arrangement paid respectively to lenders was necessary.

Heathrow and Gatwick Airports 2007[139]

The CMA considered the cost of embedded debt and new debt. And an allowance for fees was made.

- The cost of new debt was estimated by reviewing historical and recent yields on A and BBB rated debt
- For the cost of embedded debt, the CMA verified that its forward-looking estimate of the cost of debt were broadly in line with BAA's embedded debt costs. For this reason it was not necessary to consider further the treatment of either refinancing or embedded debt costs.

[138] http://webarchive.nationalarchives.gov.uk/20140402141250/http://www.competition-commission.org.uk/assets/competitioncommission/docs/pdf/non-inquiry/rep_pub/reports/2008/fulltext/539.pdf

[139] http://webarchive.nationalarchives.gov.uk/20140402141250/http://www.competition-commission.org.uk/assets/competitioncommission/docs/pdf/non-inquiry/rep_pub/reports/2007/fulltext/532.pdf

H.3. Cost of debt under competitive tendering

Recently Ofwat and Ofgem have taken a new approach to financing large projects – bidding. Here we summarise the outcomes of the regimes for Thames Tideway Tunnel and the OFTOs.

Ofwat - Thames Tideway Tunnel

Bidders were invited to submit their own weighted average cost of providing capital (WACC) during the construction phase, rather than have this fixed by the UK water regulator. Once construction is completed responsibility for setting this figure will pass to the regulator.

Two of the most significant features are the liquidity allowance and the adjustment factor for the cost of debt.

- The liquidity allowance enables the construction company to earn a return on the following charging year's expected spend to compensate for the financing cost of drawing down funding early to meet capital expenditure requirements.
- The debt adjustment factor effectively allows the WACC to increase or decrease should a specified cost of debt index increase or decrease by more than 50bp.

Ofwat has used a banded approach to the debt mechanism. It has defined the debt adjustment factor as:

where the difference between the base reference point and the annual reference point is:

(i) equal to or less than 50bps – the adjustment factor will be equal to zero;

(ii) greater than 50bps but not exceeding 100bps – the adjustment factor will be equal to 50% of the amount by which the difference exceeds 50bps; and

(iii) greater than 100bps – the adjustment factor will be equal to the amount by which the difference exceeds 75bps

	What Did They Do
Background	
Regulatory objectives	Set appropriate capital return levels for the TTT construction and post-construction period. BWACC and post construction WACC respectively
Length of price control	BWACC – stands until 2030, thereafter post construction will apply according to PR29
No of companies regulated	One project

Ofgem – OFTO regime

For the regulation of offshore electricity transmission Ofgem has taken quite a different approach from regular price control measures. The offshore transmission regime focuses on licensing specific transmission assets. The successful bidder in an OFTO tender is entitled to a

stable, 20 year, RPI inflation-linked revenue stream (TRS) in return for operating, maintaining and decommissioning the transmission assets. The bid is based on the bidders' required IRR and assumptions about the cost of debt. The cost of debt usually reflects the market cost for a standalone project at the time of bidding. No price reviews take place given that the TRS is fixed in real terms.

The OFTO's annual revenue is set out in the granted license and is based on the tender revenue stream it included in its bid. However, this TRS will be adjusted for various factors such as market rate revenue, UK Retail Price Index inflation, the proportion of revenue term, pass-through items, performance and a correction factor term.[140] Unlike earlier rounds Tender Round 3 allows the bidder to specify a proportion of the TRS over which it would like to receive indexation (previously 100% of the TRS was inflation adjusted). Moreover, a gain share mechanism was introduced for refinancing during the revenue term. The gain is calculated in line with guidelines set out in the license and Ofgem will review these calculations. The gains of refinancing will be shared of a 50/50 basis.

H.4. International regulatory precedent

H.4.1. Australia

Most Australian regulators, apart from ESCOSA, use the approach to calculating the cost of debt whereby the risk free rate is summed to a company specific debt premium. Compared to UK regulators, the debt premium is also more likely to be updated annually. In estimating the cost of embedded debt, Australian regulators systematically rely on benchmark indices. The corporate bonds characteristics typically is BBB+ 10 year. As opposed to most UK regulators, new debt is hardly ever accounted for under the Australian approach.

The Australian approach involves a transition to a trailing average approach typically ranging from 40 days to 10 years. The AER considers that it is an efficient debt financing practice of the benchmark efficient entity and thus a trailing average portfolio was reflective of the efficient debt financing costs of such an entity, minimising any expected difference. This approach would allow a service provider to manage interest rate risk without exposing itself to significant refinancing risk, promoting efficient of investment. ESCOSA have moved to a trailing average period, recognising past efficient financing practices, encourages efficient re-financing of this debt and reduces volatility, as well as incentive the issuance of new debt at or below efficient market rates. The IPART methodology uses multiple approaches; on the day and trailing average. This approach was seen to minimise distortions relative to efficient financing practice and to more closely reflect actual debt management practices of NSW utilities.

[140] https://www.ofgem.gov.uk/sites/default/files/docs/offshore_transmission_ofto_revenue_report_november_2015.pdf

H.4.2. Ireland[141]

The Commission for Energy Regulation (CER) sets out the cost of capital for the Transmission System Operator (TSO) EirGrid and ESB Networks (ESBN) which serves as both the Transmission Asset Owner (TAO) and Distribution System Operator (DSO) and Distribution Asset Owner (DAO).

In estimating the cost of debt, the CER constructed the notional cost of debt by summing the risk-free rate with a company-specific debt premium. This is done to ensure consistency in the way the cost of capital is calculated; i.e. using the same risk-free rate assumption.

The CER estimated a forward-looking cost of debt and made no embedded debt adjustment. According to the CER, while an embedded debt approach may be appropriate for pragmatic reasons, best practice in economic regulation should be to seek to phase out embedded debt adjustments as and when doing so becomes feasible.

In estimating the cost of debt, the CER assumed that ESB Networks would maintain a comfortable credit rating BBB+ or above over the regulatory period. This assessment relied on corporate bonds of European utilities, and the spread between BBB+ and A- bonds being fairly stable for at least a year.

[141] http://www.cer.ie/docs/001043/CER15193%20Europe%20Economics%20Report%20on%20WACC.pdf

ANNEX I USE OF COMPOSITE INDICES

In this annex, we provide further detail on the choice of our preferred notional benchmark for Heathrow Airport. As the CAA have tended to place more weight on actual debt costs, we look at the issue from their perspective given our recommendations to move to a notional approach. However, the lessons are applicable to other regulators.

I.1. What represents a 'good' representative index?

What do we mean by a composite index?

In the cost of debt sense, where we refer to a composite index, we mean a grouping of bonds with a particular characteristic. This does not include bank debt as this is not publicly available information. These composite indices are typically sourced from data providers such as Bloomberg and Markit iBoxx, however it is possible to create a composite index by applying rules and including bonds that meet this criteria.

Indices may differ by the following factors:

- Credit rating;
- Tenor of debt;
- Constituent group;
- Currency denomination of debt.

The approach can also differ. For example, Bloomberg pick a particular tenor e.g. 10yr debt, while Markit iBoxx use tenor ranges e.g. 10-15yr debt.

Combination of indices

It is possible to combine indices to get an allowance. There is no reason why only one index has to be used. If one index were to be used and this became less representative of the notional entity, this may create an issue. However, using multiple indices creates additional complexity.

Ofgem and Ofwat have both used a mixture of broad A and BBB indices provided by iBoxx in their most recent determinations.[142] This allows an estimate to be made of something around a mid-investment grade rating e.g. A-/ BBB+.

What makes a good index?

In the Strategy Decision for the RIIO GD1 and T1 prices controls, Ofgem set out seven criteria for selecting a notional benchmark index.[143] These were:

[142] For example, a broad A rating refers to A+, A and A- debt.
[143] Ofgem (2011) Decision on strategy for RIIO GD1 and T1 price controls: Financial Issues, p.24.

- Coverage
- Transparency of methodology
- Representative of the networks
- Objective
- Predictable
- User familiarity
- Risk of discontinuation

At the time Ofgem found that the iBoxx non-financial corporate 10yr+ indices rated well on five of the seven criteria, with user familiarity and risk of discontinuation scoring moderately.

Given the role the indices have played in recent price controls in energy and water, we would expect these to rate well should the analysis be conducted today. On coverage, we would note that this should be comprehensive of similar companies not just the company itself – otherwise there would be a risk that the notional index becomes closer to a pass-through.

While the criteria appear to be suitable for use in the aviation sector, this does not necessarily mean that the 10yr+ index is the correct index for regulating Heathrow airport. Indeed, having undertaken our analysis, we think that a 10-15yr index is more representative than the 10yr+ index due to our analysis in the main report on the characteristics and cost of Heathrow's debt. We think that these indices do score well against this set of criteria.

Why is this useful for the CAA?

Should the CAA adopt a notional approach, as per our recommendation, this will require the use of a notional benchmark index. Whether selecting an index or building their own composite index, the principles need to be borne in mind.

Third-party provider or own-index

The benefit of a third-party provided index is that daily information is available for stakeholders in a way that a reliance on the regulator is not. This should score more highly on a predictability and transparency basis. However, constructing one index may permit greater representativeness, for example, if focussing on regulated bonds.

I.2. Further details on our preferred index - aviation

What indices do we recommend?

In the main report, we have recommended that the CAA use the same family as used by Ofwat and Ofgem in their most recent decisions, the iBoxx non-financial corporate indices. We recommend that this is for both broad A and BBB rated companies, as per the other regulators. However, we recommend that these are the 10-15yr years to maturity. This is shorter than the 10yr+ index.

What does the index capture?

There are multiple figures noted in relation to the index, however the headline number is the annual (nominal) yield to maturity. This is based on yields in the secondary market, thus representing the cost of debt that would be incurred by an issuer on that date.

Membership and rules around the index

The proposed index covers bonds that have 10-15yrs remaining to maturity today (rather than at issue). The index must be over £100m in size prior to 2010 and from then on at least £250m in size.[144]

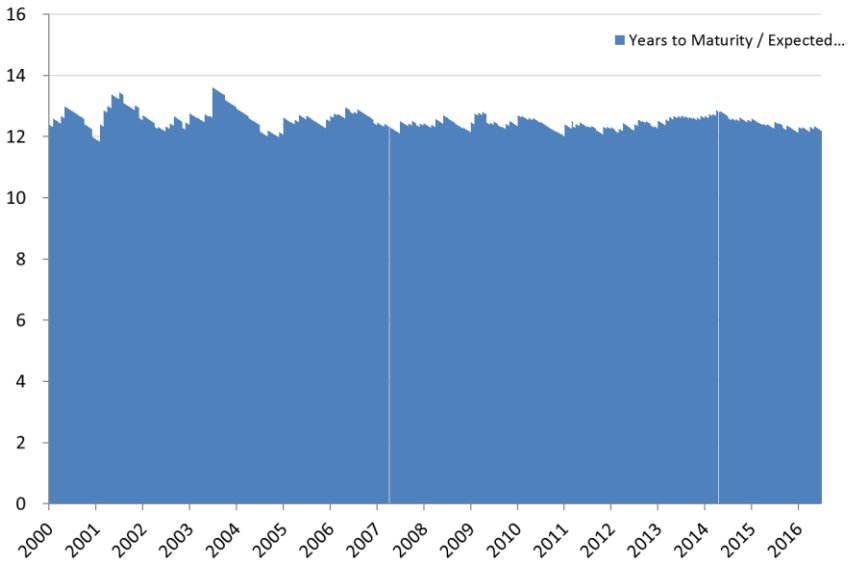
Characteristics of debt in the index

Years to maturity

The figure below shows the expected years to maturity for the 10-15yr A and BBB non-financial corporate indices respectively.

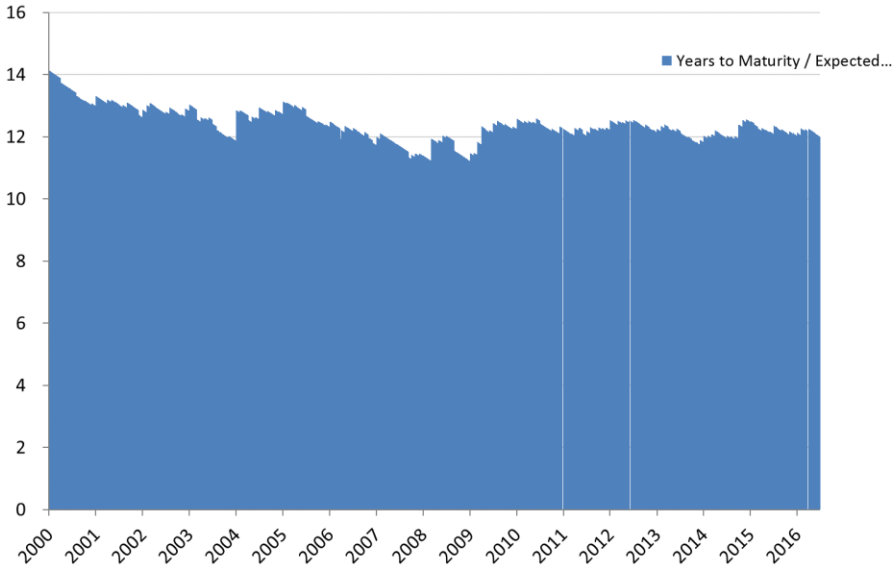
[144] The rules around membership are set out in the following location: http://content.markitcdn.com/corporate/Company/Files/DownloadFiles?CMSID=25329378592f431c9765becda11544f3

Figure I.1: Expected years to maturity – iBoxx A rated 10-15yr non-financial corporate index



Source: iBoxx

Figure I.2: Expected years to maturity – iBoxx BBB rated 10-15yr non-financial corporate index



Source: iBoxx

Bonds in the index

In this sub-section we provide a summary of the bonds included in these non-financial corporate indices in June 2016 and September 2006. Heathrow Funding bonds are included in the A rated index.

Constituent bonds in iBoxx 10-15yr A rated index (as of 28 June 2016)

Report Date	Sector6	Issuer	Sum of Index Weight in %	Count of Issuer
28/06/2016	Aerospace & Defense	Rolls-Royce Plc	2	1
	Electricity	Electricite de France	4	1
		National Grid Electricity Transmission Plc	9	3
		SSE Plc	5	1
		Yorkshire Power Finance Ltd	2	1
	Gas / Water & Multiutilities	Affinity Water Finance 2004	2	1
		Anglian Water Services Financing Plc	5	3
		DWR Cymru Financing Ltd	3	1
		Engie	4	1
		Southern Water Services (Finance) Ltd	3	1
		Suez Environnement	2	1
		Thames Water Utilities Cayman Finance Ltd	2	1
		Thames Water Utilities Finance Ltd	3	1
		United Utilities Water Plc	2	1
		Wales & West Utilities Finance Plc	2	1
		Wessex Water Services Finance Plc	1	1
		Yorkshire Water Services Bradford Finance Ltd	2	1
		Yorkshire Water Services Odsal Finance Ltd	3	2
	General Industrials	Hutchison Whampoa Finance UK Plc	2	1
	Industrial Transportation	Heathrow Funding Ltd	7	2
	Media	Comcast Corp	5	1
	Mining	Rio Tinto Finance Plc	3	1
	Mobile Telecommunications	America Movil SAB de CV	8	2
	Oil & Gas Producers	Statoil ASA	9	2
	Pharmaceuticals & Biotechnolog	Glaxosmithkline Capital Plc	4	1
	Tobacco	BAT International Finance Plc	4	1
	Travel & Leisure	Compass Group Plc	2	1
28/06/2016 Total			100	35

Constituent bonds in iBoxx 10-15yr A rated index (as of 30 September 2006)

Report Date	Sector6	Issuer	Sum of Index Weight in %	Count of Issuer
30/09/2006	Beverages	Coca-Cola Enterprises Inc	8	2
	Electricity	EDP Finance BV	5	1
		National Grid Gas Plc	7	1
		Scottish Power UK Plc	5	1
	Fixed Line Telecommunications	Deutsche Telekom International Finance BV	6	1
		France Telecom SA	25	2
		TCNZ Finance Ltd	6	2
	Food & Drug Retailers	Tesco Plc	8	1
	Gas / Water & Multiutilities	RWE Finance BV	16	1
		United Utilities Water Plc	3	1
	General Industrials	Textron Inc	4	1
	Industrial Transportation	Birmingham Airport [Finance] Plc	2	1
	Travel & Leisure	McDonald's Corp	5	1
30/09/2006 Total			100	16

Constituent bonds in iBoxx 10-15yr BBB rated index (as of 29 June 2016)

Report Date	Sector6	Issuer	Sum of Index Weight in %	Count of Issuer
29/06/2016	Construction & Materials	Bouygues SA	3	1
		Compagnie de Saint Gobain SA	2	1
		Crh Finance UK PLC	2	1
	Electricity	Electricite de France	3	1
		London Power Networks Plc	2	1
		NIE Finance Plc	3	1
		South Eastern Power Networks Plc	2	1
		SP Manweb Plc	2	1
		SPD Finance UK Plc	2	1
		Western Power Distribution [South West] Plc	2	1
	Fixed Line Telecommunications	AT & T Inc	4	1
		AT&T Inc	4	1
		British Telecommunications Plc	4	1
		Deutsche Telekom International Finance BV	5	2
		Koninklijke KPN NV	8	2
		Orange SA	4	1
		Telefonica Emisiones SAU	3	1
	Food & Drug Retailers	WM Morrison Supermarkets Plc	4	2
	Food Producers	Kraft Heinz Foods Co	2	1
	Gas / Water & Multiutilities	Centrica Plc	4	1
		RWE Finance BV	5	1
		Scotland Gas Network Plc	1	1
		Severn Trent Water Utilities Finance	3	1
		South East Water Finance Ltd	1	1
	General Retailers	Next Plc	3	2
	Industrial Transportation	ABP Finance Plc	3	1
	Media	Sky Plc	4	2
	Oil Equipment / Services & Distribution	APT Pipelines Ltd	3	1
	Pharmaceuticals & Biotechnology	Amgen Inc	7	2
	Tobacco	Imperial Brands Finance Plc	3	1
29/06/2016 Total			100	36

Constituent bonds in iBoxx 10-15yr BBB rated index (as of 30 September 2006)

Report Date	Sector6	Issuer	Sum of Index Weight in %	Count of Issuer
30/09/2006	Automobiles & Parts	GKN Holdings Plc	4	1
	Chemicals	Bayer AG	3	1
	Construction & Materials	Lafarge SA	2	1
	Electricity	Northern Electric Finance Plc	1	1
		South Wales Electricity Plc	2	1
		Yorkshire Electricity Distribution Plc	3	1
	Fixed Line Telecommunications	British Telecommunications Plc	13	2
		Telecom Italia SpA	9	1
		Telefonica Emisiones SAU	8	1
	Food & Drug Retailers	Safeway Plc	4	2
	Forestry & Paper	UPM-Kymmene OYJ	3	1
	Gas / Water & Multiutilities	Northumbrian Water Finance Plc	4	1
		Acquedotto Pugliese SpA	2	1
	Household Goods	Taylor Wimpey Plc	2	1
	Industrial Transportation	BAA Plc	4	1
	Media	BSKYB Finance UK Plc	4	1
		Daily Mail and General Trust Plc	4	2
	Oil & Gas Producers	Talisman Energy Inc	3	1
	Tobacco	BAT International Finance Plc	6	1
		British American Tobacco Holdings BV	3	1
		Imperial Tobacco Finance Plc	2	1
	Travel & Leisure	Enterprise Inns Plc	8	2
		Firstgroup Plc	3	1
30/09/2006 Total			100	27

Yields from the indices

The figures below illustrate the yields obtained from the proposed indices.

Figure I.1: Nominal yield on iBoxx A rated 10-15yr non-financial corporate index

Source: iBoxx

Figure I.2: Nominal yield on iBoxx BBB rated 10-15yr non-financial corporate index

Source: iBoxx

There are times when the differences between the indices are significant e.g. during the Global Financial Crisis in 2008/09 when the differential was c.300bps. For an A rated corporate, the use of a blended yield may be particularly generous when significant differentials exist.

I.3. Comparison to other indices

There may be other indices that could potentially be considered. In the main report, we note that the characteristics of Heathrow's bonds and the yields are broadly equivalent over a period of time. This suggests to us that this is an appropriate index. As an example, we illustrate why this may be more appropriate than other indices, for example the Industrials 10yr+ index. As Heathrow's bonds are in the 10-15yr index, they will also be in the 10yr+ index. Heathrow is also categorised under 'industrial transportation' so this may seem like an appropriate category.

Comparison to Industrials 10yr+ index

As a starting point, let us look at the constituent bonds of the Industrials 10yr+ index. This does not have a split by credit rating, like the non-financial corporate indices.

Figure I.1: Constituents of Industrials 10yr+ index (as of 29 June 2016)

Report Date	Sector6	Issuer	iBoxx Rating	Sum of Index Weight in %	Count of Issuer
29/06/2016	Aerospace & Defense	Rolls-Royce Plc	A	4	1
	Construction & Materials	Bouygues SA	BBB	5	1
		Compagnie de Saint Gobain SA	BBB	3	1
		Crh Finance UK PLC	BBB	4	1
	Electronic & Electrical Equipment	Siemens Financieringsmaatschappij NV	A	7	1
	General Industrials	Hutchison Whampoa Finance UK Plc	A	4	1
	Industrial Transportation	ABP Finance Plc	BBB	6	1
		Gatwick Funding Ltd	BBB	12	3
		Heathrow Funding Ltd	A	44	5
		Manchester Airport Group Plc	BBB	5	1
		United Parcel Service Inc	A	6	1
29/06/2016 Total				100	17

Source: iBoxx

Figure I.2: Constituents of Industrials 10yr+ index (as of 30 September 2006)

Report Date	Sector6	Issuer	iBoxx Rating	Sum of Index Weight in %	Count of Issuer
30/09/2006	Construction & Materials	Lafarge SA	BBB	5	1
	General Industrials	Textron Inc	A	4	1
		Tyco International Group SA	BBB	8	1
	Industrial Transportation	United Parcel Service Inc	AAA	13	1
		Atlantia SpA	A	12	1
		BAA Plc	BBB	55	4
		Birmingham Airport [Finance] Plc	A	3	1
30/09/2006 Total				100	10

Source: iBoxx

At present, Heathrow bonds represent 44% of all bonds in the 10yr+ Industrials index. It was 55% for BAA Plc a decade ago. This compares to around 3% across the 10-15yr non-financial corporates indices when combining A and BBB rated bonds.

One of the advantages of using a notional benchmark relates to the better incentive properties relative to actual debt costs. By selecting an index with Heathrow's own bonds dominated, this would mute the index.

The 71 bonds used by the iBoxx 10-15yr non-financial corporate index should also be more robust to change than the 17 bonds that form the 10yr+ Industrials index.

In addition, the Industrials 10yr+ index does not allow you to select a credit rating. We have previously observed that there can be significant differences between A and BBB rated bonds. If there were to be two A rated bonds included rather than two BBB rated bonds under the Industrials 10yr+ index, this could create a material difference.

While this is simply one example, this is the process that would be used in determining an appropriate index.