OFFICE OF RAIL REGULATION (ORR)

ADVICE ON ESTIMATING NETWORK RAIL'S COST OF CAPITAL

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Final Report

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EXECUTIVE SUMMARY

This report sets out our estimate for the allowed cost of capital for Network Rail for CP5 on the basis of i) an efficiently financed entity with similar risk characteristics as Network Rail (the 'full cost of capital') and ii) our estimated efficient financing costs for Network Rail given the existence of the Financial Indemnity Mechanism (FIM). This report has been prepared by a consortium led by CEPA and incorporating Indepen and Lion's Head Global Partners.

Conventional cost of capital

Approach

The full cost of capital is based on an assumed efficiently financed structure with comparable assets and risks to those of Network Rail, and as such without access to the FIM. It is assumed that the regulator will target a solid investment grade credit rating for this notional entity.[1]

Notional gearing

We have assessed the efficient level of gearing for the full cost of capital, based on regulatory precedent and market evidence. This shows that for an investment grade entity gearing levels of up to 65% (debt: RAB) are comfortably achievable, and we consider a range of 60% to 65% appropriate. In practice, gearing will need to be assessed through a financeability assessment, but that is beyond the scope of this paper.

Full cost of debt

In considering the cost of debt as part of the full cost of capital, we have considered market evidence and regulatory precedent of both the component parts of the cost of debt (risk-free rate and debt premium) and the 'all-in' cost of debt, including from recent issuances. Note that all rates referenced in this Executive Summary are in real terms. ORR has requested that CEPA separates out the cost of embedded debt and new debt, as well as proposing an overall range.

Risk-free rates are currently negative, and evidence from forward markets shows market expectations of near-zero rates throughout CP5. These rates are, however, influenced by Bank of England actions and we think it prudent to allow for future mean reversion in estimating a rate for CP5, given that the approach is to fix a single rate for CP5 rather than adopt an indexation approach. As such our preferred range for the risk-free rate is 1.5% to 1.75%.

For the debt premium, while market evidence shows historic spreads of around 100 bps to 150 bps over gilts, given the current markets it is not adequate to simply add this range to the risk-free rate to come to a view on the cost of debt. Instead we have separately estimated the cost of 'new' debt issued over CP5 and the cost of embedded debt. This allows us to more easily take account of the very low rates that corporates are accessing in today's market: all-in rates are for investment grade borrowers are below 2%, the iBoxx index (as used by Ofgem for its debt

[1] This approach could be thought of as including the FIM fee on top of the costs of the efficiently financed company with the guarantee mechanism in place.

indexation) is at a spot rate of 1.2% and High Speed One (HS1) recently raised debt at 150 bps over gilts for fixed rate debt.

Our judgement, allowing for a degree of 'headroom' is that the cost of new debt is 1.75% to 2.25% and the cost of embedded debt is 2.75% to 3.25%. In coming to these ranges, we have assumed a weighted average maturity profile of 15 to 20 years and up to 50% index-linked debt. For our total cost of debt estimate we assume that at the start of CP5, at least 80% of debt would be fixed and take account of refinancing needs and additional needs for the likely CP5 capital programme. This gives a weighting of around 75% on embedded debt costs and suggests a total cost of debt of 2.5% to 3.0% as our estimated range for CP5 to cover both embedded and new debt costs.[2]

Full cost of equity

We have considered evidence from regulatory precedent, which typically takes a CAPM-based approach, market evidence on the component parts of CAPM and market evidence from transactions. In addition, we have cross checked to a relative risk assessment, which considers the relative risk of rail to other UK regulated network utilities.

We have already discussed risk-free rates, establishing a range of 1.50% - 1.75%. For the Equity Risk Premium, we rely heavily on the evidence from the 2013 DMS study, which points to an ERP of around 5.0%. For the equity beta, we think it implausible that the beta would be over one, and that it is more likely in the range of 0.8 – 1.0. The upper end of this range is if anything conservative (i.e. generous) relative to the asset betas and market evidence on comparators.

As such, our range for the allowed cost of equity is 6.0% to 6.75%.

Full cost of capital summary

Our conclusions for the full cost of capital are summarised in Table E.1 with comparison to ORR's PR08 decision, the ORR commissioned First Economics (2011) report, and the Network Rail commissioned Oxera report. Our overall objective is to provide a viable range for the WACC, for which data limitations mean that a standard, whole company WACC figure is most appropriate.

Table E.1: CEPA summary assessment†

	ORR	**First Economics***	**Oxera***	**CEPA Estimate – narrow range****	
	PR08	**Dec 11**	**Jan 13**	**Low**	**High**
Gearing+	62.5%	62.50%	61.25%	62.5%	62.5%
Risk-free rate	2.00%	2.00%	1.75%	1.50%	1.75%
ERP	4.75%	4.70%	5.13%	5.00%	5.00%
Equity beta	1.00	0.93	0.98	0.90	1.00
Post-tax cost of equity†	**6.75%**	**6.35%**	**6.75%**	**6.00%**	**6.75%**

[2] The notional cost of debt implicitly includes the FIM fee, as we are looking at companies without access to a similar mechanism.

	ORR	First Economics*	Oxera*	CEPA Estimate – narrow range**	
	PR08	Dec 11	Jan 13	Low	High
Pre-tax cost of debt	**3.50%**	**3.20%**	**3.30%**	**2.50%**	**3.00%**
Post-tax vanilla WACC	**4.75%**	**4.40%**	**4.65%**	**3.80%**	**4.40%**
Pre-tax WACC (t=20.2%)!	**5.50%**	**5.05%**	**5.40%**	**4.38%**	**5.05%**

+ For calculating the WACC, we use the mid-point of our gearing range (60% - 62.5%).

** Based upon the midpoint of the ranges provided.*

*** Our narrow range excludes the combination of low end parameters from our broad range (risk-free rate 1.0%, ERP 4.5% and Equity beta 0.8) as combining these is likely to lead to an implausibly low cost of equity.*

† Figures rounded to the nearest 0.05%.

! Tax rate of 20.2% is an average across CP5 of 21% for 2014/15 then 20% thereafter.

Source: CEPA analysis, Oxera, First Economics and ORR.

Efficient financing costs

Approach

We have considered the efficient financing costs (i.e. the actual cost of debt) for Network Rail given the way it is currently financed. This analysis looks at actual embedded debt costs, including understanding the historic funding strategy and approach to hedging and provides comment on the efficiency of those costs. It then considers the likely efficient funding strategy for CP5, the new funding needs and real debt costs. It has also considered Network Rail's own estimate of its allowance for efficient financing costs in CP5.

Actual cost of debt[3]

Network Rail's efficient financing costs comprise both its actual issued benchmarks and its overlay interest rate swaps / Gilt Locks through which it has fixed its interest rate exposure during CP4. We have found consistent praise for Network Rail's borrowing strategy and have observed tight pricing against its key benchmarks of European Investment Bank and KfW.

Network Rail's hedging strategy has been very focused around its regulatory timetable. In 2008 Network Rail entered into forward starting interest rate swaps to pre-hedge its nominal bond issuance during CP4. Throughout CP4 interest rates have declined, as a result Network Rail has suffered from certain mark to market losses on its hedges, however had interest rates risen the converse would have been true. Given the way in which ORR sets Network Rail's funding cost we believe that the Company was prudent to seek to lock-in its funding costs for the period. Despite this, a more gradualist approach to market hedging based on underlying interest rates rather than the Company's regulatory cycle could provide similar rate protection during a specific

[3] To maintain confidentiality Section 6 of this report, setting out our analysis of Network Rail's actual cost of debt, has been redacted. We have also redacted Annex 3 of this report which provided further analysis related to Section 6.

regulatory period without the need to execute a very large hedging programme at any single point in time.[4]

Looking forward into CP5 we would consider that an efficiently financed company would seek to lock-in as much of its interest rate exposure as possible via a new set of forward starting swaps.

Given the scale of Network Rail's funding programme, we do not believe that an efficiently financed company would only tap the Sterling bond market, but rather would maintain an active presence across all of the markets that offer a funding advantage versus Sterling. Currently the most attractive rates are to be found in the US dollar market as this remains the market of greatest demand from Central Bank portfolios who value Network Rail as Government Guaranteed issuer. However US dollar demand is strongest at the short end and Network Rail will have to continue to fund the majority of its borrowing in markets that provide long term funding options, of which Sterling will remain core.

Taken in combination our expected all-in funding cost for Network Rail during CP5 is 6M Sterling Libor + 50 bps and therefore this is the rate that we have used in our modelling. These rates are significantly wider than current prevailing spreads reflecting anticipation that the UK will transition over the near term to a status of a strong AA borrower and maintain that position for the duration of CP5.

The FIM fee

We have also been asked to consider the FIM fee, based on the value of long run credit enhancement. Our analysis on the difference between historical investment grade utility issuance (full cost of debt) and Network Rail's historical issuance indicates a FIM fee in the range of 90-120 bps. The appropriate point estimate within the range is dependent upon the views over the credit enhancement given by the FIM in the future.

Differential risk

We have considered at a high level the broad set of activities that Network Rail undertakes in order to begin to assess where the risks are such that the cost of capital for an activity might theoretically be materially lower or higher than the average cost of capital applied at the company level. This differential risk assessment could in due course be used in combination with the proportionate spending for each cost type by each Operating Route to develop a view of differential risk across these routes. ORR's approach to setting incentives and efficiency targets for Network Rail will have a significant impact on how investors would view a conventionally financed entity for Network Rail. The incentives and efficiency targets could be set in such a way that investors would see little difference in risk between Network Rail's cost categories. This could mean that even if an Operating Route was carrying out a higher proportion of Civil works investors would not view it as any riskier than a conventionally financed Network Rail as a whole.

[4] Carrying out a very large hedging programme at any single point in time may also incur high costs and may also lead to capacity constraints.

1. INTRODUCTION

1.1. Background

In this report, we set out the CEPA consortium's view on both the full weighted average cost of capital (WACC) for an efficient and conventionally financed Network Rail and for the 'adjusted' WACC. For the 'adjusted' WACC, Network Rail is compensated for efficient financing costs given the way the company is actually financed. This forms part of the 2013 Periodic Review (PR13), which establishes Network Rail's required outputs, allowed revenues and access charges for the control period 2014-19 (CP5). In practice Network Rail is a company limited by guarantee (CLG) and is entirely debt-financed, benefiting from the Financial Indemnity Mechanism (FIM), a full faith and credit guarantee from the UK government.

In terms of the applicability of this report, ORR's proposed approach involves the continued use of an adjusted WACC approach. As set out in ORR (2012),[5] this approach involves:

- Identifying the full cost of capital for Network Rail, i.e. if it were conventionally financed without access to the FIM, reflecting all the risks that the investors in the company would face and hence its full conventional funding requirement.
- Next, identifying Network Rail's actual and estimated efficient financing costs, which will be lower than its full cost of capital, due to the existence and use by Network Rail of the FIM. ORR refers to the difference between Network Rail's full cost of capital for the notional entity and its efficient financing costs as the 'equity surplus'.
- Calculating an equity surplus, which is recycled before the revenue requirement is determined, i.e. the equity surplus is netted off Network Rail's bottom-line revenue requirement. We understand that ORR does this by using Network Rail's full cost of capital in the calculation of Network Rail's allowed return, and then deducting the equity surplus. This is then equivalent to the efficient financing costs of the company, which includes the 'FIM fee', the amount that Network Rail pays the Department for Transport (DfT) for the provision of the FIM.

This approach, everything else being equal, significantly reduces Network Rail's allowed revenue. This reduction in revenue could potentially cause additional financial sustainability issues, depending on the extent of new capex relative to the RAB. ORR addresses this issue by increasing the amortisation charge,[6] which remunerates past investment that has been added to the RAB, with the total allowance being broadly equal to average (sustainable) long-run steady state renewals. The increase in the amortisation charge is intended to reduce the need to issue more debt to cover the financing requirements in CP5.

To maintain confidentiality Section 6 of this report, setting out our analysis of Network Rail's actual cost of debt, has been redacted.

1.2. What is the WACC?

[5] ORR, Periodic review 2013, Financial issues for Network Rail in CP5: decision, December 2012.

[6] ORR, Periodic review 2013, Financial issues for Network Rail in CP5: consultation, August 2012 p18.

Businesses are financed using a combination of equity and debt. Conceptually, the cost of equity is the expected return that must be offered to providers of equity if they are to acquire share capital in the business. The cost of debt is similarly the expected return required by debt providers.

The cost of equity and debt are determined in the financial markets and are equal to the rate of return expected to be available from alternative opportunities with comparable risk. It follows that if the allowed cost of equity and debt are set at the 'correct' level then a business will always be able to raise finance (subject to capacity and financeability) to invest in new facilities so long as the new capital expenditure is included in the Regulatory Asset Base (RAB).

The WACC is the average of the cost of equity and debt, weighted by the proportions of equity and debt which an efficiently financed company can be expected to use to fund its activities. Hence to determine the WACC, it is necessary to determine the cost of debt, the cost of equity and the proportions of debt and equity (i.e. the level of gearing) that would be used by an efficiently financed company.

1.3. Terms of reference

Below we set out our understanding of ORR's requirements as set out in its terms of reference for this project. At a summary level the requirements are to:

- Develop a cost of capital range and a best estimate based on the assumption that Network Rail is financed conventionally and efficiently (i.e. appropriate: cost of debt, cost of equity, notional level of gearing, and cost of capital). The analysis for cost of debt should be both on the basis of with and without embedded debt.
- Estimate Network Rail's cost of debt given that is has access to the FIM.
- Determine whether Network Rail's cost of embedded debt has been efficiently incurred.
- Identify any activities Network Rail undertakes where the risks are such that the cost of capital of that activity may be materially lower or higher than the average cost of capital.
- Discuss and quantify (where possible) the impact, if any, of the Office for National Statistics (ONS) consultation on recalculating the RPI.
- Identify an appropriate FIM fee for CP5.

The study should also take account of ORR proposed financial framework for PR13.

1.4. Approach

This paper starts by taking a conventional regulatory approach to WACC, i.e. assessing a business with comparable assets and risks to what Network Rail would face as a company limited by shares (i.e. with an equity proportion) and without the support of the FIM. Then we assess what Network Rail's actual efficient cost of financing will be in CP5, giving consideration to how efficient its embedded debt is.

To determine the allowed revenues relating to the WACC we need to determine:

- the appropriate *gearing* for Network Rail's full cost of capital in the PR13 period;
- the *cost of debt* for Network Rail's full cost of capital in the PR13 period; and
- the *cost of equity* for Network Rail's full cost of capital in the PR13 period.

CAPM is the framework used to estimate the cost of equity by almost all regulators. The theoretical and practical limitations of CAPM are well known. It assumes that parameter values estimated from historic data are valid indicators of prospective values. However, CAPM is a poor predictor of historic excess returns.[7] Parameter value estimates have high standard errors and selection of 'central' or 'most likely' values is subject to considerable uncertainty. Uncritical use of historic values often results in prospective cost of equity estimates that are implausible with regard to direct market evidence.

Nevertheless CAPM remains, as stated, the framework of choice of almost all regulators when determining the cost of capital and this is the approach we use here. The figures taken for the full cost of capital in CP4 from the PR08 determination are contained in Table 1.1 below.

Table 1.1: ORR PR08 determination for full WACC

Parameter	**PR08 decision**
Risk-free rate	2.0%
Equity Risk Premium	4.75%
Asset beta	0.39
Equity beta	1.00
Cost of equity (post-tax, real)	6.75%
Gearing	62.5%
Debt premium	1.50%
WACC (vanilla)	4.75%

Source: ORR

For Network Rail's efficient financing costs we have looked at the amount of embedded debt Network Rail has, and its forecast issuance for CP5. Using evidence from the market we have then estimated what Network Rail's interest costs will be over CP5 and hence is cost of debt over this period.

1.5. Report structure

In the remainder of this note we set out:

- in Section 2 we set our assumption for gearing for the full cost of capital;
- in Section 3 we present the evidence and range estimate for the full cost of debt for Network Rail;
- in Section 4 we present the evidence and range estimate for the full cost of equity for Network Rail;

[7] See Fama & French (1989).

- in Section 5, we present our conclusions on the full cost of capital for Network Rail;
- in Section 6 [redacted] we present our analysis of Network Rail's efficient financing costs, including an assessment of the efficiency of its embedded debt;
- in Section 7 we provide our estimates for the FIM fee; and
- Section 8 contains our analysis of the differential risk that exists between the different activities undertaken by Network Rail.

Annex 1 sets out recent relevant regulatory decisions in relation to the cost of capital.

Annex 2 sets out our qualitative assessment of Network Rail's relative risk.

Annex 3 [redacted] sets out a selection of market and media reaction to Network Rail's issuance over CP4.

2. NOTIONAL GEARING

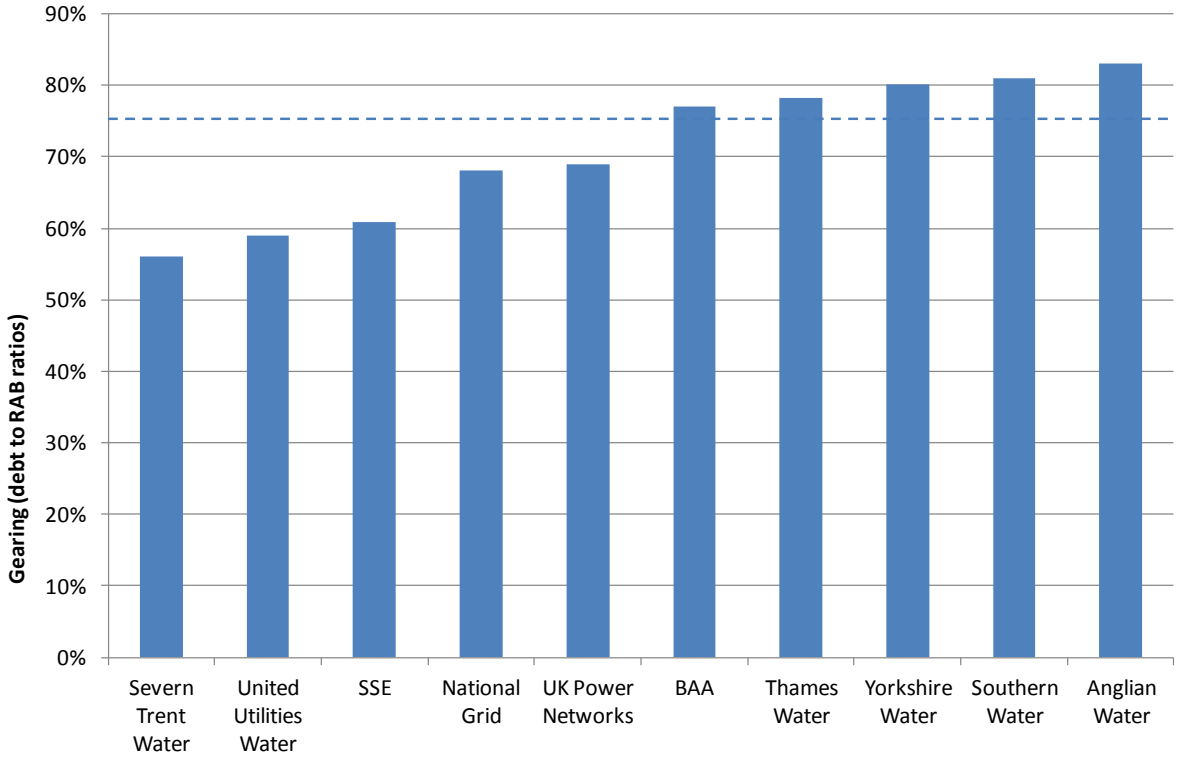
2.1. Introduction

Notional gearing is primarily an issue of financeability and as such is not discussed extensively in this report. But as notional gearing is also an input into the cost of equity calculation (since it must be used to re-lever the asset beta to produce an equity beta assumption), as well as the overall cost of capital, we provide some high level thoughts and analysis to guide our assumptions.

2.2. Evidence

Our assessment of notional gearing is based largely on the experience of relevant comparators, and the gearing levels they have been able to sustain. Figure 2.1 below shows the debt to RAB gearing ratios for comparators companies.

Figure 2.1: Debt to RAB gearing ratios for comparators



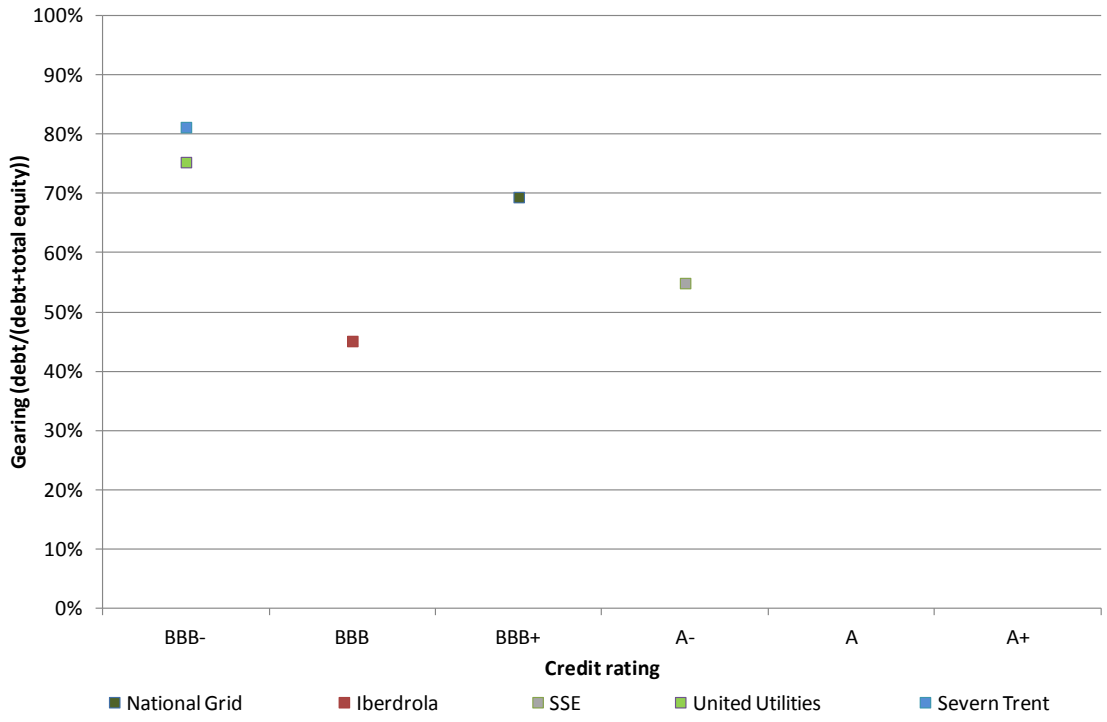
Source: Annual reports, Bloomberg, BAA

The dotted line illustrates the 75% debt to RAB limit that Network Rail faces. Rates over this have been sustained by water companies. Figure 2.2 below presents corporate investment ratings for these comparator companies. Rates over 75% for these companies are consistent with at least a BBB- rating, the lowest possible investment grade credit rating[8], whilst there are some A- rated companies which have gearing on this basis above the limit for Network Rail. Each of the comparators retains investment grade status, with Moody's taking 75% as the upper end of their

[8] This is according to credit rating agencies, but regulators may target something different e.g. 'solid' investment grade.

range for broad BBB rated companies,[9] although this is just one of several metrics and qualitative factors that are taken into account.

Figure 2.2: Credit ratings of comparator companies



Source: Moody's credit ratings (noted in Fitch equivalent categories).

2.3. Assessment

The assumed credit rating for the full cost of capital Network Rail will dictate what an appropriate gearing figure here will be. This suggests that a higher gearing ratio could be sustained, but for a company in the BBB+ to A- range, our working hypothesis is that notional gearing can remain unchanged within a range of 60-65%, with the midpoint at 62.5%. This is a conservative estimate, which takes account of the potential significant size of the new capex programme in CP5. We recommend that this range is revisited in line with ORR's financeability assessment, which will look into financial metrics and their implications for credit ratings in light of other model inputs, such as decisions on capitalisation rates and the other cost of capital parameter estimates.

Table 2.1: CEPA assessment of the assumed level of gearing

	CEPA Estimate	
	Low	**High**
Gearing	60.0%	65.0%

Source: CEPA calculations

[9] Rating is given as Fitch equivalent. Moody's rating is Baa.

3. COST OF DEBT

3.1. Introduction

In this section we present analysis on the real cost of debt that would be faced by a conventional financed and efficiently operated network company with similar business risks and assets to those faced by Network Rail (full cost of debt).

The cost of debt allowance should provide a reasonable return to cover efficient fixed financing costs, floating rate debt and any new debt. We first consider the overall cost of debt for embedded and new debt combined, before looking at these elements individually. We then verify that our overall cost of debt estimate is consistent with the allowances for these debt measures.

3.1.1. Type of debt

One aspect to note is that we do not differentiate between the cost of nominal fixed rate debt and index-linked debt in the proposed cost of debt allowances. Whilst there is an impact on cashflow-based financeability metrics, UK regulators do not appear to have made specific allowances for index-linked debt as part of the cost of debt.[10] Ofgem use an index-linked debt assumption of 25% of total borrowings in their modelling, but as noted in the RIIO GD1 and T1 cost of capital study:

'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.'[11]

Index-linked bond issuance by regulated entities in the UK have, in recent years, been relatively limited, which constrains any analysis on a different cost of debt to include. We understand from City analysts that the evidence suggests that a wide range of index-linked debt proportions can be sustained, but for the majority of companies the proportion is below 70%. Network Rail's proportion of 50% does not therefore appear inappropriate (at a debt to RAV ratio of 62.5%), though internal analysis presents figures that are lower than the figures listed above.

3.1.2. Maturity of debt

The efficiently financed entity will have debt of different maturity and we assume that the average life of debt is around 15-20 years.[12] The average length of debt assumed has implications for refinancing and the amount of debt issued, but also is useful for setting the allowed cost of debt, depending on the slope of the yield curve moving forward. Table 3.1 below shows the Weighted Average Maturities for a range of both quasi-sovereigns and regulated utilities. Further discussion of the quasi-sovereign comparator groups is contained within Section 6; for our notional entity analysis the regulated utilities are a closer comparator set.

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[10] Ofwat in PR09 for example used a level of 30% index-linked debt for their modelling, but assumed no new issuance of index-linked debt in their determination.

[11] FTI Consulting (2012) Cost of capital study for the RIIO-GD1 and T1 price controls, p131.

[12] We also assume that any debt which expires within the price control is rolled over.

Table 3.1: Weighted average maturity of debt

Companies	Current WAM (yrs)	Regulated utilities	Current WAM (yrs)
EIB	6.24	Thames Water	22.05
IBRD	5.39	Northumbrian Water	20.43
IFC	5.15	United Utilities	20.33
IADB	5.09	Severn Trent	19.10
KfW	4.67	Anglian Water	18.48
TfL	17.48	Easter Power	14.40
Tesco	14.41	Wales and West	13.74
BAT	8.28	Southern Gas	13.19
Shell	7.13	National Grid	12.30
Diageo	6.17	SSE	11.71
European Rail		BAA/ Heathrow	10.75
RFF	13.74		
SNCF	10.06	***Network Rail***	***15.59***
REFER	8.59		
Deutsche Bahn	6.53		

Source: Network Rail

Having set out our assumptions for the analysis, the paper will consider cost of debt estimates on the basis of both including and excluding embedded debt, as requested by ORR. Our analysis looks at the real risk-free rate and the debt premium for a UK investment grade, efficiently financed entity, before looking at market evidence on the all-in cost of debt as a cross-check for this area of analysis.

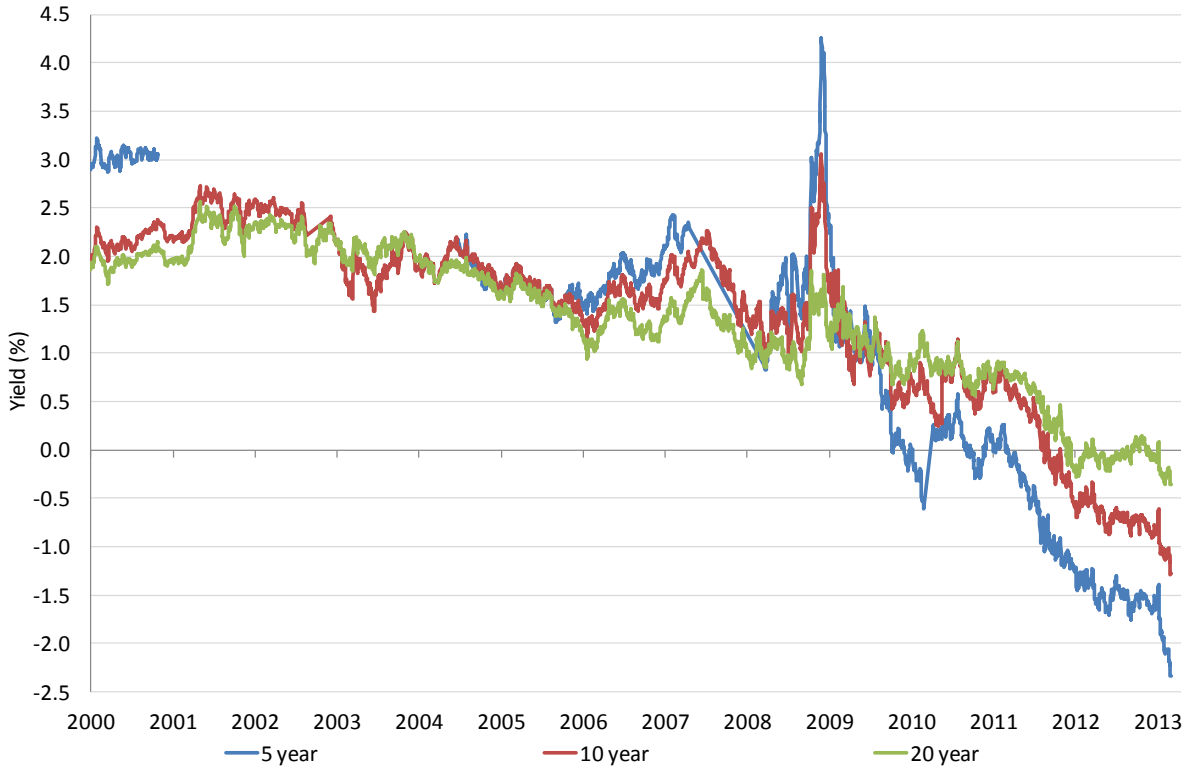
3.2. The real risk-free rate

3.2.1. Market evidence

We use historic evidence on five, ten and 20 year index-linked UK government bonds (index-linked gilts – ILGs) as a proxy for the risk-free rate. As a check, we also consider rates on nominal bonds. We note, however, that the financial crisis and the Bank of England's market interventions mean that recent evidence may not be representative of the true, underlying longer term risk free-rate.

Figure 3.1 below presents real yields on ILGs since 2000. Apart from a brief spike towards the end of 2008, there is evidence of a clear, sustained downward trend – one that predates the Bank of England's interventions. This trend resulted in a rate for ten year gilts of below 1.5% by end-2009. This downward trend has continued (and indeed intensified) in recent years, but this evidence needs to be treated with some caution such that undue weight is not attached to current negative rates when considering the appropriate allowed risk-free rate.

Figure 3.1: Real yields on ILGs



Source: Bank of England, Bloomberg

Table 3.2: Summary of Figure 3.1

As of 01/03/13 (%)	Spot	1y average	2y average	5y average	10y average
5yr	-2.34	-1.53	-1.13	0.09	0.73
10yr	-1.29	-0.71	-0.31	0.52	1.14
20yr	-0.36	-0.04	0.17	0.69	1.14

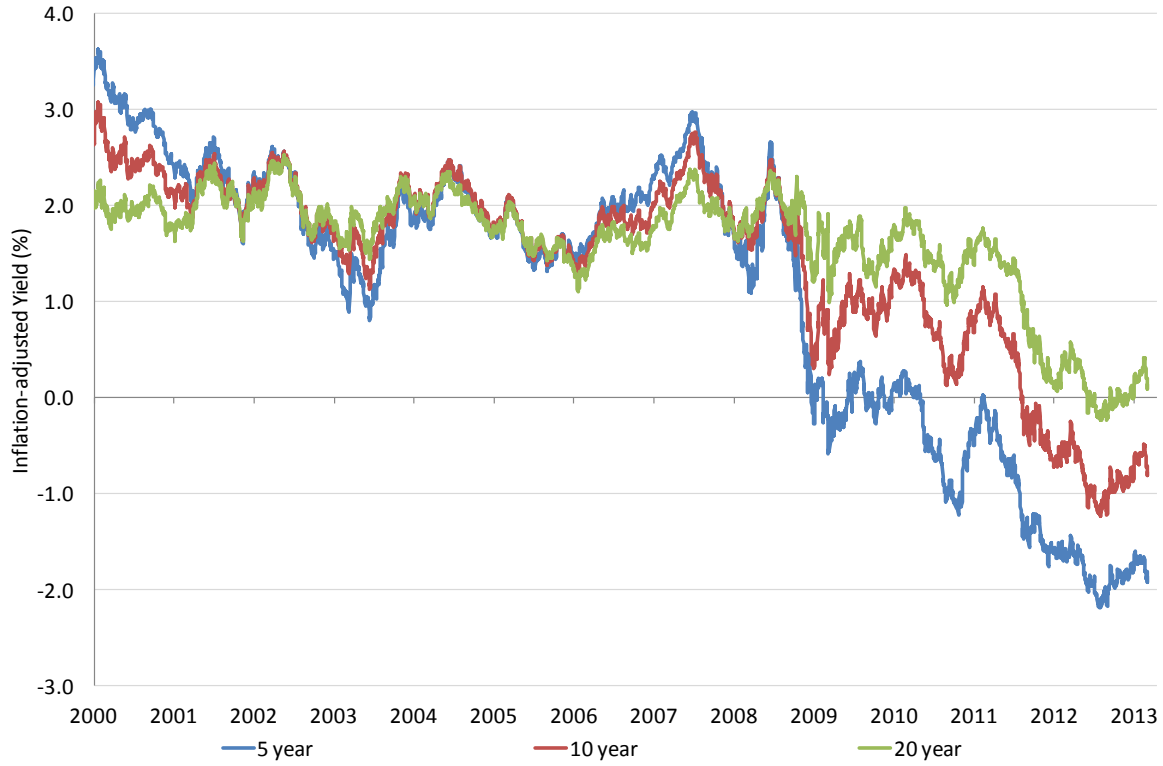
Looking at the ten year ILG, there is a 240 bps difference between the ten year average and the current spot rate. This difference is more exaggerated for the five year ILG (300 bps) and is less dramatic for the 20 year ILG (150 bps). There has been a significant drop in 2013 for each maturity of debt, which may be partly attributable to the ONS decision that followed a three-month consultation on the appropriate calculation for RPI. Market commentary suggested that expectations were for the methodology to change in light of criticisms of the methodology. The ONS found that the formulation does not meet current international standards, but ultimately ONS opted to leave the calculation unchanged in light of the recommendations provided by the National Statistician, who stated that:

'There is significant value to users in maintaining the continuity of the existing RPI's long time series without major change, so that it may continue to be used for long-term indexation and for index-linked gilts and bonds'.[13]

Figure 3.2 presents equivalent evidence based on deflated nominal gilts. The overall picture is broadly similar to that for ILGs. The yield on gilts has moved sharply downwards in recent years, and again current rates are negative.

[13] http://www.ons.gov.uk/ons/rel/mro/news-release/rpirecommendations/rpinewsrelease.html.

Figure 3.2: Risk free rate as implied by nominal gilts



Source: Bank of England, Bloomberg

Note: inflation taken as the long-term expectation of 2.7% to deflate the nominal gilt.[14]

Table 3.3: Summary of Figure 3.2

As of 01/03/13 (%)	Spot	1y average	2y average	5y average	10y average
5yr	-1.81	-1.84	-1.45	-0.41	0.76
10yr	-0.77	-0.84	-0.37	0.53	1.23
20yr	0.14	0.07	0.48	1.20	1.52

The results using the nominal basis are similar to those observed from using ILGs, with the differences between the measures being caused by differences in the choice of deflation measure, with Figure 3.2 using a long-term inflation expectation of 2.7% rather than the market implied breakeven inflation.

3.2.2. Regulatory precedent

In recent regulatory determinations, most regulators have taken a relatively conservative view of the risk-free rate, with a rate of 2.0% common. Ofgem has recently produced its ED1 strategy document, which contains further commentary on the risk-free rate and ERP, as set out below. The strategy decision confirmed the selection of 1.7-2.0% for the risk-free rate for the eight-year price control. The ED1 strategy decision also chose to index the cost of debt, which reduces the

[14] This is based upon a CPI target of 2.0% and the average RPI figure from 1989-2011 being 0.7% above the CPI. This is set out by the OBR: http://cdn.budgetresponsibility.independent.gov.uk/Working-paper-No2-The-long-run-difference-between-RPI-and-CPI-inflation.pdf.

impact of the risk-free rate on the overall cost of capital. By way of context and insight into the evolution of Ofgem's thinking, Ofgem in its 2012 Initial Proposals for GD1 stated:

'we have based our proposals on the assumption of 2.0 per cent risk-free rate and 5.25 per cent equity risk premium'[15]

Based on an analysis of historical average yields on ILGs and conventional gilts, Ofgem more recently proposed in its recent ED1 strategy decision a limit to the risk-free rate of 2%:

'…to use an initial range for the risk-free rate of 1.7 – 2.0 per cent.

We note that there is evidence to suggest that long-term estimates of the risk-free rate are currently lower than the 2.0 per cent we set in DPCR5 and in the initial proposals for RIIO-T1 and GD1. However, it has been argued by some, that the Bank of England's quantitative easing policy has pulled down the yield on ILGs by as much as 100 bps. Hence, we have kept 2.0 per cent as the upper bound of the range owing to the possibility than the downward trend described above or quantitative easing are reversed during RIIO-ED1.'[16]

Table 3.4 lists decisions made by UK regulators since 2009, and Figure 3.3 presents a longer term view, comparing decisions to historic ILG rates.

Table 3.4: Recent regulators' assessments of the risk free rate

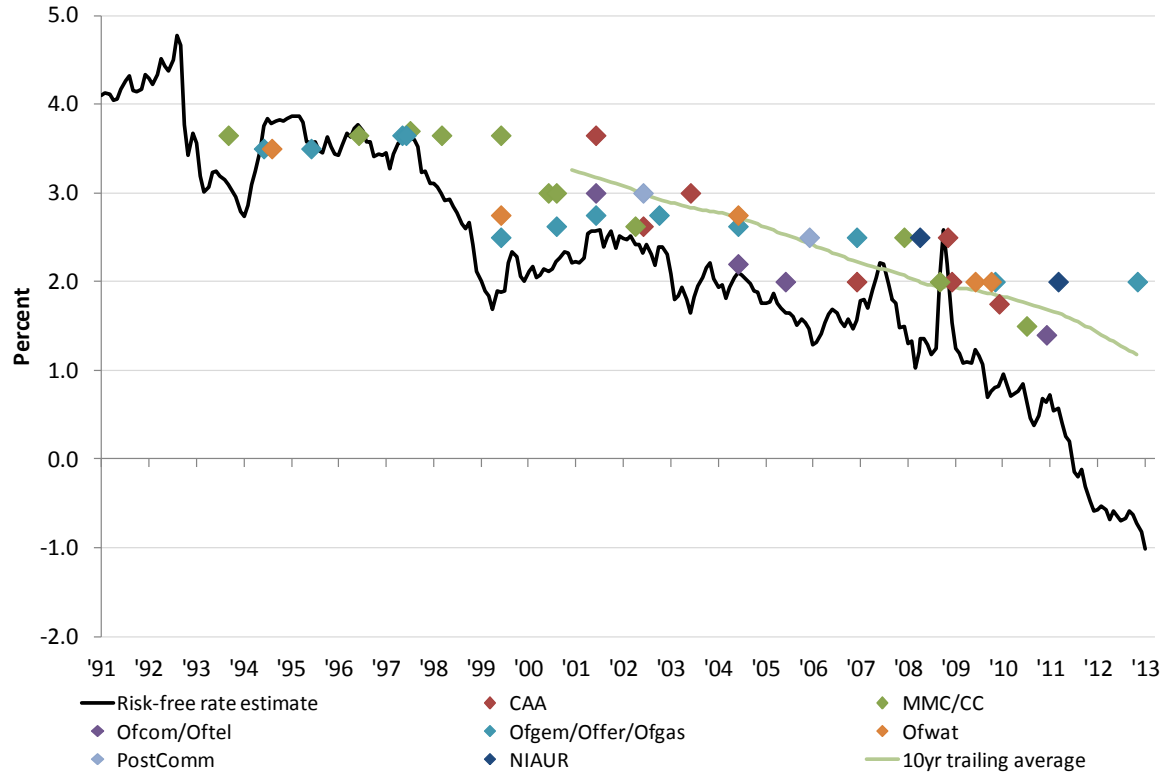
Regulator	Decision	Risk-free rate
Ofgem	ED1 Strategy (2015-23)	1.7%-2.0%
Ofgem	RIIO-GD1 & RIIO-T1 (2013-21)	2.0%
NIAUR	NIE T&D proposals (2012-2017)	2.0%
Ofcom	Mobile calls (2011-2015)	1.4%
CC	Bristol Water (2010-2015)	1.0% – 2.0%
Ofgem	Electricity distribution (2011-2015)	2.0%
Ofwat	Water & sewerage (2010-2015)	2.0%

Source: Regulatory determinations. Rates presented are before the addition of any 'uplifts'.

[15] RIIO GD1: Initial Proposals, Supporting Document - Finance and Uncertainty, para 3.34.

[16] RIIO ED1: Consultation on strategy for the next electricity distribution price controls – RIIO ED1 – Financial issues, paras 2.49 and 2.50.

Figure 3.3: Real risk-free rates and Regulator determinations



Source: Regulatory determinations and Bank of England, CEPA analysis
Note: Ofgem's RIIO ED1 strategy decision of 1.7-2.0% is not included in the above figure

Previous regulatory determinations have historically been made relatively close to the ten-year trailing average of the real risk-free rate.[17] The Ofgem RIIO GD1 and T1 decisions have more significantly deviated from this relationship, but this may be explained by the Bank of England's market interventions, the length of the price control (eight years) and the cost of debt being indexed.

The above evidence suggests regulators have generally reflected evidence of a falling risk-free rate with a lag of a few years. In our view, such an approach is understandable: the regulator's objective is to reach an expectation for the risk-free rate over a period of several years. It would not be appropriate simply to use the spot rate for ILGs. However, it appears that there is room based on recent evidence for regulators to select lower estimates than the 2.0% that has been the typical range for the most recent price controls. Indeed, the CC (in its Bristol Water determination) and Ofcom both acknowledged that the risk free rate appears to be below 2%.

The CC, in its Bristol Water decision, is also supportive of use of long-dated index-linked yields. It does note that in prior decisions it has been concerned about the distortions in these long-dated instruments but that it now puts more weight on these instruments:

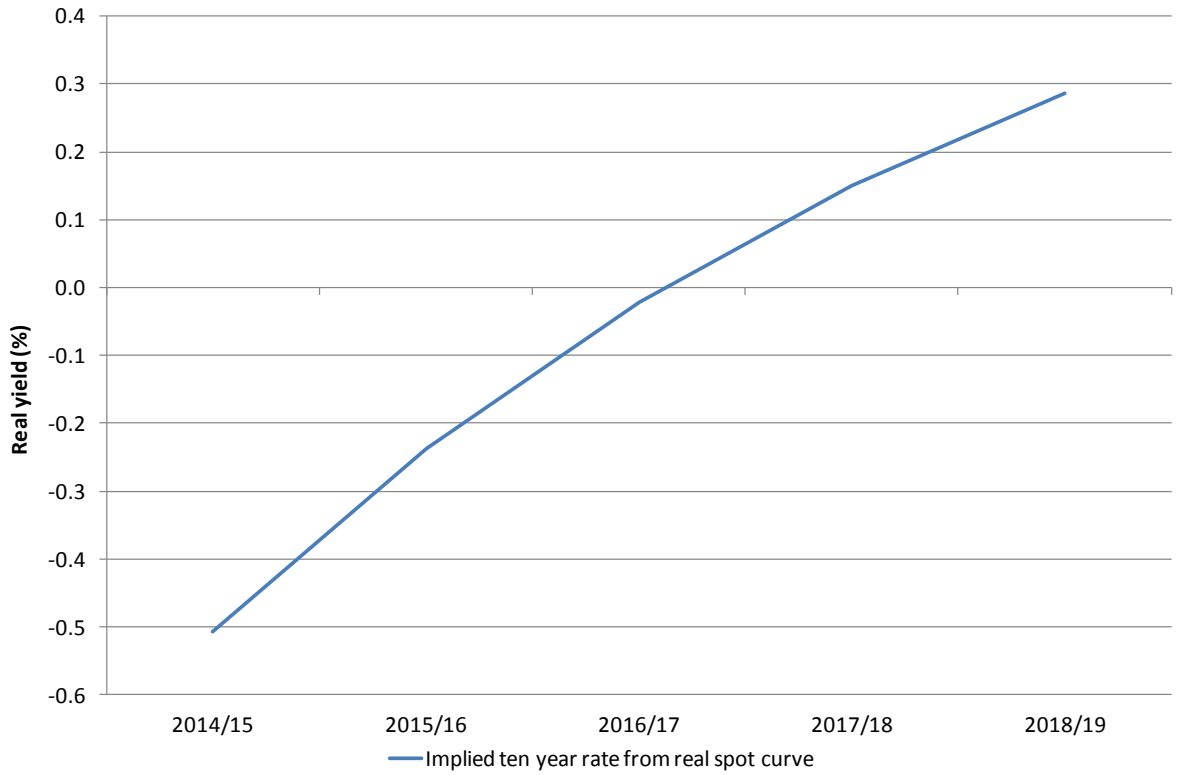
[17] This is based upon Index-Linked Gilts.

'The prolonged period of low yields may suggest that long-run rather than temporary factors are at work. We therefore now see some grounds for assuming a lower RFR*, more in line with actual long-dated index-linked yields.'*[18]

3.2.3. Analysis of forward rates

We have also conducted our own analysis of movement in the risk-free rate and what can be learnt about forward ten year rates from current longer term yields. The implied ten year rate based on the real spot curve is shown in Figure 3.4 below.

Figure 3.4: UK implied real spot curve



Source: Bank of England, CEPA analysis
Note: years relate to the end of July for each case i.e. 2014/15 figure is based upon 30 July 2014.

Real yields are below zero for short term and medium tenors and have been for some time, with the real yield on the ten year ILG being -0.95% at the end of January 2013. The implied ten year rate based on the real spot curve for specific points in time is presented below in Table 3.5.

Table 3.5: Implied ten year rate based on real spot curve

	Current	2014/15	2015/16	2016/17	2017/18	2018/19
Implied ten year rate (real)	-0.95%	-0.51%	-0.24%	-0.02%	0.15%	0.29%

Source: Bank of England
Note: Years relate to end-July in each case.

[18] CC Bristol Water pN19.

The average for the CP5 period is set to be -0.07% based on these projections. The rates at the end of the period are around 130bps higher than currently, but are very low from a historical perspective.

3.2.4. Assessment

Overall, we put limited weight on current negative rates on some tenors. The evidence does however suggest that a rate as low as 1.0% may be justifiable. However, given the considerable uncertainty regarding the underlying risk-free rate, we acknowledge that a rate of 2.0% is a possibility – and this would be consistent with regulatory precedent. Therefore, a broad range of 1.0-2.0% would not be out of the question for CP5. However, we prefer a narrower range of 1.50-1.75%, which our view is a reasonable interpretation of the evidence as a whole. Decisions here should also be consistent with the approach adopted for the Equity Risk Premium (ERP) discussed later. The risk-free rate will apply to both the cost of debt and the cost of equity unless the cost of debt is indexed for the notional entity.

Table 3.6: CEPA assessment of the risk-free rate

	CEPA Estimate	
	Low	**High**
Risk free rate (real)	1.50%	1.75%

Source: CEPA calculations

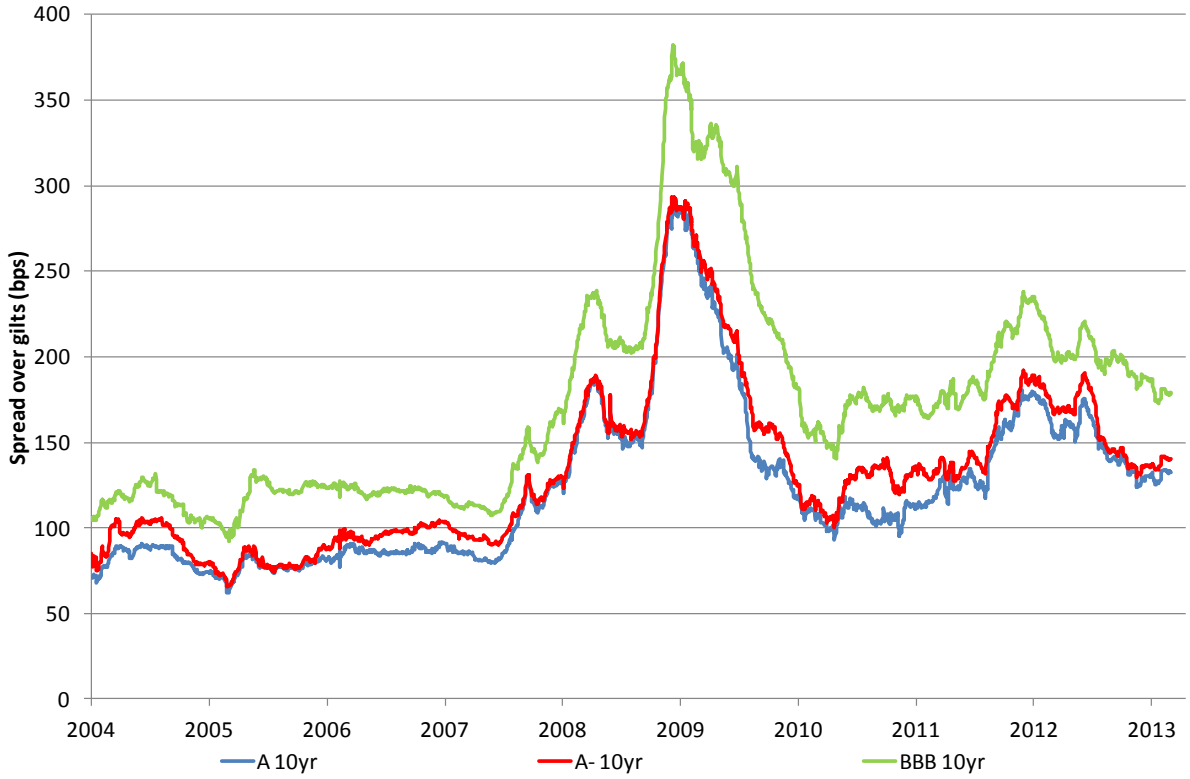
3.3. The debt premium

In considering evidence on the debt premium, it is important to note that the relevant cost of debt is that of an efficiently financed entity. We consider evidence on UK investment grade (BBB or A rated) corporate bonds as a proxy for an efficiently financed entity.

3.3.1. Market evidence

Figure 3.5 and Table 3.7 below present evidence on the debt premium for UK corporate bonds, based on the spread of those bonds over equivalent UK government bonds. Figure 3.5 presents evidence across different credit ratings for ten year debt, while Figure 3.6 presents evidence across different maturities for BBB rated debt.

Figure 3.5: UK investment grade credit spreads on 10yr bonds



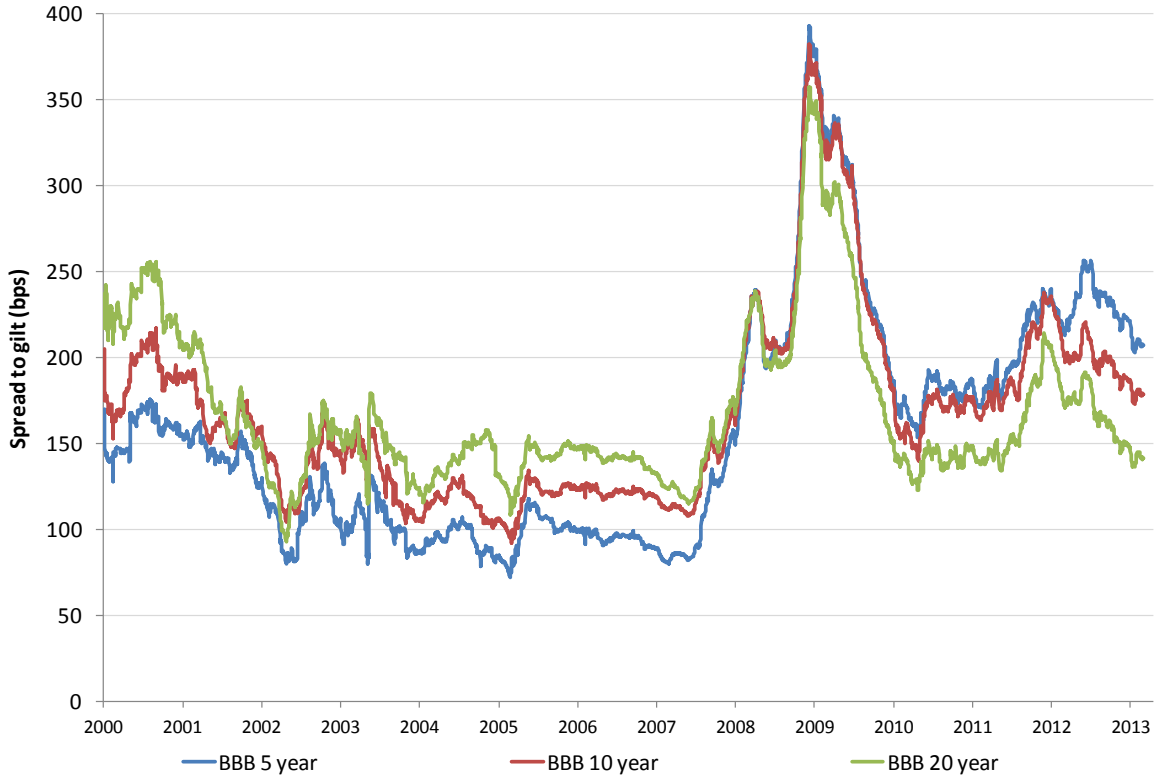
Source: Bank of England and Bloomberg

Table 3.7: Summary of Figure 3.5

As of 01/03/13 (bps)	Spot	1y average	2y average	5y average	10y average
A	132	145	146	153	120
A-	140	153	156	164	130
BBB	179	195	198	214	170

The spreads between A and BBB rated bonds for ten year maturity have remained fairly consistent over a longer time period at 50-60 bps. The difference between spreads for A and A- bonds with the same maturity is typically 10 bps. It is unlikely that ORR or the efficient company would target a credit rating as low as BBB: we would therefore expect the debt premium to be slightly less than the BBB index shown above or in the region of 20-40 bps above what is indicated by an A rated security.

Figure 3.6: UK BBB rated credit spreads by maturity



Source: Bank of England and Bloomberg

Table 3.8: Summary of Figure 3.6

As of 01/03/13 (bps)	Spot	1y average	2y average	5y average	10y average
5yr	207	229	219	227	164
10yr	179	195	198	214	170
20yr	142	163	166	187	165

In our analysis, we have generally taken a ten year tenor as our benchmark, but the above figure gives an idea what impact looking at a different maturity would have for the BBB index and this should be considered against the weighted maturity of debt noted earlier. Over a longer tenor, the spreads for different maturities have become more differentiated with the difference between five year and 20 year spreads widening to 65 bps on a spot basis compared to near zero on a ten year average basis. This should be considered against data that provides market evidence on bonds on ten year maturity.

Historic debt premia have generally been in the region of 100-200 bps above equivalent UK government bonds for the ten year index. The exception to this is the one year period from late 2008 to late 2009, in which spreads on even A and A- rated debt exceeded 250 bps and spreads on BBB rated debt approached 400 bps. However, we would expect fixed rate debt from this period to contribute a relatively small proportion of an efficiently financed entity's overall portfolio. From our assumed weighted average maturity of debt of 15-20 years, the issuance of new debt and the rolling over of embedded debt, means that the proportion issued in this period becomes increasing smaller.

We note that it is important to be consistent with use of the risk-free rate and the debt premium. The debt premium figures presented above are based on spreads over gilts, which as we have seen are in negative territory. Combining those spreads with a conservative assumption for the risk-free rate (such as 2.0%) would lead us to a highly conservative estimate for the cost of debt for a measure including new and embedded debt.

3.3.2. Regulatory precedent

Table 3.9 shows recent regulatory precedent on the allowed debt premium. Many decisions have been concentrated around the 150 bps range, suggesting a premium in the region of 100-200 bps would be consistent with such precedent. We note that Ofgem does not make an adjustment for embedded debt, however they use trailing averages to set the companies' cost of debt which of course takes account of embedded costs.

Table 3.9: Recent regulators' assessments of the debt premium (real)

Regulator	Decision	Debt premium
Ofcom	Wholesale mobile calls (2011-2015)	1.5%
CC	Bristol Water (2010-2015)	1.9%
Ofgem	Electricity distribution (2011-2015)	1.6%
Ofwat	Water & sewerage (2010-2015)	1.6%

Source: Regulatory determinations

3.3.3. Assessment

Overall, we consider that the debt premium over the underlying risk free rate is likely to be around 100-150 bps. The premium noted is based on the market proxy of the risk-free rate, rather than the regulatory risk-free rate. As the market risk-free rate is below the regulatory risk-free rate proposed, the market evidence on the debt premium will overstate what the equivalent premium would be in a regulatory setting. In our view the resulting cost of debt allowance from combining the debt premium with the risk free rate – see our summary Section 3.7 – is likely to be sufficient to cover both embedded and future debt costs for the full cost of debt.

Table 3.10: CEPA assessment of the implied debt premium

	CEPA Estimate	
	Low	High
Debt premium	1.0%	1.5%

Source: CEPA calculations

3.4. Evidence on the total cost of debt

For the transmission and distribution price controls under the RIIO framework, Ofgem decided to based its cost of debt allowance on an index of non-financial broad A and broad BBB rated ten year plus corporate debt deflated by Bank of England ten-year breakeven inflation. The historic rates for this index are presented in Figure 3.7 below. The implied cost of debt at our most recent data point is around 1.2%, while the average over ten years has been around 2.8%.

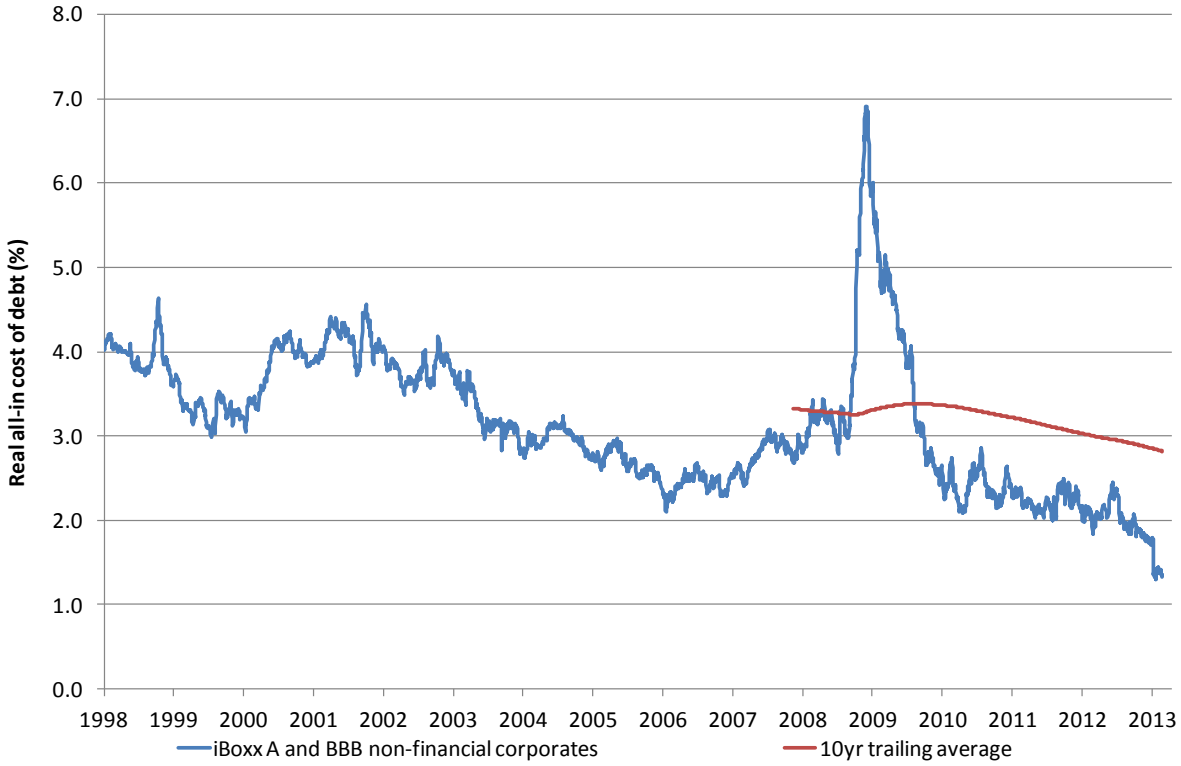
3.4.1. Market evidence

In this section we consider evidence on the total cost of debt from:

- the iBoxx index, as used by Ofgem; and
- Bloomberg all-in cost of debt indices.

For an estimate including embedded debt and new debt, we focus on longer term trailing averages and the potential timings of debt issuance from a notional and efficiently financed entity. The use of trailing averages provides a view of the long term cost of debt, taking into account actual embedded debt costs. It does not explicitly include new debt unless the index is used to update the cost of debt allowance during the control, which is Ofgem's approach under RIIO. Our approach is generally to examine ten years of historic data and assume equal weightings of issuance over this period to form the basis of our estimate.

Figure 3.7: iBoxx non-financial A rated and BBB rated 10yr real cost of debt indices

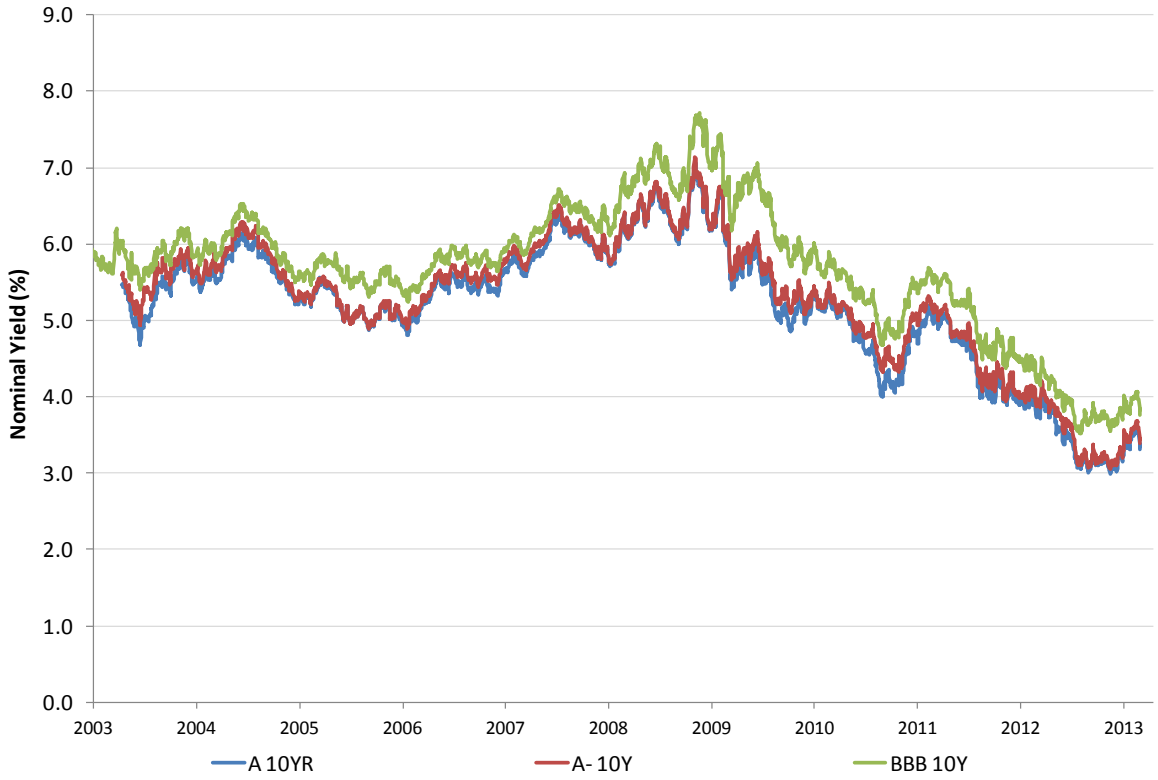


Source: Markit iBoxx

Table 3.11: Summary of Figure 3.7

As of 01/03/13 (%)	Spot	1y average	2y average	5y average	10y average
10yr+ A and BBB	1.21	1.92	2.05	2.83	2.82

Figure 3.8: Nominal yield for Bloomberg 10yr cost of debt indices



Source: Bloomberg

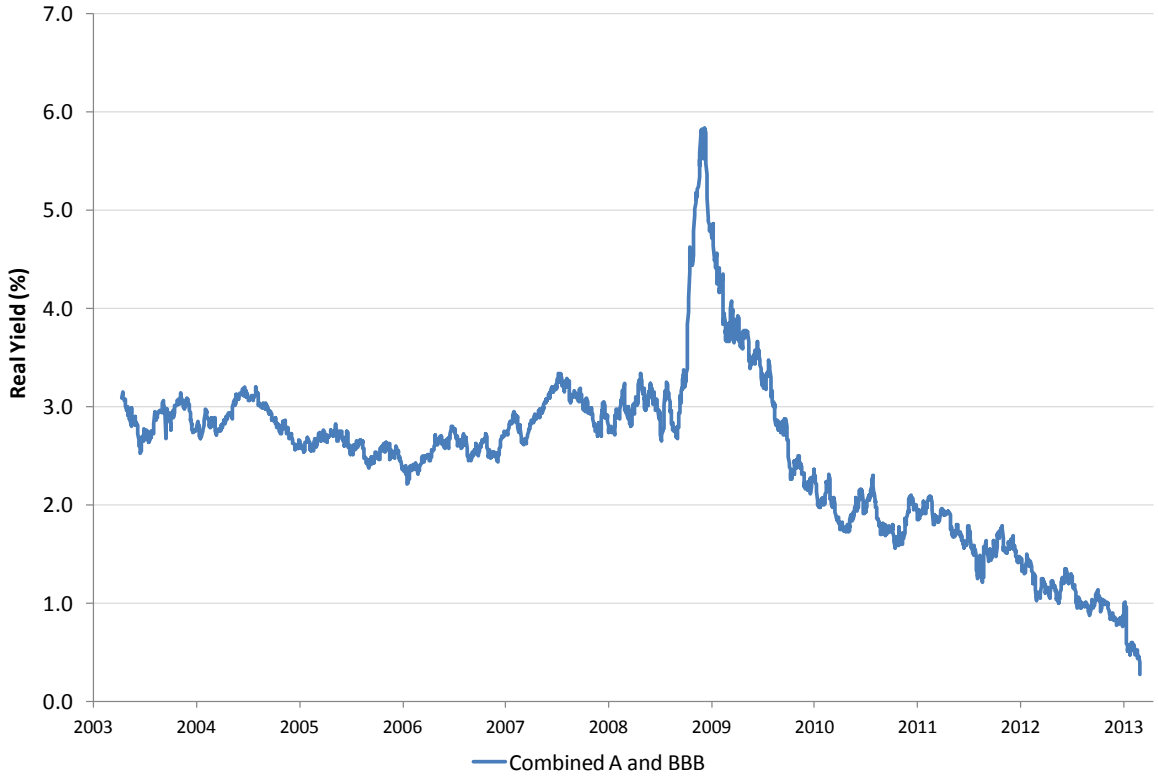
Table 3.12: Summary of Figure 3.8

As of 01/03/13 (%)	Spot	1y average	2y average	5y average	10y average
A 10yr	3.30	3.38	3.87	4.85	5.19
A- 10yr	3.38	3.46	3.96	4.96	5.29
BBB 10yr	3.77	3.88	4.38	5.46	5.69

Yields on A, A- and BBB nominal debt have fallen below 5% in recent years, which is extremely low compared to the longer term period. To get an accurate picture of how this Bloomberg data series compares to the iBoxx indices presented above, we need to look at this in real terms and deflated using the same measure as used for the iBoxx (i.e. break-even inflation). It should also be noted that the Bloomberg indices are for ten year maturity, whilst the iBoxx indices are ten years plus.[19]

[19] As of 5 February 2013, the two iBoxx indices averaged together for our headline series had remaining time to maturity of 22 years and 17 years. This is a broad measure of BBB and A, unlike the Bloomberg indices which are BBB and A specific.

Figure 3.9: Real yield for Bloomberg 10yr combined A and BBB index



Source: Bloomberg, CEPA analysis

Table 3.13: Summary of Figure 3.9

As of 01/03/13 (%)	Spot	1y average	2y average	5y average	10y average
10yr A and BBB	0.28	0.97	1.28	2.21	2.49

The average maturity for Bloomberg being ten years as opposed to almost 20 years for the iBoxx index has a significant effect when looking at more recent data. For the ten year average, there is a difference of 30bps between the iBoxx and Bloomberg methods, but for the spot rate the difference is approximately 90bps.

3.4.2. Regulatory precedent

Table 3.14 below shows the regulatory precedent on the cost of debt. Ofgem have indexed the overall cost of debt allowance using the iBoxx indices, as discussed previously.

Table 3.14: Recent regulators' assessments of the overall cost of debt

Regulator	Decision	Cost of debt (real)
Ofgem	RIIO ED1 strategy (2015-2023)	Indexation
Ofgem	RIIO GD1 and T1 (2013-2021)	Indexation
CER	Electricity transmission and distribution (2011-2015)	3.2%
CC	Bristol Water (2010-2015)	3.9%
Ofwat	Water & sewerage (2010-2015)	3.6%
Ofgem	Electricity distribution (2010-2015)	3.6%

ORR	CP4 (2009-2014)	3.5%

Source: Regulatory determinations

Many of the previous regulatory determinations were made at a time of uncertainty around the global financial crisis, but reflect the market evidence at the time. With the exception of the Ofgem decision, market evidence has pointed towards a lower overall cost of debt, noting that these figures include both embedded debt and new debt.

3.5. Cost of debt for embedded debt only

In determining the cost of embedded debt only, we can look at the trailing averages from the iBoxx and Bloomberg data. Of these two indices we can place more weight on the iBoxx cost of debt evidence presented in Figure 3.7 compared to the Bloomberg data as presented in Figure 3.9, as the average maturity in the iBoxx data (ten years plus) is closer to the weighted average life of debt that we have assumed. Consequently we assume a cost of debt for embedded debt of 2.75-3.25%.

Table 3.15: CEPA assessment of the overall cost of debt for embedded debt only

	CEPA Estimate	
	Low	**High**
Overall cost of debt for embedded debt	2.75%	3.25%

Source: CEPA calculations

3.6. Cost of debt for new debt only

The cost of debt for new debt only is more difficult to estimate than the cost of debt for embedded debt as this is a forecast. Evidence can be gathered from forward curves on expected movements in yields in coming years, as noted in the real risk-free rate section. This suggests that the cost of debt will rise over the course of CP5, and by around 130 bps by the end of the price control.

It is our view that a longer-term average of rates is more appropriate from a forward-looking perspective than the spot rate in isolation, but any trends in rates should be considered in arriving at a conclusion as to the appropriate rate. The market evidence shows relatively steady rates between 2003 and 2008, but since late-2009, the rates observed have fallen significantly and the cost of debt for newly issued debt at present is below the longer term average.

Observing the spot rates for the iBoxx ten year plus non-financials A and BBB rated, this gives a figure of 1.21%, almost 100 bps above the spot rate for the Bloomberg combined index. Further market evidence is provided by the recent bond issuance by High Speed 1 (HS1 - discussed in Text Box 3.1). HS1 was able to issuance tranches at spreads to the equivalent gilts of 175 bps for inflation-linked bonds and 150 bps for fixed rate notes. The nominal yield to maturity for the fixed rate debt was 4.49%, with a yield on the index-linked debt of 1.57%.

Box 3.1: High Speed One

High Speed One (HS1) raised their first public bond on Tuesday 5th February 2013. The company own the concession to run the railway line between London and the Channel Tunnel. The company is owned by Borealis Infrastructure and Ontario Teachers' Pension Plan and issued two tranches of debt, amortising between 2028 and 2039. Fitch and Standard & Poors both rated the company at A-, with the average life of the debt being 21.7 years for this issuance.

The company was able to raise £760m in the UK bond market, significantly above a target of £455m. The target involved an inflation-linked bond amount of £150m, with £305m of fixed rate notes. The tranches were priced at spreads over equivalent gilts of 175 bps for inflation-linked bonds and 150 bps for fixed rate notes. This was 5 bps lower than the price guidance for each.

This compares to a 2012 private placement which priced at 3.79% for the 15.5yr trance, 4.21% for the 18.5yr tranche, an 18.8yr tranche at 164 bps over Libor and a 23.5yr tranche at 4.72% nominal.

Source: Project Finance

Therefore, whilst a rate of 1.75-2.25% is below regulatory precedent, this rate does not appear inappropriate as a figure for the whole of CP5 for new debt only.[20] The low end of the range is above current issuance rates for investment grade utilities[21] and therefore allows for some increase in rates over CP5.

Table 3.16: CEPA assessment of the overall cost of debt for new debt only

	CEPA Estimate	
	Low	**High**
Overall cost of debt for new debt	1.75%	2.25%

Source: CEPA calculations

3.7. Overall cost of debt allowance

The overall cost of debt allowance including embedded debt depends on the proportions assumed for new debt and embedded debt. Assuming that all embedded debt is rolled over and 10% of the opening debt balance is issued as new debt issuance, an illustrative proportion of new and embedded debt can be observed below. The totals of £7.5bn of refinanced debt below and £15.0bn of new debt compares to £7.4bn of refinanced debt and £15.7bn of new issuance in Network Rail's Financing plan to the ORR.[22]

[20] Regulatory precedent includes both new and embedded debt.

[21] For example, the iBoxx indices by Ofgem being at a spot rate of 1.21.

[22] The analysis contained within the table is useful in providing a cross-check on our overall cost of debt estimates. As this is for the full cost of capital, if we were to consider the planned actual Network Rail debt issuance profile, this would suggest that debt issuance would remain the same with and without the FIM, which we do not believe is the case.

Table 3.17: Illustrative proportion of new and embedded debt

GBPbn	Embedded debt remaining	Refinanced debt	New issuance	Total debt	Debt proportion from embedded (end-year)
Year 0	£30.00	-	-	£30.00	100.0%
Year 1	£28.50	£1.50	£3.00	£33.00	86.4%
Year 2	£27.00	£1.50	£3.00	£36.00	75.0%
Year 3	£25.50	£1.50	£3.00	£39.00	65.4%
Year 4	£24.00	£1.50	£3.00	£42.00	57.1%
Year 5	£22.50	£1.50	£3.00	£45.00	50.0%

Source: CEPA analysis

At the end of the five year price control, the proportion of total debt, which comes from embedded debt is 50%. Over the price control, it would appear as though a ratio of 75%:25% for embedded versus new debt would be appropriate as an approximate average of no new debt at the start of the price control and 50% by the end of the CP5. Taking CEPA's view on the cost of embedded and new debt (2.75-3.25% and 1.75-2.25% respectively), this ratio confirms the appropriateness of a range of 2.5-3.0% for the overall cost of debt including embedded debt.[23]

Table 3.18: CEPA assessment of the overall cost of debt

	CEPA Estimate	
	Low	High
Overall cost of debt for new and embedded debt (real)	2.50%	3.00%

Source: CEPA calculations

[23] For modelling purposes, we would assume a level of index-linked debt of 50% and a proportion of fixed debt of at least 80%.

4. COST OF EQUITY

4.1. Introduction

There are three components to the cost of equity:

- the risk-free rate, which is discussed in Section 3.1.1 above;
- the equity risk premium (ERP), which is discussed in Section 3.2.1 below; and
- beta, which is discussed in Section 3.2.2 below.

In this section we first present evidence on the individual parameters, before summarising our view on the overall CAPM-based cost of equity. We then check this approach to evidence from the market, notably comparable transactions and the implications for the WACC.

4.2. Relative risk

We carried out our cost of equity assessment with reference to comparator sectors/ companies. In order to ensure we are choosing comparators that have a similar asset base and business risks to Network Rail we have carried out an assessment of Network Rail's business risks to other regulated network sectors. This analysis is set out in Annex 2. In summary, we consider that Network Rail has a similar risk profile to that of the water sector, a similar to potentially slightly higher overall risk profile than the energy sector and a lower risk profile to airports. The main differences which may be considered as pushing a conventionally financed Network Rail's risk above that of the comparator sectors is:

- a potentially tougher 100% sharing factor on opex (although this gives it more reward if it out performs); and
- a large number of uncertainty mechanisms in the Ofgem RIIO price controls; and
- Ofgem's RIIO price control's cost of debt indexation.

4.3. Equity risk premium

Observed values for the ERP – produced by comparing the returns on the market with returns on risk-free assets – vary substantially depending on:

- whether the benchmark against which the premium is measured is taken to be short-term notes or longer-term bonds;
- the time horizon under consideration;
- the country being measured; and
- whether a geometric or arithmetic average is calculated.

We discuss each of these in turn and provide an estimate based on a standard CEPA approach that is well-documented.

For transparency we focus on the latest figures calculated in the Dimson, Marsh & Staunton *Credit Suisse Global Investment Returns Sourcebook 2013* (DMS), using the longest available time

horizon for the UK. For consistency with our evidence on the risk-free rate, we focus on the premium over long term government bonds rather than short term bills.

In general, the use of an arithmetic or geometric mean alone will not provide an unbiased estimate for the equity risk premium. In order to achieve this unbiased estimator for long-run returns, Blume (1974) uses a weighted average of the geometric and arithmetic means.[24] Blume found that if the past was indicative of the future, the arithmetic mean provides a more unbiased and consistent estimate of the expected annual reflect, while the geometric mean would underestimate the expected annual return. Blume provides a formula to highlight the appropriate weightings based upon different time horizons. Based on an investment period of eight years, the share for the arithmetic mean would be c. 94%, with just 6% from the geometric mean. Extending the investment period to 30 years would still give a significant majority share to the arithmetic mean (74% against 26% for the geometric mean). As a result we place greater weight in our analysis on the arithmetic mean.

Table 4.1 presents evidence based on the longest available time period for the premium against bonds, using either the arithmetic or geometric mean. Considering the evidence presented within the DMS sourcebook, 5.0% represents an upper limit for our estimate of the ERP, using the arithmetic mean and the longest available time horizon.

Furthermore, DMS are clear on the subject, as stated below (CEPA insert in square brackets):

'The historical [equity risk] premium is often summarized in the form of an annualized rate of return. This is a geometric mean. … For the future, what is required is the arithmetic mean … which is larger… We adjust the arithmetic mean [downwards] for (i) the differences between the variability of the stock market over the last 101 years, and the variability that we might anticipate today, and (ii) the impact of unanticipated cash flows and of declines in the required risk premium'.[25]

DMS indicate that both these factors imply that the correct treatment is to shave down the historic arithmetic mean when estimating a forward looking estimate. We consider that the DMS approach is appropriate.

Table 4.1: UK premium against bonds

Time period	Arithmetic Mean (% p.a.)	Geometric Mean (% p.a.)
1900-2012 (real)	5.0%	3.7%

Source: Dimson, Marsh & Staunton (2013) Credit Suisse Global Investment Returns Sourcebook 2013

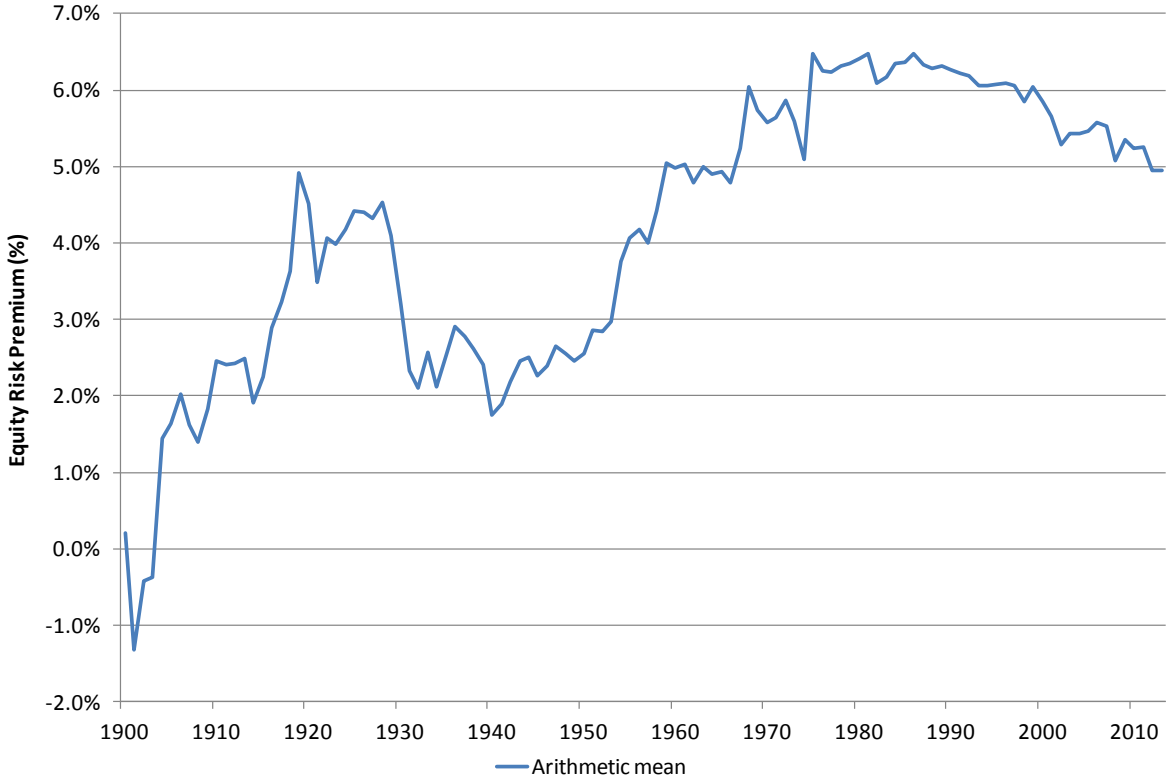
Figure 4.1 below shows how the ERP (based on DMS evidence) has developed over time. The plotted line represents the cumulative (arithmetic) mean up to and including each year on the horizontal axis. The long term ERP has fallen gradually in recent years to around 5%, from highs of over 6% in the 1970s and 1980s.[26]

[24] $E(R_N) = \left[\left(\frac{T-N}{T-1}\right) * A_N\right] + \left[\left(\frac{N-1}{T-1}\right) * G_N\right]$
where T is the number of data points used, N is the time period, AN is the arithmetic mean and GN the geometric mean.
Source: Blume, M.E. (1974) 'Unbiased estimators of long-run expected rates of return,' *Journal of the American Statistical Association*, 69:347, pp.634-638.

[25] Dimson, Marsh & Staunton (2012) p194.

[26] The high values of over 6%, however, are sometimes considered to be an overstatement based on academic evidence.

Figure 4.1: Cumulative arithmetic average of UK premium against bonds



Source: CEPA analysis of DMS data

We also consider evidence from the Barclays Capital *Equity Gilt Study*. The study calculates an arithmetic mean of a 3.0% premium against the real interest rate for government debt in the UK (1900-2011) and a 4.2% premium over a shorter time period (1950-2011).

Regulators' recent assessments of the ERP (summarised in Table 4.2 below) show a relatively wide range, reflecting the various calculation options, time periods and sources available. Ofgem also now proposes a range for the ERP of 4.75 – 5.5% as set out below.

'Our preferred approach is to rely on the well-established long term ERP estimates provided by Dimson, Marsh and Staunton (DMS). … In their 2012 update, DMS estimate the ERP for the UK to be 3.6 per cent when using the geometric mean, and 5.0 per cent when relying on the arithmetic mean of the historical series.

We note that there has been no consensus in the debate about which of the arithmetic mean or geometric mean is more appropriate for the purpose of setting the cost of equity in a regulatory context'.[27]

Table 4.2: Recent regulators' assessments of the equity risk premium

Regulator	Decision	ERP (real)
Ofgem	RIIO ED1 Strategy decision (2015-2023)	4.75-5.50%
Ofgem	RIIO-GD1 & RIIO-T1 (2013-2021)	4.75% - 5.25%
NIAUR	NIE T&D proposals (2012-2017)	4.8%
Ofcom	Mobile calls (2011-2015)	5.0%
CC	Bristol Water (2010-2015)	4.0% - 5.0%

[27] Ibid, paras 2.52 – 2.55.

Regulator	Decision	ERP (real)
Ofgem	Electricity distribution (2011-2015)	4.7% - 5.0%[28]
Ofwat	Water & sewerage (2011-2015)	5.4%

Source: Regulatory determinations.

Our overall view is that a range for the ERP of 4.5-5.0% is appropriate, especially given the fall for the risk-free rate. The lower end of a broader range would be influenced primarily by the evidence from Barclays, rather than the long term arithmetic mean figures provided by DMS. As noted previously, any decision has to be consistent with the approach adopted for the risk-free rate.

Table 4.3: CEPA assessment of the ERP – broad range

	CEPA Estimate	
	Low	High
Equity risk premium	4.5%	5.0%

Source: CEPA calculations

4.4. Equity beta

The company specific parameter that is incorporated in our cost of equity estimate is the equity beta which represents a combination of underlying business risk and any financing risk (introduced by taking on debt). Estimates of the equity beta are specific to a level of gearing (which captures the degree of financing risk), and as such are not generally comparable across companies.

For most listed companies, it is possible to measure the raw equity beta directly. However, this is not the case for unlisted companies or parts of larger groups. Our approach is to estimate asset betas for a range of comparator companies, primarily network utilities which appear similar in terms of risks to a conventionally financed Network Rail itself. Asset betas are calculated by 'de-levering' estimates of equity betas; that is, stripping out the company-specific financing risk. Asset betas are, therefore, in theory comparable across companies, and can be 're-levered' to reflect the financing risk of the conventionally and efficiently financed entity (which we assume to have a gearing rate of 62.5%). Table 4.4 below shows our estimates of asset beta and equity beta for our comparators, based on one, two or five years of (daily) data on returns.

Table 4.4: Comparator daily beta estimates

Company	Asset beta averages			Equity beta at 62.5% gearing		
	1yr	3yr	5yr	1yr	3yr	5yr
National Grid	0.23	0.26	0.26	0.61	0.69	0.69
SSE	0.35	0.35	0.40	0.93	0.93	1.07
United Utilities	0.21	0.22	0.26	0.56	0.59	0.69
Severn Trent	0.23	0.23	0.25	0.61	0.61	0.67

[28] These numbers are implied from the relevant Ofgem publication since it does not make final decisions on elements of the calculation explicit. It does, however, recommend an overall cost of equity of 6.7%.

Source: Bloomberg and CEPA calculations

Note: Uses market capitalisation as the basis for gearing and domestic indices for beta calculations.

4.5. Assessment

We have undertaken high level analysis of the risks across sectors in Annex 2 and consequently what the appropriate equity beta should be for the full cost of capital. Our view is that the company would be in an environment which is slightly more risky than energy price controls under RIIO and water regulation with PR09, but slightly less risky than typical airports regulated in Q5, although there will be differences between airports e.g. Heathrow is likely to be less risky than other airport comparators in part due to capacity constraints.

The equity beta for the GD1 and T1 price controls was determined to be 0.9 and the same decision was made by Ofwat in their PR09 final determination. Our relative risk analysis would indicate that the appropriate broad range for this would be 0.8-1.0, with evidence from our regulatory comparison pointing towards the middle of this range and our comparator evidence pointing towards the lower end of this range.

Table 4.5: CEPA assessment of the equity beta – broad range

	CEPA Estimate	
	Low	**High**
Equity beta	0.8	1.0

Source: CEPA calculations

5. CEPA ASSESSMENT OF THE FULL COST OF CAPITAL FOR NETWORK RAIL FOR PR13

5.1. Conclusion

In this section we briefly summarise our conclusions on the individual components of the full cost of capital for Network Rail, and on our overall assessment. We do not repeat the discussion of the evidence underlying our parameter estimates.

Our conclusions are summarised in Table 5.1 with comparison to ORR's PR08 decision, the ORR commissioned First Economics (2011) report, and the Network Rail commissioned Oxera report. Our overall objective is to provide a viable range for the WACC, for which data limitations mean that a standard, whole company WACC figure is most appropriate.

Table 5.1: CEPA summary assessment

	ORR	First Economics*	Oxera*	CEPA Estimate – narrow range**	
	PR08	Dec 11	Jan 13	Low	High
Gearing+	62.5%	62.50%	61.25%	62.5%	62.5%
Risk-free rate	2.00%	2.00%	1.75%	1.50%	1.75%
ERP	4.75%	4.70%	5.13%	5.00%	5.00%
Equity beta	1.00	0.93	0.98	0.90	1.00
Post-tax cost of equity†	**6.75%**	**6.35%**	**6.75%**	**6.00%**	**6.75%**
Pre-tax cost of debt†	**3.50%**	**3.20%**	**3.30%**	**2.50%**	**3.00%**
Post-tax vanilla WACC†	**4.75%**	**4.40%**	**4.65%**	**3.80%**	**4.40%**
Pre-tax WACC (t=20.2%)†!	**5.50%**	**5.05%**	**5.40%**	**4.38%**	**5.05%**

+ For calculating the WACC, we use the mid-point gearing of 62.5%.

** Based upon the midpoint of the ranges provided.*

*** Our narrow range excludes the combination of low end parameters from our broad range (risk-free rate 1.0%, ERP 4.5% and Equity beta 0.8) as combining these is likely to lead to an implausibly low cost of equity.*

† Figures rounded to the nearest 0.05%.

! Tax rate of 20.2% is an average across CP5 of 21% for 2014/15 then 20% thereafter.

Source: CEPA analysis, Oxera, First Economics and ORR

6. NETWORK RAIL'S ACTUAL COST OF DEBT

[REDACTED]

7. FIM FEE

7.1. Background

Network Rail benefits from the FIM provided by the UK Government through lower debt costs. Network Rail is required to pay a fee (the 'FIM fee') to DfT for the provision of the FIM. The FIM fee for CP4 was set at 80 basis points.

ORR has stated that it "will calculate the FIM fee for CP5 by reference to the long-run value of the credit enhancement".[29] Given the current volatility in the financial markets, ORR has noted that the FIM's short-term credit enhancement could be significantly higher than 80 basis points and ORR's previous advice to ministers has assumed a range of 78 to 129 basis points for CP5.

As ORR state in their 2012 Decision paper, changes to the FIM fee would not impact on Network Rail's overall financial position. This is because an increase in the FIM fee would increase Network Rail's assumed efficient financing costs on a full cost of capital basis, which would in turn lead to an increase in Network Rail's allowed return for CP5.

We have been asked by ORR to consider the appropriate FIM fee, which we understand from ORR should be based on the difference between the full cost of debt and Network Rail's actual cost of new debt, assuming all new debt is issued from the start of CP5. The cost of equity is not considered as part of this analysis as we understand that it is ORR policy to not apply the FIM to equity.

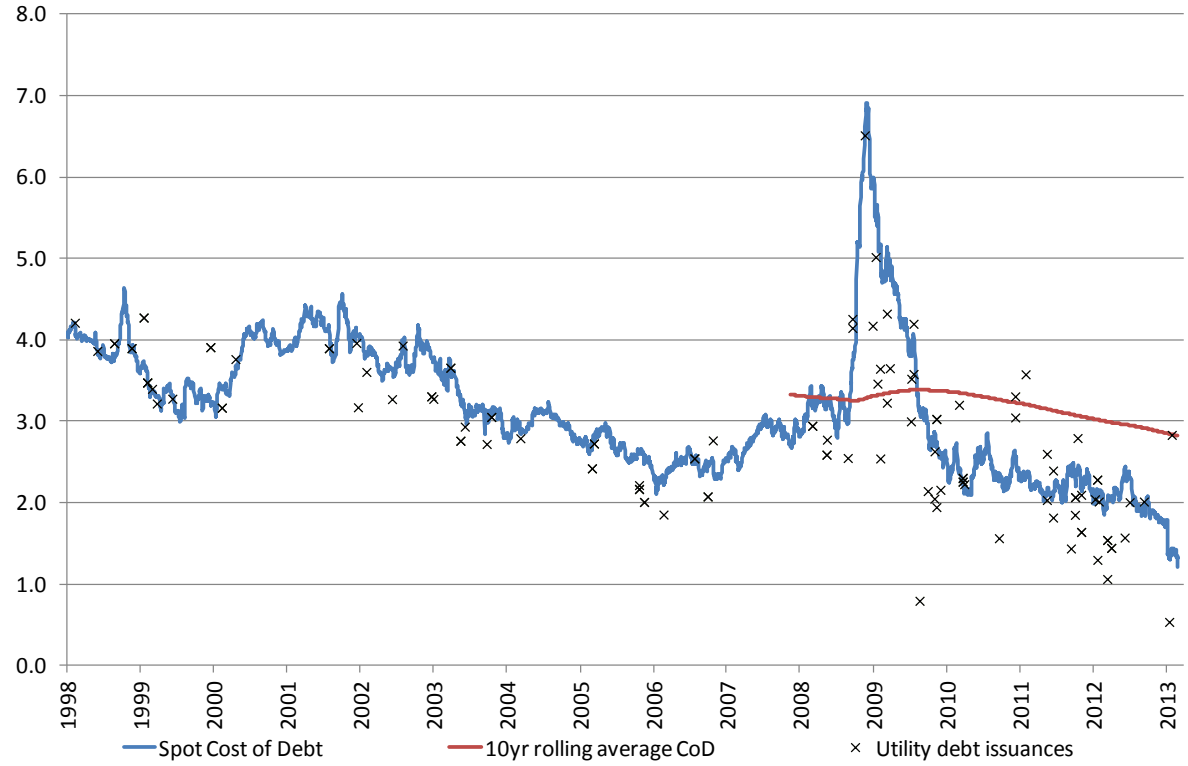
Our approach, set out below, was to take the difference in cost between historic investment grade utility (A- and BBB+ rated) bond issuance and Network Rail's issuance. We agreed with ORR that this approach is consistent with ORR's preference for calculating the FIM fee based on the long-run credit enhancement it provides.

7.2. Our analysis

We understand the approach taken by Network Rail in arriving at a FIM fee estimate of 125 basis points in its strategic business plan was to consider the difference in spreads of utility bond issuance and Network Rail's issuance in CP4. We have considered domestic utility bond issuances back to 1998/99 and looked at average spreads over equivalent gilts. This gives a spread of approximately 140-160 bps for A- and BBB+ rated issuances. We compared an average of UK gilts to iBoxx's combined non-financials ten-year plus broad A and BBB index as a cross-check for these figures. We believe that given the average tenor of the combined iBoxx index (circa 19.5 years), it is most appropriate to compare this index to the 20 year UK nominal gilts. From 1999-present, the iBoxx index spread to the 20 year gilt is 161 bps. As this is slightly above the 140-160 bps spread for utility bonds, this may indicate that utility bonds are slightly below the iBoxx benchmark (whilst noting that utility bonds currently comprise around 60% of bonds used for this benchmark themselves). This view is confirmed by the figure below, showing utility bond issuances relative to the iBoxx spot and ten-year rolling average.

[29] ORR, Periodic review 2013, Financial issues for Network Rail in CP5: decisions, December 2012, page 70.

Figure 7.1: Utility bond issuances



Source: Bloomberg, Markit iBoxx, CEPA analysis

Our assumption is therefore that utility bonds can issue below the benchmark by approximately 20-30 bps looking at a longer time horizon. The benchmark itself is 160 bps over gilts. As we understand it, Network Rail have issued debt at circa 40 bps over gilts since the government guarantee. Looking at the difference between these figures would suggest a FIM fee of 120 bps if looking at the credit enhancement Network Rail received relative to a A/BBB rated company, or lower at potentially around 90-100 bps if considered relative to a utility.

Further market evidence is provided by the recent bond issuance by High Speed 1. This does not have the same guarantee as Network Rail and may be considered a relatively close comparator. HS1 was able to issuance tranches at spreads to the equivalent gilts of 175 bps for inflation-linked bonds and 150 bps for fixed rate notes in a February 2013 issuance. The nominal yield to maturity for the fixed rate debt was 4.49%, with a yield on the IL debt of 1.57%. Taking our assumption that Network Rail traded at 40 bps over gilts, this would point to a FIM fee, based on nominal debt, of 110 bps.

7.3. Conclusion

Based on the difference between historic utility bond issuance and Network Rail's issuance we estimate a range of around 90 bps to 120 bps. Evidence from the High Speed 1 issuance indicates that a FIM fee towards the top end of this range may be appropriate.

8. DIFFERENTIAL RISK

8.1. Introduction

A requirement for this project is to begin to identify any activities that Network Rail undertakes where the risks are such that the cost of capital for that activity may be materially lower or higher than the average cost of capital. This section looks into the different bases for WACC, possible lines of disaggregation and what evidence base would be appropriate to use to provide further evidence for these calculations.

8.2. Context

For the purposes of this paper we define 'differential risk' as the difference in risk across different activities or dimensions. ORR has decided that Network Rail should only be allowed to cover efficient costs of financing, with the allowed cost of capital reflecting risks the business faces. This implies that if different degrees of risk are faced within different activities, there could be different cost of capital to reflect this. As Network Rail is one company and is financed as one company, a single cost of capital is appropriate.

In their December 2011 consultation, ORR stated that although some business activities e.g. enhancement, maybe more risky in nature, splitting the cost of capital is not necessary in CP5. Typically in the UK, regulated companies would tend to have a single cost of capital reflecting the risks in their business, but infrastructure investors may be used to considering the cost of capital on a project-by-project basis and UK regulators have on occasion used different approaches to the single cost of capital e.g. for Heathrow T5.

ORR's May 2012 report on 'Setting the financial and incentive framework for Network Rail in CP5' stated that as a regulator they were seeking to establish route-level cost of capital figures in CP6 (England & Wales and Scotland will be separate for CP5). This fits in with potential Network Rail devolution, both horizontally e.g. at the route level, and vertically e.g. concessions. This approach could over time assist with comparative regulation.

The terms of reference required us to consider qualitatively differential risk within Network Rail and how this could potentially lead to different cost of capitals across the routes. The discussion provided in this section is intended to facilitate analysis directed towards such an approach. This process is evident with Network Rail's regulatory accounts from 2011/12 onwards being split by operating routes and ORR requiring that the January 2013 SBP contain separate plans for each operating route.

The impacts of disaggregation are minimised if Network Rail remains as one company and is financed as such; therefore the consequences of disaggregation depends how it is applied and whether any out/under performance in each of the routes is ring-fenced. If there is no ring-fencing, there can be benefits for the regulators without imposing significant costs or uncertainty on Network Rail. These would include the potential for comparative regulation, greater transparency and permitting the regulator a greater understanding of Network Rail's business. If there was ring-fencing between activities, it would restrict cross-subsidisation, enhance local decision making and can facilitate industry change.

The Department for Transport (DfT) and Transport Scotland have not ruled out introducing equity into Network Rail in the long-term, so an investigation of a notional Network Rail on a disaggregated basis at this stage may be useful as an initial phase preceding future control periods. With the disaggregation to the SBP and regulatory accounts, the current period may be useful to look at shadow arrangements and address potential difficulties before it comes to the implementation, if required, of the preferred approach. Note, both the DfT and Transport Scotland in their SOFAs have ruled out introducing unsupported debt into Network Rail in CP5.

There are reasons why such an approach may come across difficulties at the current time. The foremost problem will likely be around having sufficient accurate data and the difficulty of examining risk on this individual basis.

8.3. Estimating the WACC

We consider that in there are two principal methods for calculating the WACC for Network Rail:

- top-down – a single cost of capital is set for Network Rail; and
- bottom-up – the cost of capital is comprised of the WACC for individual elements of Network Rail.

The two approaches should in theory yield the same answer, but the approaches have a different focus. The bottom-up approach may be more transparent, but it imposes greater data requirements and assumptions on how investors may view a company's risks.

For the purposes of this section we focus on a hybrid of both the bottom-up and top-down approaches. Starting with a top-down cost of capital for Network Rail, we assess the riskiness of each of the building blocks – renewals, maintenance, enhancements and operations and support – would lead to a higher, lower or the same cost of capital as a notional Network Rail as a whole.

Using relative riskiness assessment for each cost type and the allowed expenditure for each of the cost types we believe that a differential risk profile can be created for each of the ten operating routes. Note, it is beyond the scope of this report to attempt to make any assessment of different WACCs across Network Rail activities.

8.4. Cost type differential risk

In Table 8.1 below, based on discussions we have held with ORR, we have further disaggregated ORR's four high level building blocks for Network Rail and provide a description of each of the cost types and set out our view on whether the cost types have relatively more, less or the same risk as Network Rail as a whole on average. In theory this should mean that if the relative risk of the different costs types is weighted together they should approximate to the 'average' riskiness of a notional Network Rail (e.g. the debt/ equity premium placed on a notional Network Rail).

In developing the relative risk rating for each of the cost types we have made the following assumptions:

- the projects/ activities within each of the cost categories have similar risks (or sufficient risk identification and risk mitigation has been carried out on more riskier projects to bring them in line with the average);

- no allowance is made for any interrelations between cost types/ business units; and
- we have not made an adjustment for the regulatory factors that may mitigate the associated risk in the table (we discuss this after Table 8.1).

In relation to the first bullet point above, we do not further break down projects by the stages they are in e.g., design phase, construction phases, etc. For large projects this would be a key consideration for investors, but, as we discuss in the next section, the decision faced by the investor is dependent on the regulatory regime and the degree of risk that would be transferred to investors rather than the consumers.

Table 8.1: Illustration of Network Rail's differential risk across activities

Building blocks	Sub-categories of cost	Description	Relative risk against 'Network Rail average'	
Enhancements	Committed projects	Projects for which the design is generally well advanced, construction may have started, engineering access is likely to have been planned or contracts are in place.	Similar	Some construction risk, however as projects are generally well advanced (at least in the design phase) the risk is likely to be well understood by NR. We would, therefore, not expect the risk in this category to exceed the Network Rail 'average'.
	Named schemes	These schemes' costs or requirement are generally more uncertain.	↑	High level of uncertainty in relation to the costs and requirements, therefore we would expect a higher level of risk than on average.
	Specific funds	Funds for Network Rail to carry out enhancement projects which are not specified at the start of the price control. Use of funds have industry governance arrangements.	Similar	Fixed amount of funds for Network Rail to carry out projects, low risk unless expenditure deemed to be inefficient.
	HLOS capacity schemes	Specific projects from the HLOS identified to increase capacity.	Similar	Range of maturity over the projects, on average similar risk to Network Rail as a whole.
Renewals	Track	Replacement/ renewal of track.	↓	Low relative risk. Well understood and standard activity for Network Rail.
	Civil works	Major area of work, covers bridges, earthworks etc.	↑	Higher relative risk as access constraints and variety of assets to deal with (some over 150 years old). Network Rail has identified Civil works as having the most uncertainty of its activities for CP5.

Building blocks	Sub-categories of cost	Description	Relative risk against 'Network Rail average'	
	Buildings	Works on stations and depots.	Similar	Some construction risk, however likely to be well understood by Network Rail.
	Signaling	Covers the replacement of all signaling including in-trains signaling replacing on track signaling.	↑	Higher relative risk associated with the rollout of ERTMS.[30] NOS is also a consideration, with the network signaling being moved into 14 control centers.
	Electrification assets	Overhead lines, etc.	↓	Low relative risk. Well understood and standard activity for Network Rail.
	Telecoms	Communications equipment.	Similar	Risk associated with the introduction of new communications equipment, but no significantly higher than the Network Rail average.
Maintenance			↓	Risk associated with efficiency targets (unit costs). Well understood activities and relatively accurate forecast of work should be achievable.
Support and operations			Similar	Risk associated with efficiency targets and possibly volume. However, no more that Network Rail as a whole. Same risk as Network Rail on average.

[30] European Rail Traffic Management System.

While we have assessed the different cost types based on their differential risk, a key consideration is the regulatory regime. More precisely, ORR's approach to setting the allowances for each of the different cost categories, incentive rates and whether there are any uncertainty mechanisms in place.

For CP4 uncertainty and incentives are treated differently between capex and opex. For opex, ORR set a fixed ex ante allowance and any under-/ over-spend is kept/ borne by Network Rail i.e., a 100% symmetric incentive rate is in place. For capex (both renewals and enhancements), the incentive strength is around 25% on capex approved by ORR, in other words 75% of any capex overspend is added to the RAB.[31] The ORR is yet to set out its determination on the incentive mechanisms for CP5, however we consider it reasonable to assume that similar incentive rates will be in place. For capex with uncertainty over cost, it is our understanding that the intention of the ORR is to reconsider costs in around 18 months time when there is greater certainty around costs and then make a RAB adjustment at the beginning of the following control period, CP6. .

8.5. Operating Route risk differential

We consider that the risk differentials across the cost types can be combined to give a view of the risk differential across the Operating Routes. Combining these costs could be done on the basis of each Operating Routes' relative expenditure levels across the cost types. For example, if a particular Operating Route was allowed a significantly higher proportion of its total allowance to undertake Civil works than for Network Rail on average, then it could be considered that this Operating Route would have a relatively higher WACC than the Network Rail average (on the basis of Civil works having a higher relative risk).

We note that it is unlikely that this 'weighting' can be carried out in a precise way, however it will provide an indication as to whether a particular Operating Route may appear to be more risky than Network Rail's average risk. In addition, some consideration would need to be given to whether the expenditure in a particular category is related to one or more projects. For example, if an Operating Route is undertaking a significant Civil project which accounts for almost all its expenditure in this category then this may be viewed as increasing the risk to investors. A consideration of financeability would also need to be carried out if an Operating Route's capex was significantly high relative to its RAB. For large projects, such as the Thameslink programme, there may also be a question of apportionment of costs with the projects going across routes and how these will affect the relative risk across the different routes.

The efficiency targets for each route would also need to be considered. For example, if Scotland and Wales were set different efficiency targets from the rest of the UK routes then this could impact on the perceived risk differential between these routes.

In Text Box 8.1 overleaf we set out an example from electricity transmission where the regulator, Ofgem, set different WACCs for transmission companies based on the level of different cost activities they are carrying out.

[31] ORR, Periodic review 2013, *Consultation on incentives*, December 2011, p116.

Box 8.1: Case Study of Scottish Electricity Transmission

The RIIO T1 price control is Ofgem's determination for both gas and electricity transmission for the period 2013-2021. Within this determination there are two Scottish companies, SHETL and SPTL, as well as National Grid as both the TO and SO. Ofgem's Final Proposals gave a lower level of notional gearing to the two Scottish companies in light of the additional risks they were facing, due to the need for major investment in system reinforcement to support the low carbon network and security of supply.

The size of the investment programme for electricity transmission in Scotland is £6bn over the RIIO T1 period, which is high relative to the asset base. The £6bn includes a package of uncertainty mechanisms to address risk. SPTL and SHETL own and operate the transmission assets in Scotland and the financial package is intended to provide the appropriate level of financial reward. A lower gearing level provides a higher overall cost of capital, ceteris paribus. The gearing level for the Scottish transmission companies was set at 55%, while the gearing level for National Grid was 62.5%. Ofgem also set different levels of gearing across regulatory regimes to reflect risk.

While we have focused on theoretically building the risk profile for the different Operating Routes using the bottom-up analysis, another key differentiating factor between the Operating Routes, which investors would take into account, is management performance. Currently, there is likely to be insufficient evidence, objective or subjective, about the management performance at the Operating Routes level that would lead to different WACCs. While this may become a contributing factor to route specific WACCs in the future (if ORR decided to proceed with this approach) it could be mitigated somewhat by ORR continuing with, or even strengthening, the management incentive arrangements.

8.6. Conclusion

Through our discussion with ORR and review of Network Rail's business plans we consider that differing levels of risk can be identified for the different costs types across Network Rail's business. This differential risk assessment can be used in combination with the proportionate spending for each cost type by each Operating Route to develop a view of differential risk across the Operating Routes. However, without quantifiable evidence as to how the market might view Network Rail's risk as a whole and across its cost types taking this analysis further at this stage is difficult.

ORR's approach to setting incentives and efficiency targets for Network Rail will have a significant impact on how investors would view the riskiness of an efficiently and conventionally financed Network Rail. The incentives and efficiency targets could be set in such a way that investors would see little difference in risk between Network Rail's cost categories. This could mean that even if an Operating Route was carrying out a higher proportion of Civil works investors would not view it as any riskier than a notional Network Rail as a whole. A key consideration, as evidenced by Ofgem's decision in RIIO-T1 for the Scottish transmission companies compared to National Gird, is that the size of

the future capex programme relative to the RAV may impact on the required cost of capital, not least due to financeability issues.

ANNEX 1: RELEVANT RECENT REGULATORY DECISIONS AND MAR

A1.1. Introduction

In this annex we present a number of recent regulatory decisions on the cost of capital and our Market Asset Ratio (MAR) analysis.

A1.2. Recent regulatory decisions

Table A1.1 sets out the WACC estimates as given by the relevant regulator.

Table A1.1: Summary of recent post-tax regulatory decisions

Regulator	Sector description	Control Period	Cost of debt	Cost of equity	WACC
Ofgem	Energy – gas distribution (RIIO – GD1)	2013-2021	2.92	6.70	4.43
Ofgem	Energy – electricity and gas transmission (RIIO – T1)	2013-2012	2.92	6.80 – 7.00	4.51
Ofgem	Electricity distribution (DPCR-5)	2010-2015	3.60	6.70	4.84
Ofwat	Water and sewerage	2010-2015	3.60	7.10	5.00
Ofcom	Wholesale mobile calls	2011-2015	3.00	5.30	3.92
NIAUR	Energy – NIE T&D	2012-2017	3.20	6.32	4.45
CAA	Airports - Heathrow	2008-2013	3.55	7.30	5.05
CAA	Airports - Gatwick	2008-2013	3.55	7.90	5.29

In order to aid comparability, Table A1.2 presents the regulatory data from Table A1.1 with all WACC estimates on a pre-tax basis. The calculations in Table A1.2 are on the basis of a notional level of gearing of 60% and a tax rate of 20.2%.[32]

Table A1.2: Recent regulatory decisions on a consistent pre-tax basis

Regulator	Sector description	Control Period	Cost of debt	Cost of equity	WACC
Ofgem	Energy – gas distribution (RIIO – GD1)	2013-2021	2.92	8.38	5.11
Ofgem	Energy – electricity and gas transmission (RIIO – T1)	2013-2012	2.92	8.50 – 8.75	5.21
Ofgem	Electricity distribution (DPCR-5)	2010-2015	3.60	8.38	5.52
Ofwat	Water and sewerage	2010-2015	3.60	8.88	5.72
Ofcom	Wholesale mobile calls	2011-2015	3.00	6.63	4.46

[32] We have adjusted the weighting of the cost of debt and the cost of equity in the WACC calculation to reflect a common notional gearing assumption. However, we have not attempted to restate the regulators' cost of equity decisions to take into account this notional gearing assumption. The 20.2% tax rate is a simple average of 21% in 2014/15 followed by 20% thereafter in CP5.

Regulator	Sector description	Control Period	Cost of debt	Cost of equity	WACC
NIAUR	Energy – NIE T&D	2012-2017	3.20	7.90	5.09
CAA	Airports - Heathrow	2008-2013	3.55	9.13	5.79
CAA	Airports - Gatwick	2008-2013	3.55	9.88	6.09

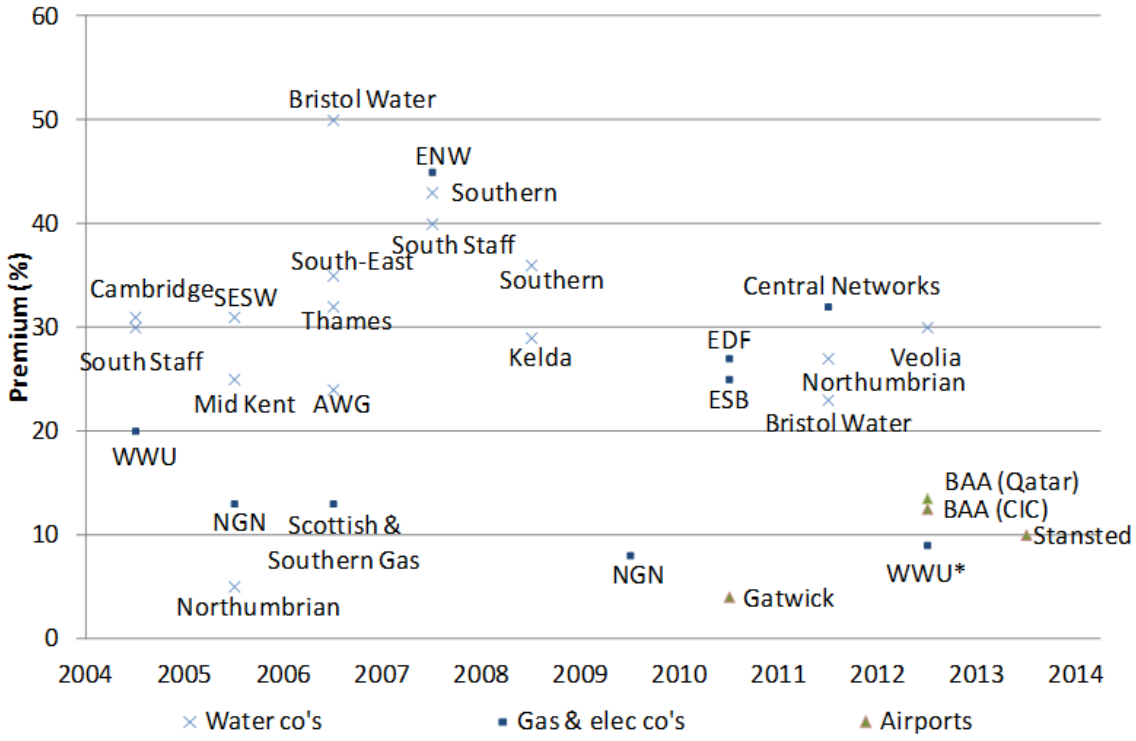
A1.3. MAR analysis

The MAR is a well-established tool used by equity analysts to compare allowed and actual returns on capital. At its simplest, the concept is that in the absence of other factors a company will earn its allowed return on its RAB. In this case it would have an MAR of one. In this section we investigate the scale of observed MAR values for recent transactions.

Analysis of MARs suggests that the traded values of utility companies have generally exceeded their RABs by 10-30% since 2004 (see Figure A1.0.1 below). This is a strong indication of outperformance against the allowed WACC, as it is highly unlikely as outperformance on incentives and cost would contribute any more than 10% of premium. The Chairman of Ofwat supported this position in a March 2013 lecture, stating that:

"The continuing trend for water companies to be sold for prices around 130% of RAV only suggests that the regulator's adopted cost of capital is too high and the premia reflect excess demand for these assets."[33]

Figure A1.0.1: MAR premia for recent UK utility transactions



[33] Observations on the regulation of the water sector: A lecture by Jonson Cox, Chairman of the Water Services Regulation Authority (Ofwat), 5 March 2013.

The MAR analysis clearly shows the continuing appetite for regulated assets, which are perceived by many investors to have bond-like characteristics and may be evidence that the cost of capital allowed by regulators has been sufficiently generous for regulatory determinations.

ANNEX 2: QUALITATIVE ASSESSMENT OF RELATIVE RISK

A2.1. Introduction

In this annex we present our assessment of risk for a notional WACC regime compared with relevant comparators. This is primarily useful as a way of understanding a benchmark level for the cost of equity in the absence of any direct measurements. It also enables us to identify any areas of risk that are particularly significant. These may be areas where equity investors would be particularly exposed or where there is a discrepancy between the regime and the selected comparators.

We begin by considering three key questions that underlie our analysis of relative risk:

- What is our definition of risk?
- What categories of risk should be considered?
- Which are the relevant comparators?

The following sections address each of these in turn.

A2.1.1 Definition of risk

We want to capture two aspects in relation to determining an appropriate notional asset beta for Network Rail:

- how much volatility is there; and
- how diversifiable is that for investors.

Risk is assessed by investors on a forward-looking basis. So we need to consider not just what risks are at a given point in time, but how they might be perceived to develop over time. These might, for example, be informed by the expenditure to RAB forecasts for CP5 (capex intensity). Also important is the scale or importance of the risk – e.g. systematic volatility on 0.1% of the asset base is not important.

Note, we focus on underlying asset risk. Debt contributes to overall equity risk as well, since fixed payments to debt holders influence the sensitivity of equity returns to cashflow fluctuations. Since the impact of debt can be captured quantitatively through the measure of gearing, we do not include it in this qualitative relative risk assessment.

A2.1.2 Categories of risk

It is important to strike a balance in defining what will be assessed. On one hand, the finer or more disaggregated the assessment, the more likely it is to capture any differences. On the other, the more disparate categories are covered, the more difficult it is to draw overall conclusions.

Anything that influences investor returns (or the timing of those returns) potentially matters. In the context of regulated sectors there are two broad sources or influences, risk and uncertainty. These two influences might affect outturn revenues and costs. Offsetting these risks/ uncertainties however, may be incentive or mitigation mechanisms as part of

the regulatory regime that an ordinary business would not receive. Our proposed list of different risk categories to consider is:

- Volume/margin.
- Capex risk – renewals/ maintenance and enhancements.
- Opex.
- Incentive regime (including strength and output focus).
- Regime (including expected stability, duration of price control, potential policy impacts etc.).

We have summarised these risk categories in Table A2.2 below. This table captures (a) what each category entails and how it is affected by regulation, and (b) to what extent it is diversifiable.

Table A2.1: Risk categories

Risk element	**Description**	**Diversifiable?**
Volume / margin risk	Demand risk can be considered as two elements: volume and margin risk. Volume risk is largely determined by whether the regulatory regime is a price or revenue cap. Margin risk is based on the allowed cost pass-through and whether (any) volume drivers match operational gearing levels.[34]	Diversifiable and non-diversifiable elements. In general, a risk category that is more likely to be related to the business cycle and macro-economic factors.
Capex risk	Capex risk is affected by two dimensions: treatment of overspend – whether the difference is passed through to consumers or borne by the company; and treatment of benefits – how companies are awarded for efficiency gains.[35]	In principle diversifiable. Elements may be positively or negatively correlated with macro-economic factors.[36] Scale of capex may affect ability to raise funds but this is a slightly separate issue to systematic risk.
Opex risk	Operating cost risk is based on the degree to which regulation allows the pass-through of costs to users, and how much these costs vary in practice.	Diversifiable and non-diversifiable elements.
Incentives	Performance incentive mechanisms inside the direct price control have become increasingly important in several regulatory regimes.	Diversifiable and non-diversifiable elements. In theory, company incentive risk should be diversifiable if incentives are symmetric and

[34] A revenue cap may transfer nearly all volume risk away from companies; however, margin risk will remain as companies' costs are a function of volume. Whether volume terms or other mechanism match a regulated company's fixed and variable costs will affect margin risk.

[35] Both of these are functions of the size of the investment programme relative to RAB as it influences the magnitude of any mistakes or judgements.

[36] The CC notes in its Bristol Water determination: '*we did not see evidence that the risks associated with capex* [are] *positively correlated with market risks—for example, if capex prices are positively correlated with the economic cycle, the resulting effect on water companies' cash flow would be negatively correlated with the market.*"

Risk element	Description	Diversifiable?
	Both their size and the variation of payments can have a material impact on companies' overall risk profiles.	investors can diversify within a sector.
Regime and policy	Regulatory risk primarily refers to the consistency, credibility and predictability of the regime. This relates to how likely it is that the regulatory goal posts will move. Perceptions of this may be affected by the transparency of decisions, how frequently major changes have occurred, and how established the regulator is in its position. Regulated entities may also be exposed to broader policy risk.	In principle diversifiable, but again elements may be linked to macro factors that might change regulatory or policy decisions.

A2.1.3 Comparators

What determines the list of relevant comparators? We are examining relative risk to solve a data problem – so data availability is important. Other regulatory decisions are one source of data, but the most direct evidence (within the CAPM framework) comes from market-based beta estimates. In theory, therefore, any listed entity would do (not just regulated entities). But making these comparisons is challenging so the fewer logical leaps made the better – hence other regulated sectors are useful, since they are in many ways closely comparable. The water sector is likely to provide the best data as it has the greatest number of listed entities, but we can also consider the recent RIIO T1 and GD1 price control reviews since National Grid is listed, although it is set a WACC based on its different licences. Our chosen comparators are:

- Rail (Network Rail CP4) – based on our best view and understanding of final proposals.
- Energy (RIIO-T1 and GD1) – a broad characterisation of RIIO as a whole, recognising that there were some differences by network. However, (a) these differences were relatively small and within the margin of error for a qualitative relative risk exercise, and (b) the main listed comparator, National Grid, has assets subject to each variant of RIIO so the broad-brush approach is appropriate.
- Water and sewerage (PR09) – based on our best view and understanding of final proposals, also drawing on the CC's analysis for Bristol Water
- Airports – there are no UK listed comparators, but it provides a useful source since arguably more variation than other regulated sectors

A2.2. Analysis of Network Rail risk

In Table A2.2 below we provide a risk assessment of Network Rails different business risk relative to the comparators discussed above. A downwards pointing arrow indicates lower risk than ORR's current proposals for CP5, while an upwards pointing arrow indicates greater risk.

Table A2.2: Qualitative assessment of relative risk

Risk category	Network Rail – CP5	Network Rail – CP4		Energy networks – RIIO		Water – PR09		Airports	
Volume/ margin	Hybrid price/ revenue cap matched to fixed/ variable cost split.	Similar	Hybrid price/ revenue cap matched to fixed/ variable cost split.	↓	Revenue cap with uncertainty mechanisms.	↓	Pure price cap but linked to connections or v. stable demand.	↑	Price cap results in (second-order) exposure to demand risk, but risk is still relatively low.
Maintenance/ renewals	Difference exists between maintenance, more of an opex item, and renewals. The inclusion of three-quarters of inefficient spend in the RAB means there is not significant risk, but differs across activity types.	↓	Relatively exposed, especially to maintenance over/ under-spend..	↓	Menu regulation with IQI sharing factor around 60-70%.	Similar	CIS sharing factor of around 70-85%. Average rather than upper quartile efficiency requirement.	Similar	In principle there is some exposure, but in practice this is not especially significant.
Enhancement capex	Three-quarters of inefficient spend in the RAB reduces risk. Enhancement programme is significant and risk is higher for less developed projects.	↓	Enhancement set based on P80 (i.e. higher costs estimates than renewals which was at P50).	↓	IQI sharing factor around 60-70%. Uncertainty mechanisms via cost and volume drivers. Transmission is more risky due to the size of the capex programme relative to the RAB..	↓	Scale of capex is an issue, but low risk excluding the Thames Tideway (can be higher risk)	↑	Single large capex programmes with high cost-to-RAB ratios.

Risk category	Network Rail – CP5	Network Rail – CP4		Energy networks – RIIO		Water – PR09		Airports	
Opex	Potentially sharper incentives than EBSM	Similar	Similar	↓	IQI sharing factor around 60-70%. Uncertainty mechanisms via cost and volume drivers.	Similar	Traditional approach to opex, although likely to change for next price control.	Similar	Effective 100% opex efficiency incentive rate.
Operational gearing and investment intensity	High capex to RAB expenditure through CP5.	Similar	High capex to RAB expenditure through CP4.	Similar	High capex intensity for some networks. Scale of Transmission expenditure recognised as risk driver.	↓	High capex to RAB for some networks, but generally less overall.	↓	Generally not as extensive, but enhancement in Q5.
Indexation	RPI and net (of efficiency) RPEs.	Similar	RPI indexation.	↓	RPI, RPEs and cost of debt indexation.	↑	RPI indexation.	↑	RPI indexation.
Uncertainty mechanisms	Proposal is for a reopener if there is a material change in circumstances.	↓	Reopeners for material change, AICR less than 1.4 and if Network Rail forecasts that it cannot finance itself in the next 18 months.	↓	Significant uncertainty mechanisms include cost and volume drivers, connections and tax.	Similar	'Shipwreck' clause, as well as notified items and relevant changes in circumstance.	Similar	No overall re-opener, or uncertainty mechanism.
Incentive regime	Some strengthening of incentive regime (e.g. electricity).	Similar	Some uncapped incentives (e.g. Schedule 8).	Similar	Increasing focus on output incentives.	Similar	Focus on output (particularly quality of service).	Similar	Fairly standard package of incentives.

Risk category	Network Rail – CP5	Network Rail – CP4		Energy networks – RIIO		Water – PR09		Airports	
Regime and policy	Similar regime to CP4.	Similar	Arguably some limited concerns related to Railtrack collapse.	Similar	Established regime with long (eight year) controls Any uncertainty over gas network policy is very long-term.	↑	Anticipation of Future Price Limits likely to have affected perceptions in recent years.	↑	Change in law and move away from automatic role of the CC will change perceptions of risk.
Overall		Similar	While some categories are slightly lower relative risk, overall similar.	Similar/ Lower	Transmission may be similar in terms of risk, but other energy programmes appear less risky.	Similar/ Lower	In general, perceived lower risk, but large projects e.g. Thames Tideway can affect this going forward.	Similar/ Higher	Slightly higher risk is dependent on scale of enhancement programme, which is often small-scale. Will vary by airport e.g. due to capacity constraints.

ANNEX 3: MEDIA REVIEW OF CP4 DEBT ISSUANCE

[Redacted]