Economic Insight

November 2019

Economic Insight Ltd

ASSURANCE REVIEW AND ASSESSMENT OF THE EVIDENCE ON THE WACC AT RP3

A report for NATS

CONTENTS

1. Introduction and executive summary

This report sets out our independent assessment of the existing evidence relating to the weighted average cost of capital (WACC) at RP3. Our report does not seek to advocate any particular view of what the WACC should be. Rather, in addition to providing an objective appraisal of the evidence, we identify the key issues we think merit further consideration during the CMA redetermination process. Based on this, our view is that total market returns; the estimation of the asset beta; and the cost of new debt, are critical issues. Overall, whilst there are some questions regarding NERL's evidence, we have greater concerns regarding the CAA's position - which has deficiencies in specific areas and appears inconsistent with an intuitive understanding of the factors that drive an appropriate WACC for NERL. Most obviously, the relative riskiness of its equity and debt and a time-consistent view of the UK economy over RP3.

1.1 Introduction and context

Following the CAA's referral of its RP3 Final Decision relating to NATS En Route plc (NERL) to the CMA, Economic Insight was commissioned by NATS to undertake an independent review of the evidence relating to the WACC. The purpose of this is not to introduce new evidence as to 'what' the level of the WACC should be for NERL at RP3. Rather, the scope of our work is focused on reviewing and appraising:

- **The robustness of the existing evidence base** developed by the CAA and NERL.
- **The inferences** the CAA and NERL have drawn from the evidence.
- **The internal consistency** of both the assumptions and arguments made in determining the key parameters of the WACC, by the CAA and NERL.

Our overarching objective is not, therefore, to advocate particular views as to the 'value' of the WACC; either as a whole, or in relation to any individual component. Rather, our primary aim is to provide NERL with an **independent appraisal of the evidence base.** We have also **identified the 'key issues' we think merit consideration during the redetermination**, which we hope will assist the CMA in prioritising specific areas. Finally, we are mindful that a large quantity of evidence has

been developed relating to the WACC. As such, this report **synthesises and distils** this in a way that may be convenient for the CMA. Our report is structured as follows:

- The remainder of this chapter provides an executive summary of our findings.
- Chapter 2 sets out our review and assessment of the key issues, organised around each of the main parameters relating to the cost of equity.
- Chapter 3 provides our assessment of the evidence relating to the cost of debt.
- Chapter 4 contains our conclusions and findings.

1.2 Executive summary

1.2.1 Overview of the respective positions of the CAA and NERL relating to the WACC

As can be seen from Table 1, the WACC is an area in which the CAA and NERL have particularly divergent views for RP3. The CAA proposes a cost of equity of 5.40% (real, post-tax), compared to a figure of 8.93% for NERL. Similarly, the CAA proposes a cost of debt of 0.86 (real, pre-tax), compared to 1.07% for NERL. Overall, the CAA proposes a vanilla WACC of 2.68%, compared to a figure of 4.21% for NERL.

Table 1: Finalised positions on the WACC

	CAA		NERL
	Draft proposals	Final Proposals	Response to Draft Proposals
COST OF EQUITY			
Inflation (RPI)	3.00%	3.00%	3.00%
Real risk-free rate	-1.40%	-1.70%	-1.40%
Nominal risk-free rate	1.6%	1.2%	1.6%
TMR	5.40%	5.40%	6.25%
Equity Risk Premium	6.80%	7.10%	7.65%
Equity Beta	0.9600	1.0000	1.3500
Asset beta	0.460	0.460	0.570
Debt beta	0.130	0.100	0.050
Cost of equity (real post tax)	**5.13%**	**5.40%**	**8.93%**
COST OF DEBT			
Cost of embedded debt (real)	2.30%	2.30%	2.13%
Proportion of embedded debt	30.00%	30.00%	30.00%
Cost of new debt (real)	0.10%	0.10%	0.40%
Proportion of new debt	70.00%	70.00%	70.00%
Overall cost of debt (real)	0.76%	0.76%	0.92%
Issuance & liquidity cost allowance	0.10%	0.10%	0.15%
Overall cost of debt (real, pre-tax)	**0.86%**	**0.86%**	**1.07%**
OVERALL WACC			
Gearing	60.0%	60.0%	60.0%
Equity	40.0%	40.0%	40.0%
Vanilla WACC	**2.57%**	**2.68%**	**4.21%**
Tax uplift to cost of equity	11.70%	9.90%	
WACC (pre-tax real, RPI)	**2.84%**	**2.91%**	

Source: CAA; UK RP3 Decision Document – Appendix E.

FOCUSING ON THE INTUITION, THERE ARE REASONS TO EXPECT THE WACC TO BE SOMEWHAT LOWER AT RP3, RELATIVE TO RP2. THIS IS PRIMARILY DRIVEN BY THE COST OF DEBT. THE STORY ON THE COST OF EQUITY IS MORE COMPLEX – AS LARGE OR SUDDEN CHANGES IN MARKET RETURNS ARE UNSUPPORTABLE - AND A REDUCTION IN SYSTEMATIC RISK SEEMS IMPLAUSSIBLE. THUS, THE CAA's OVERALL POSITION IN ITS FINAL DECISION SEEMS FUNDAMENTALLY PROBLEMATIC.

1.2.2 Our overarching assessment and implications

Stepping back, when one considers the evidence as a whole, we consider there are 'in principle' intuitive reasons to expect the WACC to be reduced at RP3, relative to RP2. These primarily relate to the cost of debt, where market data clearly points to a reduction overall. On the cost of equity, intuitively the story is much more mixed. Specifically, *some* reduction in total market returns (TMR) can be rationalised, but this very much depends on the time-horizon one applies and expected UK economic performance over that horizon. Under any perspective, however, 'large' or 'sudden' changes in TMR cannot be rationalised. Similarly, it is hard to rationalise a reduction in systematic risk at this time.

With the above issues in mind, NERL's position in its Revised Business Plan could be considered questionable, in that it implied an *increase* in the WACC overall, relative to RP2 (4.51%, vanilla versus 4.25% at RP2). However, its revised position in response to the CAA's Draft Proposals mitigates such concern – with an updated vanilla WACC of 4.21%, representing a slight decline relative to RP2.

The CAA's overall position in its Final Decision seems more fundamentally problematic – noting that this implies a large reduction in the vanilla WACC relative to RP2, from 4.25% to 2.68%. The problem with the CAA's position is that, in addition to a reduced cost of debt (which is to be expected, albeit a matter of degree), it embeds a very large reduction in the cost of equity, which is contrary to economic intuition. This is a consequence of the CAA assuming both a very large and sudden reduction in TMR and a reduction in NERL's asset beta. Putting detailed technical methodological questions to one side, this simply seems implausible.

Our assurance review has incorporated a thorough assessment of the existing evidence base. Overall, we consider that NERL and the CAA have clearly undertaken substantial work relating to the WACC. However, in keeping with our above observations, both suffer from certain limitations. Accordingly, in the following table we summarise our view of the robustness of evidence developed, for each component of the WACC, where: red = *'low robustness';* amber = *'medium robustness';* and green = *'high robustness'.*

Table 2: Evidence robustness rating

	CAA	NERL
Risk free rate		
Total market returns		
Asset beta		
Debt beta		
Embedded debt		
Cost of new debt		
Issuance and liquidity costs		

Source: Economic Insight

1.2.4 Summary of our assurance review findings

In relation to the key parameters relating to the **cost of equity,** the findings from our review are as follows:

- The approach taken to estimating the real **risk free rate** (RFR) by both the CAA and NERL is generally appropriate, based largely on observable yields on UK gilts. However, both are deficient in one important respect. Namely, the CAA relies only on an 'index-linked' approach (to support its proposed figure of -1.7%, RPI, real)[1], whereas NERL relies only on a 'nominal' approach (and argues the CAA should set a figure no lower than -1.4%, RPI, real).[2] Whilst economic theory provides a plausible basis for understanding 'why' the implied *real* RFR might vary between these two methods (primarily, the possibility of inflation and liquidity risk premia) the empirical evidence reveals the differences to be 'unexplained'. As such, one cannot preclude the possibility that the relative yields implied under the two methods are subject to market distortions. Further, the 'size' of impact arising from the inflation risk premium; liquidity risk premium; and possible market distortions, is inherently uncertain. One cannot objectively say that any of these factors are 'more' or 'less' uncertain than any other. The implication of this is that, whilst there might be in principle reasons for favouring an index-linked approach, in practice we cannot say that either the index-linked or notional approach will provide an objectively better measure of the real RFR. As such, and consistent with considerable regulatory precedent, we suggest the CMA should consider attaching weight to both index-linked and nominal methods 'in practice', when estimating the *real* RFR (as it has in previous redeterminations). This is also consistent with advice PwC has given to the CAA at prior determinations and advice Europe Economics (EE) has consistently given to Ofwat.

- In relation to **total market returns,** it is helpful to focus on the key underlying intuition in order to evaluate the CAA's and NERL's proposals. Specifically, the UK's overall economic performance (in particular, productivity) is a key driver of equity returns. Hence, the appropriate approach to TMR critically depends on the 'assumed time horizon' and 'UK economic context'. In addition, because the equity risk premium and RFR are inversely related, generally one expects total equity returns to be relatively stable over time (a widely accepted point, repeatedly highlighted in the UKRN study). This relationship is not 'perfect' or 'immediate', however. Following from this intuition, if a 'shorter-term' view is taken, there is a rationale for some reduction in TMR, consistent with the prevailing downward trend in regulatory determinations and poor recent UK productivity performance. However, if a 'longer-term' view is taken, this is not the case. We find that both the CAA's position (a significant reduction in TMR to 5.4%, RPI real) and NERL's position, suffer from internal consistency problems, when considered through this lens. Specifically, the CAA's position is more consistent with a 'short-term' view, but its methodologies and treatment of evidence contradict this. Similarly, NERL's position in its Revised Business Plan suffered from the same problem in the opposite direction. However, we find that by lowering its proposed TMR to 6.25% in its response to the CAA's Draft

[1] *The CAA states that if it applied a nominal approach, the real RFR would be -1.3%.*
[2] *NERL proposed a higher figure than this in its Revised Business Plan, of 0.46% (RPI, real), based on the deflated yields on nominal bonds. Its position in response to the CAA's Draft Proposals that the CAA should not set a RFR of less than -1.4% was not based on any additional analysis. Hence it may not be appropriate to interpret the -1.4% as NERL's view of what the real RFR would be on a deflated nominal basis using the latest available data.*

Proposals, 'in practice' NERL has mitigated the impact of said inconsistencies.[3] These inconsistencies likely arise from the failure of either the CAA or NERL to root their approaches in a clearly articulated and time consistent view of the UK economy.

- The CAA's position in its Final Decision appears especially problematic. It implies a rate of change (reduction) in TMR faster than any previously regulatory determined TMR figure. For example, as recently as June this year, Ofcom found TMR to be 5.8% (real, RPI). To put that into context, when setting TMR in the Bristol Water redetermination, the CMA was mindful not to depart from an assessment of TMR made 18 months earlier for Northern Ireland Electricity. Given this, the CAA's position could only be rationalised if, in addition to taking a short-term view, there was an expectation of a marked further decline in UK economic performance over RP3. However, the OBR's most recent forecasts are not supportive of this – and so we find the CAA's position to be implausible, from any reasonable perspective. In addition, the CAA's proposed TMR raises further problems when considered against other aspects of RP3. Specifically, if a short-term / low returns / low productivity perspective is applied for TMR, it must be applied consistently across all aspects of the price control. The CAA's position on efficiency appears contrary to this, in that it supposes NERL can deliver overall efficiency gains that are at least 'as big' as at RP2.
- NERL's revised position in response to the CAA's Draft Proposals (it lowered its proposed TMR from 6.8% to 6.25%, RPI deflated) does not raise the same issues. Specifically, it implies a modest rate of change and is consistent with a long-term decline in TMR. However, it does represent an increase when considered against the shorter-term pattern in regulatory determined TMR, which in our view, is *somewhat* problematic.[4] We note that in a recent report for Thames Water, Frontier Economics found TMR to be 6.22%, RPI deflated.

- As regards the **asset beta**, the choice of comparators relied upon by both the CAA and NERL did not start from a transparent and robust framework that allowed a comprehensive comparison of their relative risk. In practice, NERL's comparator choice is, however, based on a more complete risk analysis and is generally more supportable than the comparators relied upon by the CAA (for example, the CAA's comparators include utilities, which are likely to be poor comparators).

  - In terms of the estimation window, it is most important to apply a time-consistent approach relative to other elements of the WACC. At times of uncertainty, there is perhaps a greater rationale to lean on longer estimation windows; and so we propose 2 or 5 year horizons.
  - We further consider it more appropriate to derive beta estimates from European, rather than domestic, indices, given the likely ability of investors to diversify beyond the UK (thus, NERL's evidence is preferred to the CAA's in this regard).

[3] *i.e. methodologically speaking, the inconsistencies remain, but by taking into account the CAA's proposed TMR range and evidence, and thus reducing its proposed TMR to 6.25%, the 'in practice' effect of this is diluted.*

[4] *However, this does depend on the time horizon being applied. NERL's position would be time-consistent with a longer-term perspective.*

- Adjustments for operating leverage, and other relative risk factors, should also be made – but again, this should start from a broader, robust, risk framework. A failure to adjust for operating leverage in particular would risk ignoring, or understating, a key dimension of NERL's equity risk: namely, that it has relatively 'thin' cash flows which, when considered in the context of its cost structure, means that fluctuations in demand could materially impact equity returns.
- The emergence of ENAV as a comparator is helpful and clearly provides a potentially useful evidence point. However, the relatively short term time horizon over which data is available somewhat limits the inferences that can be drawn – and a careful assessment of its risk, relative to NERL, indicates some differences that must be taken account of.
- Finally, we are concerned that, to date, the CAA has not addressed the fact that its proposed beta for RP3 implies a reduction in systematic risk relative to RP2. Based on our initial review of the relevant evidence, there is no basis to suppose that systematic risk has declined since the previous control. Seen in this context, the CAA's proposed beta of 0.460, which is lower than the asset beta it set at RP2 (0.50), is counterintuitive. In contrast, directionally, NERL's proposed asset beta of 0.570 is more intuitively sensible. Relatedly, the CAA does not appear to have considered the potential impact of other changes in its regulatory approach at RP3 for the WACC. For example, under its governance arrangements, the CAA may ex-post adjust the cash flows of NERL relating to a backwards-looking assessment of its capex efficiency. Further, the considerable latitude the CAA's governance proposals afford the regulator more broadly would seem to increase regulatory risk. Moreover, the proposed capex incentives are penalty only, and so skew equity returns to the downside (see our separate review of the evidence on capex governance for further details).

- The parties have differing views concerning the **debt beta.** The CAA proposes a figure of 0.10, whereas NERL proposes a figure of 0.05. In terms of the evidence, the CAA's position seems to attach more weight to 'indirect' methods than 'direct' (econometric) methods, which we disagree with (we recommend equal weight should be used). We consider that the CAA's advisors are conflating the apparent 'transparency' of indirect methods with 'greater accuracy'. In addition, both the CAA's and NERL's indirect methods are under-developed. Specifically, they are based on 'broad assumptions' to set the key input parameters. So, whilst we think the indirect method is valuable, if it is to be relied upon in the redetermination, much more care is needed to ensure the evidence sources and comparators properly reflect the relative risk faced by NERL – and that the approach is time-consistent with other elements of the cost of equity.

Turning to the components of the cost of debt, our review of the evidence suggests the following:

- In relation to **embedded debt,** both the CAA and NERL apply the same methodology, deriving this from the real yield on the NATS bond. Other than differing views on RPI inflation, therefore, their positions are identical. We consider the method sound and so have no comments.

- Turning to the **cost of new debt,** the CAA proposes a figure of 0.1% (RPI, real) whereas NERL proposes an equivalent figure of 0.42%. Overall, we find the

methods relied upon by each party to be sound. Both utilise a 'bottom up' method, which starts from the yield on the NATS bond and makes adjustments (the CAA also utilises top-down evidence, and so is somewhat more complete methodologically – we think NERL's evidence base would have benefitted from using this approach also). The parties' proposed positions differ predominantly because the CAA removes certain adjustments to the yield on the NATS bond.

- Looking at the proposals in the round, we are concerned as to the credibility of the CAA's figure, when it is compared in relative terms to other regulated industries. Specifically, historically the CAA has set a cost of new debt for NERL that is close to (but below) the water industry. In contrast, its proposal for RP3 implies a cost of new debt equivalent to just 29% of that proposed by Ofwat at PR19. Again, focusing on intuition, while there are some features of NERL that would suggest its financing costs should be below those in the water industry (e.g. implicit government support) there are many other features that go in the opposite direction (e.g. NERL has more intangible assets, the income generated from said assets is less secure, it is exposed to volume risk, its assets have shorter lives – relative to the water industry). Hence, this marked reduction in the relative cost of new det compared to the water sector appears difficult to rationalise.
- Indeed, there appears to be little consideration of these important intuitive factors that impact the relative riskiness of debt. More narrowly, one such factor that creates an upward pressure on NERL's financing costs is its shorter licence termination notice period. Whilst both NERA, for NERL, and EE, for the CAA, recommended an upward adjustment for this, the CAA has excluded it. In our view, this is a clear error. Obviously, 'precisely' identifying the impact of a shorter licence period is challenging. However, this does not detract from the unarguable 'in principle' need to apply such an adjustment (which the CAA itself accepts) in order for NERL to recover its efficient debt costs.

- The CAA proposes an allowance of 0.10% for **issuance and liquidity costs**, compared to 0.15% as proposed by NERL. Here, we find the overall evidence base is underdeveloped.

  - The CAA relies primarily on analysis undertaken for the water industry.
  - NERL primarily points to the RP2 allowance of 0.15% to support its position.
  - From our review, we consider that precedent implies that the combination of issuance and liquidity costs must be above the 0.1% proposed by the CAA.
  - In addition, we find the approach used by the CAA understates NERL's liquidity costs, because it is based on broad 'rules of thumb' from the water industry, which understate NERL's credit facilities as a proportion of its debt.

1.2.6 Recommended issues for consideration by the CMA during its redetermination

The scope of our review has not included developing our own assessment of an appropriate WACC. Indeed, we are mindful that this will of course be a key area of focus for the CMA during its redetermination – and so the CMA will need to reach its own view on this matter. However, our review has identified a number of 'key issues' that we think should be carefully considered as part of the redetermination process. The hope is that, given the considerable complexity surrounding the WACC, this may assist the CMA in weighing up which topics to focus on. These are summarised below in Table 3.

Table 3: Recommended issues for consideration by the CMA

WACC Parameter	Our recommended areas for consideration
Risk free rate	• Consider evidence from both yields on index-linked and deflated nominal gilts.
Total market returns	• Evaluate any proposed TMR in the context of a time-consistent view of the UK economy. • Check consistency of methods against above. • Check consistency of other price control assumptions against above. • Consider intuition for 'direction' and 'speed' of implied changes in TMR. • Consider the 'rate of change' in TMR implied, relative to prior determinations.
Asset beta	• Ensure selection of comparators is rooted in a clear risk framework and comprehensive risk analysis. • Check beta estimation window is consistent with broader WACC approach. • Derive betas predominantly from European indices (potentially investigate further evidence on ability to diversify beyond UK). • Apply relevant adjustments for relative risk to final comparators, as appropriate. • Consider changes in systematic risk since RP2 when determining final beta value.
Debt beta	• Consider evidence from both 'indirect' and 'direct' methodologies. • Ensure input parameters for any indirect method are determined with care, based on clear criteria, so that they properly reflect the relative risk faced by NERL.
Cost of embedded debt	• NA.
Cost of new debt	• Identify intuitive factors that impact relative cost of debt (up or down) relative to other industries. • Check relativities of implied cost of debt compared to other industries. • Include adjustment for shorter licence termination notice period. • Include adjustment for liquidity.
Issuance and liquidity costs	• Ensure that 'efficient liquidity' costs are included in addition to issuance costs. • In quantifying efficient liquidity costs, ensure the methodology reflects the 'efficient scale' of liquidity requirements for NERL.

Source: Economic Insight

1.2.7 A perspective on Brexit

The current uncertainty surrounding Brexit adds a further complication to any determination of the WACC for NERL at this time. It is by no means clear that this uncertainty will be resolved during the CMA's redetermination process. The overall impact of Brexit and Brexit uncertainty on the WACC is difficult to determine with any precision. However, on balance our judgement is that it perhaps points to some further downward pressure on the cost of debt, but upward pressure on the cost of equity.

There is no simple way for the CMA to take account of this when setting the WACC as part of its redetermination. However, our overall take is that it perhaps provides a further reason to be wary of adopting an 'overly mechanical' approach to the WACC. In addition, whilst, overall, we consider a 'time-consistent' approach to the WACC is more important than the precise choice of time horizon, Brexit uncertainty perhaps provides a reason to be wary of attaching undue weight to short-term data. Ultimately, Brexit considerations will likely need to be factored in through more qualitative means (for example, judging 'where' in an evidence range to pick a number).

2. Review and assessment of evidence on the cost of equity

In this chapter we provide our assessment of the existing evidence base relating to the cost of equity at RP3. We find that the approach to TMR and the asset beta are particularly contentious issues. On the former, we are concerned about the lack of a time-consistent approach, transparently linked to UK economic performance. As a result, there are internal inconsistencies between the levels of TMR proposed and the evidence base relied upon, for both the CAA and NERL. The CAA's position is especially problematic, as it assumes a 'large' and 'sudden' reduction in TMR that cannot be easily rationalised from any perspective – and contradicts various other assumptions. NERL's revised (lower, relative to its Plan) TMR appears logical in the context of a gradual downward trend in TMR, but is somewhat questionable when set against nearer-term trends. In relation to the asset beta, neither the CAA's nor NERL's evidence starts from a transparent, risk-based framework. However, NERL's evidence nonetheless includes a more thorough risk-based approach than the CAA's. Directionally, the CAA's proposed reduction in the asset beta seems counter-intuitive, when considered in light of likely changes in systematic risk at RP3. In part, this is likely because the CAA relies unduly on utility comparators to inform its beta range.

In the following sections, we set out our independent assessment of the existing evidence relevant to the determination of the cost of equity for NERL at RP3. Specifically, we review and critique the evidence relied upon by both the CAA (as used to inform the cost of equity it determined for NERL in its Final Decision) and that relied upon by NERL. In each case, we pay attention to both: (i) the evidence itself – i.e. its robustness; but also (ii) the relative weight attached to, and inferences drawn from, it.

The chapter is structured around the key parameters of the cost of equity, as follows:

- overview of the respective positions of NERL and the CAA;
- the risk free rate;
- total market returns;
- asset beta; and
- debt beta.

2.1 Overview of the respective positions of NERL and the CAA

In its Final Decision, the CAA set NERL an allowed cost of equity of 5.40% (real, post tax), which represented a slight increase on that proposed by the regulator in its Draft Proposals of 5.13%. These figures compare to NERL's latest position (as set out in its response to the CAA's Draft Proposals), which implied an overall cost of equity of 8.93%.

Table 4: Summary of finalised positions on the cost of equity

	CAA		NERL
	Draft proposals	Final Proposals	Response to Draft Proposals
Inflation (RPI)	3.00%	3.00%	3.00%
Real risk-free rate	-1.40%	-1.70%	-1.40%
Nominal risk-free rate	1.6%	1.2%	1.6%
TMR	5.40%	5.40%	6.25%
Equity Risk Premium	6.80%	7.10%	7.65%
Equity Beta	0.9600	1.0000	1.3500
Asset beta	0.460	0.460	0.570
Debt beta	0.130	0.100	0.050
Cost of equity (real post tax)	**5.13%**	**5.40%**	**8.93%**

Source: CAA; UK RP3 Decision Document – Appendix E.

As outlined above, in the following sections we set out our assessment of the available evidence in relation to each cost of equity parameter in turn.

2.2 The risk free rate

In this section we set out and evaluate the respective evidence of the CAA and NERL relating to the RFR. Before doing so, Table 5 briefly summarises the relative positions and evidence sources developed by each.

Table 5: Summary of positions and evidence relating to the RFR (RPI deflated)

	CAA (Final Decision)	NERL (Response to Draft Proposals)
Risk free rate	**-1.7%**	**-1.4%**
Evidence sources (ranges shown)		
Yields on UK index-linked gilts	-1.9 to -1.7%	NA
Yields on UK nominal gilts	NA	-1.1 to + 1.5%

2.2.1 The CAA's position and supporting evidence

In its Draft Proposals, the CAA estimated the RFR based on an analysis of the yield on (index-linked) UK government bonds (gilts), adjusted to reflect anticipated interest rate changes, so as to derive forward-looking rates. The CAA's analysis included examining the yields on 5, 10, 15 and 20 year gilts. In practice, the CAA's central

estimate was based on 10-year gilts.[5] This provided an implied forward-looking yield of -1.4% (RPI-deflated) at the mid-point of RP3, using market data up to September 2018.

In its Final Decision, the CAA adopted the same methodology, but updated its estimates, based on more recent market data (up to April 2019). The CAA found that, on this basis, the yield on 10-year gilts implies a RFR of -1.9% at the mid-point of RP3. However, the CAA also noted that the 10 and 20 year spot rates imply a range of -1.7% to -1.8%, once forward-rate adjustments are made. Thus, the CAA ultimately proposed a RFR of -1.7% in its Final Decision, stating: *"given the volatility in ILGs in the last 6 months and the uncertainty associated with Brexit-related impacts, we propose a point estimate for the RFR of -1.7%, towards the higher end of the range."*[6]

2.2.2 NERL's position and supporting evidence

In its October 2018 Revised Business Plan, NERL assumed a RFR of 0.46% (RPI-deflated).[7] This was based on the mid-point of NERA's (2018) estimates, which suggested a range of -1.1% to 1.5%.[8]

NERA's assessment of the range at that time was based on the following evidence and analysis:

- NERA examined the long-run yields on nominal gilts, between 1900 and 2017, as calculated by DMS. Using this approach, NERA found the long-term RFR to be 2.4% (RPI deflated).
- NERA quoted various regulatory precedents, which it suggested are consistent with a RFR of 1.5% (RPI deflated).[9]
- NERA also looked at the evidence on 'short term' yields on 10 year government gilts. Here, NERA's method was to examine the 1 month average yield on 10 year gilts, which it quoted as being 1.41%. NERA then adjusted this for expected rate rises up to the mid-point of RP3. NERA applied an adjustment of 63 basis points (bps) for this. Finally, NERA deflated the sum of these two factors by the HM Treasury consensus forecast of RPI for 2022, which NERA quoted as being 3.2%. So, adjusting for expected rate rises and inflation, NERA suggested the short-term evidence implies a RFR of -1.1% (RPI deflated).[10]

In explaining its recommended range of -1.1% to 1.5% for the real RFR, NERA stated that the low-end simply reflected its analysis of the short term yields on gilts (as above). In relation to the upper end, NERA stated that it placed: *"more weight on long-run evidence"*[11] – noting that the rate of return varies with the business cycle. NERA

[5] *'Appendices to Draft UK Reference Period 3 Performance Plan proposals.' CAA; (February 2019); page 40.*
[6] *'UK RP3 CAA Decision Document: Appendixes.' CAA (August 2019); page 49.*
[7] *'Appendices: RP3 Business Plan 2020-2024.' NATS (October 2018); see table on page 165.*
[8] *'Updated Weighted Average Cost of Capital for NATS (En-Route) plc at RP3.' NERA (September 2018); table 2.3, page 9.*
[9] *'Updated Weighted Average Cost of Capital for NATS (En-Route) plc at RP3.' NERA (September 2018); see Figure 2.1 on page 8 and table 2.3 on page 9.*
[10] *'Updated Weighted Average Cost of Capital for NATS (En-Route) plc at RP3.' NERA (September 2018); individual calculation steps are set out in footnote 10; page 8.*
[11] *'Updated Weighted Average Cost of Capital for NATS (En-Route) plc at RP3.' NERA (September 2018); page 8.*

also highlighted that its proposed figure of 1.5% is consistent with regulatory precedent.

In broad terms, the methodologies and evidence adopted and relied upon by the CAA and NERL for determining the RFR are similar. Consistent with this, we note that in its response to the CAA's Draft Proposals, NERL did not submit further evidence on the RFR and remarked that: *"the CAA's approach and proposals are not unreasonable."*[12] However, on closer inspection there are some important differences that require consideration. Most notably, the CAA starts from an 'index-linked' approach to determining the real RFR, whereas NERA (on behalf of NERL) starts from a 'nominal' approach. We consider the relative merits of these methodological differences in our assessment of the evidence in the next section.

We also note that, in its response to the CAA's Draft Proposals, NERL advocated that the CAA should 'maintain' its mid-point for the RFR of -1.4% (RPI deflated). On reviewing NERL's response, this could be characterised as follows:

- that it reflects a 'pragmatic' position, whereby NERL has not provided any additional views itself as to what the RFR should be, but is simply suggesting that the CAA should not 'go lower' than the figure of -1.4%, as per its Draft Proposals; and / or
- that NERL recognised that more recent market data likely implies a lower RFR than that proposed in its Revised Business Plan; and that were its own method updated, this would now imply a figure of (or about) -1.4%.

We note that, in either case, because the CAA revised its assessment of the RFR down to -1.7% in its Final Decision, the Parties have divergent views as to the appropriate value in real terms.

2.2.3 Our assurance review

Basing an assessment of the RFR on the yields on government gilts is standard practice. As such, we find that the approaches of both the CAA and NERL are, at a high level, appropriate. However, we consider there to be two issues that have not been adequately addressed to date and so require further consideration in the context of the referral to the CMA:

- firstly, the distinction between an 'index-linked' and 'nominal' approach to estimating the RFR; and
- secondly, the appropriate time horizon to apply.

THE IMPLIED REAL RFR CAN VARY, DEPENDING ON WHETHER ONE STARTS FROM INDEX-LINKED GILTS, OR DEFLATED NOMINAL GILTS.

2.2.3.1 Index linked versus nominal approaches to estimating the risk free rate

As noted above, it is standard practice to estimate the RFR based on the yields on government zero coupon bonds (adjusted for forward looking rate expectations). As these yields can be directly observed, this is a relatively straightforward exercise. However, in practice one can observe yields in relation to both: (i) index-linked; and (ii) nominal, government gilts. Importantly, the implied *real* RFR can vary, depending on which approach one starts from. Indeed, consistent with this, we note that in its Final Decision, the CAA stated that, on its own analysis, a nominal approach: *"would*

[12] *'NERL's response to CAP1758: Draft UK reference period 3 performance plan proposals.' NERL (April 2019); page 57.*

lead to a higher estimate for the [real] RFR (closer to -1.3%)."[13] This, of course, compares to the CAA's proposed figure of -1.7%.

In its Final Decision, the CAA relied entirely on an index-linked approach. This is on the basis that a nominal method would be: *"a departure from the approach recommended by the UKRN cost of equity report."*[14] However, we do not think that this, in and of itself, provides a strong basis for selecting the method. Rather, to determine the appropriate balance of evidence, it is important to consider carefully exactly 'what' the index-linked and nominal approaches are measuring and the reason they give rise to differing implied real terms estimates of the RFR. In the following, we therefore address this in more detail, discussing in turn:

- the causes of differences between index-linked and nominal yields;
- the relevance of these differences to the appropriate approaches to estimating the real RFR;
- evidence on the inflation risk and liquidity premium;
- whether differences between the index-linked and nominal approach can be explained with data; and
- regulatory precedent.

Drawing the above together, we then set out our views as to how the existing evidence should be interpreted and the implications of this for determining the RFR at RP3.

Understanding differences in index-linked and nominal yields

Yields on nominal gilts represent returns to bondholders before taking inflation into account (i.e. they include compensation for the impact of inflation). Thus, in simple terms, one might consider the 'difference' between the yields on index-linked and nominal gilts to reflect investors' expectations of inflation (Et[π]). Consistent with this, the link between the yields on nominal (yNt) and index-linked (yRt) gilts is often expressed in terms of the Fisher equation – as follows:

$$yN\ t = y\ R\ t + Et[\pi]$$

Thus, if one were to adopt the 'nominal' approach to estimating the real RFR, it is necessary to reduce the estimated yields by expected inflation (in this case, RPI). Intuitively, one might also imagine that – so long as the 'right' inflation measure was used - this method should give the same estimate of the real RFR as implied by the yields on index-linked gilts, as used by the CAA.

However, the relevant academic literature highlights that, in practice, the picture is more complex. Specifically, differences between the yields on nominal and index-linked gilts might be further affected by:

- an inflation risk premium;
- (potentially) a liquidity premium; and
- market distortions (impacting observed yields on index-linked gilts).

In relation to the inflation risk premium, the intuition is set out by Kupfer (2018),[15] who explains that in relation to the yields on nominal gilts, because future inflation

[13] *'UK RP3 CAA Decision Document: Appendixes.' CAA (August 2019); page 48.*
[14] *'UK RP3 CAA Decision Document: Appendixes.' CAA (August 2019); page 48.*
[15] *'Estimating Inflation Risk Premia using Inflation-linked bonds: a review.' Alexander Kupfer; journal of Economic Surveys (2018).*

expectations are uncertain, investors require additional compensation for this – i.e. an 'inflation risk premium'.

The liquidity premium (sometimes called the 'illiquidity premium') refers to the compensation investors require for not being able to quickly realise the fair market value of their investment. In practice, the theoretical and empirical literature suggests that index-linked gilts are less liquid than nominal gilts, and so one would expect a liquidity premium to apply to these (relative to the yield on nominal gilts). The intuition for this is set out by various authors, including Ejsing et al (2012)[16] and Campbell et al (2009).[17]

The above features are also accepted by, and embedded into, the way in which central banks themselves estimate yield curves. For example, in describing its own estimates of yield curves, the Bank of England (BofE) states: *"Illiquidity in the conventional and index-linked gilt markets could distort this measure [the expected inflation implied by the difference between the yields on nominal and index-linked gilts], and in practice there will be an 'inflation risk premium.'"*[18]

In addition to the above, the observed yields on index-linked gilts in particular may be subject to various 'distortions'. The literature generally discusses three main types of distortion: (i) taxation (differential tax treatment of real and nominal gilts); (ii) institutional investment patterns (for example, life assurance and pension funds in the UK need to adhere to certain legislative and regulatory requirements that impact their portfolio decisions, which can impact the relative yields on gilts); and (iii) government policy and interventions (for example, post the 2008 financial crisis, the extensive use of quantitative easing).

Relevance to determining the appropriate approach to estimating the real RFR

A 'face value' interpretation of the above issues might seem to point to some straightforward implications regarding the method for estimating the RFR:

- Firstly, that the deflated yield on nominal gilts may overstate the RFR, as it will include an inflation risk premium. Therefore, to the extent that a 'nominal approach' is used, account of this may need to be taken.
- Secondly, to the extent index-linked gilts incorporate a liquidity premium, this too may need to be adjusted for, in order for this approach to provide a reliable estimate.
- Thirdly, when relying on the yields on index-linked gilts, care must be taken to consider possible market distortions. Post-crisis, this debate has centred on whether the yield on index-linked gilts may be 'artificially' low. Thus, yields on index-linked gilts might understate the RFR.

Conventionally, there has been a tendency for the above considerations to point towards favouring determining the RFR based on yields on index-linked gilts. This is because we *'know'* the deflated yield on *nominal gilts* includes an inflation risk premium - and therefore, may be overstated (albeit the *extent* of that is unknown). On the other hand, the impact of illiquidity and market distortions (on index-linked gilts)

[16] *'Liquidity and credit risk premia in government bond yields.' Ejsing, Grothe and Grothe; European Central Bank (2012).*
[17] *'Understanding Inflation-Indexed Bond Markets.' Campbell, Shiller and Viceira. Yale ICF (2009).*
[18] *'Notes on the Bank of England's Yield Curves.' Bank of England (DATE); page 5, footnote 8.*

is sometimes assumed away for simplicity.[19] Indeed, the UKRN study suggests that the possibility of 'distortions' impacting the yield on index-linked gilts can be ignored. The authors suggest this is because, whilst such distortions may well exist, they do not matter, because the observed yield is, in fact, the yield faced by investors (i.e. *'the price is the price'*).[20] We disagree with this characterisation. The relevant objective is to estimate the real RFR. However, the RFR is a 'hypothetical' notion – designed to capture the 'risk free' return investors would face. There is, therefore, no direct measure of this - and so yields on government gilts are simply considered the best proxy, albeit imperfect. The point is, however, that the hypothetical RFR should not only be free from risk, but also should be undisturbed by market distortions. Hence, we think the rationale set out in the UKRN paper is a poor reason to disregard the potential impact of distortions when determining the RFR. As we note elsewhere, the CMA and CC have consistently taken such distortions into account.

IN PRACTICE, THERE IS CONSIDERABLE UNCERTAINTY AROUND THE FACTORS THAT EXPLAIN DIFFERENCES IN REAL YIELDS DERIVED FROM NOMINAL AND INDEX-LINKED GILTS. THIS POINTS TO A NEED TO CAREFULLY BALANCE THE EVIDENCE.

In practice, we think the key issue is the 'uncertainty' inherent in relation to the factors that truly drive the observed differences in real returns from nominal and index-linked gilts. There are two perspectives for thinking about these uncertainties:

- **Perspective 1.** Suppose one could accurately identify 'expected (RPI) inflation' and used this to deflate the yield on nominal gilts. In this case, if there were no 'market distortions' the difference between the deflated nominal yield, and the index-linked yield, must be accounted for by the inflation risk premium and / or the liquidity premium. Consequently, seen through this lens, a testable hypothesis might be whether the differences between the nominal and index-linked approaches for NERL can be explained by (one's best estimates) of these phenomena. If this was not the case, however, then by definition 'something else' is explaining the differences (i.e. some form of market distortion effect).

- **Perspective 2.** Alternatively, suppose one could accurately identify the 'inflation risk' and 'liquidity' premia. In that case, the difference between the index-linked and nominal approach should provide an accurate view of expected inflation (again, absent any market distortion effects). So, suppose that one tested this, and then found that the implied expected inflation was very different to that assumed by the regulator. This, in turn, might imply that: (a) market distortions were impacting the differences in observed real yields; and / or (b) the regulator's inflation assumption was incorrect (or, at least, is inconsistent with investor's expectations). In practice, there is uncertainty inherent in attempting to distinguish between these two possibilities.

Under either perspective, the point is that, for so long as there is some 'residual' difference in implied real yields, something other than inflation risk and liquidity risk must be at play – logically, some form of market distortion. In such a situation, it seems to us objectively difficult to strongly conclude either way as to whether deflated yields on nominal gilts, or yields on index-linked gilts, provide a better measure of the real RFR. This would therefore imply a need to be measured and balanced when assessing evidence under either approach.

[19] *Or, perhaps another characterisation is that such an approach assumes that the existence of a liquidity premium and / or impacts of market distortions are 'more uncertain' than an inflation risk premium.*
[20] *'Estimating the cost of capital for implementation of price controls by UK regulators.' Wright, Burns, Mason and Pickford (2018); page 34.*

With the above issues in mind, in the following sections, we address:

- evidence on the inflation risk premium;
- evidence on the liquidity risk premium;
- the extent to which said premia account for differences in observed real yields; and
- relevant regulatory precedent.

Evidence on the inflation risk premium

There are various existing estimates of the inflation risk premium in the UK. A BofE paper by Lui et al (2015)[21] provides a long time series, which is helpful to the issues under consideration here. The approach taken by the authors is to develop an affine term structure model of breakeven interest rates, which decomposes implied breakeven rates into a measure of expected inflation and a risk premium. In turn, the risk premium is decomposed into an 'inflation' and 'liquidity' component.

Figure 1 shows the trends in the inflation risk premium on nominal UK government gilts, as estimated by the Bank. The premium for both 5 and 10 year maturities are reported.

Figure 1: Analysis of the inflation risk premium

Source: Bank of England[22]

The authors report the following findings:

- The estimates of the inflation risk premium on nominal gilts vary considerably over time. **Since 2004 the inflation risk premium has averaged just 15 bps** - 10 year maturities. It peaked at 75 bps in October 2009, but has also been as low

[21] *'The Information content of market-based measures of inflation expectations derived from government bonds and inflation swaps in the United Kingdom: staff working paper No. 551.' Lui, Vangelista, Kaminska and Relleen; Bank of England (2015).*

[22] *See Chart 4 of paper.*

as -40 bps in Q4 of 2011. Pre-2004, higher levels of inflation risk premium have been observed.

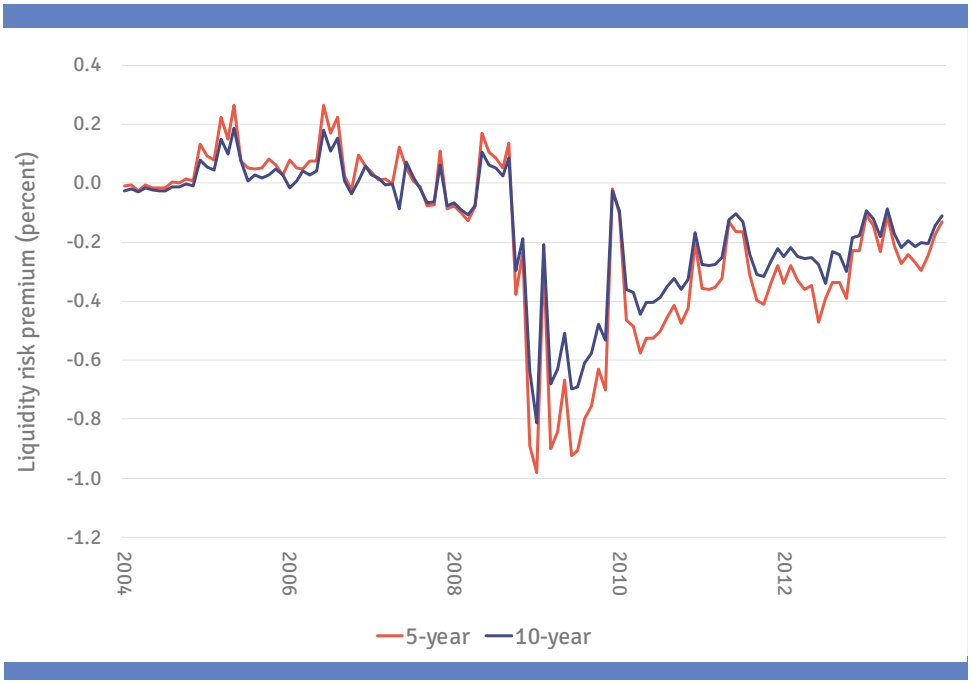
- The authors note that their results differ from a number of existing studies, which have implied a persistently negative inflation risk premium post-crisis (i.e. below their finding of 15 bps). The authors suggest that said studies may be conflating the impact of the inflation premium with the impact of illiquidity.

BANK OF ENGLAND DATA SHOWS A LARGE INCREASE IN THE LIQUIDITY PREMIUM AROUND THE FINANCIAL CRISIS, THE IMPACT OF WHICH IS STILL UNWINDING.

Evidence on the liquidity risk premium

The BofE study also provides an estimate of the liquidity risk premium over time. Figure 2 below shows the results, again for both 5 and 10 year maturities. In interpreting the data, it is important to note that a 'negative' liquidity premium for nominal gilts implies a positive premium for index-linked gilts (i.e. the authors take it to be evidence of illiquidity in the market for index-linked gilts).

Figure 2: Analysis of the liquidity risk premium



Source: Bank of England[23]

The authors report the following findings:

- Like the inflation risk premium, the liquidity premium has varied significantly over time. **Since 2012, they find it has averaged -20 bps** (but during the height of the financial crisis, it reached as high as -80 bps).

- The liquidity risk premium has, at various times, accounted for a high proportion of the total risk premium.

Interestingly, we note that the data generally shows a significant departure in the liquidity premium from prevailing levels around the time of the financial crisis, which still continues to be unwinding, in even the most recent data (i.e. the liquidity premium appears 'high' relative to the past, but is gradually reducing).

[23] *See Chart 4 of paper.*

Differences between the index-linked and nominal approaches cannot be explained with data

Following from the preceding sections, if one was *certain* that there were no market distortions impacting the yields on index-linked gilts, one might 'prefer' this method to deriving the RFR from deflated yields on nominal gilts. Or, put another way, if one could 'be sure' that any differences between the index linked or nominal approaches could be entirely explained by the inflation risk and / or liquidity risk premia, one could take the view that (once those are taken into account) either approach is valid and hence the 'index-linked' approach alone is reliable and, therefore, sufficient in any case.

ASSERTIONS THAT HIGHER IMPLIED REAL YIELDS DERIVED FROM NOMINAL GILTS CAN BE EASILY EXPLAINED BY THE INFLATION PREMIUM ARE FALSE. THE TRUTH IS MORE COMPLEX.

Indeed, consistent with this, other regulators have recently sought to argue exactly this point. For example, in its Draft Determinations for the water industry at PR19, Ofwat, like the CAA, noted that its estimates of the real RFR (based on index-linked gilts) were lower than those implied by an analysis of nominal gilts. Specifically, Ofwat found the CPIH average yield on 10 and 20 year index-linked gilts was -0.45%. This was lower than the equivalent figure for CPIH deflated nominal gilts, of -0.08%.[24] However, Ofwat argued that this difference was most likely explained by the presence of the inflation risk premium in the nominal gilts yield, which it stated varies from 30 bps to 35 bps. As such, Ofwat suggests: *"the inflation risk premium in nominal gilts is the most plausible factor driving the 37 basis point difference [between the methods]."*[25]

In effect, the above argument implies that one can rely entirely on the 'index-linked' approach because: (i) implicitly, those yields are not subject to any 'distortion'; and hence (ii) the nominal approach does not actually provide any additional information or evidence (once the inflation risk premium is taken into account).

In light of the evidence on the inflation risk and liquidity premia, as estimated by the BofE, we do not think it sensible to assume this is the case, however. For example, specifically in relation to the inflation risk premium, we showed that this had averaged just 15 bps over the 10 years from 2004-2014, well below the level Ofwat asserts above (and the level needed to account for the observed difference in yields on deflated nominal and index-linked gilts). Consequently, in relation to Ofwat's position, there seems little basis to suppose that the difference between the methods can be explained in such a straightforward manner.

The above goes to much broader point regarding the uncertainties at the heart of this issue. To illustrate this further, in the following table we calculate what the CAA's own assessment of the real RFR would be under the index-linked and nominal approaches, after making relevant adjustments for risk premia. Reflecting the fact that the BofE's data showed that the liquidity risk premium was unusually high during the crisis and is still 'unwinding', we present the calculations based on risk premia estimated over both: (i) the whole 2004-2013 time period available in the data; and (ii) 2004-2007 (i.e. pre crisis, to capture the likely impact post unwinding).

[24] *'PR19 Draft Determinations: cost of capital appendix.' Ofwat (July 2019); page 22, table 2.3.*
[25] *'PR19 Draft Determinations: cost of capital appendix.' Ofwat (July 2019); page 23.*

Our approach is as follows:

- The CAA has stated that, if it deflated the yield on nominal gilts by its assumed RPI inflation of 3.0%, the implied RFR would be -1.3% (this implies a non-deflated nominal yield of 1.66%).
- We then deduct the BofE's estimated inflation risk premium. Over the period 2004-2013 (inclusive), this was 15 bps, implying a final RFR of -1.45%. Over the 2004-2007 period, the premium was 9 bps, implying a RFR of -1.39%.
- Turning to the index-linked approach, the CAA has said that this implies a real RFR of -1.7%.
- As the above will not include any adjustment for a liquidity premium, again we deduct the BofE's estimates. The Bank's data shows a premium of 15 bps over the 2004-2013 period. Over the pre-crisis period, the premium is close to zero (very slightly negative, in fact).
- Thus, we arrive at a final real RFR of -1.85% (whole time period) and -1.68% (pre-crisis).

AFTER ADJUSTING FOR INFLATION AND LIQUIDITY PREMIA, THE TWO METHODS CONTINUE TO GIVE DIVERGENT RESULTS, RAISING THE POSSIBILITY OF YIELDS BEING 'DISTORTED'. SO, UNLESS ONE CAN SAY THE UNCERTAINTY AROUND MARKET DISTORTION IS LESS THAN THE UNCERTAINTY IN MEASURING THE INFLATION AND LIQUIDITY PREMIA, BOTH METHODS APPEAR VALID.

Table 6: Differences between index-linked and nominal approaches after adjustments

Variable	Risk premium based on 2004-2013	Risk premium based on 2004-2007
Yield on nominal gilts (CAA)	1.66%	1.66%
RPI inflation (CAA)	3.00%	3.00%
Yield on nominal gilts deflated (CAA)	-1.30%	-1.30%
Inflation risk premium (Bank of England)	0.15%	0.09%
Real RFR implied by nominal approach	**-1.45%**	**-1.39%**
Index-linked RFR (CAA)	-1.70%	-1.70%
liquidity risk premium (Bank of England)	0.15%	-0.02%
Real RFR implied by index-linked approach	**-1.85%**	**-1.68%**
Difference between methods after adjustments	**-0.40%**	**-0.29%**

Source: Economic Insight

Critically, the two approaches do not reconcile, with a difference of between -0.40% and -0.29% respectively. Following from our previous discussion, it is difficult to determine 'why' this is the case. For example, it could be that: (i) investor's expectations of inflation differ from the CAA's assumed inflation; (ii) the yields on index-linked gilts may be understated, due to market distortions; and / or (iii) the estimates of the inflation and liquidity risk premium may themselves not be accurate. Indeed, in relation to this final point, we would certainly not suggest that the above table represents the 'best', or 'only', way of making the adjustments discussed here.

However, that is precisely the point. Namely, there is significant and inherent uncertainty in the real RFR implied by the yields on nominal and index-linked gilts. Therefore, in our view, **care must be taken when considering the relative weight attached to the CAA's alternative estimates of -1.3% and -1.7% derived from nominal and index-linked gilts respectively.**

Regulatory precedent

Further to the above, we have reviewed a range of regulatory determinations in order to ascertain the extent to which regulators rely on yields on index-linked gilts and deflated nominal gilts when setting the real RFR. The results of our research are summarised in Table 7.

Table 7: Summary of methods used by regulators

Determination	Date	Evidence relied upon	
		Index-linked	Nominal
Ofcom approach to BT cost of capital	Aug-05	Yes	Yes
Ofcom Local Loop Charge Control for BT	Mar-12	Yes	No
Ofgem - RIIO-GD1	Dec-12	Yes	Yes
Ofgem - RIIO-T1	Dec-12	Yes	Yes
CAA Q6 Final Proposals (GAL & HAL)	Oct-13	Yes	Yes
CC NIE	Mar-14	Yes	No*
CAA RP2	Jun-14	Yes	Yes
Ofwat PR14	Dec-14	Yes	No
CMA Bristol Water	Oct-15	Yes	No*
NIE RP6	Jun-17	Yes	Yes
Ofwat PR19 Draft Determinations	Jul-19	Yes	No

Source: Economic Insight review of regulatory precedent
**Whilst the CMA has primarily relied upon evidence from yields on index-linked gilts, it has nonetheless examined and taken account of yields on deflated nominal gilts – we discuss this further below*

'We find that evidence from the index-linked approach is used more frequently; but that, nonetheless, evidence from yields on nominal gilts has still been widely relied upon historically.'

As can be seen from the above, all of the determinations make use of evidence from yields on index-linked gilts. In contrast, evidence from yields on nominal gilts is used in 6 out of the 11 examples. Therefore, we find that evidence from the index-linked approach is used more frequently; but that, nonetheless, evidence from yields on nominal gilts has still been widely relied upon historically.

As a point of clarification, the above table provides a relatively 'narrow' assessment, in that we identify evidence as being 'relied upon' only where the regulator has explicitly taken it into account in setting their determined RFR. There are a number of instances where the above mentioned authorities have, nevertheless, paid some attention to the yields on nominal gilts. Indeed, as we expand on below, the CMA / CC are a good example of this.

The CMA's / CC's previous positions

In relation to the CMA's / CC's previous decisions relating to the RFR, the authorities have expressed a general preference for focusing on the yield on index-linked gilts. For example, in the Northern Ireland Electricity (NIE) decision, the CC stated: *"since 2000, the CC has taken the view that long-dated index-linked gilt yields are in principle the most suitable basis for estimating the RFR applicable to the cost of equity."*[26]. In its Bristol Water (2015) decision, the CMA similarly stated that: *"we continue to regard index-linked gilt yields as in principle the most suitable source for estimating the RFR, since index-linked gilts have negligible default and inflation risk."*[27]

However, whilst the above is the CMA's / CC's 'in principle' position, in practice the authorities' have been more nuanced and have typically also taken into account / have examined the real yield implied by nominal gilts. For example, this was the case in both the NIE and Bristol Water (2015) determinations.[28]

The reason the CMA / CC has previously considered and reviewed the real return implied by nominal gilts is that it is concerned that the yields on index-linked gilts may be affected by various market distortions. Again, in the NIE case, the CMA summarised this as follows: *"in previous reports in the last ten years, the CC paid attention to distortions in the index-linked markets that may affect the shape of the yield curve."*[29]

2.2.3.2 The appropriate time horizon to apply

Related to the above is the question of what 'time horizon' to apply when setting the RFR. Here, our general view is that, whilst the CAA is primarily concerned with setting a WACC appropriate to the RP3 time period, as with other regulators, its broader duty to further the interests of customers (users of air transport) means it may wish to 'balance' efficiency and risk over both the shorter and longer term.

In this sense, there is no single 'right' time period over which to consider the RFR. However, because a number of WACC (and other price control) parameters are associated with economic performance more broadly, it is important to ensure transparency and internal consistency. We discuss this point more fully in relation to TMR (see the next section of this report) – and so do not expand on this in any detail here.

In relation to the RFR, the key considerations would seem to be as follows:

- If one is adopting a more 'near term' perspective, then (in general) more recent data on the RFR would seem to be pertinent. Whereas, if one is adopting a 'longer-term' perspective, historical data become more relevant (thus, some allowance for mean reversion may be appropriate).

[26] *'Northern Ireland Electricity Limited price determination.' Competition Commission (March 2014); page 13-21*
[27] *'Bristol Water plc: A reference under section 12(3)(a) of the Water Industry Act 1991: Appendices 5.1 – 11.1 and glossary.' CMA (2015); page A10(11)-36.*
[28] *'Northern Ireland Electricity Limited price determination.' Competition Commission (March 2014); see nominal analysis on pages 13-22 to 13-23.*
[29] *'Northern Ireland Electricity Limited price determination.' Competition Commission (March 2014); page 13-22*

- To the extent that more recent yields diverge from longer-term averages, the critical question to consider is 'why'. Here, evidence we have highlighted that is important to consider includes:
  - the possibility of market distortions – and thus, the question of whether they might persist over the relevant time horizon; and
  - the fact that the inflation and liquidity risk premia seem to be highly time variant (e.g. the liquidity premium appears to be unwinding).
- Crucially, both the possibility of 'distortions' and the risk premia are related to UK economic performance. Hence, without clarity as to what the assumed UK economic context is over the time period one is seeking to set the RFR, there is a clear risk of internal inconsistency. This point does not seem to be addressed explicitly by either the CAA or NERL.

2.2.3.3 Summary of our assurance review relating to the risk free rate

Drawing the above considerations together, from our assurance review our views are as follows:

- In principle, both the nominal and index-linked approaches provide valid ways of assessing the real RFR (albeit both have some limitations, which mean they must be interpreted with care).
- Economic theory provides a sound basis for understanding the differences between the yields on nominal and index-linked gilts – being a function of inflation; an inflation risk premium; and a liquidity risk premium. **However, the empirical evidence shows that the differences between the methods cannot, in reality, be easily explained.**
- **This might occur for a range of reasons and is inherently 'unknowable'.** Given this, therefore, we do not think it appropriate to conclude strongly one way or another as to whether one method provides a 'better' estimate than the other '*in practice*'. Specifically, one cannot be sure that the yields on nominal gilts will accurately estimate the real RFR, due to uncertainty as to the size of any inflation risk premium. Similarly, one cannot be sure that the yields on index-linked gilts are accurate, as they may be subject to various market distortions. Put another way, we do not regard the possibility of yields being 'distorted' as being 'less certain' than the uncertainty regarding either the inflation or liquidity risk premia.
- Indeed, in practice, there are reasons to suppose the financial crisis and subsequent policy response created exactly such distortions, the effects of which are continuing to unwind.
- **Therefore, we think the most appropriate approach for RP3 is to place some weight on both methods.**
- In light of this, we consider that, while the 'general' approach of both parties is reasonable, **both the CAA's and NERL's positions are somewhat problematic, as each relies on '<u>only one</u>' of the index-linked or nominal approaches.**

IN LIGHT OF THE AVAILABLE EVIDENCE, WE THINK THE MOST APPROPRIATE APPROACH TO ESTIMATING THE RFR AT RP3 SHOULD DRAW ON THE YIELDS ON <u>BOTH</u> NOMINAL, AND INDEX-LINKED, GILTS.

It is also helpful to consider the views of the CAA's own advisors on this matter. Consistent with our own views, we note that, in their advice to Ofwat in relation to the WACC for water companies at PR19, EE based its estimates of the RFR on an average of both the index-linked and nominal approaches.[30] Relatedly, we note that: (i) EE has advised the CAA on various WACC parameters for RP3, but notably, not the RFR; and (ii) that, like the CAA, Ofwat's proposed RFR only places weight on the index-linked approach – and so ignores the advice of its own advisors. Consequently, it appears that the regulators have been somewhat 'selective' in their use of evidence, without providing an explanation for this. We also note that at RP2, in its advice to the CAA, PwC was of the view that the RFR should be based on both index-linked and nominal gilts, stating: *"in forming an overall view on the RFR, we consider both the evidence from real and nominal government bonds and combine the two to present a plausible range for the real RFR."*[31]

The CAA's observation in its Final Decision that the UKRN study uses an index-linked approach is accurate. However, we do not think this provides a strong rationale for relying only on this approach. Specifically, the UKRN study itself contains no real discussion of the issues outlined here; nor, therefore, any analysis of the factors that explain differences in the yields on index-linked and nominal gilts. In our view, this is a deficiency in the UKRN study, rather than itself being a source of evidence that the index-linked approach is 'superior' (again, noting the distinction between 'in principle' reasons one might have for favouring it, over 'in practice' realities, as acknowledged by the CMA / CC).

[30] *'The cost of capital for the water sector at PR19.' Europe Economics (July 2019); page 22.*
[31] *'Estimating the cost of capital for NERL.' PwC (February 2014); page 33.*

2.3 Total market returns

Here we provide our assessment of the existing evidence relating to TMR, as relied upon by the CAA and NERL. The summary table below provides an overview of the respective positions of the Parties and the supporting evidence of each. Note, that in relation to the values indicated for each evidence source, these are reported 'at face value' (i.e. they reflect the interpretation of the CAA / NERL in each case, rather than our own).

Table 8: Summary of positions and evidence relating to TMR (RPI deflated)

	CAA (Final Decision)	NERL (Response to Draft Proposals)
TMR	**5.4%**	**6.25%***
Evidence sources (ranges shown)		
UKRN study	5% - 6%	NA
Realised historical returns	5% - 6%	6.2%-6.8%
Forward looking evidence	5.0%-5.8%	7.2%-8.1%
Regulatory precedent	5.2%-5.7%	6.10%-6.75%
Investor surveys	3.6%-4.6%	NA**

**As we subsequently note, NERL's revised position in its response to the CAA's Draft Proposals also took the CAA's evidence on realised historical returns into account. **NERA's April 2019 report includes an analysis from investor surveys drawing on the Fernandez et al study. However, this is used to support a line of argument that TMR has not declined over time, rather than to produce a 'range' for the real TMR. In addition, it is not clear said evidence directly informed NERL's proposed TMR.*

2.3.1 The CAA's position and supporting evidence

In its Draft Proposals, the CAA identified a range for TMR of 5%-6.25%, with a point estimate of 5.4% (RPI deflated). In its Final Decision, the regulator reconfirmed its point estimate, stating that this figure is: *"around the mid-point of the ranges from different sources and approaches."*[32] The CAA further noted that various cross-checks, including MARs, point towards TMR at the lower end of its overall range. The CAA's position is based on a range of evidence, organised around the following categories, which we summarise in the subsequent subsections:

- the UKRN study;
- average realised historical returns;
- forward-looking evidence;
- regulatory precedent; and
- investor surveys.

2.3.1.1 Evidence from the UKRN study

In its Final Decision, the CAA cited the Wright et al (2018) study for the UKRN[33], which included a range of evidence relating to TMR. The CAA highlighted the fact that the

[32] *'UK RP3 CAA Decision Document Appendices.' CAA (August 2018); Appendix E; page 45.*
[33] *'Estimating the cost of capital for implementation of price controls by UK regulators.' Stephen Wright; Phil Burns; Robin Mason; Derry Pickford. UKRN (March 2018).*

UKRN study advocates basing TMR on long-run realised returns, reflecting both UK specific, and international, evidence. The CAA noted that the UKRN study proposes a TMR range of 6-7%, which reflects a geometric average (5%) uplifted by between 1% and 2% to account for serial correlation. The CAA also highlighted that the authors of the report suggest that the case for adjustments at the higher end of the range (2%) is less, if regulators are setting returns over relatively long time horizons (e.g. 10 years or more).[34]

In addition, the CAA interpreted the UKRN estimates as being in real-CPI terms. Hence, the CAA made a further adjustment to the UKRN range of 6-7% to reflect its view of the RPI-CPI wedge, which the CAA assumed to be 1%. Thus, the CAA stated that the UKRN study implies TMR of 5-6% on an RPI deflated basis. Accordingly, it is helpful to clarify the basis for the CAA's assumed 1% RPI / CPI wedge. We therefore show this in the following table, where for each source relied upon by the CAA, we summarise average forecast RPI and CPI inflation measures and the implied wedge. In each case, the time horizon on which the averages are based refers to the RP3 period only, which reflects how the CAA made use of the forecasts.

Table 9: Summary of inflation forecasts sourced relied upon by the CAA in its Final Decision

Source	CPI	RPI	RPI / CPI wedge
HM Treasury consensus (May 2019)	1.95%	2.95%	1.00%
OBR Economic and fiscal outlook (March 2019)	1.98%	3.00%	1.03%
Bank of England Inflation Report (May 2019)	2.00%	NA	NA
IMF World Economic Outlook (April 2019)	2.01%	NA	NA

Source: Economic Insight review of sources quoted by the CAA

2.3.1.2 Average long-run realised historical returns

In its Draft Proposals, the CAA set out a summary of TMR implied by historical realised returns, as contained in a range of published sources.[35] Some 15 sources were included in total; and the CAA further explained that it has adjusted estimates where it considered appropriate to reflect: (i) an assumed 1% RPI-CPI wedge; and (ii) an RPI inflation forecast of 3%.

In its Final Decision, the CAA did not include any additional analysis of realised historical returns, but referred to the same sources as identified in its Draft Proposals. It is not clear exactly what inferences the CAA draws from said sources as: (i) it did not state numerically its view of the implied TMR for each individual source within the relevant chart in which it is summarised; and (ii) when reaching its overall views on

[34] *'UK RP3 CAA Decision Document Appendices.' CAA (August 2018); Appendix E; page 33.*
[35] *'Appendices to Draft UK Reference Period 3 Performance Plan proposals.' CAA (February 2019), see Figure d3, page 35.*

TMR, the CAA did not seem to explicitly identify the range or average implied by these evidence sources, nor how they have been weighted, relative to other evidence. However, overall, it seems that the CAA's view is that realised historical returns support a range for TMR of 5-6% (RPI deflated).[36]

It is helpful to further set out how some specific evidence on realised historical returns relied upon by the CAA was developed, in order to help inform the questions relevant to evaluating its overall robustness subsequently.

PwC November 2017 report

PwC's 2017 report for the CAA relating to H7 contained an analysis of long-term realised real returns. This was based on both the Dimson, Marsh and Staunton (DMS); and Barclays datasets (which provide timeseries of UK equities going back to 1899).

Using the above data, PwC's methodology for estimating long-run realised returns was as follows:

- PwC firstly estimated the arithmetic average returns for the whole time period for both datasets. PwC interpreted the data in RPI deflated terms and found that it indicated a TMR range of 6.3% to 7.0%, assuming a 20 year holding period.
- PwC then made a downward adjustment of -0.3% for the RPI formula effect. This reflects the fact that there have been structural changes to the ONS' measure of RPI over time and the majority of observations in the data pre-date this change. PwC's adjustment factor was a 'judgement' informed by estimates from Ofgem and the ONS. Following this, PwC found the implied TMR range was 6.0% to 6.7% (RPI deflated).
- Finally, PwC made an adjustment for forward looking returns of -0.4%, to arrive at a range of 5.6% to 6.3% on an RPI deflated basis.

Table 10 summarises PwC's analysis.

Table 10: PwC's TMR estimate based on long-run realised historical returns

	DMS	Barclays
Real TMR (RPI%)	7.0%	6.3%
Formula effect	-0.3%	-0.3%
TMR post formula effect	6.7%	6.0%
Forward looking returns adjustment	-0.4%	-0.4%
Final real TMR	**6.3%**	**5.6%**

Source: PwC

[36] *'UK RP3 CAA Decision Document Appendices.' CAA (August 2018); Appendix E; page 45. See paragraph E87 in particular, where the CAA states: "historical average returns appear to support a range of 5-6%."*

PwC February 2019 report

PwC's February 2019 report for the CAA in relation to H7 contained a review of other relevant studies that included estimates of TMR, based on realised historical returns (and compared these to its own previous estimates).

Firstly, PwC examined a study by Jorda et al (2017), which examines long-run asset returns across 16 economies over the period 1870 to 2015. In summarising the study, PwC focused on UK-specific data. PwC stated that this shows real terms TMR of 7.2% over the whole period. As Jorda et at used CPI to calculate real returns, PwC made a further adjustment of 1.0% for the RPI / CPI wedge. Thus, PwC concluded that the study implies a real (RPI deflated) TMR of 6.2%.[37]

Secondly, PwC summarised the UKRN study, which we ourselves address elsewhere as part of our assurance review. The study examined realised returns in the UK from 1899 to 2016. PwC's view was that this implies a real TMR on a CPI deflated basis of 5.0%. PwC then reduced this by 1.0% for the RPI / CPI wedge, before applying an upwards adjustment of 1.0% - 2.0% for serial correlation. PwC therefore concluded that the UKRN study implies a real (RPI deflated) TMR of 5.0% - 6.0%.[38]

In addition to the above, PwC set out some views regarding certain methodological points relevant to estimating TMR using historical approaches. These are as follows:

- **Averaging methods.** One observes academic studies using both 'arithmetic' and 'geometric' averaging techniques. PwC stated that in practice the decision between the two tends to depend on: (i) the investment holding period in question (with arithmetic being more appropriate for shorter periods and vice versa); and (ii) the extent to which serial correlation occurs (geometric averages are more useful where there is serial correlation, and vice versa).

- **Investment holding periods.** PwC's view was that the CAA should take a long term view when setting the parameters of the cost of capital. In its report, PwC stated that infrastructure investors typically have long investment horizons.

- **Adjustments for serial correlation.** PwC stated that, where there is serial correlation, arithmetic averages may overstate TMR. Conversely, PwC also explained that geometric averages may understate TMR, as they understate return volatility. PwC then calculated its own upwards adjustment to the geometric mean to reflect this issue. Here PwC found an adjustment of 1.2% to 1.8% was appropriate, which they noted was lower than the 1%-2% range recommended in the UKRN study.[39]

PwC did not update its own analysis of TMR based on historical realised returns, as summarised above. Therefore, in its updated report, it continued to show this as being consistent with a range of 5.6% to 6.3% (RPI deflated). Notwithstanding this, ultimately, PwC concluded: *"taking into account the new evidence available on long-run returns, we conclude that a real (RPI) TMR range informed by long-run historical*

[37] *''Estimating the cost of capital for H7 – Response to stakeholder views.' PwC (February 2019); pages 39 and 48.*
[38] *''Estimating the cost of capital for H7 – Response to stakeholder views.' PwC (February 2019); page 48.*
[39] *''Estimating the cost of capital for H7 – Response to stakeholder views.' PwC (February 2019); page 45.*

PwC DISREGARDS ITS OWN ESTIMATES OF TMR IN FAVOUR OF LOWER NUMBERS IT INFERS FROM ACADEMIC STUDIES.

evidence of approximately 5.0% to 6.0% is appropriate."[40] PwC did not explain why it had disregarded its own analysis in favour of this range.

PwC August 2019 report

PwC's August 2019 report responded to various submissions and evidence put by other parties relating to the TMR for the purposes of determining both the H7 and RP3 price controls. This report did not contain any significant new analysis of realised returns per se (rather, the consultancy reviews and makes use of NERA's analysis in this regard), but included the following points:

- PwC argued that, when examining realised historical returns, a 10 year trailing average is more appropriate than the 30-year trailing average analysis submitted by NERA. PwC argued that the longer trailing average: *"does not adapt to changes in the return outlook or economic environment."*[41] PwC further stated that a 10 year trailing average is generally *"more appropriate."*[42] PwC highlighted that, when looking at the 10 year trailing average, there is a clear downward trend in TMR since 2012.

- PwC presented an analysis of the relationship between real equity returns and the real interest rate, undertaken by Simon, Marsh and Staunton (DMS). DMS examined data across 21 countries over 118 years. They then exclude high inflation periods and so identify 2,382 observations of overlapping 5 year periods. DMS then rank these periods from highest to lowest (real interest rate) and bands them. Using this data, PwC's report included a chart, showing the returns to equity over each subsequent 5 years by real interest rate band. PwC concluded: *"this analysis shows there is a clear relationship between the current real interest rate and subsequent real equity returns."*[43] PwC also noted that the DMS study included regression analysis that supported this conclusion.

In its further updated August 2019 report, PwC did not set out any view as to what TMR is implied specifically by long-run realised historical returns. However, considering the totality of evidence (i.e. forward-looking evidence and other sources) it stated: *"we have not changed our view that the CAA should set a TMR in the range of 5.1% to 5.6% (RPI-deflated)."*[44]

2.3.1.3 Forward-looking evidence

The CAA's Draft Proposals included a summary of dividend growth model (DGM) based estimates of TMR. The CAA specifically cited estimates developed by Ofwat, Ofcom, EE, CEPA and PwC – which the regulator suggested supported a range of 4.0%-6.3% (RPI deflated).[45]

[40] *''Estimating the cost of capital for H7 – Response to stakeholder views.' PwC (February 2019); page 48.*
[41] *'Estimating the cost of capital for H7 and RP3 – Responses to stakeholder views on total market return and debt beta.' PwC (August 2019); page11.*
[42] *'Estimating the cost of capital for H7 and RP3 – Responses to stakeholder views on total market return and debt beta.' PwC (August 2019); page12.*
[43] *'Estimating the cost of capital for H7 and RP3 – Responses to stakeholder views on total market return and debt beta.' PwC (August 2019); page13.*
[44] *'Estimating the cost of capital for H7 and RP3 – Responses to stakeholder views on total market return and debt beta.' PwC (August 2019); page16.*
[45] *'Appendices to Draft UK Reference Period 3 Performance Plan proposals.' CAA (February 2019); page 35, para D35.*

In its Final Decision, the CAA highlighted the TMR range implied by PwC's January 2019 report, which suggested a TMR of 5.3-6.2%.[46] The CAA further noted that the upper end of PwC's range was driven by the current dividend growth estimate, which is volatile. The CAA states that PwC therefore: *"considered that its proposed TMR of 5.1-5.6%, based primarily on forward-looking methods, remains appropriate."*[47]

In reaching its overall view on TMR in its Final Decision, the CAA placed some weight on the above mentioned forward-looking evidence. In addition, the CAA interpreted the forward-looking evidence it has collected as being supportive of a range for TMR of 5.0-5.8% (RPI deflated). However, the CAA further suggested that various other 'cross-checks' (e.g. MARs) are supportive of a number towards the lower end of this range.[48]

2.3.1.4 Regulatory precedent

The CAA's Draft Proposals and Final Decision both set out a range of regulatory precedent relating to TMR (some 29 publications are included).[49] The CAA further stated that precedent from Ofwat, Ofcom and Ofgem implies a TMR range of 5.2% to 5.7%.[50] The CAA primarily focuses on the most recent precedent from other UK regulators, which it considers indicates that TMR have fallen "significantly" since the previous round of price controls.

Other key points relating to precedent highlighted by the CAA in its Final Decision are as follows:

- NERA's estimates of TMR for NERL appear to be an 'outlier', relative to estimates developed by other advisory firms.
- The CAA refers in more detail to recent publications by Ofwat, Ofgem and Ofcom. In each case, the CAA draws attention to the extent to which each regulator attaches weight to 'historical' versus 'forward-looking' evidence. Here, the CAA characterises the positions as follows: (i) Ofwat attaches 'equal weight' across various approaches; (ii) Ofcom places most weight on historical approaches (but nonetheless uses forward-looking evidence); and (iii) Ofgem only uses historical approaches (DGM is a 'cross check').
- Since the CAA's Draft Proposals, ADP has published its 2019 business plan. The CAA highlights that this includes a nominal TMR of 8.0% - therefore, 5.0% on an RPI-deflated basis. [51]

2.3.1.5 Investor surveys

The CAA's Final Decision also makes reference to evidence from investor surveys. This includes Ofgem's review of market returns forecasts, which the CAA states implies average TMR of 3.6% (RPI deflated). The CAA also notes that in its RIIO-2 methodology, Ofgem updated its analysis from the survey of investor manager forecasts, which implies TMR of 4.6% (RPI deflated). The CAA also referred to

[46] *'UK RP3 CAA Decision Document Appendices.' CAA (August 2018); Appendix E; page 38.*
[47] *'UK RP3 CAA Decision Document Appendices.' CAA (August 2018); Appendix E; page 38.*
[48] *'UK RP3 CAA Decision Document Appendices.' CAA (August 2018); Appendix E; page 45, para E87.*
[49] *'UK RP3 CAA Decision Document Appendices.' CAA (August 2018); Appendix E; page 43, Figure E.4.*
[50] *'UK RP3 CAA Decision Document Appendices.' CAA (August 2018); Appendix E; page 41, para E67.*
[51] *'UK RP3 CAA Decision Document Appendices.' CAA (August 2018); Appendix E; page 42, para E47.*

evidence from Fernandez et al.[52] Here, the CAA noted that, whilst NERA (for NERL) suggested this implied TMR of 11.6%, the estimates from the study are volatile. Furthermore, PwC found that the 2017 estimate from Fernandez was 8.3% (nominal) which is consistent with the CAA's view of an appropriate range for TMR on an RPI deflated basis.

2.3.2 NERL's position and supporting evidence

In its Revised Business Plan for RP3 (October 2018), NERL proposed TMR of 6.8% (RPI deflated), which reflected the mid-point of the range suggested by NERA (6.5%-7.1%).[53] NERL's evidence at the time consisted of:

- regulatory precedent;
- market evidence (long-run realised historical returns); and
- forward-looking evidence.

In its response to the CAA's Draft Proposals in April 2019, NERL revised its view on the appropriate TMR down slightly to 6.25% (RPI deflated). NERL stated that this reflects a revised estimated TMR range produced by NERA of 6.2%-6.8%, considered alongside the CAA's proposed range of 5.0%-6.25%. NERL explained that: *"taking into account both ranges, we consider that selecting a point estimate (6.25%) at the upper bound of the CAA's proposed range for RP3 would be more consistent with latest CMA precedent of aiming up within total market return ranges, reduce the risk that the CAA's current point estimate is underestimating the total market return and yet still be consistent with the CAA's range overall. Using the NERA proposed total market return range alongside the CAA's own evidence would result in a more appropriate and, importantly, more reliable point estimate."*[54]

In the following we summarise the specific evidence relied upon.

2.3.2.1 Regulatory precedent

In relation to regulatory precedent, NERL's Revised Business Plan provided a summary of TMR, as estimated by economic regulators and the CMA for the purposes of making price determinations.[55] NERL stated that this shows a range for TMR of between 6.10% and 6.75% (RPI deflated). This was based on an analysis provided by NERA in its September 2018 WACC report.[56]

NERL also highlighted that more recent 'indicative' estimates by Ofwat, Ofgem and the CAA (from 2017 – 2018) suggest a lower range for TMR of 4.85% to 6.5%.[57] However, NERL suggested that that this is because the approaches taken by the regulators suffer from a somewhat consistent set of shortcomings and are also 'selective' in their use of evidence. This point is based on analysis by NERA (2018) who provided a review of the approaches adopted by other regulators more recently.[58] Methodological

[52] *'Market Risk Premium and risk-free rate used in 51 countries in 2013: a survey with 6,237 answers.' Fernandez, P, Aguirreamalloa, J and Linares, P; IESE Business School (2013).*
[53] *'Appendices: RP3 Business Plan 2020-2024.' (NATS (En Route) plc; page 165.*
[54] *'NERL's response to CAP1758: Draft UK reference period 3 performance plan proposals.' NATS (April 2019); page 57.*
[55] *'Appendices: RP3 Business Plan 2020-2024.' (NATS (En Route) plc; see table, page 158.*
[56] *'Updated Weighted Average Cost of Capital for NATS (En-Route) plc at RP3.' NERA (September 2018); See annexes A2; A3; and A4 specifically.*
[57] *'Appendices: RP3 Business Plan 2020-2024.' (NATS (En Route) plc; see table, page 158.*
[58] *'Updated Weighted Average Cost of Capital for NATS (En-Route) plc at RP3.' NERA (September 2018); Figure A.1, page 37.*

concerns associated with these more recent estimates highlighted in NERA's report include:

- whether equity returns are lower in a low risk-free rate environment;
- selective and inconsistent used of methods in calculating historical averages;
- relative weight attached for forward-looking evidence; and
- soundness of assumptions and methods used to support DGM estimates.

2.3.2.2 Market evidence (realised historical returns)

NERA (March 2018) estimated long-term realised equity terms drawing on a range holding periods and averaging methods, using DMS data from 1900 to 2017. Specifically, NERA examined long-term returns using: simple; overlapping; Blume and JKM averaging techniques. Holding patterns ranging from 1 year to 20 years are set out in NERA's report. This showed an overall range for TMR of 6.2% to 7.7% (RPI deflated) depending on precisely 'which' combination of averaging method and holding period is assumed.[59]

In its March 2018 report, NERA further suggested that it prefers to use 'arithmetic' approaches to averaging, as these are more appropriate: (a) for 'shorter' forecasting periods (relative to the data observation period); and (b) where auto-correlation is limited. NERA cites Brealey and Myers and established practice as being supportive of this. NERA also suggested that holding periods of 1 to 5 years are most appropriate. This is based on: (i) existing practitioner approaches; (ii) a CFA survey of equity market participants; and (iii) evidence from Helm and Tindall (2009), which suggests most utilities are held by private equity, with a holding period of 4-5 years. Taking these considerations into account, NERA suggested the evidence supports a narrower range for TMR of 6.8% to 7.1%.[60]

NERA finally made an adjustment for the RPI 'formula effect', ranging from zero to 30 bps. Thus, NERA's final assessment in its March 2018 report was that realised historical returns imply TMR of 6.5% to 7.1% at RP3.

In September 2018, NERA produced a further report,[61] in which its analysis of TMR was updated. NERA's methodology was as per that described above. Specifically: (i) a range of holding periods were examined, with NERA ultimately favouring periods of 1-5 years; (ii) NERA continued to prefer an arithmetic average; and (iii) NERA retained the RPI 'formula effect' adjustment. As such, NERA's assessment was that evidence from realised historical returns supported TMR of 6.5% to 7.1%.

In April 2019, in response to the CAA's Draft Proposals, NERA provided a further update report, which also included analysis of realised historical returns.[62] NERA's update report addressed the following issues:

- NERA suggested that the evidence does not show equity returns have fallen post financial crisis / in a low interest rate environment. NERA provided analyses of trends in equity returns across various global equity markets.

[59] *'The weighted average cost of capital for NATS (En-Route) plc at RP3.' NERA (March 2018)' table 2.2, page 4.*
[60] *'The weighted average cost of capital for NATS (En-Route) plc at RP3.' NERA (March 2018)' table 2.2, page 5.*
[61] *'Updated weighted average cost of capital for NATS (En Route) plc at RP3.' NERA (September 2018).*
[62] *'Cost of Equity for RP3 Prepared for NERL.' NERA (April 2019).*

- NERA did not consider that the BofE CPI/RPI index provides an accurate basis for estimating historical CPI deflated returns. Hence, it considered the CAA's evidence on historical realised returns (including inferences drawn from the UKRN study) to be understated.

- NERA questioned the basis for, and extent of, downwards adjustments to historical returns based on the arithmetic mean, in relation to the predictability of returns at longer horizons.

NERA updated its own estimates of TMR, based on historical realised returns, in its April 2019 paper. Retaining its existing preferred averaging methods and holding periods, NERA found a slightly lower TMR range of 6.2% to 6.8%.[63] NERA stated this reflects new evidence on different inflation indices. As noted at the start of this section, NERA's revised range, alongside the CAA's own proposed range, ultimately informed NERL's revised position on TMR (6.25%, RPI deflated) in its response to the CAA's Draft Proposals.

2.3.2.3 Forward-looking evidence

NERA (September 2018) set out evidence on TMR from the BofE's DGM model, which NERA noted is consistent with the CMA's approach in the NIE determination. NERA found the BofE's model implies a TMR of 7.2% to 8.1% (RPI deflated).[64]

In its April 2019 report, NERA highlighted concerns regarding the forward-looking evidence developed by the CAA and other regulators. NERA argued that: (i) the reliance on UK GDP growth as a proxy for dividends is inappropriate (given companies' global exposure); and (ii) the approaches disregard the use of analyst forecasts to inform short-term dividend growth. NERA's re-stated its view that DGM based estimates of TMR are between 7.2% to 8.1% (RPI deflated).[65]

[63] *Cost of Equity for RP3 Prepared for NERL.' NERA (April 2019); page 55.*
[64] *'Updated weighted average cost of capital for NATS (En-Route) plc at RP3.' NERA (September 2018); page 33.*
[65] *Cost of Equity for RP3 Prepared for NERL.' NERA (April 2019); page 59.*

THE ESTIMATION OF TMR IS HIGHLY TECHNICAL – SO IT IS HELPFUL TO 'STEP BACK' AND CONSIDER THE UNDERLYING INTUITION BEHIND ANY PROPOSED CHANGES.

2.3.4 Our assurance review

In this section we set out our review of the evidence relating to TMR. Here, we note that the arguments around the estimation of TMR are highly detailed and technical in nature. Whilst these detailed matters are important, for the purpose of our review, **it is helpful to 'step back' and consider the debate in terms of the key underlying intuition.** These are as follows:

- the rationale for significant changes to real TMR;
- time inconsistency and UK economic performance; and
- the relative size and scale of adjustment.

2.3.4.1 Whether TMR should be expected to vary significantly over time

It is generally established in both economics and finance theory that the RFR and ERP are inversely related. The basic intuition is that, when equity markets are more volatile (or during a crisis) the required return on stocks is higher (increasing the ERP). Investors therefore 'drop' risky assets in a 'flight to safety', and in turn purchase 'risk free' assets (thus reducing the RFR). Hence, the *overall* return on equity (TMR) is unchanged. In practical terms, this means the expectation is that TMR should be relatively stable.

Not only is this well-established in theory, but a range of empirical studies have further demonstrated the strength of this relationship. For example, Diamond (1999) examines the equity risk premium in the US between 1926 and 1998 and finds: *"the increase [in the ERP] is mainly due to a significant decline in bond returns, since long-term stock returns [TMR] have been quite stable"*[66] [emphasis added]. Similarly, Harris and Marston (1999) found overall equity returns in the US between 1982-1998 were relatively stable. However, beneath that overall return, they found: *"strong evidence… that the market risk premium changes over time. Moreover, these changes appear linked to the level of interest rates as well as ex ante proxies for risk drawn from interest rate spreads in the bond market."*[67]

Indeed, it is important to highlight that the Wright et al UKRN study (2018) makes precisely this point in various places. Specifically, the authors state: *"we do not see any obvious evidence in the history of returns themselves that cast doubt on the key evidential basis for the treatment of the EMR [TMR]: that long-run stock returns are stable in real terms."*[68] In describing their preferred method for estimating TMR, they continue: "*the best means – one that satisfies the twin criteria of implement ability and defensibility – to estimate the EMR [TMR] is to assume that it is constant."*[69]

Critically, however, there is an important distinction between the 'long-run' and the 'short-run' when considering equity returns. Specifically, the above intuition holds if one is considering returns over relatively long time horizons. However, over shorter periods of time, this is not necessarily the case. For example, the respective yields on 'risky' and 'riskless' assets may be subject to distortions and / or there may be frictions that delay the ability of investors to 'exit' one investment and 'enter' another.

---

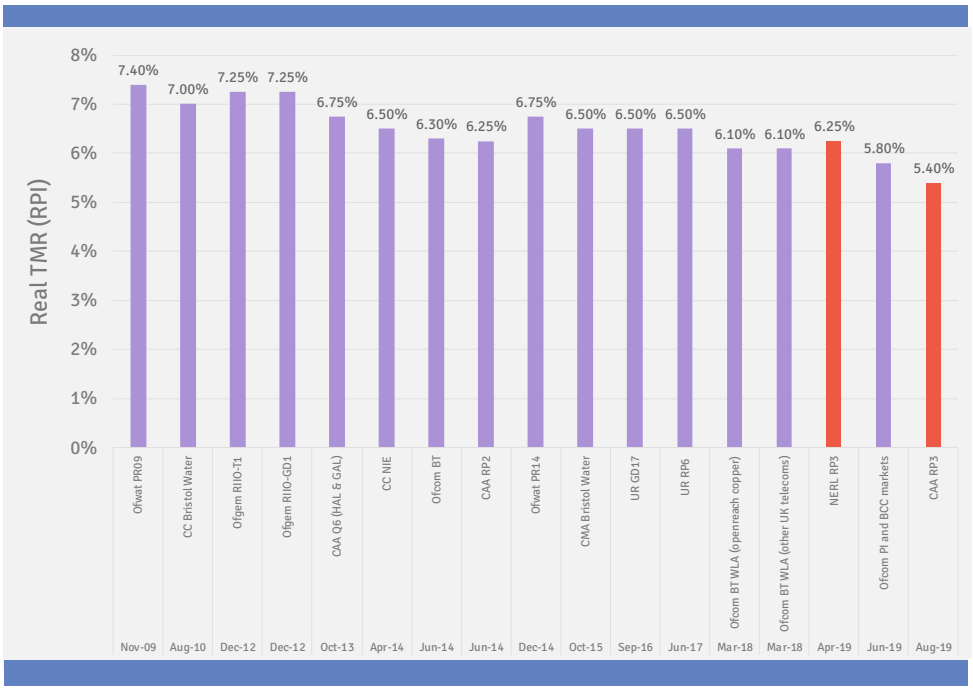
66 *'What stock market returns to expect for the future?' P Diamond, MIT (1999).*
67 *'The Market Risk Premium: Expectational Estimates Using Analysts' Forecasts.' Harris and Marston (1999); page 15.*
68 *'Estimating the cost of capital for implementation of price controls by UK regulators.' Wright; Burns; Mason and Pickford (2018); page 38.*
69 *'Estimating the cost of capital for implementation of price controls by UK regulators.' Wright; Burns; Mason and Pickford (2018); page 48.*

Consequently, the RFR may not perfectly or immediately adjust in response to a change in the ERP; and vice-versa. Hence, there can be some variation in TMR over time. Again, the UKRN paper is entirely consistent with this, stating: *"we simply stress again that, while evidence for counter-cyclical risk premia is strong…. this should not be taken as a claim that the ERP instead moves precisely one-for-one in the opposite direction to the RFR."*[70]

With the above in mind, it is firstly helpful to establish how the TMR proposed by the CAA and NERL compare to regulatory precedent over time. We therefore summarise this in Figure 3 (we have intentionally only included TMRs actually set in final determinations by regulators and have excluded 'indicative' numbers from methodologies or initial proposals).

REGULATORY SET TMR IS RELATIVELY STABLE OVER TIME, BUT HAS BEEN GRADUALLY DECLINING. THE CAA's POSITION AT RP3 IS UNUSUAL, IN THAT IT INDICATES A 'STEP-DOWN' IN TMR. NERL's POSITION IS UNUSUAL, IN THAT IT REPRESENTS AN INCREASE RELATIVE TO SHORT-TERM TRENDS.

Figure 3: Comparison of CAA and NERL proposed real TMR relative to precedent (chronological order)



Source: Economic Insight analysis of determinations

As can be seen from the above, in previous determinations the 'regulatory set' TMR has been relatively stable going back to 2009, ranging from 7.4% to 5.8% (RPI real). It is also apparent from the data that regulators have somewhat reduced their determined TMR over time. However, this decline has been very gradual. In this context, our observations regarding the TMR proposed by NERL and the CAA are as follows:

- NERL's figure of 6.25% is more in-line with 'longer term' precedent and a gradual decline when viewed over the long-term. However, it actually represents a slight increase relative to the most recent regulatory determinations, and so **NERL's proposal is out of line with this downward pattern in the shorter-term** (however, as the chart shows, precedent also reveals regulators have sometimes

[70] *'Estimating the cost of capital for implementation of price controls by UK regulators.' Wright; Burns; Mason and Pickford (2018); page 39.*

set 'higher' TMR values in the context of a more gradual trend down – e.g. Ofwat at PR14).

- The CAA's proposed figure of 5.4% represents a significant 'step-down'. That is to say, whilst the data shows a gradual downward pattern, **the size of reduction the CAA is proposing for RP3 appears unusual.**

'It is therefore vital to consider what the plausible rationale might be for a marked reduction in real TMR at this time. In our view, there are three possibilities.'

When considering the proposals of NERL and the CAA, it is important to also take into account the 'elapsed time' between determinations, in order to properly scale the relative size and speed of changes being considered for RP3. We discuss this matter subsequently.

Given the intuition set out above, it is therefore vital to consider what the plausible rationale might be for a marked reduction in real TMR at this time. In our view, there are three possibilities:

- Firstly, that **a more 'short-term' perspective to the WACC is being applied more broadly,** potentially allowing for a change in TMR, relative to historically established levels over the long-term.

- Secondly, that **the UK economy has 're-based' to a new long-term equilibrium, characterised by lower equity returns.** As such, a long-term approach to the WACC might nevertheless plausibly embody some reduction in TMR. This might be termed the 'lower for longer' argument.

- Thirdly, that the reduction in TMR is not, in fact, explained by any intuitive change in underlying fundamentals, but **reflects an objectively justified change in methodological approach**. The inference of this being, of course, that previous estimates were 'incorrect' and overcompensated equity investors.

In the following we expand on the above *possibilities* and consider the relevant evidence for each. Here we are not yet considering the actual positions of the CAA and NERL per se, which we turn to subsequently. Rather, we are simply focusing on the factual evidence of relevance. As we expand on further below, this evidence suggests:

- **If one adopted a 'shorter term' perspective to the WACC, some reduction in TMR at RP3 would be justified.** However, (i) it is then essential to ensure internal consistency in terms of the method used to derive TMR and the WACC, and the price control more broadly; and (ii) we do not necessarily advocate a shorter term time horizon.

- **There is insufficient evidence to conclude that the UK economy has re-based to a new low-returns equilibrium – and so the 'lower for longer' argument is not a sound basis for reducing TMR.**

- **The methodological considerations under debate provide a poor basis for a step down in TMR.**

A shorter term perspective on the WACC would support a reduction in TMR at RP3, due to low productivity in the near term

In our view, there is no single 'right' time horizon for regulators to adopt when setting the WACC. Indeed, as we commented in relation to the RFR, regulators typically have to balance their aims of determining an appropriate risk/reward package for a time-limited price control, against their other duties (most notably, customer and environmental considerations) which tend to require considering such matters over the longer-term. Hence, the key issue is to ensure that the assumptions are internally consistent across the price control. Indeed, this is our second key issue regarding TMR and we discuss it in detail subsequently.

Setting the above to one side, it is helpful to consider what the evidence shows, assuming one *did* adopt a 'shorter-term' perspective to determining TMR and the WACC. In this context, there is a wide body of literature that considers the relationships between equity returns and macroeconomic performance – most notably, productivity, inflation and interest rates.

Overall, **the evidence suggests a particularly strong relationship between equity returns and growth / productivity**. Indeed, the Ramsey[71] and Cass[72] general equilibrium model builds upon the key assumption that the RFR equals the sustainable growth rate (excluding population growth). The Gordon Growth Model links the elements of the cost of capital to economic growth.[73] It is, therefore, not hard to see that the rate of return on equity will naturally depend on the level of economic activity (thus, productivity). This positive relationship between productivity and equity returns is non-contentious and is endorsed by a range of further authors, including: Gordon (1959) and Baker, De Long and Krugman (2005). There are also various published empirical studies that demonstrate the relationship in practice. For example, a paper by EE (2012)[74] finds a high correlation between movements in UK index-linked gilts and average GDP growth. Indeed, as noted above, the authors of the UKRN study agree with this point.

To help further illustrate this, we have undertaken an analysis of the relationship between growth in multi-factor productivity in the UK (i.e. changes in productivity that are not due to changes in inputs) and quarterly equity returns (for the FTSE 100). Both of these measures are expressed as rolling 12-month averages of quarter-on-quarter changes. As expected, whilst there are some periods in which market returns diverge from productivity growth, overall there is a strong, positive, association between the two. The only notable period of divergence in the data seems to relate to the period of negative returns, starting around the year 2000. However, it should be noted that the fall in returns was related to the burst of the dot-com bubble (where underlying productivity growth in the real economy remained more robust). Over the last decade, from 2008, we find the correlation coefficient to be 0.39.

---

71 *'A mathematical theory of saving.' Ramsey, F.P; Economic Journal, 38, 152, (1928), pp543–559.*

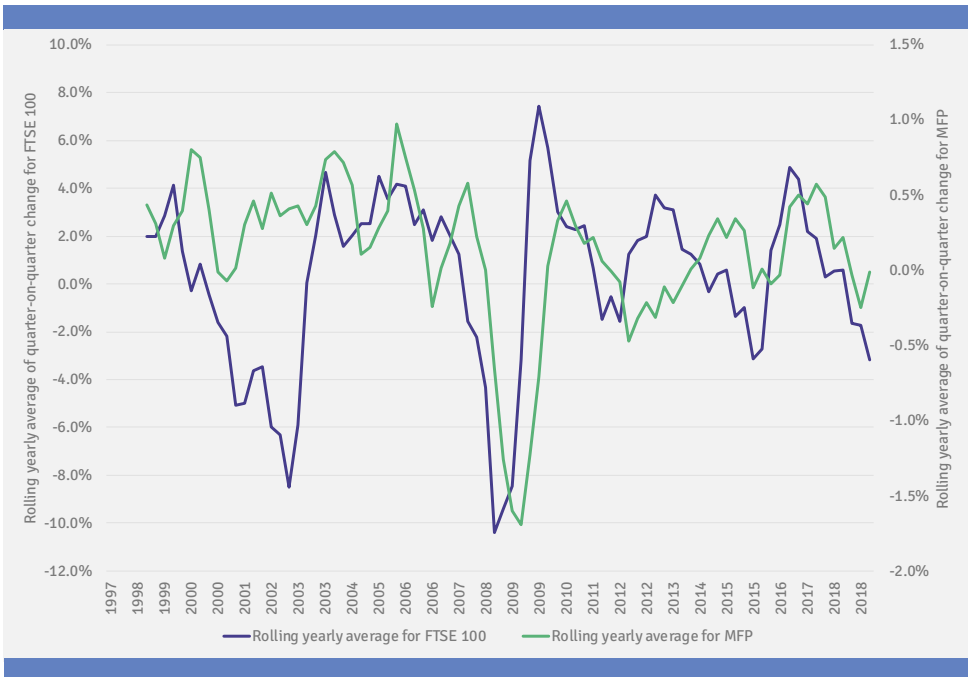
72 *'Optimum Growth in an Aggregative Model of Capital Accumulation.' Cass, D; Review of Economic Studies, 37 (3), (1965); pp233–240.*

73 *'Dividends, Earnings and Stock Prices.' Gordon, M; Review of Economics and Statistics, 41 (2), (1959); pp99–105*

74 *'The Relationship between Sustainable Growth and the Risk-free Rate: Evidence from UK Government Gilts.' Europe Economics (2012).*

EQUITY RETURNS ARE STRONGLY RELATED TO PRODUCTIVITY PERFORMANCE.

Figure 4: Time series of UK MFP and FTSE returns



Source: Economic Insight calculations using ONS and LSE data

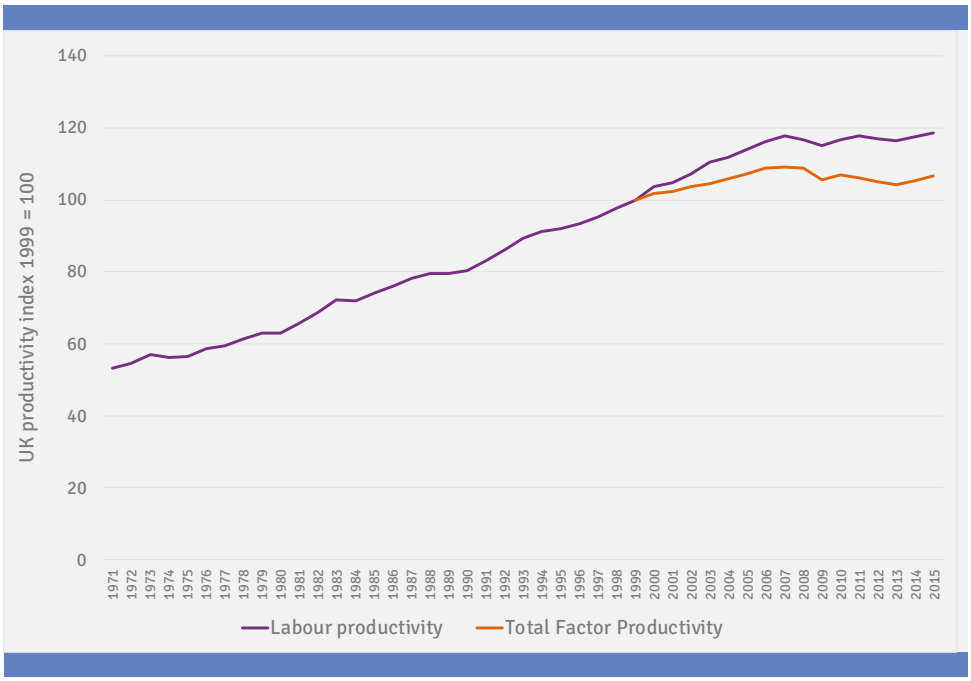
Once one understands that equity returns are fundamentally related to productivity, it is clear that, if a 'shorter term' perspective was applied to setting the WACC, some reduction in TMR would logically be justified Specifically, as has been well-documented, the UK's productivity performance has effectively 'flatlined' since the 2008 financial crisis.

To illustrate this further, Figure 5 (overleaf) shows the UK's total factor productivity (TFP) and labour productivity (output per hour worked) over time. A longer time series is available for the latter; back to 1971. This shows that, in the decade prior to the financial crisis and recession, labour productivity was growing in line with its long-term average (around 2% pa). However, since then, productivity has flatlined, or slightly fallen:

- labour productivity has averaged just 0.1% pa since 2008; and
- TFP has averaged -0.3% pa since 2008.

GIVEN THE UK'S POOR PRODUCTIVITY PERFORMANCE, WHICH IS EXPECTED TO CONTINUE 'NEAR TERM', IF ONE APPLIES A SHORT-TERM PERSPECTIVE TO TMR (AND THE WACC), THERE IS A RATIONALE FOR SOME REDUCITON IN TMR – BUT ONLY IF THERE IS INTERNAL CONSISTENCY ACROSS THE PRICE CONTROL.

Figure 5: UK TFP performance



Source: Economic Insight analysis of EU KLEMS data

Of relevance to a 'near term' perspective for RP3, official forecasts expect UK productivity to remain 'low' over the next couple of years, but then to improve gradually. For example, the following table sets out the OBR's latest productivity forecasts for the UK up to 2023. As can be seen, these remain at or below 1.0% until 2020, and then increase.

'The outlook for productivity growth remains hugely uncertain. Over the next few years we still expect some recovery from the weak rates seen since the financial crisis. But that may not arrive, or may take longer to materialise, so that productivity continues to disappoint. Alternatively, productivity could surprise to the upside – for example if business investment rebounds more strongly than we expect.' –

OBR

Table 11: UK forecast labour productivity growth

	2018	2019	2020	2021	2022	2023
Productivity (output per hour)	0.7%	0.9%	1.0%	1.1%	1.2%	1.3%

Source: OBR Economic and fiscal outlook March 2019

However, whilst 'in general' near term productivity is expected to be weak, even this is subject to some uncertainty – particularly in light of Brexit. For example, in commenting on its productivity forecast, the OBR states: "*the outlook for productivity growth remains hugely uncertain. Over the next few years we still expect some recovery from the weak rates seen since the financial crisis. But that may not arrive, or may take longer to materialise, so that productivity continues to disappoint. Alternatively, productivity could surprise to the upside – for example if business investment rebounds more strongly than we expect.*"[75]

The implications of the above are:

- If one was setting a WACC specifically with a 'short term' perspective in mind, there is some basis to assume a lowering of TMR over RP3, as the UK's poor productivity performance is expected to persist somewhat. Hence, of our three 'in principle' rationales for a reduction in TMR, this has some merit. The scale of any

[75] *'OBR Economic and fiscal outlook.' OBR (March 2019); page 59.*

such reduction would, however, need to be carefully considered in light of the uncertainty relating to even near-term productivity performance in the UK.

IF THE RATIONALE FOR A REDUCED TMR WAS A MORE 'SHORT-TERM' VIEW, IT WOULD BE ESSENTIAL FOR ALL OTHER WACC PARAMETERS TO BE CONSISTENT WITH THIS – AND FOR THE RP3 CONTROL MORE BROADLY TO BE CALIBRATED TO A LOW PRODUCTIVITY ENVIRONMENT.

- However, if this was the rationale for any reduction in TMR, it would be essential to ensure that: (i) all other parameters of the WACC were consistent with this view; and similarly; (ii) the RP3 price control more broadly was calibrated to a low productivity view of the world.

- In addition, we do not ourselves 'endorse' a short-term perspective to setting the WACC. As noted above, there is no definitely 'right' time horizon to apply and the appropriate perspective seems to rest on the balance of regulators' objectives. As we subsequently explain, however, the current uncertainty surrounding Brexit might point towards the need for a longer-term view.

We subsequently consider whether the CAA's / NERL's position can be rationalised from this perspective.

There is insufficient evidence to say the UK has 're-based' to a lower returns / productivity equilibrium – and so this provides no basis for a step down in TMR

The second 'in principle' reason for a step-down in TMR is that, even if one retained a long-term perspective on the WACC, there were reasons to believe the UK economy had fundamentally 're-based' to a new equilibrium, so that equity returns were permanently lower.

Here, to varying degrees, regulators and their advisors have, in recent times, advanced arguments that focus on this rationale. This might be broadly termed the 'lower-for-longer' argument. However, this has primarily been framed in terms of a possible relationship between equity returns and interest rates (and, relatedly, inflation). For example, PwC (2017) on behalf of the CAA has framed the issue in these terms, referring to *"expectations of a 'lower for longer' interest rate environment"* in the context of reduced TMR.[76] This is, in our view, the wrong area of focus as – for the reasons previously outlined – productivity is by far the stronger driver of equity returns.

The intuition for this is clear. At its most fundamental, productivity determines growth and hence returns. In contrast, interest rates are generally a monetary policy tool, primarily designed to help achieve a target rate of inflation. In turn, the relationship between inflation, interest rates, and economic performance is much more complex than the one between productivity and equity returns. For example, the literature includes theoretical models in which a positive relationship between inflation and productivity / equity returns is expected, but also models in which an inverse relationship with inflation exists. In early Keynesian macroeconomic models, there is an inherent output-inflation trade-off, the existence of which (in the long-run, at least) was challenged by neoclassical 'rational expectations' models. The existence of a short-run trade-off, however, still underlies the 'Taylor rule' for inflation targeting. See Briault (1995) and Walsh (1998) for more detail on these various models.[77]

[76] *'Estimating the cost of capital for H7 A report prepared for the Civil Aviation Authority (CAA).' NERA (2017).*

[77] *'The costs of inflation.' Briault, Clive. Bank of England quarterly bulletin (1995). 'The new output-inflation trade-off.' Walsh, Carl E. Federal Reserve Bank of San Francisco Economic Letter; (1998).*

'We do not consider that this observed low interest rate directly translates into a low expected return on equity… it is therefore hard to reconcile… that equity returns should be lower for longer with the actual recent evidence from the equity market.' – Frontier Economics

These various theoretical models also reflect real world examples in which we can observe both 'high inflation' at a time of poor economic performance (e.g. during the 'stagflation' in the 1970s); but also 'low inflation' at a time of robust economic performance (e.g. as observed in the UK prior to the financial crisis). In this context, we note that PwC's presentation of the relationship between real interest rates and equity returns excludes periods of high inflation. This seems questionable, as it appears to 'selectively' ignore instances where the relationship is contrary to the one they are seeking to demonstrate.

Indeed, in a recent report, Frontier Economics states: *"we do not consider that this observed low interest rate directly translates into a low expected return on equity… we recognise that there are forces in a low-interest bond market that would suppress he expected equity return… however, there are also other forces that would lead to a higher expected equity return, such as flight to safety."*[78] Frontier continues to examine the evidence on the relationship between equity returns and yields before concluding: *"it is therefore hard to reconcile… that equity returns should be lower for longer with the actual recent evidence from the equity market."*[79]

In our view, it is plain that low interest rates / inflation alone provide no real basis for reaching a view on whether the UK equity returns have been re-based. The more pertinent question is whether the UK has reached a new 'low productivity' (and therefore, 'low returns') equilibrium that will persist (noting that it is this persistence that distinguishes this rationale for a reduction in TMR from the 'short term' perspective rationale we discussed previously).

The available evidence does not suggest that such a new equilibrium has been reached. At most, the evidence is highly uncertain, meaning that such an assumption would seem to be wholly inappropriate for the purposes of determining a price control. For example, as we previously set out, whilst the OBR expects productivity to be depressed near-term, its numbers show a recovery over the more medium term.

Consistent with the above, the OBR's most recent Economic and Fiscal Outlook states: *"as Brexit uncertainty begins to dissipate, and productivity growth gradually improves."*[80] Furthermore, the OBR has separately provided forecasts of longer-term productivity in the UK. Here the OBR's position is as follows:

"Overall, growth in annual output per hour averaged 2.1 per cent over the twentieth century, compared with just 1.1 per cent in the nineteenth. Although there have been large fluctuations from year to year, there has been a discernible upward drift in average productivity growth over the past two-and-a-half centuries, as demonstrated by the ten- and fifty-year rolling averages. That is consistent with some 'endogenous growth' models, which predict gradually rising growth over time, essentially because of increasing returns. More recently productivity growth has been lower, reflecting the experience since around the time of the late-2000s financial crisis, so there is some uncertainty as to the most appropriate assumption for the next fifty years and in particular whether we should put most weight on the experience of the past decade, or the longer-run trends… Over our fifty-year forecast period, productivity growth averages 1.8 per cent, somewhere between the averages in the nineteenth and twentieth

78 'Cost of Capital for PR19.' Frontier Economics (March 2019); page 9.
79 'Cost of Capital for PR19.' Frontier Economics (March 2019); page 10.
80 'OBR Economic and fiscal outlook.' OBR (March 2019); page 8.

centuries."[81] Over the longer-term, the OBR states it expects productivity to return to 2.0% pa.[82]

Drawing the above together, we summarise our views as follows:

- Whilst there is considerable uncertainty over the UK's near-term economic performance and productivity, particularly relating to Brexit, there is as yet no evidence or consensus that suggests the economy has been more permanently 're-based.' As such, we do not think a 'long-term' perspective to WACC can be reconciled to any 'step change' down in TMR at this time.

- This issue has been clouded somewhat by confusion around the 'lower-for-longer' debate, in which there has been an undue focus on interest rates and / or inflation, rather than the more fundamentally important question of UK productivity performance.

- We also note that, in its advice to Ofwat on the WACC at PR19, PwC has repeatedly emphasised the importance of productivity to the determination of TMR and the WACC. Indeed, Ofwat itself has highlighted this, stating: *"PwC highlighted a range of factors affecting the UK economy that are likely to constrain prospects for growth in equity returns over the short to medium term. These include… lower expectations of future growth, linked to the UK's poor productivity performance"*[83] [emphasis added].

IF THE PROPOSED STEP DOWN IN TMR WAS BASED ON A 'NEW' AND 'OBJECTIVELY BETTER' METHOD THAN PREVIOUS APPROACHES, THIS WOULD ALSO BE A LEGITIMATE RATIONALE. THIS DOES NOT SEEM TO BE THE CASE, HOWEVER. RATHER, THE EXISTING EVIDENCE REFLECTS A CONTINUATION OF WELL-ESTABLISHED TECHNICAL DEBATES REGARDING HOW TMR SHOULD BE ESTIMATED.

The methodological considerations under debate provide a poor basis for a step down in TMR.

The third possible rationale we have identified for a marked change (reduction) in TMR is a methodological one. That is to say, suppose the methods now being relied upon by the CAA were objectively 'better' than previous methods. If said new methodological changes themselves suggested a reduction in TMR this would then be 'objectively justified' and so might provide comfort that there are good grounds for a significantly reduced TMR at RP3.

If we apply this lens to the various debates concerning the estimation of TMR, however, it is difficult to identify a 'new' and 'objectively better' method that has emerged. Rather, in our view, what has occurred is simply the continuation of well-established debates regarding the theoretical correctness of alternative approaches, at the end of which the CAA (and other regulators) have placed significantly more weight on methods that happen to produce 'lower' TMR estimates (i.e. those methods are not new).

For example, consider the UKRN study, which appears to form a particularly key source for the CAA's position on TMR based on historical realised returns. The paper addresses, or exposes, the following issues of relevance:

- **The appropriate investment horizon.** Here, the authors recommend a long term horizon (for example, 10 years). However, in keeping with our own views, they primarily emphasise the need for time consistency. Critically, this is not a

[81] *'Fiscal sustainability report.' OBR (July 2018); box 3.1, pages 56-57.*
[82] *'Fiscal sustainability report.' OBR (July 2018); page 55.*
[83] *'Delivering Water 2020: Our methodology for the 2019 price review Appendix 12: Aligning risk and return.' Ofwat (December 2017); page 28.*

new debate, nor (given the authors' views) is there any reason to suppose that a 10 year horizon is especially more or less appropriate than any other.

- **The risk free rate.** As we discussed in the previous section of this report, the UKRN authors recommend an index-linked approach to this. However, the UKRN paper fails to address the key drivers of differences between real yields implied by index-linked and nominal gilts. Again, this is not a new debate and nor, in our view, does the UKRN study provide any compelling evidence that has suddenly resolved it.

- **The interpretation of real returns.** The CAA (and other regulators and their advisors) have recently interpreted the TMR range from the UKRN paper / DMS data as being in real 'CPI' terms (i.e. a range of 6%-7%, which is then reduced to 5%-6% on an RPI basis, once the RPI/CPI wedge is applied). However, the fact is the inflation index in the DMS data has changed substantially over time, moving from the index of retail prices, to RPI and then to CPIH. It is therefore questionable as to whether the 6%-7% figure can be interpreted in CPI or CPIH terms. Indeed, historically the DMS data has typically been interpreted in RPI terms. Therefore, TMR implied by the data might equally imply real returns of 6%-7% RPI deflated. Indeed, we note that Frontier Economics in a recent report makes exactly this point – in fact suggesting that, objectively, there are three interpretations of the data and, like us, highlighting that regulators have always previously interpreted the data in RPI terms. Frontier conclude: *"all three interpretations have some potential challenges and caveats attached, without one being obvious superior."*[84] Frontier further notes that if all three interpretations are balanced evenly, the real TMR implied is significantly higher than current regulatory interpretations. We agree with Frontier on this. This is, therefore, yet another example of where there is 'reasonable' and 'unresolved' debate, rather than the emergence of a 'new' and 'better' method.

- **Averaging techniques.** The UKRN study favours a geometric approach, adjusted upwards for omitted compensation for volatility. Again, the debate regarding averaging techniques is not 'new', and nor has this paper resolved it. In fact, across the literature a range of averaging methods are used – and there tends to be consensus that the appropriate methods to apply at a more detailed level should primarily turn on the overarching approach to the WACC and, critically, the time horizon assumed.

- **Balance of methods.** The UKRN paper discusses the weight regulators should attach to differing approaches to estimating TMR more broadly. We do not think this is a debate that can be definitively resolved and so the paper's recommendations offer little compelling 'new' evidence.

The above should not be interpreted as a criticism of the UKRN paper. In some respects, it is a helpful contribution to a difficult and complex area. We are merely seeking to demonstrate that, if the explanation or rationale for a reduction in TMR is 'methodology' driven, this would only seem to be appropriate if: (i) a 'new' method can be clearly identified; and (ii) that method is 'objectively better' than previous methods. In the case of the UKRN study, neither appears to be true. In fact, the re-

[84] *'Cost of Capital for PR19.' Frontier Economics (March 2019); page 16.*

interpretation of real returns on a CPI, rather than RPI, basis alone appears to be particularly material – and yet is clearly not 'objectively correct'.

Summary of our views

Bringing the above together, we would summarise our views as follows:

- Given the complexities in the estimation of TMR, it is helpful to 'step back' from the detail and consider the intuition for any marked step-down in TMR at this time (given that the CAA is proposing this).
- Intuitively, three 'in principle' reasons might exist for such a change: (i) adopting a more short-term perspective to the WACC; (ii) retaining a long-term perspective, but where the UK has re-based to a low-returns equilibrium; or (iii) the adoption of a new, and objectively better, method, which itself implies a reduction in TMR.
- In practice, the evidence shows that:
  - **A 'short-term' perspective would justify a reduction in TMR at RP3.** However, care is then needed to **ensure internal consistency across other WACC parameters and the price control.** In addition, we do not endorse a short-term perspective, per se.
  - There is no basis to conclude that the UK has re-based to a new lower returns equilibrium. Hence, **a significantly lower TMR cannot be reconciled with a regulator applying a 'long term perspective'.**
  - The methodological debate around approaches to estimating TMR is not new, nor have the key issues been objectively resolved one way or another. Thus, **method changes provide no basis for reducing TMR.**

A ROBUST APPROACH TO TMR REQUIRES A TIME CONSISTENT AND COHERENT VIEW OF UK ECONOMIC PERFORMANCE. BOTH THE CAA's AND NERL's EVIDENCE DOES NOT START FROM THIS POSITION – CREATING A RISK OF INTERNAL INCONSISTENCIES.

2.3.4.2 Time consistency with economic performance

Having reviewed the existing evidence on TMR relied upon by the CAA and NERL, in our view, the main issue that requires further consideration is the apparent lack of a coherent and consistent view of the UK economy. Specifically, we think that a robust approach to estimating TMR for RP3 requires one to be clear about:

- the time horizon over which one is seeking to estimate equity returns; and
- what one assumes in terms of the UK economy's performance over that time horizon.

This is essential for four reasons, which we expand upon further in the following passages. Firstly, because there are relationships between equity returns and economic performance, without clarity as to the 'time period' and 'economic performance' being assumed, there is no way of knowing **whether the estimated TMR is consistent with the economic context** (which itself should be evidence-based). Secondly, because other important price control parameters are also influenced by the UK's economic performance, without this clarity, one cannot determine **whether the various price control components set by the regulator reflect an internally consistent picture of economic performance.** Thirdly, one's view on these factors can also influence **'what methods'** are most appropriate for determining TMR. For example, if one is primarily adopting a 'short-term' perspective, a greater case can be made for utilising forward-looking evidence,

whereas where a longer-term view is being taken, this is less likely to be the case. Fourthly, these same considerations should also determine the '**appropriate application of methods.**'

Issue 1: interrelationships between equity returns, economic performance and time consistency

We previously established that there are strong interlinkages between equity returns and economic performance (primarily, productivity) – and that this is, therefore, critical when determining TMR. Namely, it means that for TMR assumptions to be appropriate for RP3, it is essential to clearly establish 'over what time period' one is seeking to 'set' equity returns and the economic backdrop to that. Specifically:

- If one considered the objective is to set a TMR (and the WACC) specifically to reflect an appropriate level of return over RP3 (i.e. relatively short-term, over the period 2020-2024) it should be informed by projected economic performance over that time period.

- On the other hand, if one considered the objective to take a 'longer-term' view to setting TMR, then clearly that would need to be informed by a similarly long-term perspective on economic performance.

We also therefore previously established that, if one considered a 'nearer-term' perspective to be appropriate, there is both an intuitive and evidence-based reason to suppose that TMR should be *somewhat* lower, relative to previous price determinations. Whereas, if one adopted a 'longer-term' view, this would not be true, and there would be little reason to expect a reduction in TMR. Critically, of course, this is a matter of degree, as the appropriate time horizon exists on a continuum.

A limitation of both the CAA's and NERL's evidence is that it is not particularly clear as to either the 'objective' or the relevant 'assumed economic context.' In the following we briefly expand on this.

In the CAA's decision document, it makes various references that seem relevant to understanding the 'time horizon' it considers to be the relevant objective (i.e. over which to balance risk), without said objective ever being made explicit. Our reading of these statements is that the general implication is that the CAA has considered its objective to be set the WACC in the context of the RP3 time horizon (i.e. a relatively short term perspective).[85] The CAA is similarly unclear as to exactly what it is assuming regarding the UK's economic performance over the relevant time horizon. For example, in its Final Decision document, the CAA does not set out any clear description of assumed UK economic performance around which it has calibrated the WACC (or other price control parameters). Similarly, in the detailed appendices to its Final Decision, the extent of the CAA's discussion of economic assumptions is limited to the following. When discussing traffic forecasts, it explains that: *"GDP is a key economic assumption underpinning the forecasts and has been revised down since our draft proposals."*[86] There are various references to Brexit risk, but again, without any cogent picture of what is actually being assumed as regards economic performance.

[85] *For example, when discussing inflation the CAA refers to the RP3 period. When discussing its approach to the WACC in general, the CAA similarly refers to the RP3 time period. The CAA also further repeatedly refers to 'recent market evidence' and 'recent regulatory precedent' as providing a signal of a reduction in the WACC at RP3. See, 'UK RP3 CAA Decision Document.' CAA (August 2019); pages 96; and 99, for example.*

[86] *'UK RP3 CAA Decision Document: Appendices.' CAA (August 2019); page 14.*

When discussing TMR there is no discussion whatsoever about the economic context the CAA considers this to be consistent with.

Similarly, NERL's Revised Business Plan is itself not explicit in terms of the objective or economic context and therefore suffers from a similar weaknesses to the CAA's position in this regard. Like the CAA, when setting out its position on TMR, NERL does not discuss the assumed economic backdrop to this, or the time horizon. For example, in the appendices to its revised business plan, NERL summarises a range of evidence that it referred to, before surmising that: *"the data is more supportive of an increase in TMR since 2014 than a decrease."*[87]

Drawing the above together, we would highlight the following key observations:

- Firstly, it is in some ways difficult to evaluate the appropriateness of the proposed TMR estimates proposed by the CAA and NERL. Put simply, because the question: "appropriate to what?" is not addressed.

- Secondly, however, their respective positions as regards TMR (and discussions thereof) are such that, implicitly (and logically) **the CAA's assumed TMR implies a 'shorter term' view, relative to NERL's position, which is consistent with a 'longer-term' view.**

- Secondly, absent a clear articulation of 'objectives' and 'assumed context', **there is obviously a high 'in-principle' risk of internal inconsistencies,** both 'within' the parameters relevant to setting the WACC, but also more broadly across the price control.

In our view, this 'time' and 'economic' consistency point is the most intuitively important issue to be considered in relation to TMR during the CMA's redetermination of the control. We also note that this issue was highlighted by the UKRN study, which stated: *"we would argue that, more important than the choice of time horizon per se is that all components of the CAPM-WACC are estimated using a methodology that is consistent with the time horizon."*[88]

Issue 2: the importance of interrelationships with other price control components

Related to the above, other key price control components are themselves directly or indirectly influenced by what one assumes about economic performance. Therefore, to ensure the various elements of the price control are robust and internally consistent, it is again vital to ensure these all tie back to a clear and holistic picture of the economy over a consistent period of time.

Here, the most obvious interconnection is with the 'efficiency challenge' NERL should be set. To clarify, by this we mean both 'cost' (opex) efficiency and the efficiency improvements implied by any improvements in outcomes targets NERL is required to deliver against (i.e. the 'totality' of the efficiency challenge that is set). With this in mind, also recall that the efficiency challenge consists of both a 'catch up' and 'frontier shift' element, where the latter consists entirely of productivity gains. Hence, logically:

---

87 *'Appendices: RP3 Business Plan.' NERL (October 2018); page 160.*
88 *'Estimating the cost of capital for implementation of price controls by UK regulators.' Wright, Burns, Mason and Pickford; UKRN (2018); page 29.*

- If one assumes a 'low equity returns / low productivity' context for setting TMR (relative to previous determinations) it is essential that the overall efficiency challenge is consistent with that view. In other words, the overall efficiency challenge would likely need to be 'lower' than in previous determinations.[89]

- Whereas, if one assumed a 'high equity returns / high productivity' context, consistent with previous determinations, a consistent efficiency assumption might be a level of challenge 'in line' with previous price controls.

'The CAA's position on efficiency is plainly at odds with the low productivity / short term context required to rationalise the significant step-down in TMR for RP3 it is proposing… in NERL's response to the CAA's draft proposals, it revised its position on TMR downwards to 6.25% (RPI deflated). On this basis NERL's latest position does not, 'in practice' seem to suffer from this inconsistency. '

It seems to us, however, that the CAA has failed to ensure this consistency is achieved in practice. The key points are as follows:

- The CAA is assuming an opex efficiency challenge for RP3 that appears at least as big as that for RP2. It is also assuming improved outcomes performance relative to RP2. Hence, the 'total efficiency challenge' seems to be larger than the one set at the prior price control. Thus, the CAA's position on efficiency is plainly at odds with the low productivity / short term context required to rationalise the significant step-down in TMR for RP3 it is proposing.[90]

- In its Revised Business Plan, NERL was assuming an *increase* in TMR. However, in NERL's response to the CAA's draft proposals, it revised its position on TMR downwards to 6.25% (RPI deflated). On this basis NERL's latest position does not, 'in practice', seem to suffer from this inconsistency (at least to the same degree).

The key implication of the above is that, if one looks at the overall picture, there is an inherent tension in the CAA's position (i.e. 'the numbers') across the building blocks of the RP3 price control. The appropriate response should start from a much more transparent articulation of the time horizon and assumed economic context. In either event, either the TMR would need to be reduced for the efficiency challenge to be consistent with it, or vice versa.

Issue 3: the appropriate selection, application and interpretation of methods for estimating TMR – and internal consistency

The determination of TMR is complex. There is a wide range of methods that can be used; and, within each method, a range of analytical techniques for applying them. Relatedly, having developed various evidence, one must consider how to interpret and weight it. The arguments around all of these are technical and detailed in nature.

Our perspective on this is that, with few exceptions, there are no approaches that are intrinsically superior or inferior to others. Rather, their appropriateness very much depends on a number of case-specific considerations. Therefore, the paramount issue is to ensure the assumptions underpinning TMR estimation are themselves internally consistent (and consistent with the WACC more broadly). This is related to the above,

[89] *This logic follows from the fact that the 'catch up' element should be ever decreasing, assuming prior price controls are appropriately calibrated and remove relative efficiency over time. Hence the remaining element of the challenge (frontier shift) should be closely related to UK productivity. Further, in NERL's case, it is not clear that any 'catch up' inefficiency has been identified per se.*

[90] *Strictly speaking, this point relates to the 'frontier shift' (productivity) component of the efficiency challenge. In practice, the CAA does not separately identify 'catch up' and 'frontier shift' and hence we cannot 'observe' what it is assuming. However, we note that: (a) it has not even been established that there is a catch up inefficiency element for NERL; and (b) logically (labour) related productivity must drive most of its efficiency performance.*

because pertinent considerations again include: (i) the time horizon in question; and (ii) assumed economic performance over that time horizon.

For example, in relation to 'averaging methods' for estimating TMR using historical realised returns, it is well-known that either the arithmetic or geometric methods can give biased estimates. 'In general', the arithmetic method is less problematic if one is considering a shorter-term time horizon and vice versa. Rather than discuss the technical detail of each individual methodological consideration at length, in the following summary table we have 'characterised' the choices between methods and their application in terms of the balance between the 'short-term' and 'long-term'. In doing so, we acknowledge that: (i) there is no 'hard cut-off' between the choices – rather, it is a matter of degree; and furthermore (ii) that factors other than the time horizon may also inform the methodology decisions. Nevertheless, our simplified characterisation hopefully provides a helpful way of illustrating the importance of consistency – and a means to examine more easily the choices made by the CAA and NERL. To be of further help, for the CAA's and NERL's position, we have used highlighting to indicate our judgement as to their 'internal consistency'. Specifically: (i) green indicates no internal inconsistency issue; (ii) amber indicates some degree of internal inconsistency; and (iii) red indicates a high degree of internal inconsistency.

Table 12: Examining the consistency of methods used with the positions of the CAA / NERL

	Shorter term view	Longer term view	CAA's position (Final Decision)	NERL's position (Revised Business Plan)*
Position on real TMR (RPI deflated)			5.4%	6.8%
Position proposed TMR and arguments most consistent with			Shorter-term view.	Longer-term view.
Weighting of methods	Somewhat more weight on forward-looking methods such as DGM (or recent past).	Somewhat more weight on historical / long term methods, such as realised historical returns.	No transparent weighting of methods, but appears to take all evidence into account.	No transparent weighting of methods, but appears to take all evidence into account.
Application of forward-looking methods (DGM models)	More weight on forward-looking evidence to inform dividend growth – e.g. analyst forecasts.	More weight on longer-term GDP forecasts to inform dividend growth.	Based on forecast GDP growth.	(Primarily) analyst forecasts.
Application of historical realised return methods				
Averaging technique	Arithmetic.	Geometric.	Geometric (UKRN).	Wide range of averaging methods (NERA) – but arithmetic favoured.
Averaging horizon	Shorter (e.g. 5 years).	Longer (e.g. >10 years).	Long-term – 1899-2016 (UKRN / PwC) - but also advocates 10 yr trailing average if arithmetic used (PwC)	Long-term – 1900-2017 (NERA) – uses 30 yr trailing average
Holding periods**	Shorter (e.g. 5 years or less).	Longer (e.g. > 10 years).	Longer.	Shorter (1-5 years).
Size of adjustment for serial correlation (if geometric used)	Larger adjustment needed over shorter time horizons / holding periods.	Smaller adjustment needed over longer time horizons / holding periods.	Range of 1%-2% indicated, but advocates a 'smaller' adjustment.	NA.

**Revised Business Plan figure shown, as this is consistent with the evidence and method relied upon by NERL. The company's more recent lower proposed TMR of 6.25% was proposed on the basis of it taking into account the CAA's range, rather than it being supported by its own approach / methods. ** This relates to the period over which investors 'hold' equity. It is therefore less directly relevant to the 'time horizon' over which TMR is estimated. However, in general one would expect there to be some association between the two. Namely, it is more logical to adopt a longer-term perspective to TMR / WACC in industries where investments are longer-lived and where, therefore, one might expect investors to themselves have a longer-term attitude.*

When looking at the above, in our view there are clear tensions between the 'perspectives' applied by the Parties' to support their positions on TMR and their balancing of the evidence / detailed application of specific methodologies. This is not surprising, given (as we observed earlier) neither party has rooted its approach to TMR (or the WACC) in a transparent and coherent description of an assumed time horizon and broader economic performance. That is to say, we are not suggesting that either the CAA or NERL have necessarily been intentionally selective in their treatment of the evidence. Rather, such internal inconsistencies are, in our view, unsurprising if the approach is not rooted in clearly articulated assumptions, around which consistency can be ensured.

THE CAA's PROPOSED TMR NUMBER IS MOST CONSISTENT WITH A SHORT-TERM VIEW ON THE ECONOMY, BUT ITS METHODS ARE MORE CONSISTENT WITH A LONG TERM VIEW. NERL'S POSITION IN ITS BUSINESS PLAN HAD THE OPPOSITE PROBLEM – ALTHOUGH MITIGATED IN PRACTICE.

Put simply:

- The CAA's proposed TMR number and lines of argument appear most consistent with a 'nearer-term' view of the UK economy. However, in general its evidence and method are more consistent with a 'longer-term' view.
- In contrast, NERL's position (in its Revised Business Plan) suffered from the opposite problem. In practice, the impact of this is mitigated by NERL's subsequent reduction in its proposed TMR to 6.25% in its response to the CAA's Draft Proposals. Specifically, because NERL also takes the CAA's range / evidence into account in lowering its number, it somewhat 'dilutes' any inconsistency.

2.3.4.3 The relative size and scale of adjustments

Building on the theme of time and internal consistency, it is helpful to consider the 'size' and 'speed' of the rate of change in TMR implied by the parties' proposals for RP3. To do this, we have taken our analysis of regulatory precedent and have calculated the 'percentage point change in TMR per annum' relative to the preceding regulatory determination. Specifically:

- we take the difference between the TMR in *'determination t'* and *'determination t-1'* to get the percentage point change;
- we calculate the number of days between each determination, then divide by 365 to convert this into years; then finally;
- we divide the % point change (normalised) by the elapsed years since the prior determination.

By doing this, we can objectively assess the movement in TMR proposed by NERL and the CAA to assess 'how material' they are, given elapsed time. This is important because, as noted above, whilst we expect TMR to be relatively stable over time, clearly some adjustment is logical (so long as it consistently reflects the time horizon in question and, thus, 'elapsed time').

Accordingly, the following figure shows the results of our analysis. Here, the key findings are as follows:

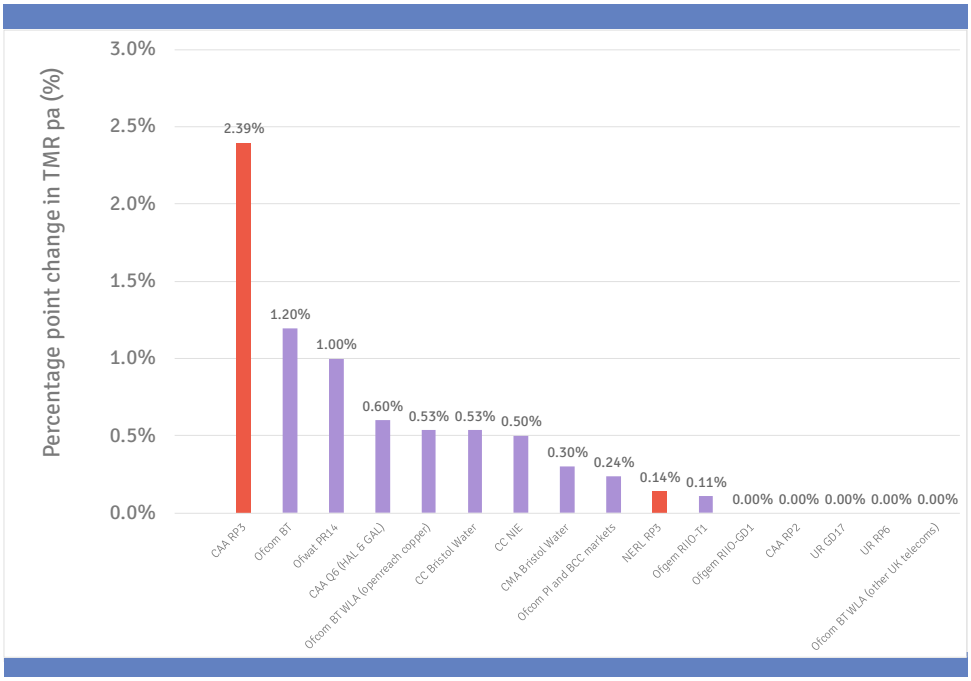
- Precedent is generally consistent with regulators (including the CMA and CC) making relatively gradual changes to TMR over time. Indeed, excluding the RP3 proposals of NERL and the CAA, the average % point annual rate of change in TMR is 0.36%. Over the sample, the annual rate of change varies from 0.0% to 1.2%.

- Compared to this, the CAA's proposed TMR of 5.4% appears highly unusual, implying an annual rate of change of 2.39%. This is far higher than any other previous rate of change implied by a regulatory final determination.

- The annual rate of change implied by NERL's proposed TMR is modest, at 0.14% (i.e. is below average). However, as we noted above, NERL's proposal might be considered more unusual in a different sense (i.e. it implies a modest increase relative to the recent direction of travel of regulatory determined TMR).

THE CAA'S PROPOSED TMR REPRESENTS A FASTER RATE OF CHANGE RELATIVE TO PRIOR REGULATORY DETERMINATIONS THAN ANY OTHER REGULATOR SET TMR. THIS COULD ONLY BE RATIONALISED BY A FURTHER REDUCTION IN UK ECONOMIC PERFORMANCE OVER RP3. THIS HAS NOT BEEN ESTABLISHED.

Figure 6: Percentage point change in TMR per annum, relative to prior determination – (normalised to show changes in positive numbers)



Source: Economic Insight analysis of regulatory determinations

Joining the above up to our previous discussion of the 'intuition' for changes in TMR over time, **we find it hard to reconcile the CAA's proposed figure of 5.4% to a time-consistent view of the UK economy.** Specifically, if the CAA is adopting a 'shorter-term' perspective, we think some reduction in TMR can be explained. However, the size of the reduction and implied rate of change would suggest a further sudden reduction in UK economic performance that is expected to persist over RP3. We do not see where this has been established. In addition, we would note that such an assumption would be at odds with other methodological choices and assumptions made elsewhere by the CAA, as we highlighted in Table 12.

'For this determination, we considered that NIE (2014) represented an appropriate comparison for estimating the equity market return… being published within the last 18 months.' – the CMA

On the other hand, whilst the 'rate of change' implied in NERL's proposals is more typical, the fact that it is proposing an *increase* in TMR relative to recent determinations nonetheless raises some questions.

The rate of change issue has also been considered previously by the CMA. For example, when determining the TMR in the Bristol Water (2015) case, the CMA said: *"for this determination, we considered that NIE (2014) represented an appropriate comparison for estimating the equity market return… being published within the last 18*

months."[91] That is to say, the CMA considered it reasonable to assume that its determined TMR should be similar to (and in fact, in the Bristol case, the same) as one determined 18 months prior. This would seem to be consistent with the gradual rate of change that is generally apparent in the above data.

We also note that **in its recent report for Thames Water, Frontier Economics proposed a TMR figure of 6.22%,**[92] fractionally below that now proposed by NERL, and much more consistent with a long-term gradual reduction in TMR.

2.3.4.4 Summary of our assurance review relating to TMR

Drawing the preceding analyses together, having reviewed the evidence on TMR, our views are as follows:

- The 'in practice' estimation of TMR is highly technical – and there is detailed discussion from both NERL and the CAA regarding the specific pros and cons of various methodological choices. **In determining the appropriate approach to TMR at RP3, it is therefore important to 'step back' and consider the underlying intuition.**

- **In our view, this must start from a transparent articulation of the time horizon assumed - and the corresponding UK economic performance.** Neither the CAA nor NERL's approach does this and so both are at risk of internal inconsistencies. We further find that, in practice, the positions of each party in fact suffer from such inconsistencies.

- **For its part, the CAA is proposing a marked reduction in TMR for RP3, to 5.4% (RPI deflated). In our view, the intuition for such an assumption requires a relatively 'short-term' perspective, in which UK economic (and in particular productivity) performance is expected to further deteriorate.** We do not think this has been factually established, however. Furthermore, such a perspective is inconsistent with the method choices made by the CAA.

- **NERL's position, on the other hand (6.25% real, RPI) is more consistent with a somewhat longer-term view of the UK economy.** Like the CAA, however, the method and evidence relied upon appears inconsistent with such a perspective (albeit, to a lesser degree).

- Notwithstanding the inconsistency in the CAA's position, some reduction in TMR relative to the past is supportable, if seen through a 'shorter-term' lens. **However, the 'size' and 'speed' of reduction implied by the CAA's figure of 5.4% is unprecedented and, in our view, is not objectively supportable.** It is also contrary to the position the CMA / CC has taken in the past on the speed of change in TMR.

- **The lack of a coherent and time-consistent view of the UK economy also gives rise to inconsistencies across the price control.** For the CAA, the

[91] *'Bristol Water plc A reference under section 12(3)(a) of the Water Industry Act 1991 – Final Report.' CMA (October 2015); page 332.*
[92] *'Cost of capital for PR19.' Frontier Economics (March 2019); page 16.*

significant step-down in TMR is at odds with an overall assumed efficiency challenge that is 'at least as big' as the one set at RP2.

- We are aware that other regulators (most notably Ofwat and Ofgem) are currently signalling a 'similar' position to the CAA on TMR (although have yet to make final determinations of this). We have not discussed this as part of our review, as we consider it irrelevant. This is because **the recently articulated positions of other regulators reflect the same concerns and observations we have raised regarding the CAA's (and NERL's positions).** Namely, they fail to ground their approach in a time-consistent view of the economy. Hence, in Ofwat's case, the obvious common sense tension between its view that *"now is the time for an efficiency step change",* at the same time as assuming a collapse in TMR.

- Separately from the key intuitive arguments, **we are concerned by the reinterpretation of realised historical returns in CPI terms by the economic regulators, based on the recent UKRN study.** Again, we have not addressed this in detail within our observations here. We simply note that, as observed by Frontier Economics, there are a range of entirely legitimate and plausible interpretations of the data in real terms. What matters is that the CAA's proposed interpretation represents a clear change from the past and ignores the legitimacy of other perspectives (the inference being that the UKRN paper has 'resolved' the debate). We do not consider that to be credible.

2.5 Asset beta

In the following, we provide an evaluation of the evidence relating to the asset beta. By way of summary, Table 13 shows the finalised positions of the CAA and NERL in relation to this. The table further summarises the evidence each party developed and the range for asset betas implied by this (noting that these are 'as stated' by each party and do not reflect our own interpretation of the evidence).

Table 13: Summary of positions and evidence relating to the asset beta

	CAA (Final Decision)	NERL (Response to Draft Proposals)
Asset beta	**0.46**	**0.57**
Evidence sources (ranges shown)		
UK airports	0.54*	NA
International listed airports	NA	0.53 – 0.58****
Utility comparators	0.44**	NA
ENAV	0.40 – 0.48	0.53 - 0.58
Regulatory precedent	0.3 - 0.83***	NA

**EE define this is an upper bound, within a 'constraint range' for NERL's asset beta. Hence, although a range is estimated, the CAA appears only to draw on the 0.54 figure. **Similarly, this is defined by EE is a lower bound within a 'constraint range' for NERL's asset beta. ***this does not appear to form part of EEs' finalised proposed beta range, upon which the CAA reaches it decision. ****On the basis of ADP.*

2.5.1 The CAA's position and supporting evidence

In its Final Decision, the CAA proposed an asset beta of 0.46 for NERL. The CAA further described this as a 'conservative' view, in light of updated information.[93] The CAA's determination of the asset beta was informed by the following evidence (primarily developed by EE):

- views on appropriate comparators and their relative risk;
- beta estimates for UK airports;
- beta estimates for regulated utilities;
- beta estimates for ENAV; and
- regulatory precedent from other utility sectors.

In the following we briefly summarise the CAA's evidence for each of the above.

2.5.1.1 Assessment of relevant comparators and their relative risk

EEs' December 2018 report contained some discussion of the relative risk of potential comparators to NERL for the purpose of determining the asset beta. This is as follows.

EE firstly identified UK airports as being firms that it would expect to have a 'higher' asset beta than NERL. EE suggested that this is because traffic through UK airspace is

[93] *'UK RP3 CAA Decision Document: Appendices.' CAA (August 2019); Appendix E; page 56.*

more internationally diversified. As such, EE suggested it should have lower volatility and lower correlation of volatility with UK macroeconomic volatility (and so, it is argued, less of the risk in such traffic will be systematic in nature). EE also stated that NERL benefits from a risk-sharing mechanism, which does not apply to UK airports.[94]

EE secondly identified 'typical' UK utilities (energy and water) as being firms that it would expect to have 'no higher' an asset beta than NERL. Here, the key points raised by EE were that, whilst said firms were subject to similar regulatory frameworks, they were not exposed to volume / demand risk (whereas, NERL is). In addition, EE acknowledged that said firms might also have lower betas than NERL, due to NERL having higher operational leverage. However, EE suggested this is a more 'tentative' reason to suppose NERL's beta should be higher, as it is difficult to interpret differences in operating leverage across firms in different industries.[95] EE also noted that some regulated utilities, such as SONI, might be 'more similar' to NERL.

EE then identified firms that might be more 'direct comparators' for NERL. Here, EE noted that the best comparator would be another ANSP, and highlighted that the only listed ASNP is ENAV (an Italian firm). EE set out a view that NERL and ENAV were similar in several respects, and referred to evidence from the ACE (2016) report to support this view. EE highlighted that NERL and ENAV: (i) have similar operational and economic features; (ii) operated under the same EU regulatory framework (iii) have similar key performance areas; and (iv) are also subject to the same risk sharing mechanism. EE also addressed points previously raised by NERA as to why ENAV might not be comparable in certain respects.[96] Finally, and also of relevance to 'relative risk', EE observed that:

- around 80% of ENAV's revenues were from en-route – hence some form of adjustment would be needed to reflect the risk of the relevant notional firm; and
- NERL is probably more exposed to Brexit related risk than ENAV.

2.5.1.2 UK airports

As outlined above, EE suggested that NERL's asset beta should be lower than that of UK airports. Accordingly, its December 2018 report provided an assessment of comparator airport betas. Specifically, EE sought to proxy a 'non-Heathrow' and 'Heathrow' beta.

In relation to the former, EE assumed that the beta assigned to Gatwick at Q6 (a figure of 0.56) provides a relevant proxy for the 'non-Heathrow' estimate.

In relation to the 'Heathrow' asset beta, EE estimated betas for two comparator airports: AdP and Fraport. For both, 1 and 2 year betas were estimated, using domestic and EU indices. These implied unlevered betas ranging from 0.44 to 0.58. EE noted that if they equally weighted the 1 and 2 year estimates and domestic and EU indices, their analysis implies unlevered betas of:

- 0.55 for AdP; and
- 0.48 for Fraport.

[94] *'Components of the Cost of Capital for NERL.' Europe Economics (December 2018); page 17.*
[95] *'Components of the Cost of Capital for NERL.' Europe Economics (December 2018); page 18.*
[96] *'Components of the Cost of Capital for NERL.' Europe Economics (December 2018); pages 19-20.*

EE then selected the lower (Fraport) number as a 'ceiling' for a UK airport beta, as a proxy for Heathrow. With an assumed debt beta of 0.1 and gearing of 60%, EE found this implies an asset beta of 0.54 (for Heathrow, as a comparator).[97]

EEs' updated (June 2019) report does not include any additional evidence on the betas for AdP and Fraport. However, in bringing its various beta estimates together, it positioned the 0.54 estimate (which it described as being a proxy for Heathrow) as providing the 'upper bound' for NERL's asset beta, within a constraint range.[98]

2.5.1.3 ENAV

In its December 2018 report, EE estimated 1 and 2 year betas for ENAV, using both domestic and European indices. They found that ENAV's unlevered beta varied from 0.34 to 0.71, depending on whether the domestic or European index was used - and on the time period. However, EE then narrowed the range by focusing on the 2 year estimates. It then used the domestic estimate as the 'floor' and the European estimate as the 'ceiling', implying a range of 0.34 to 0.54. They then assumed that the asset beta range was the same as the unlevered beta range, by assuming a debt beta of zero.[99]

In its June 2019 WACC report to support the CAA's Final Decision, EE updated its analysis of ENAV's 1 and 2 year asset betas. As before, EE estimated betas for ENAV, using both domestic and European indices. The revised report identified an asset beta range of 0.40 – 0.48 on this basis (assuming a zero debt beta).[100]

As we subsequently explain when we set out how EE and the CAA ultimately draw the various evidence strands together, further adjustments were made to the estimated ENAV betas to reflect revenue mix and operational leverage.

2.5.1.4 Utility comparators

In its Final Decision, the CAA also relies upon estimates of betas from other regulated utilities. Specifically: Centrica; National Grid; Pennon; SSE; Severn Trent; and United Utilities.

EEs' (December 2018) report estimated 1 and 2 year betas for the above companies. They found an overall range of unlevered betas of 0.30 to 0.54. The average of the 2 year unlevered betas was 0.38; and the average of the 1 year unlevered betas was 0.43. However, EE 'focused' on the 2 year numbers, and so suggested the data supported a figure of 0.38. They then assumed a debt beta of 0.125 at 60% gearing (based on the water sector), which implies an asset beta of 0.46 (which EE interpreted as a 'floor'.)[101]

In its updated (June 2019) report, EE found that the unlevered betas for these companies ranged from 0.27 to 0.50, with an average of 0.36. They then applied a debt beta of 0.125, resulting in an overall asset beta of 0.44.[102] EE only updated

---

97 *'Components of the cost of capital for NERL.' Europe Economics (December 2018); page 39.*
98 *'Comments on NERA/NERL critiques of Europe Economics.' WACC analysis.' Europe Economics (June 2019); page 22. EE appears to refer to a figure of 0.54 and 0.55 in various places.*
99 *'Components of the cost of capital for NERL.' Europe Economics (December 2018); page 42.*
100 *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis' Europe Economics (June 2019); page 21.*
101 *'Components of the cost of capital for NERL.' Europe Economics (December 2018); page 43.*
102 *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis' Europe Economics (June 2019); page 22.*

estimates for 2 year betas (whereas in its first report, both 1 and 2 year betas were calculated - although as above, only the 2 year beta was relied upon).

2.5.1.5 Regulatory precedent

EEs' December 2018 report set out a table, showing a range of regulatory determinations of asset beta for regulated utilities going back to 2013. This showed a wide range of estimates, from 0.30 to 0.83.[103] In practice, this evidence does not appear to be used to inform EEs' proposed beta range.

2.5.1.6 Determining an asset beta estimate from the evidence

Europe Economics December 2018

To draw the various evidence together, a number of steps were undertaken. Firstly, EE (2018) stated that the overall range for the NERL asset beta was 0.29 to 0.54.[104] This is based on its estimates for ENAV, where EE made further adjustments to reflect the fact that around 80% of ENAV's revenues are attributable to en-route traffic, with the remainder being terminal services. EE suggested that this implies the ENAV beta is effectively a weighted average of an airport beta and a beta for en-route.

Secondly, interpreting the above as the ENAV range, EE considered whether any adjustments are required for operational leverage between ENAV and NERL. EE examined three measures of operational leverage: (i) capex/opex; (ii) capex/total assets; and (iii) opex/total assets. EE found these methods imply adjustment ratios ranging from 1 (i.e. no adjustment) up to 1.21, with an average of 1.09 (i.e. a 9% adjustment). They then applied this to the mid-point of the overall ENAV range above (0.42, based on the range of 0.29 to 0.54). This, in turn, implies a figure of 0.46, which they noted is at the bottom of their recommended 'constraint range' (see below).[105]

Thirdly, EE suggested that any figure selected should be consistent with what it calls a 'constraint range'. This is the range within which they say an asset beta for NERL must plausibly lie. This is defined in terms of UK utilities as a 'floor' and UK airports as a 'ceiling'. Accordingly, EE (December 2018) defined the asset beta constraint range for NERL as being 0.46 to 0.54.[106] EE clarified that their interpretation of the evidence is not that the asset beta lies at the centre of the constraint range (which merely informs the 'plausible limits' of the range). Rather, they suggested that the combination of these two sources of evidence (the constraint range and the overall range) implies the appropriate beta lies above the mid-point of the overall comparator range (i.e. must be at or above 0.46).

Europe Economics June 2019

As highlighted in the preceding sections, EEs' (June 2019) report provided updates on some, but not all, of the beta evidence relied upon by the CAA. Of relevance to determining the overall range and point estimate, we note the following:

[103] *'Components of the cost of capital for NERL.' Europe Economics (December 2018). Table 3.3m page 15.*
[104] *'Components of the cost of capital for NERL.' Europe Economics (December 2018); page 43.*
[105] *'Components of the cost of capital for NERL.' Europe Economics (December 2018); page 44.*
[106] *'Components of the cost of capital for NERL.' Europe Economics (December 2018); page 44.*

- The 'constraint range' changed to 0.44 as the 'floor' (based on its updated assessment of a utility beta);[107] and to 0.54 as the 'ceiling' (based on UK airports).

- The overall 'comparator range' changed to 0.36-0.46.[108]

- EE continued to suggest an adjustment for operational leverage is appropriate and continued to apply a factor of 9%. Based on the mid-point of the overall range (0.41), that implies an asset beta for NERL of 0.45. EE noted that this is just above the minimum of its constraint range.[109] They further suggested that a value towards the 'bottom end' of the constraint range was supported by the analysis.

CAA Final Decision

As noted above, the CAA ultimately applied an asset beta of 0.46 in its Final Decision, which it suggested is conservative, in light of the updated evidence from EE. The CAA does not appear to attach particularly more or less weight to any one evidence source in reaching this view. It noted, however, that its assumption of 0.46 is above EEs' minimum proposed value of 0.44 (i.e. the 'floor' in the constraint range).[110]

2.5.2 NERL's position and supporting evidence

As previously summarised, in its response to the CAA's Draft Proposals, NERL suggested an asset beta of 0.57.[111] This is around the 'top end' of the range proposed by NERA (on behalf of NERL). The evidence relied upon to support this includes:

- views on appropriate comparators and their relative risk;
- beta estimates for ENAV;
- beta estimates for listed international airports; and
- changes in systematic risk between RP2 and RP3.

In the following, we briefly summarise each of the above in turn.

2.5.2.1 Appropriate comparators and their relative risk

NERA's March 2018 report

In its March 2018 report for NERL, NERA set out its assessment of a suitable comparator set and their risk, relative to NERL. In relation to appropriate comparators, NERA suggested:

- That international listed airports, not UK airports (such as Heathrow) should be used. This is because the betas for UK airports, themselves not being listed, are therefore 'estimates' derived from comparators. So, NERA suggested that the step of 'estimating' the beta for a UK airport, before then considering its relative risk,

---

107 *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019); page 22.*
108 *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019); page 22.*
109 *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019); page 22.*
110 *'UK RP3 CAA Decision Document: Appendices.' CAA (August 2019); page 53.*
111 *'NERL's response to CAP1758: Draft UK reference period 3 performance plan proposals.' NERL (April 2019); page56.*

adds further measurement error. NERA suggested this is avoided if one simply uses the listed international airports in the first place.[112]

- NERA did not think that other regulated utilities should be used. Specifically, whilst NERA considered NERL's asset beta should, logically, be above those of utilities, that does not mean the observed betas of utilities are in any way informative of the 'range' for NERL's beta. NERA stated that this is both because systematic risk varies significantly across utilities, relative to NERL; and also because of differences in regulatory risk (which impact the degree to which such risks are allocated to the companies, relative to NERL).[113]

In relation to the interpretation of (or adjustments to) comparator betas, NERA emphasised the importance of analysing their risk, relative to NERL. NERA examined three main risk categories: (i) traffic risk; (ii) operational leverage; and (iii) 'other' risks, which mainly relate to: Brexit and impacts associated with UK economic performance; expansion of European hubs relative to the UK; and regulatory risk.

Regarding traffic (demand) risk, NERA provided three analyses. They firstly showed trends in demand (CSUs) for NERL, relative to other airports since the 2008 financial crisis. NERA stated that this shows that demand for NERL was more responsive to the crisis, relative to international listed airports, and has recovered less strongly.[114] Secondly, NERA compared the standard deviation of passenger demand and the split of transfer and international passengers across airports. NERA observed that NERL has amongst the highest volatility in demand. Thirdly, NERA reviewed and summarised the extent to which the listed airports are exposed to / shielded from demand risk by their respective regulatory regimes.

Drawing the above evidence together, NERA suggested that AdP (which operates Charles De Gaulle and Orly) is the most appropriate comparator for NERL.[115]

In relation to operating leverage, NERA presented a time series analysis, using three metrics: opex/RAB; capex/RAB; and capex/opex. NERA then compared NERL's operating leverage to Heathrow's on the basis of capex/RAB; and opex/RAB. NERA highlighted that NERL has higher operating leverage than Heathrow and that the difference between them has increased over time. NERA therefore noted that, to the extent the CAA relies upon Heathrow as a comparator, the implied asset beta for NERL *must be higher than 0.505* (the logic being that, at RP2, the CAA's asset beta estimate for Heathrow had not been upwards adjusted to reflect NERL's relatively higher leverage).[116]

NERA's September 2018 report

NERA's updated report of September 2018 largely reflected the above in terms of the assessment of relevant comparators and relative risk. Specifically, NERA continued to propose that listed international airports (not UK airports) are the most appropriate comparator, and that utilities are not helpful comparators.[117]

---

112 *'NERL's asset beta for RP3.' NERA (March 2018); page 2.*
113 *'NERL's asset beta for RP3.' NERA (March 2018); pages 3 - 4.*
114 *'NERL's asset beta for RP3.' NERA (March 2018); page 24.*
115 *'NERL's asset beta for RP3.' NERA (March 2018); page 29.*
116 *'NERL's asset beta for RP3.' NERA (March 2018); page 31.*
117 *'Updated weighted average cost of capital for NATS (En-Route) plc at RP3.' NERA (September 2018); page i in executive summary.*

NERA's April 2019 report

NERA's position in its 2019 report remained broadly consistent with the above. Again, NERA emphasised its view that listed international airports are the most relevant comparators; and that utilities are not relevant. NERA also further continued to take the view AdP is the 'closest' comparator – and that UK airports do not represent an 'upper bound' for NERL's asset beta.[118]

2.5.2.2 Beta estimates for ENAV

NERA's March 2018 report

In its March 2018 report, NERA considered the suitability of ENAV as a comparator for informing NERL's asset beta. At the time, NERA's view was that ENAV should not be used, primarily due to the short time period for which relevant data was available – and also because of the volatility in ENAV's beta over that time period (from which NERA suggested the market had not reached a view on its systematic risk).[119]

NERA's September 2018 report

NERA's September 2018 report included an estimate of ENAV's asset beta. This reflects a slight change in position, relative to NERA's previous report (above). Specifically, whilst previously NERA considered ENAV was not an appropriate comparator (due to data limitations), in this later report, NERA considered ENAV to be useful (i.e. because more time had elapsed, meaning more data was available), so long as the implied estimates were *"treated with caution, and adjusted to take into account the key differences between ENAV and NERL."*[120] NERA found ENAV's asset beta to be 0.52 (2 year); and 0.66 (1 year). NERA further suggested that ENAV may understate the appropriate asset beta for NERL.

NERA's April 2019 report

NERA's updated report of April 2019 both reviewed EEs' beta estimates for ENAV and provided further estimates of said beta. In relation to the former, key issues highlighted by NERA included the following:

- a concern that EEs' estimates for ENAV were based on a local index, and so were understated;
- EE made an incorrect assumption that ENAV's terminal services are higher risk than En-Route; and
- the resultant beta estimates were implausibly low.

NERA then set out their own updated estimate of an asset beta, based on ENAV. NERA's approach was as follows: (i) the Euro Stoxx 600 was used as the index; (ii) a debt beta of 0.05 was assumed; and (iii) 2 year (average and spot) betas were estimated. NERA reported that this implies an asset beta range of 0.45 to 0.49 for ENAV.

NERA then made two adjustments: (a) an 8% uplift to reflect its assessment that ENAV's En-Route services are subject to greater risk than its terminal services; and

[118] *'Cost of equity for RP3.' NERA (April 2019).*
[119] *'NERL's asset beta for RP3.' NERA (March 2018); page 38.*
[120] *'Updated weighted average cost of capital for NATS (En-Route) plc at RP3.' NERA (September 2018); page 12.*

(b) a 9% uplift for operating leverage (see separate discussion). NERA thus reported a 'corrected' asset beta range of 0.53 to 0.58 for ENAV. They suggested an appropriate value for NERL would be towards the top of that range, given NERL's greater exposure to traffic risk (which is not adjusted for).[121]

2.5.2.3 Beta estimates for international airports

NERA's March 2018 report

NERA estimated asset betas for internationally listed airports in its March 2018 report. Both 2 and 5 year betas were estimated. NERA included the following airports in its analysis: AdP; Frankfurt; Zurich; Vienna; Copenhagen; Sydney; Auckland; and AENA. The overall average asset betas reported were 0.54 (2-year); and 0.48 (5-year).[122] The overall range was wide, from 0.22 (Vienna); to 1.08 (Auckland). NERA noted that Vienna and Copenhagen both had particularly low asset betas. It suggested this may be related to the fact that for both, Government retains high levels of shareholdings. NERA therefore does not consider these to be helpful comparators for setting an asset beta for NERL. In relation to Auckland, NERA did not find any reasons to exclude it, although it noted its asset beta is atypically high.[123]

NERA's September 2018 report

NERA updated its estimates of asset betas for the above mentioned airports, including data up to August 10th 2018. NERA found that both the 2 and 5 year asset betas had increased, which it suggested reflected a 'flight to quality' and 'return to normal' post crisis. NERA found the average asset betas were 0.59 (2 year); and 0.50 (5 year).[124]

NERA's April 2019 report

NERA's latest report included a further update of asset betas for listed international airports (same sample as above). The latest data showed a range of 0.58 (2 year) to 0.50 (5 year). NERA continued to identify ADP as the most relevant comparator (2-year beta of 0.58; 5-year of 0.53).[125]

2.5.2.4 Changes in systematic risk since RP2

NERA's March 2018 asset beta report contained various evidence relating to whether systematic risk has changed since RP2. Relevant evidence contained in NERA's report is as follows:

- NERA examined how volume risk has changed over time. It noted that the CAA previously found that NERL was exposed to around 70% of total volume risk after risk sharing was applied. NERA updated this analysis an found NERL has in practice borne 67% of volume risk between the period before RP2 to now.[126]
- NERA also analysed trends in NERL's operating leverage (operational intensity), relative to Heathrow. Here NERA found that, although there was some year-to-

121 'Cost of equity for RP3.' NERA (April 2019); page 26.
122 'NERL's asset beta for RP3.' NERA (March 2018); page 18.
123 'NERL's asset beta for RP3.' NERA (March 2018); page 20.
124 'Updated weighted average cost of capital for NATS (En-Route) plc at RP3.' NERA (September 2018); page 12.
125 'Cost of equity for RP3.' NERA (April 2019); page 32.
126 'NERL's asset beta for RP3.' NERA (March 2018); page 6.

year volatility, in general NERL's operational intensity has been stable since RP2.[127]

- NERA noted that Brexit uncertainty was a new risk since RP2. In terms of demand risk, NERA highlighted that NERL's volume forecasts did not reflect asymmetric downside risk scenarios linked to Brexit.[128]
- A possible increase in regulatory risk was highlighted, which might create additional asymmetric downside risk.
- NERA suggested that the incentive schemes might create asymmetric risk if there was an unequal treatment of bonuses and penalties (or if the targets were set such that downside was more likely).

Overall, NERA's view was that, relative to RP2, there was an increase in asymmetric downside risk for NERL at RP3 – and that this would not typically be reflected in the standard CAPM cost of equity.[129]

2.5.2.5 Determining an asset beta estimate from the evidence

In its March 2018 report, NERA suggested a range for NERL's asset beta of 0.55 to 0.60. The lower bound was equal to NERA's estimate of AdP's 2 year asset beta, which NERA suggested was the most appropriate comparator. The upper bound of 0.60 reflected the average 2 year beta for all listed international airports (excluding Copenhagen and Vienna). NERA justified their exclusion on the basis that a high proportion of their shares are state owned.[130]

In NERA's September 2018 updated report, its proposed range for NERL's asset beta was revised upwards to 0.56 – 0.66. NERA's proposed lower bound reflected its updated estimated of AdP's 2 year asset beta. NERA's proposed upper bound reflected its assessment of the average 2 year beta for international listed airports (with 'less weight' attached to airports NERA considered to be 'less comparable').[131]

In its April 2019 report, NERA's final proposed asset beta range for NERL was from 0.53 to 0.58. This is consistent with NERA's updated estimate for ENAV (described above). However, NERA continued to take the view that AdP is NERL's closest comparator; and NERA's updated analysis suggested an asset beta for AdP of 0.58. NERA suggested the asset beta for NERL should be at the top end of its proposed range, given NERL's greater exposure to traffic risk, relative to ENAV (for which no adjustments are made).[132]

[127] *'NERL's asset beta for RP3.' NERA (March 2018); page 31.*
[128] *'NERL's asset beta for RP3.' NERA (March 2018); page 34.*
[129] *'NERL's asset beta for RP3.' NERA (March 2018); page 35.*
[130] *'NERL's asset beta for RP3.' NERA (March 2018); pages 44 - 45.*
[131] *'Updated weighted average cost of capital for NATS (En-Route) plc at RP3.' NERA (September 2018); page 14.*
[132] *'Cost of Equity for RP3.' NERA (April 2019); page 33.*

2.5.4 Our assurance review

Having reviewed the above evidence regarding the asset beta for NERL at RP3, we consider the key issues to be as follows:

- the selection and weighting of relevant comparators;
- the time periods for beta estimation;
- the use of 'domestic' or 'wider' indices for beta estimation;
- the interpretation of an asset beta for ENAV;
- adjustments for operational leverage;
- adjustments for relative risk; and
- changes in systematic risk since RP2.

We have therefore structured our findings and analysis around the above issues in the following subsections.

THE CURRENT COMPARATOR CHOICES FOR BETA ARE NOT THE RESULT OF AN OBJECTIVE AND COMPREHENSIVE ASSESSMENT OF RELATIVE RISK. HOWEVER, NERL's EVIDENCE IS BASED ON A MORE THOROUGH RISK ANALYSIS THAN THE CAA's.

2.5.4.1 Selection of relevant comparators and weight attached to evidence

The range of different beta estimates from companies across various industries set out above illustrates the main risk of the use of comparator analysis to determine beta for a regulated company. In the absence of a 'perfect' comparator, such analyses can descend into a 'pick and mix', in which parties choose preferred comparator betas based on assertions of similarities that are rooted in, at best, a partial assessment of the risks that the companies in question actually face. Further, a partial understanding of risk then makes it difficult to justify the weight attached to different comparator betas when arriving at an overall view on the beta for a regulated company.

In this context, some of the weaknesses of both NERA's and EEs' approaches become apparent. For example, EE argues that NERL's asset beta should be lower than that of UK airports, based on two observations: (i) that some of NERL's traffic is global and therefore less correlated with UK macroeconomic volatility; and (ii) that airports do not have access to NERL's risk-sharing mechanisms.[133] EE gives no consideration to other differences or similarities in the risks that NERL and UK airports face – including factors such as operating leverage, which it considers for other comparators. EE therefore lacks a robust basis for its conclusions regarding the choice of comparators.

A further example is in EEs' use of utility comparators. EE treats energy and water utility companies as a group and uses the average estimated beta as the bottom of its 'constraint range'. This is, again, based on a partial assessment of risk, driven primarily by the observation that such comparators typically do not face volume risk. In this case, the failure to consider risk in a holistic manner leads EE to gloss over the fact that energy comparators have materially higher betas than water comparators. This potentially has important implications for the bottom of the constraint range under EEs' approach, but the lack of an overall framework for thinking about risk means that this is simply not considered.

We think that similar observations also apply to some aspects of NERA's approach (on behalf of NERL) albeit to a lesser degree. NERA does make a more rigorous assessment of the differences between NERL and potential comparators than EE,

[133] *'Components of the Cost of Capital for NERL.' Europe Economics (2018); page 17.*

focusing on three broad areas: (i) traffic risk; (ii) operating leverage; and (iii) a broad category of 'other risks', including the UK's European Union membership and changes to NERL's incentive schemes. This assessment is, however, applied only to potential airport comparators and applied only to these specific risks. Other potential comparators are dismissed on the basis of the sort of 'pick and mix' approach to comparators we set out above.

In our view, the selection of relevant comparators and subsequent weighting of evidence requires a somewhat different approach to those pursued by EE and NERA. This approach should combine the following aspects.

- **The approach should begin with a wide set of potential comparators and then narrow this down,** according to a risk-based framework. The initial set of candidate comparators can be based on listed companies in related industries, primarily (for NERL) air travel.

- **The selection of comparators should be based on an objective set of criteria,** derived from a consideration of the full range of risks that both NERL, and the potential comparators, face. This is important because the observation that NERL and another company are similar, or different, with respect to a particular risk does not mean that, overall, the company is (or is not) a good comparator.

- **The weighting of the selected comparators should be based on the assessment of risks set out in the preceding step.** No comparator will be a perfect match for NERL, but an understanding of similarities and differences across all risk areas will allow a much better judgement to be made as to whether particular comparators have higher, or lower, systematic risk than NERL, and therefore how evidence from them should be weighted.

To provide an example of the application of risk-based criteria, we now provide a high-level assessment of the comparator groups that NERA and EE used, namely: airports and ANSPs in NERA's case; and airports, ANSPs and utilities in EEs' case.

In the first place we note that there are three potential sources of systematic risk, and we assess the potential comparators' similarity to NERL against these.

- **Revenue risk**, which is determined by systematic risk relating to: (i) prices; and (ii) volumes.

    - » ANSPs have potentially similar revenue risk to NERL. Overall demand is unlikely to differ too strongly between ANSPs. ANSPs face similar regulation in the form of a price cap and volume risk sharing (but not all have Oceanic, for which there is greater traffic risk).
    - » Airports have potentially similar revenue risk to NERL. Overall demand shares many of the same drivers for airports and for NERL. We understand that some airports also face price cap regulation and volume risk sharing mechanisms.
    - » Utilities have much lower revenue risk than NERL, as for the most part their prices are fixed and they are fully (or mainly) shielded from volume risk.

- **Cost risk** which is again determined by systematic risk relating to (i) input prices; and (ii) volumes.

- ANSPs have potentially similar cost risk to NERL, primarily because their regulatory structure gives them some protection from inflation risk and volume-related cost risk is likely to be broadly similar.
- Airports may potentially have somewhat similar cost risk to NERL, given that they are likely to face similar volume-related cost risk (although an analysis of cost-response would be required to inform this).
- Utilities have lower cost risk than NERL. This is for two reasons. Firstly, their 'cost response' to changes in demand is likely to be lower than for NERL. Secondly, to the extent that changes in demand drive *variable* cost risk, we note that the demand utilities face in the supply of water and energy is materially less volatile than demand for air travel.

- **Operating leverage**, which affects the balance between fixed and variable costs - and therefore how strongly profits change with volume. Evidence from both EE and NERA suggests that NERL has higher operating leverage than both ANSP and airport comparators.

We summarise this assessment in Table 14.

Table 14: Application of high-level criteria to comparator groups

Category	Revenue risk	Cost risk	Operating leverage	Overall conclusion
ANSPs	Potentially similar	Potentially similar	Lower	**Potentially suitable**
Airports	Potentially similar	Potentially similar	Lower	**Potentially suitable**
Utilities	Materially lower	Materially lower	Unknown	**Unsuitable**

Source: Economic Insight

The above is only a high level assessment and does not reflect the type of detailed risk analysis we would recommend to inform specific comparator selection. However, in the context of our assurance review, it illustrates why such an approach is so important. Indeed, based on the above and our review of the evidence of the parties, our overall view is that NERA's comparator base provides a more robust basis for comparison than EEs'. This is primarily because of EEs' use of utility comparators, which face materially lower revenue and cost risk and are therefore unsuitable as a basis for assessing NERL's beta.

2.5.4.2 Time periods for beta estimation

Choosing the time period over which beta is estimated is generally thought of as balancing: (i) the gain in statistical robustness from the additional observations gained through a longer time period; with (ii) the fact that betas change over time, such that using a longer time frame for beta estimation may not capture more recent changes. In addition, we think that a third consideration is also important; namely, time consistency with other parameters used in estimating the WACC.

With daily returns data, it is generally considered that at least a year of data is required to generate a sufficiently robust estimate, with most emphasis generally put on two-year estimates (with five-year estimates also analysed in some cases). For example, Wright et al (2003) suggest that betas estimated over one and two year periods will generally give sufficiently low standard errors to use for estimation purposes, although where there are material differences they suggest examining six month betas.[134] This is based on their finding that going from a one to two year estimation period generally leads to a fall in beta standard errors of 40%, while moving to three and four years of data leads to further falls of 22% and 15% respectively. In their reports on NERL's beta for RP3, NERA consider both two- and five-year asset beta estimates, while EE consider one- and two-year periods.

The choice between one-, two- and five-year beta estimation windows is, overall, driven by the weight that one attaches to statistical robustness versus the risk of including 'out of date' returns information. In the context of economic regulation, we consider that the need for consistency and predictability implies that most weight should be attached to the first criterion. This will generally favour a 'longer' estimation window. In addition, maintaining time consistency with other WACC parameters may also point to favouring a longer estimation period. In general, there is no obviously 'correct' timeframe and the overriding requirement is to maintain internal consistency. However, where there is significant uncertainty around future developments, for example over the UK's European Union membership, this could also point towards leaning on longer term evidence.

Our overall recommendation, therefore, is that most emphasis be placed on two- and five-year beta estimation windows. In addition, we think that the risk of failing to detect changes in beta due to the use of a longer timeframe can be mitigated by the use of betas estimated on rolling windows. This can detect trends over time in beta, and therefore aid in the understanding of whether beta appears to be stable, rising, or falling. Where there appears to be instability in estimated betas, analysis should be undertaken to understand whether betas tend to 'revert' to a particular level (in which case a longer timeframe should be favoured), or whether betas appear to be trending in a particular direction (in which case a shorter timeframe is preferable).

2.5.4.3 Use of domestic versus 'wider' indices

The question of the relevant index to use when estimating beta goes to the heart of the relationship between the practical estimation of betas and the underlying theory of the CAPM. Beta in the theoretical CAPM is defined with respect to the 'market portfolio'. This portfolio includes *all* risky assets, held in the same proportions, as described by Fama and French (2004):[135]

"With complete agreement about distributions of returns, all investors see the same opportunity set … and they combine the same risky tangency portfolio T with risk-free lending or borrowing. Since all investors hold the same portfolio T of risky assets, it must be the value-weight market portfolio of risky assets. Specifically, each risky asset's weight in the tangency portfolio, which we now call M (for the "market"), must be the

[134] *A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK.' S. Wright, R. Mason & D. Miles (2003); page 87.*

[135] *'The Capital Asset Pricing Model: Theory and Evidence.'. E.F. Fama & K.R. French, 'Journal of Economic Perspectives', Vol.18 No.3. (2004); page 28.*

total market value of all outstanding units of the asset divided by the total market value of all risky assets."

The theoretical CAPM in this respect is clearly very far from observable facts about the portfolios of risky assets that investors actually hold. In this context, Wright et al (2003) raise the possibility of addressing this with the *"pragmatic solution"* of a portfolio *"which reflects the composition of assets held by the dominant owners of the stocks in question".* Such a portfolio would be constructed from a mix of UK and overseas stocks and bonds. They note, however, that it is more common to use an all-equity domestic index.[136]

In practice, we agree with NERA and EE on using equity indices when estimating betas, rather than constructing portfolios that add other assets such as bonds. This is primarily for the pragmatic reason that constructing new portfolios using combinations of equities and bonds would introduce the need to make additional decisions, for example over which bonds to include and the weights to attach to them. The use of existing equity indices, on the other hand, avoids the need for debates over these issues. In addition, using equity indices is the approach generally taken by market participants when estimating betas.

The question is therefore which *equity index* it is appropriate to use in estimating betas. In practice, this is a choice between the use of an equity index for the domestic market and the use of a wider index, such as a Europe-wide portfolio of stocks. EE places weight on betas estimated using both domestic and European indices, whereas NERA use a European index for Eurozone comparators and domestic indices for others. The main area of disagreement is, therefore, on the appropriate weight to apply to domestic indices for Eurozone countries.

In our view, NERA is correct to say that the appropriate way to think about this is *"the financial market that best represents their investment opportunity set".*[137] The intuition for this is that the fundamental insight of the CAPM is that required returns depend on the contribution of the asset to the risk of investors' portfolios. As such, in practice the price of a particular asset will be determined by the actual portfolios of its investors. Consequently, we do not think that EE is correct to say that domestic indices should be used because *"the equity beta ultimately to be derived from this exercise will be applied to a domestic (UK) index and the ERP used will be a domestic UK ERP".*[138] The question is what the relevant market is *for the asset in question*.

The available evidence tends to indicate that investors can, and do, diversify beyond the UK. For example, Professor Zalewska stated that: *"[g]iven the international nature of investors investing in the UK market, as well as the fact that it is common for British investors to diversify abroad, and that European assets are commonly held, two European stock market indices were also selected."*[139]

Overall, we consider European indices represent the most appropriate basis for estimating betas for Eurozone stocks. We further consider it more plausible that the relevant set of potential investments is wider than the domestic German, French or

---

136 *A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK.' S. Wright, R. Mason & D. Miles (2003); page 97.*

137 *'NERL's Asset Beta for RP3: A Report for NERL." NERA (2018); page 16.*

138 *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (2019); page 6.*

139 *'Estimation of the debt beta of the bond issued by NATS En-Route) plc.' Anita Zalewska, University of Bath (April 2019)' pages 12-13.*

Italian markets only. In addition, we think that NERA's criticism that domestic European indices (unlike the FTSE All Share) contain limited numbers of large cap stocks has some force. The wider coverage of the Europe Stoxx 600 (and FTSE All Share) is more in the spirit of the diversified 'market portfolio' concept that underlies the CAPM. In this respect, we also agree with NERA that, in principle, the benchmark for the market return should include the asset in question – a point which further favours the Europe Stoxx 600 index.

2.5.4.4 Adjustments for operational leverage

Operational leverage refers to the balance between fixed and variable costs within a company's cost structure. The principle that higher operational leverage generally increases systematic risk is well established in finance theory. The intuition for this is that, in most circumstances, a higher proportion of fixed costs would be expected to *increase* the volatility of profits that a business earned. This is because total variable costs change with volume and can therefore be expected to offset changes in revenue that occur when volume changes. The greater is the share of variable costs in the company's cost structure, the greater is the impact of this offsetting effect, and therefore the more stable is the company's overall profit.

This can be shown mathematically as follows. The value of any asset equals the present discounted value (PDV) of its cash flows. This, in turn, equals the PDV of the asset's revenues, less the PDVs of its fixed and variable costs, as set out in the equation below:

$$PDV(Cash\ Flow) = PDV(Revenue) - PDV(Fixed\ Costs) - PDV(Variable\ Costs)$$

or

$$A = R - F - V$$

The systematic risk or beta of these cash flow equals the weighted sum of the betas of revenue, fixed costs and variable costs, with weights determined by revenue, fixed and variable costs, as a share of the value of the asset:

$$\beta^{Asset} = \frac{R}{A} \cdot \beta^{Revenue} - \frac{F}{A} \cdot \beta^{Fixed\ Costs} - \frac{V}{A} \cdot \beta^{Variable\ Costs}$$

To show the impact of operating leverage on beta, first assume that the beta of fixed costs is zero. As fixed costs do not vary with quantity, it is reasonable to expect the beta of fixed costs to be lower than that of variable costs, although in practice the level of fixed costs may vary with market returns. Assume, further, that the beta of variable costs equals the beta of revenue. Again, this simplifying assumption is reasonable to the extent that fluctuations in revenue and variable costs are associated with volume, although there is no strong reason to expect the impacts to be the same for prices. These assumptions imply that the above expression can be rewritten as follows:

$$\beta^{Asset} = \beta^{Revenue}\left(1 + \frac{F}{A}\right)$$

This implies that systematic risk increases as the ratio $\frac{F}{A}$, fixed costs as a share of total asset value, increases.

The principle of adjusting beta for operational leverage is also well established in economic regulation. Such adjustments were applied by the CMA and CC at both the 2010 and 2015 (PR09 and PR14) price redeterminations for Bristol Water. These adjustments involved an uplift to asset beta, based on listed water and sewerage companies. This reflected the observation that Bristol Water, as a water-only company, had higher operational leverage than water and sewerage companies, and would therefore be expected to have higher systematic risk.

We note, however, that the 'flavour' of the rationale for the adjustment to Bristol Water's asset beta is somewhat different to the canonical case for operating leverage increasing systematic risk, in that it does not rely on variable costs offsetting fluctuations in revenue. The CMA summarised NERA's arguments on behalf of Bristol Water as being that: *"WoCs have a lower ratio of required return to revenue than WaSCs, are more exposed to short-run cyclical profit fluctuations and hence have higher systematic risk".*[140]

In practice, in 2015 the CMA established Bristol's higher operating leverage by examining several metrics:[141]

- the ratio of totex to average regulatory capital value (RCV), i.e. expenditure as a percentage of asset value;
- the ratio of revenue to average RCV, i.e. revenue as a percentage of asset value; and
- the ratio of operating cash flow to revenue, which the CMA measured by considering the percentage of allowed wholesale revenue from return on capital and RCV run-off.

The CMA based the uplift it applied on the latter measure, which gave a 13% uplift in 2015 and a 18% uplift in 2010.

In our view, both economic theory and regulatory precedent are clear that operational gearing affects systematic risk and that, where possible, allowance should be made for this. While this is inevitably difficult, because of the lack of either objectively 'correct' measures of operational gearing or a formulaic relationship between operational gearing and beta, this does not obviate the need to take account of its impact. As the CMA set out in its 2015 redetermination:[142]

> *"In coming to a view on the level of any uplift, we do however recognise that not all of the operational gearing will necessarily reflect systematic risk, and also that not all beta risk will result from operational factors … Although there is uncertainty over the scale of any uplift, and we agree that calculating a single value is difficult, we were not persuaded that zero is a suitable point estimate for the uplift."*

However, while precedent from the CMA establishes the *principle* of adjusting for differences in operating leverage, the CMA's logic for an adjustment in the case of Bristol Water was somewhat different to the standard, volume-driven, explanation for the impact of operating leverage on beta. For NERL, however, which faces volume risk through its price cap and has a lower RAB than other regulated companies, the

---

140 *'Bristol Water Plc: A Reference Under Section 12(3)(A) of The Water Industry Act 1991. Provisional findings report.' Competition Commission (2010); page N48.*

141 *'Bristol Water plc: A reference under section 12(3)(a) of the Water Industry Act 1991'. Appendices 5.1 – 11.1 and glossary. Competition and Markets Authority (2015); page A10(1)-26.*

142 *'Bristol Water plc: A reference under section 12(3)(a) of the Water Industry Act 1991'. Appendices 5.1 – 11.1 and glossary. Competition and Markets Authority (2015); page A10(1)-31.*

balance between fixed and variable costs in its overall cost structure is clearly the main way in which operating leverage affects the level of systematic risk.

This presents difficulties, as companies' accounts do not split out costs into fixed and variable categories, and so operating leverage is difficult to measure. This is reflected in EEs' and NERA's focus on three measures of 'operating intensity' rather than operating leverage per se: the ratios of capex to total assets, opex to total assets and capex to opex. These measures are clearly imperfect and reflect difficulties in generating a reliable measure of the relativities between fixed and variable costs.

In addition, we note EEs' view that operating leverage is *"of most relevance when considering two firms exposed to the same underlying risks but deploying different business models in responding to them."* We do not accept that operating leverage is less relevant when considering firms that have other differences in risk. While it would clearly not be informative to make adjustments to reflect differences in operating leverage to firms that were dissimilar across a large number of other drivers of risk, if a firm is viewed as sufficiently comparable to be used as evidence on beta in the first place, then adjustments to reflect differences in operating leverage will generally improve the accuracy of the comparison. Hence, there seems to be some logical tension in EEs' argument.

In this context, EE did apply a specific adjustment to its estimates for ENAV's asset beta, based on differences in operating leverage. The adjustment was based on the average difference between ENAV and NERL on the three metrics set out above: capex to total assets, opex to total assets and capex to opex. We agree with EE that it is difficult to call between these measures and therefore consider that their methodology for making this adjustment appears broadly appropriate.

Our overarching conclusions on operating leverage are, therefore, as follows.

ADJUSTMENTS FOR OPERATING LEVERAGE ARE ESPECIALLY IMPORTANT – AS EXPOSURE TO DEMAND RISK, PAIRED WITH NERL'S COST STRUCTURE, MEANS VARIATION IN DEMAND COULD MATERIALLY IMPACT EQUITY RETURNS – A FACT THE CAA ITSELF HIGHLIGHTS.

- **First, that operating leverage is a clear in principle driver of systematic risk** and should be assessed as part of the framework for assessing potential comparator risk set out above. That is to say, it should be considered alongside factors such as volume risk when coming to a view as to relative risk.
- **Secondly, that adjustments to beta should be made, based on available measures of operating leverage.** As a rigorous measure of operating leverage may be difficult to obtain, it may be necessary to average across multiple available measures. However, a failure to adjust for operating leverage would risk ignoring or understating a key dimension of NERL's equity risk: namely, that it has relatively 'thin' cash flows which, when considered in the context of its cost structure, means that fluctuations in demand could materially impact equity returns. Indeed, consistent with this, when commenting on its own financeability testing of NERL in its Final Decision, the CAA states: *"in our stress tests, RORE reduces to close to zero or negative. This reflects the relatively high sensitivity of RORE to the changes in regulatory returns from lower traffic and higher costs, given the relatively small size of NERL's RAB."*[143]

[143] *'UK RP3 CAA Decision Document: Appendices.' CAA (August 2019); page 83.*

2.5.4.6 Interpretation of ENAV beta

The existence of the Italian Air Navigation Services Provider, ENAV, provides a potential new comparator, operating within the same industry as NERL, which was unavailable at RP2. Overall, we consider that evidence from ENAV is potentially of value, and this is reflected in the attention that both EE and NERA paid to this evidence. We do, however, suggest that some caution should be applied when using beta evidence from ENAV, and that such evidence should be used alongside evidence from other comparators.

This is for the following reasons.

- While there are many respects in which ENAV should be expected to face similar risks to NERL, there may be important differences between them. We discuss this point in more detail in the section on adjustments for relative risk, below.
- Further, the existence of evidence from ENAV should not distract from the fact that other comparators are available, were used historically in assessing NERL's beta, and may continue to provide good points of comparison.
- While there is now sufficient data to estimate betas for ENAV based on two-year timeframes, we do not yet have a sense, overall, of 'how stable' ENAV's beta is over time.

2.5.4.7 Adjustments for relative risk

In principle, we think that there is a strong case for making adjustments to beta based on relative risk, where evidence supports such adjustments. Any such adjustments, must, however, have strong empirical foundations, be rooted in economic theory, and be based on a systematic assessment of differences in risk between companies.

In practice, adjustments for relative risk were only made to beta estimates for ENAV. This was an area in which EEs' and NERA's approaches were markedly at odds:

- EE adjusted ENAV's estimated beta based on its assessment of differences in risk between terminal and en-route services. This was based on the 'in principle' argument that en-route services are more diversified than terminal services and should therefore be expected to have **lower systematic risk.**[144]
- **NERA applied an adjustment in the opposite direction,** based on differences in the regulatory regimes for ENAV's terminal and en-route services, with en-route services exposed to higher volume risk.[145] This was based on a more rigorous assessment of the different regulatory regimes that applied, alongside empirical evidence.

Overall, we consider that this illustrates the problems with making adjustments based on relative risk in the absence of an overall framework for assessing systematic risk across the board. While EEs' 'in principle' argument that having more diverse demand would tend to lower the systematic risk of en-route services is not obviously wrong, this is one driver of risk among many - and the assertion is made without any

[144] *'Components of the Cost of Capital for NERL.' Europe Economics (2018); page 17.*
[145] *'Cost of Equity for RP3.' NERA (2019); pages 20-22.*

supporting empirical evidence. Consequently, not only does EE's approach fail to ensure that the 'net' adjusted beta appropriately reflects differences in overall systematic risk between ENAV and NERL, but the factual basis for the 'one' adjustment that is made is never established.

NERA's application of adjustments for relative risk is much more comprehensive. Again, however, we consider that its approach would have benefited from the application of an overarching risk framework, rather than taking as its starting point EEs' proposed adjustment and then 'working outwards' to include related categories of risk.

2.5.4.8 Changes in systematic risk relative to RP2

THE APPROPRIATE BETA RANGE FOR RP3 SHOULD BE INFORMED BY A MORE THOROUGH ANALYSIS OF CHANGES IN SYSTEMATIC RISK SINCE RP2. INITIAL EVIDENCE IS NOT SUPPORTIVE OF ANY REDUCTION IN SYSTEMATIC RISK.

Good regulation is consistent and predictable. As part of this, the assessment of beta should place due weight on regulatory precedent. This implies that at least some weight should be placed on the asset beta estimate from RP2 – and that deviations from this should have solid theoretical and evidential justifications. In practice, however, both EEs' and NERA's main estimates were based on comparator approaches, with limited consideration given to the RP2 estimate and how risk has changed since then.

NERA did subsequently provide a more thorough assessment of changes in risk relative to RP2 in its April 2019 report.[146] However, this was more in the spirit of a 'sense check' of the CAA's proposed lower beta for RP3. In our view, a fuller assessment of changes in all of the drivers of risk since RP2 is required, which takes beta at RP2 as a starting point. This would help to ensure that due weight is attached to regulatory precedent, as well as providing a cross-check on comparator-based approaches.

Our preliminary conclusion is that there is evidence to expect systematic risk to be somewhat higher than at RP2. This is for the following reasons:

- With respect to **revenue risk** the fundamentals of price cap regulation are maintained. However, potential changes to NERL's risk sharing mechanism and changes to its incentive schemes could increase volume risk. Relatedly, as we set out in the conclusions chapter of our report, where we briefly provide an overview of Brexit impacts, NERL may well face increased revenue risk as a result of Brexit uncertainty.

- We are not aware of strong reasons to expect **cost risk** to be materially different to its level at RP2.

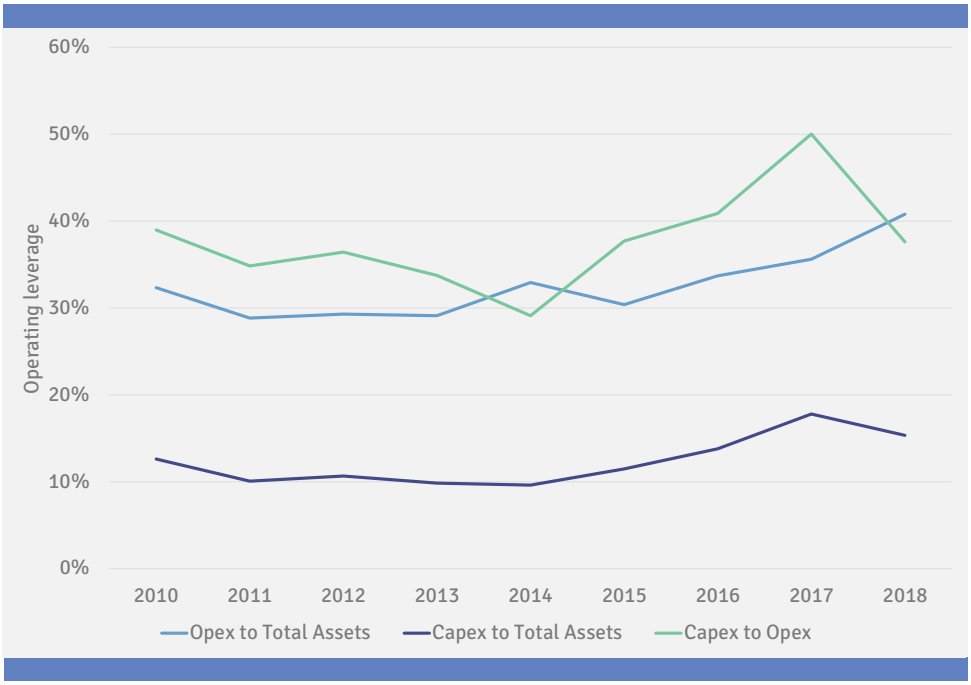
- There is evidence that NERL's **operational gearing** has increased since RP2 (see Figure 7 overleaf).

As we highlight in our separate assurance report on capex governance, the CAA's proposals to introduce three new capex incentive mechanisms increase financial and regulatory risk. At least some element of this may be systematic in nature. Notwithstanding that, as the mechanisms are 'penalty only' they further skew NERL's

[146] *'Cost of Equity for RP3.' NERA (2019).*

equity returns to the downside. All else equal, this also suggests equity investors face higher risk at RP3 relative to RP2.

Figure 7: Changes in NERL's operating leverage since RP2



Source: NERL Regulatory Accounts

We summarise this assessment in the table below.

Table 15: Changes in risk since RP2

Risk type	Assessment
Revenue	Potentially higher than RP2
Cost	Similar to RP2
Operating leverage	Higher than RP2

Source: Economic Insight

This brief review of evidence on changes in systematic risk since RP2 therefore suggests that, intuitively, the asset beta for RP3 should be at least the 0.50 determined at RP2 and, potentially, higher.

2.5.4.9 Summary of findings from our review

Our overall findings from our assurance review are as follows:

- **The selection of comparators should be based on an objective set of criteria and based on a systematic assessment of the different types of risk that NERL and potential comparators face.** We do not think that either EE or NERA grounded their approaches in such a framework (although, in general, NERA considered relative risk more carefully than EE).

- **The choice of estimation window for betas needs to balance the number of available observations and how recent these are, as well as maintaining internal consistency with timeframes used in other parts of WACC estimation.** We place more weight on the need to ensure the statistical robustness of the estimate than on having the most recent possible estimate, and more generally note that during periods of uncertainty (such as Brexit) it is generally preferable to place weight on longer-term estimates. We therefore think most weight should be placed on five-year windows for beta estimation, where feasible.

- **We recommend focusing primarily on betas estimated with references to European, rather than domestic, indices.** This is because we consider it likely that these more plausibly represent the portfolio of investors.

- **Operating leverage is a driver of systematic risk and should be included in any assessment of relative risk.** We think that adjustments to beta to reflect differences in operating leverage should be made. Whilst we acknowledge the inherent difficulties in measuring operating leverage in practice, a failure to adjust for this guarantees that beta estimates will not reflect an important, and widely accepted, driver of systematic risk (again, noting that this, along with other factors, means that variation in demand can materially impact equity returns for NERL).

- **The existence of ENAV as a potential comparator is of use, although some caution should be applied when interpreting evidence derived from the company.** There are reasons to expect its risk profile to differ from NERL's in certain respects, while other comparators may continue to remain relevant.

- **Where possible, adjustments to beta should be made to reflect differences in relative risk.** These adjustments should be based on an assessment of the totality of risk, reflecting the objective framework for assessing risk set out in the first bullet point above.

- **In general, insufficient consideration has been given to changes in systematic risk relative to RP2.** To ensure that due weight is attached to regulatory precedent, the RP2 beta should be taken as a starting point in an analysis of changes in risk since RP2.

2.7 Debt beta

The following subsections provide an assessment of the evidence pertaining to the debt beta. The summary table below outlines the latest positions of the CAA and NERL on this issue - and the relevant supporting evidence relied upon by each (as characterised by them).

Table 16: Summary of positions and evidence relating to the debt beta

	CAA (Final Decision)	NERL (Response to Draft Proposals)
Debt beta	**0.1**	**0.05**
Evidence sources (ranges shown)		
Direct econometric estimates	-0.09 – 0.03	-0.2 – 0.0
Indirect estimates	< 0.15 – 0.21*	0.05 – 0.1**
Regulatory precedent	0.1	0.05 – 0.1

**The Europe Economics June 2019 report does not explicitly set out a single recommended range. Our understanding of the evidence is that it implies a range that must be below this. We provide an analysis of this subsequently. **NERL did not develop its own primary evidence, but drew on sensitivity analysis undertaken by NERA that began from EE's estimates.*

2.7.1 The CAA's position and supporting evidence

In its Final Decision, the CAA proposed a debt beta of 0.1. This represented a reduction relative to the figure of 0.13 in its Draft Proposals, which the CAA explained was because: *"the plausible range of the debt beta has increased to the downside."*[147] In the CAA's Final Decision document, the regulator stated it had relied upon the following evidence in reaching this view:

- direct econometric estimates;
- indirect methods; and
- regulatory precedent.

2.7.1.1 Direct econometric estimates

Europe Economics (June 2019)

EE (June 2019)[148], on behalf of the CAA, provided a critique of the direct econometric estimates of NERL's debt beta, produced by Professor Ania Zalewska (which we summarise subsequently). The key points raised by EE were as follows:

- EE stated that they prefer 'indirect methods' in general, due to the poor statistical properties of direct econometric approaches. Here, EE highlighted that regression results can be highly volatile; are often negative; and that the confidence intervals are sufficiently wide, such that one cannot rule out zero values. EE also noted that the Competition Commission previously favoured an indirect approach in 2007.[149]

147 *'UK RP3 CAA Decision Document: Appendices.' CAA (August 2019); page 57.*
148 *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019).*
149 *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019); page 9.*

- EE suggested that the 'volume' of results contained in Professor Zaleswska's paper is not indicative of the number of reliable evidence points. Specifically, EE stated that the paper repeats the same findings multiple times; and that the various estimation techniques are not, in practice, 'different'; and so do not really provide 'additional evidence'.[150]

- EE stated that the regressions are 'spurious', with low goodness of fit (as measured by adjusted R2).[151]

We note that the EE report does not, itself, contain any direct econometric estimates, however.

PwC (August 2019)

In its August 2019 report, PwC examined econometric (direct) methods for estimating the debt beta. As a starting point, PwC replicated Professor Zaleswska's work on behalf of NERL to derive econometric estimates of debt betas for both NERL and Heathrow. Using this approach, PwC found: *"our regression analysis produces broadly similar results across all bonds and different specifications of the market portfolio… we find that under this approach, debt beta estimates for the six HAL bonds and the NATS bond are generally in the region of -0.1 over the period considered i.e. 2006 – 2019."*[152]

PwC then re-ran the above analysis over more recent time periods (2010-2019; and 2016-2019). Here they found some evidence that debt betas have increased more recently and are *"closer to zero."*[153]

PwC next presented an analysis using 'rolling' debt betas. This again implies slightly higher debt betas than the long-run estimates derived by Zaleswska. However, in relation to NERL, PwC's results consistently showed, even on a rolling basis, that NERL's debt beta is at, or below, zero. Specifically, PwC found: *"the 5-year rolling betas have remained below -0.05 while the 2-year rolling estimates have come closer to zero."*[154]

Finally, PwC expressed some concern regarding the use of daily data for debt beta estimation purposes. This included problems relating to non-trading and slow response of the security to the market movement. PwC found that academic literature generally does not point strongly one way or the other as to whether 'daily' or 'monthly' data frequency should be used. However, given the concerns it identified, PwC explored the impact of using monthly estimates and ultimately concluded that, although both daily and monthly approaches are valid, more weight should be placed on the latter.

Drawing the above together, the following table summarises PwC's estimates of NERL's debt beta.

---

150 *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019); page 12.*
151 *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019); page 12.*
152 *'Estimating the cost of capital for H7 and RP3 - Response to stakeholder views on total market return and debt beta.' PwC (August 2019); page 25.*
153 *'Estimating the cost of capital for H7 and RP3 - Response to stakeholder views on total market return and debt beta.' PwC (August 2019); page 25.*
154 *'Estimating the cost of capital for H7 and RP3 - Response to stakeholder views on total market return and debt beta.' PwC (August 2019); page 27.*

Table 17: Summary of PwC econometric estimates of NERL debt beta

	Daily (2-year)	Daily (5-year)	Monthly (5-year)
Average over last 3 years	-0.05	-0.07	0.03
Long run average over the period data is available	-0.09	-0.09	0.00

Source: Components of the Cost of Capital for NERL; Europe Economics (December 2018); page 44.

From the above, PwC's analysis implies a debt beta range for NERL of between -0.09 and 0.03. However, it is clear that the vast majority of estimates PwC derived showed a debt beta for NERL of zero or below (we provide an analysis of this subsequently, as part of our review).

Finally, in terms of the weight the CAA should attach to the different evidence sources, PwC reached the following conclusions: *"In preparing for H7/RP3, we recommend that the CAA takes a balanced view across a range of estimation approaches (empirical and decomposition) and aligns the time period used for debt beta estimation with that used for asset/equity beta estimation. While we recommend both daily and monthly estimates of debt betas are presented, we suggest more weight is given to monthly estimation frequency in the selection of a debt beta assumption, in comparison to the selection of an equity beta assumption."*[155]

2.7.1.2 Indirect methods

EE provided evidence on NERL's debt beta using 'indirect methods'. This was firstly set out in the consultancy's December 2018 report; and was subsequently updated in its June 2019 report.

Europe Economics December 2018 WACC report

Indirect methods for estimating the debt beta are 'decompositional', in that the debt beta is effectively 'inferred' from other parameters. EEs' December 2018 report on the WACC sets out such an approach. In doing so, EE assumed the following parameter values:

- a nominal risk free rate of 1.6% (taken from PwC's estimates);
- an equity risk premium of 8.3% (again, PwC);
- a probability of default of 0.2% (an assumption, taken from S&P Global); and
- a loss on default of 20% (an assumption, which EE describe as a *"typical estimate of costs of bankruptcy"*).[156]

EE concluded that, overall, this analysis implied a debt beta of 0.19.

[155] *'Estimating the cost of capital for H7 and RP3 - Response to stakeholder views on total market return and debt beta.' PwC (August 2019); page 30.*
[156] *'Components of the Cost of Capital for NERL.' Europe Economics, (December 2018); page 38*

Europe Economics June 2019 update

In its June 2019 report, EE updated its indirect estimates of NERL's debt beta. In the first instance, it updated these only to reflect the CAA's latest proposals for other relevant parameters, such as the RFR. EE stated that this update implies a revised debt beta range of 0.19 - 0.25.[157]

In addition, and in response to issues raised by NERL, EE considered how the debt beta estimates would change, if a liquidity premium was included and adjusted for. EE did not explicitly state that it agrees a liquidity premium should be factored into the calculation; but, rather, described it as a sensitivity analysis. Once this is taken into account, EE found that the range for the debt beta is reduced to 0.15 - 0.21.[158]

As regards to the detail of its indirect method, EE originally assumed a probability of default of 0.2% and a loss on default of 20%. In regard to the former, EE continued to assume an 'annual probability' is the appropriate measure. EE went on to explore the following sensitivities:

- EE examined how the debt beta would change if the probability of default increased to 2%. They found the debt beta range would fall to 0.14 to 0.19.[159]
- In relation to the 'loss on default' EE examined a higher assumed number of 55%. When combined with a 0.2% probability of default, EE said that the debt beta range would reduce to 0.18 to 0.24.[160]
- EE acknowledged that if a probability of default of 2% was combined with a loss on default of 55%, the debt beta would reduce to 0.04 to 0.09. However, EE stated that: *"At a 2 per cent annual probability of default, over a ten year period NERL would be expected to default nearly 20 per cent of the time. We consider this highly implausible."*[161]

EE did not set out what it ultimately concluded the revised debt beta range should be, in light of the above modifications. We would note that EE accepted that higher loss on default is plausible, implying a range for the debt beta of 0.18 to 0.24. However, EE also showed the implied impact of a liquidity premium adjustment, without explicitly stating whether such an adjustment should be made. However, EE did not report what the debt beta range would be if both a liquidity adjustment and higher loss on default assumption were made. As such, a neutral interpretation of the evidence would seem to be that the implied range would be below 0.15 - 0.21 (i.e. adjusting for the liquidity premium, but also noting that EE accepted the loss on default may be higher).

[157] *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019); page 17.*
[158] *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019); page 18.*
[159] *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019); page 18.*
[160] *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019); page 19.*
[161] *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019); page 19.*

2.7.1.4 Regulatory precedent

EEs' December 2018 report referred to the following regulatory precedent.

Table 18: Precedent referred to in EE report

Determination	Debt beta
Competition Commission CAA Q5	0.1 (range of 0.09 – 0.19)
Competition Commission Bristol Water	0.1
Ofcom Wholesale Local Access Review	0.1

Source: 'Components of the Cost of Capital for NERL'; Europe Economics, (December 2018); page 44.

2.7.2 NERL's position and supporting evidence

In NERL's response to the CAA's Draft Proposals, the company set out that its view is that an appropriate debt beta at RP3 is 0.05. This reflects a range recommended by NERA (April 2019)[162] of 0 to 0.1. In turn, this reflects three sources of evidence:

- direct econometric estimates from Professor Ania Zalewska;
- indirect estimates; and
- regulatory precedent.[163]

2.7.2.1 Direct econometric estimates from Professor Ania Zalewska

Professor Ania Zalewska (April 2019) developed econometric estimates of NERL's debt beta.[164] Her approach was to focus on producing various estimates of the debt beta specifically relating to the NATS bond.[165] As a cross-check, estimates were also derived for 6 Heathrow bonds. Three econometric methods were used, as follows:

- Simple OLS regressions (which the author justified on the basis that this technique is often used by regulators).
- Maximum likelihood methods (GARCH 1,1) (which the author notes provide more precise estimates than OLS).
- Kalman Filter regressions (which the author says are useful, as they allow for time-varying estimates).

The author further evaluates debt betas against a range of indices, including the FTSE all share; FTSE ALL Europe; and Stoxx 600.

In relation to the NATS bond specifically, Zalewska's results show the following:

[162] *'Cost of Equity for RP3.' NERA (April 2019).*
[163] *'NERL's response to CAP1758: Draft UK reference period 3 performance plan proposals.' NERL (April 2019); pages 56-67.*
[164] *'Estimation of the debt beta of the bond issued by NATS En-Route) plc.' Anita Zalewska, University of Bath (April 2019).*
[165] *Ticker ED1004032.*

- using OLS estimation, negative debt betas were found against all three indices used – and were statistically insignificant;[166]
- using maximum likelihood, again negative debt betas were found against all three indices[167]; and
- Kalman Filter estimates show that, with minor exceptions, betas are negative (ranging from -0.2 to 0).[168]

Overall, in relation to the NATS bond, the author concluded that the evidence suggests the debt beta is: *"statistically significantly negative for most of the investigated period, and statistically insignificant from zero in the last few years."*[169] The 'cross checks' presented in relation to Heathrow bonds were also consistent with this finding.

2.7.2.2 Indirect estimates

In its April 2019 report, NERA (on behalf of NERL) provided its own 'indirect' estimate of the debt beta.[170] Here, NERA's approach was to start from EEs' own estimates (described above) and to then make a number of adjustments. Key points are as follows:

- NERA observed that EE had assumed the 'wrong' value for the equity risk premium;
- EEs' approach failed to adjust for a liquidity premium, and overstated 'systematic risk' (and thus, the debt beta); and
- EEs' approach included 'inappropriate inputs' in relation to both the default premium and the debt premium.

Having made adjustments to address the above, NERA found the 'corrected' range for the debt beta to lie between 0.05 to 0.1.[171]

2.7.2.3 Regulatory precedent

NERL's proposed debt beta is also supported by regulatory precedent. As far as we can tell, two examples were cited, as follows:

- PWC's latest estimate for Heathrow at H7, which indicated a value of 0.05; [172]
- the CAA's determination of the debt beta at RP2, which was 0.1.[173]

---

166 *'Estimation of the debt beta of the bond issued by NATS En-Route) plc.' Anita Zalewska, University of Bath (April 2019)' page 3.*
167 *'Estimation of the debt beta of the bond issued by NATS En-Route) plc.' Anita Zalewska, University of Bath (April 2019)' page 3.*
168 *'Estimation of the debt beta of the bond issued by NATS En-Route) plc.' Anita Zalewska, University of Bath (April 2019)' page 16.*
169 *'Estimation of the debt beta of the bond issued by NATS En-Route) plc.' Anita Zalewska, University of Bath (April 2019)' page 1.*
170 *'Cost of Equity for RP3.' NERA (April 2019); from page 38.*
171 *'Cost of Equity for RP3.' NERA (April 2019); from page 42.*
172 *'The weighted average cost of capital for NATS (En-Route) plc at RP3.' NERA (March 2018); page 0.05.*
173 *'Cost of Equity for RP3.' NERA (April 2019); from page 42.*

2.7.4 Our assurance review

Having reviewed the existing evidence, in this section we set out our views. This addresses both the quality of that evidence and the inferences drawn from it. We have organised our comments around the following issues:

- consistency between the CAA's proposed debt beta, its own evidence and the recommendations of its consultants;
- the relative merits of direct and indirect debt beta estimation; and
- the quality of evidence base used to inform indirect estimates.

We then briefly summarise our findings.

2.7.4.1 The consistency between the CAA's proposed debt beta, its own evidence and the recommendations of its consultants

The CAA has relied on a range of evidence to inform its proposed debt beta of 0.10. However, from our review, there seems to be some lack of clarity as to precisely how this evidence has been weighted and the extent to which it is consistent with the recommendations of the CAA's advisors. As such, in the following we briefly outline the key issues we have identified relating to this. In turn we address: (i) PwC's direct econometric estimates; (ii) EEs' indirect estimates; and (iii) the weighing of these.

PwC's econometric (direct) estimates of asset beta

In relation to PwC's econometric estimates of NERL's debt beta, we previously noted that the consultancy set out a summary table, showing that its analysis implied an overall range of -0.09 to 0.03. However, whilst this is true, it turns on omitting certain estimates. More importantly, however, it masks the fact that the vast majority of PwC's estimates imply a zero debt beta for NERL. Briefly, on the first issue, we observe that estimates derived using the Stoxx 600 and FTSE all Europe index actually imply a lower end of -0.10 (although this is not material).

Turning to the second issue, in Figure 8 (see next page), we summarise the various debt beta estimates reported by PwC. As can be seen, out of the eleven estimates provided, only one method (monthly estimation, restricted to the last three years) provides a *positive* debt beta. In fact, this understates the extent to which the one positive number is an outlier, as we have limited our summary to PwC's OLS methodologies.

Figure 8: Summary of PwC reported debt betas for NERL

Source: Economic Insight

It is therefore worth considering how one should interpret the above in a manner consistent with PwC's own proposals. Of relevance to this, we re-cap PwC's recommendations relating to 'direct' (econometric) estimates is as follows:

- that the time period used should be aligned to that for asset beta estimation; and
- both daily and monthly methods should be used, but that more weight should be placed on the latter.

Leaving to one side our own views on the time period appropriate for estimating asset betas, as we set out previously, the CAA's own assessment seems to be based on relatively near-term time horizons (1- 2 year rolling betas). Turning to PwC's debt beta estimates above, this would imply the most internally consistent estimates are those estimated over the 2016-2019 period. Thus, the internally consistent range for the debt beta, as estimated by PwC is:

- for daily estimates -0.03 (therefore, zero); and
- for monthly estimates 0.03.[174]

Next, we consider PwC's recommendation that the latter should have more weight attached to it. Taking this at face value, we note that:

- if 60% weight is attached to the monthly approach, the implied debt beta is 0.018.; and
- if 70% weight is attached to the monthly approach, the implied debt beta is 0.021.

Drawing the above together, we would suggest that **an interpretation of PwC's findings from the direct (econometric evidence) most consistent with the**

[174] *Focusing on the FTSE 100 index in order to be conservative.*

consultancy's own recommendations would be a debt beta range for NERL of 0.018 to 0.021.

EEs' Indirect Estimates

We previously noted that, in its June 2019 paper, EE accepted that a 'higher loss on default' is plausible, which would imply a reduced debt beta range of 0.18 to 0.24. We also noted that EE set out the impact of adjusting for a liquidity premium, which implies a debt beta range of 0.15 to 0.21. However, we noted that EE did not show the impact of a higher loss on default and liquidity adjustment concurrently. More broadly, nor did EE ultimately define a single recommended range for the debt beta. As we note subsequently, this seems to reflect inadequacies and uncertainties pertaining to key input parameters EE rely upon, such that ultimately, the indirect estimates are largely a 'sensitivity analysis'.

To address the first of the above limitations, in the following table we have re-calculated the debt-beta implied by EEs' own evidence, but where we show the *combined* impact of making both an adjustment for liquidity and a higher loss on default. Our analysis and results are set out in the following table. As can be seen, **this implies a reduction in in the debt beta range to 0.14 to 0.17.**

Table 19: EEs' indirect debt beta estimates adjusting for both liquidity and higher loss on default

	Low	High	Mid-point
Probability of default	0.20%	0.20%	0.20%
Debt premium	1.41%	1.83%	1.62%
Liquidity premium	0.30%	0.30%	0.30%
Risk free rate	1.56%	1.56%	1.56%
% loss given default	20%	20%	20%
Increased loss given default	55%	55%	55%
ERP	7%	7%	7%
Results			
Debt beta (no adjustment)	0.19	0.25	0.22
Debt beta (liquidity premium adjustment)	0.15	0.21	0.18
Debt beta (higher loss given default)	0.18	0.24	0.21
Debt beta (adjusting for both liquidity and higher loss given default)	**0.14**	**0.20**	**0.17**

Source: Economic Insight

As we explain further subsequently, a key limitation of EEs' approach is the lack of sound evidence to underpin the input assumptions for its indirect method. So, above, we are simply seeking to outline how EEs' analysis should itself be interpreted, leaving to one side our views on EEs' evidence in the first place.

Weighting of evidence sources

Still focusing on the CAA's own evidence and the recommendations of its consultants, it is important to consider the relative 'weight' that should be attached to each method. Here, we note that the CAA received somewhat conflicting advice. Specifically:

- EEs' view was that econometric methods were, essentially, flawed and should be ignored; whereas
- PwC's recommendation was that the CAA should attach equal weight to the direct (econometric) and indirect methods.

In practice, the CAA seems to have ignored PwC's position in favour of EEs'. In the following table, we therefore set out what the implied range for NERL's debt beta would be, had the CAA taken PwC's view of the appropriate weight of evidence into account.

Table 20: Debt beta range for NERL based on CAA evidence only and consistent with CAA PwC's recommendations

	Low	High	Mid-point
Direct (PwC)*	0.018	0.021	0.020
Indirect (EE)	0.140	0.200	0.170
Average (consistent with PwC advice)	**0.079**	**0.111**	**0.095**

Source: Economic Insight
**Low and high values both reflect attaching more weight to monthly estimates, as favoured by PwC and set out previously*

As can be seen, if the CAA had followed PwC's advice on evidence weighting, the implied debt beta range would be from 0.079 to 0.111, with a mid-point of 0.095. We note that this is fractionally below the CAA's own proposed debt beta.

We should emphasise, however, that the above approach assumes it would be appropriate for the CAA to interpret its consultants' results and recommendations 'at face value' and with 'equal weight'. In practice, however, and as we subsequently highlight, we do not consider this is the appropriate perspective to apply. Specifically:

- we disagree with EEs' view that the econometric approaches should be excluded; and
- whilst we consider indirect methods to be valuable, the evidence to support the input assumptions relied upon by EE is extremely limited and of low quality.

2.7.4.3 The relative merits of direct and indirect debt beta estimation

Stepping back from the detail of the actual evidence of each party, and the recommendations of their respective consultants, it is important to give careful consideration to the relative merits of 'direct' and 'indirect' methods for estimating debt betas. In summary, we would characterise the relative pros and cons of the approaches as follows:

- The main advantage of **direct approaches** is that they measure the key variable of interest (i.e. the volatility of debt returns to the market). Therefore, so long as the 'right' data is available, the debt beta can be directly observed from this method. The main disadvantage, however, is that there can often be data limitations, mainly associated with the thin trading of debt. In practice, this can limit the statistical validity of econometric models used to estimate debt betas.

THE FACT THAT ONE CAN 'OBSERVE' THE UNCERTIANTY OF A DIRECT METHOD (THROUGH THE EXPLANATORY POWER OF A MODEL) DOES NOT MEAN IT IS MORE UNCERTAIN THAN THE INDIRECT METHOD.

- In contrast, the main advantage of **indirect approaches** is that they provide a very practical method for estimating the debt beta. That is to say, there are usually no impediments to obtaining relevant data. The approach is also rooted in clear, well understood, economic theory. There are two main downsides to the approach, however. Firstly, the debt beta is effectively a 'residual' under this method, which 'drops out' of an equation. This means that its reliability is dependent on the input assumptions for all other parameters being appropriate. In practice, those parameters are themselves uncertain and difficult to estimate. Secondly, although the 'theory' on which the method is based is sound, in practice empirical evidence suggests it is hard to neatly attribute overall volatility into its constituents parts. As a result, there can often be unexplained variation. The key implication of this is that, whilst 'in theory' once the other components of volatility are accounted for, the remainder can be assumed to be the debt beta, in practice, one cannot be sure.

Following from the above, we find both methods have pros and cons and are subject to uncertainty. There is perhaps a tendency to assume the statistical (direct) method is 'more uncertain' / 'less precise', by virtue of the fact that one can observe the uncertainty to some degree (e.g. through the explanatory power of a model). However, the fact that one cannot so easily 'observe' the uncertainty in the indirect method does not imply it is more reliable.

Consistent with the above, we find examples of both methods being used, which we briefly summarise below.

Academic literature

Whist we have not undertaken a detailed literature review as part of our evidence review, we have briefly reviewed examples of relevant academic research. These examples show a mixture of direct and indirect methods being endorsed and applied. Examples are summarised below.

Domantas (2010) outlines both the 'direct' regression / econometric; and indirect methods for estimating debt betas. The author generally prefers the econometric method, stating: *"all in all, we believe though that the regression betas should be*

superior as they measure directly the covariance of bond yields with the market returns."[175]

Holthausen and Zmijewski (2012) applies an indirect method, noting its simplicity. However, the author refers to the regression method as: *"the normal technique for estimating [debt] betas."*[176]

Schwert and Strebulaev (2014) rely on regression techniques to infer debt betas, regressing monthly corporate bond returns over the period 1996-2004. They find debt betas to be *"very small for highly rated firms."* In addition, the authors apply a sensitivity analysis, in which the debt beta is assumed to be zero. This is described as follows: *"First, the market values of corporate debt are not generally available. Therefore, estimates of debt beta are inherently noisy. In addition, the contribution of debt beta to unlevered asset beta is marginal in most cases. Based on this reasoning, we use an estimate called the simple unlevered asset beta, where we set βD equal to zero."*[177] This is relevant because it is consistent with some of the limitations of direct estimates, as we noted above.

Our brief review suggests the literature is supportive of the use of both methods; and also contains examples of both methods being applied in practice. As such, this would seem to be more **consistent with PwC's recommendation that the CAA attach weight to both the direct and indirect method, and contrary to EEs' recommendation that only the indirect method should be used.** However, it might be helpful for a fuller literature review to be undertaken to better understand: (i) whether there are systematic variations in when the methods are used; and (ii) the reasons for this.

Summary of our views

Drawing the above together, our views relating to the relative weight of 'direct' and 'indirect' evidence is as follows:

- The CAA draws on both direct and indirect evidence, which we consider to be appropriate. However, we disagree with EEs' recommendation that econometric (direct) estimates should be excluded. EEs' recommendation appears to reflect a 'false perception' that direct methods are inherently more uncertain / less reliable than indirect methods. As a result of this, the CAA's proposed debt beta is likely to be over-stated. Specifically, **an equal weighting of the CAA's own direct and indirect evidence would imply a lower debt beta than the 0.1 it proposes.**

- NERL's evidence base places considerable weight on the direct econometric estimates. Whilst the company does provide some indirect evidence, this consists of sensitivity analysis around EEs' work. We therefore consider NERL's evidence to be somewhat 'deficient', in that ideally, **we think NERL should have developed its own indirect estimation method.** However, this does not imply NERL's proposed debt beta is inappropriate. Indeed, we consider the direct evidence from Professor Zalewska to be robust and reliable.

---

175 *'Practical approach to estimating cost of capital.' Skardziukas, Domantas; Erasmus University, Rotterdam (2010).*

176 *'Pitfalls in Levering and Unlevering Beta and Cost of Capital Estimates in DCF Valuations' in 'Journal of Applied Corporate Finance.' Holthausen and Zmijewski; Morgan Stanley (2012).*

177 *'Capital Structure and Systematic Risk.' Schwert and Strebulaev; Rock Centre for Corperate Governance, Stanford University (2014); page 10.*

- Whilst our 'in principle' view is that the direct evidence and indirect evidence should be weighted equally, in practice we are concerned about the quality of the existing indirect evidence (see next subsection). Consequently, **for so long as one was reliant only on the existing evidence, we caution against placing equal weight on EEs' indirect estimates (which are little more than assumption-driven sensitivity analyses).**

2.7.4.4 The quality of evidence base used to inform indirect estimates

As we have previously explained, the debt beta estimates derived from any indirect method are contingent on assumed values for a range of other input parameters. Some of these, such as the RFR and ERP, are addressed elsewhere in this report – and so we do not discuss them further here. It is, however, helpful to focus on three parameters that are particularly pertinent to debt beta estimates:

- the probability of default;
- the expected loss on default; and
- the liquidity risk premium.

As noted above, EE (on behalf of the CAA) developed indirect estimates, which in turn required EE to determine values for the above. Whilst NERL did not itself develop direct estimates, NERA (on its behalf) offered some counter proposals regarding values for these three parameters. Accordingly, in the following we set out our views as to the existing evidence for each in turn.

Probability of default

The probability of default refers to the % chance that a company 'defaults' (i.e. cannot pay) on its debt. In combination with the 'loss on default' (discussed below) it determines the 'default premium' within the overall debt premium. Under the indirect method, estimates of the debt beta will vary, depending on the assumed probability of default.

We previously explained that, in its December 2018 report, EE assumed a probability of default of 0.2% (an assumption, taken from S&P Global). In its April 2019 report, NERA suggested that this was too low, because EE had used an 'annual' probability, rather than a 'cumulative' probability. In its June 2019 paper, EE rejects NERA's suggestion, stating: *"we believe it should be clear from the mathematics of the formula that the relevant probability of default is the default in any one year, since the calculation is to capture the expected return in any one year, and accordingly that NERA's proposal of using a cumulative probability over the lifetime of a bond (and hence a probability of default perhaps times as high) is flawed."*[178] Notwithstanding that view, EE calculate the debt beta assuming a 2% default probability as a sensitivity analysis.

We are, however, concerned by the lack of analysis and evidence to support EEs' proposed default rate of 0.2%. Specifically, footnote 39 to EEs' December 2018 report states that the 0.2% assumed default probability is a 'rounded' median value from S&P (2015). Below we have reproduced the S&P table for transparency.

[178] *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019); page 18.*

Table 21: S&P one year corporate default rates

	Weighted average (1981-2015)	Median	Min	Max
Aerospace/automotive/capital goods/metal	2.19%	1.31%	0.00%	9.39%
Consumer/service sector	2.28%	1.63%	0.00%	6.27%
Energy and natural resources	2.19%	1.44%	0.00%	10.00%
Financial Institutions	0.66%	0.30%	0.00%	2.80%
Forest and building products/homebuilders	2.67%	1.49%	0.00%	14.43%
Health care/chemicals	1.44%	0.84%	0.00%	4.86%
High technology/computers/office Equipment	1.16%	0.92%	0.00%	4.82%
Insurance	0.3%	0.27%	0.00%	4.65%
Leisure time/media	3.54%	2.14%	0.00%	16.87%
Real estate	0.80%	0.00%	0.00%	12.00%
Transport	2.65%	0.52%	0.00%	18.43%
Telecoms	2.10%	1.86%	0.00%	6.00%
Utility	0.45%	**0.17%**	0.00%	4.26%

Source: S&OP[179]

From the above, it would seem as though the 0.2% figure used by EE relates to a 'rounding' of the 0.17% median default rate for utilities as reported by S&P – estimated over 1981 to 2015. We have a number of observations on this:

- The use of the median value fails to take into account the very wide spread of default rates within each industry. For example, even within utilities, S&P reports a maximum default rate of 4.26%. Indeed, the mean for utilities is 0.45% (and, across the board, mean values are higher than median). However, EE does not appear to have considered this.

- The default rates vary considerably across the industries. For example, for transport the mean default rate is 2.65%, with a median value of 0.52%. Similarly, for aerospace the mean default rate is 2.19%, with a median of 1.31%. Thus, using the S&P data, the implied default rate is highly sensitive to the comparator used. This does not, however, appear to have been considered in any detail.

- Default rates vary considerably over time. The above data summarises the long-run averages reported by S&P. However, the S&P report also shows annual numbers for 2014 and 2015. These show considerable year-to-year variation by industry. This goes to a key theme of our review: the need for time consistency.

[179] *'2015 Annual Global Corporate Default Study And Rating Transitions.' S&P (2016); Table 19.*

The default rates should be estimated over the same time horizon being used to evaluate the cost of equity more broadly. Leaving to one side our views on that the relevant time horizon, again, this does not appear to have been considered.

To further explore the above issues, we have reviewed similar data published by Moody's. The table below shows the one year default rate by industry averaged over 1970 to 2017.

Table 22: Moody's one year default rates 1970 – 2017 by industry group

Industry group	Default rate (%)	Industry group	Default rate (%)
Aerospace & defence	0.85%	High tech industries	1.77%
Automotive	2.33%	Hotel, gaming and leisure	4.20%
Banking	0.51%	Media: advertising, printing, publishing	5.96%
Beverage, food & tobacco	1.17%	Media: broadcasting & subscription	3.54%
Capital equipment	1.61%	Media: diversified & production	2.41%
Chemicals, plastics & rubber	1.09%	Metals & mining	3.10%
Construction & building	2.59%	Retail	2.82%
Consumer goods: durable	2.37%	Services: business	2.08%
Consumer goods: non-durable	3.77%	Services: consumer	2.15%
Containers, packaging, glass	2.30%	Sovereign & public	0.51%
Energy: electricity	2.60%	Telecoms	2.23%
Energy: oil & gas	2.38%	Transportation: cargo	1.99%
Environmental industries	3.66%	Transportation: consumer	2.91%
FIRE: Finance	0.86%	Utilities: electricity	0.13%
FIRE: insurance	0.36%	Utilities: oil & gas	0.15%
FIRE: real estate	0.95%	Utilities: water	0.12%
Forest products & paper	2.94%	Wholesale	3.44%
Healthcare & pharma	1.34%		

Source: Moody's[180]

Similar to the S&P data, the Moody's figures show considerable variation by industry. For example, utilities have low annual default rates of up to 0.15%. However, transportation sectors have much higher default rates, of up to 2.91%. Again, we note

[180] *'Annual Default Study: Corporate default and recovery rates, 1920 – 2017.' Moody's (2018). Adapted from Exhibit 37.*

that these default rates are long-term averages and that average annual default rates vary considerably over time in the Moody's data.

IT IS CLEAR THAT THE EVIDENCE UNDERPINNING THE EXISTING 'INDIRECT ESTIMATES' ARE BASED ON SIMPLISTIC ASSUMPTIONS.

Drawing the above together, we do not ourselves draw any strong conclusions as to 'what' the assumed default rate for NERL should be. However, it is clear that the existing evidence is based on simplistic assumptions which are not, in our view, fit for purpose. Therefore, if the CMA were to draw on indirect methods, we suggest the key issues are as follows:

- **Carefully identifying comparator industries that most reflect the likely efficient risk faced by NERL's debt investors.**
- **Ensuring the time period over which the default rate is assessed is consistent with the time frame being used for the determination of the cost of equity more broadly.** Most obviously, if one is primarily seeking to set a cost of equity with a 'short term' perspective that reflects risk over RP3, then clearly, more recent data on default risk is more relevant. Whereas, if one is incorporating a longer-term view, the opposite will be true.

Finally, previously in our review we re-calculated the implied debt beta, using EEs' method, and assuming the simultaneous allowance for a higher expected loss on default and liquidity premium. We showed that, where these adjustments are made, the debt beta range from EEs' evidence reduces to 0.14 to 0.20. In light of the above, it should be noted that, if one assumed a 'range' for the default probability of 0.2% (as proposed by EE) up to 2.91% (transport) **the mid-point for the debt beta would reduce to 0.06.** For clarity, we are not advocating this as the appropriate number. Rather, we are simply seeking to highlight how important it is to consider the comparators and time periods with care.

Expected loss on default

Loss on default refers to the percentage of debt that would not be recovered by a debtholder in the event of default. It is sometimes expressed as being the inverse of the 'recovery rate'. Estimates of the debt beta will be sensitive to this number.

EEs' indirect method originally assumed a value of 20%. However, from our review, it was clear that this was simply a relatively high level assumption. Indeed, in their June 2019 paper, EE acknowledge this, stating: *"the 20 per cent figure we used was simply a costs-in-bankruptcy "rule of thumb" often used in scenarios analysis."*[181]

In contrast, NERA (April 2019) suggested a value of 55%. NERA explain that this is based on an assumed recovery rate of 45%, taken from Moody's and is consistent with the Competition Commission's 2007 decision regarding the London airports.[182] So, NERA's assumption is more evidence-based than that of EEs'. However, our view is that neither provides a robust basis for an indirect analysis of the debt beta. We expand on this in the following passages.

Evidence shows that recovery rates can vary significantly over time and by bond. To help illustrate the time dimension, the following table summarises Moody's reported

[181] *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019); page 18.*
[182] *'Cost of Equity for RP2.' NERA (April 2019); page 40.*

recovery rates (and implied loss on default) for senior unsecured bonds (noting this is the evidence source that NERA appears to refer to).[183]

Table 23: Recovery rates and loss on default on Senior Unsecured Bonds

	Emergence year			Default year		
	2017	2016	1987-2017	2017	2016	1987-2017
Recovery rate (%)	54.1%	11.7%	47.9%	47.4%	29.2%	47.9%
Loss on default (%)	45.9%	88.3%	52.1%	52.6%	70.8%	52.1%

Source: Moody's

Referring to the above, the 'default year' numbers are, in our view, most relevant. The long term data from Moody's suggests a loss on default percentage of 52% (i.e. broadly in line with NERA's assumption of 55%, but well above that proposed by EE). However, what is striking is just how sensitive the results are to the time period. For example, using 2016 data, the loss on default would have been as high as 71%; but using 2017 data the loss percentage would be lower, at 53%.

EEs' LOW LEVEL OF ASSUMED LOSS ON DEFAULT SEEMS UNSUPPORTABLE ON ANY BASIS. HOWEVER, THERE REMAINS A NEED TO LOOK AT THIS MORE CAREFULLY - AND IN A TIME-CONSISTENT WAY.

The above matters because, as we have highlighted previously, it is important to apply 'time consistent' assumptions when setting the cost of equity, which reflect a well-defined and transparent articulation of assumed economic performance. Consequently, whilst the low percentage proposed by EE appears unsupportable on any basis, there remains, in general, a need to look very closely at how recovery rates are evolving over time. Therefore, to the extent the CMA considers indirect methods, this clearly requires more careful examination.

In addition to recovery rates / loss on default varying over time, data shows these can vary significant from one bond to another. Just to illustrate this point, the following figure shows the percentage 'loss on default' across 9 bonds, as reported by Moody's. Here we have used the long-term average from 1983-2017, but as noted above, the time horizon is, itself, an important consideration.

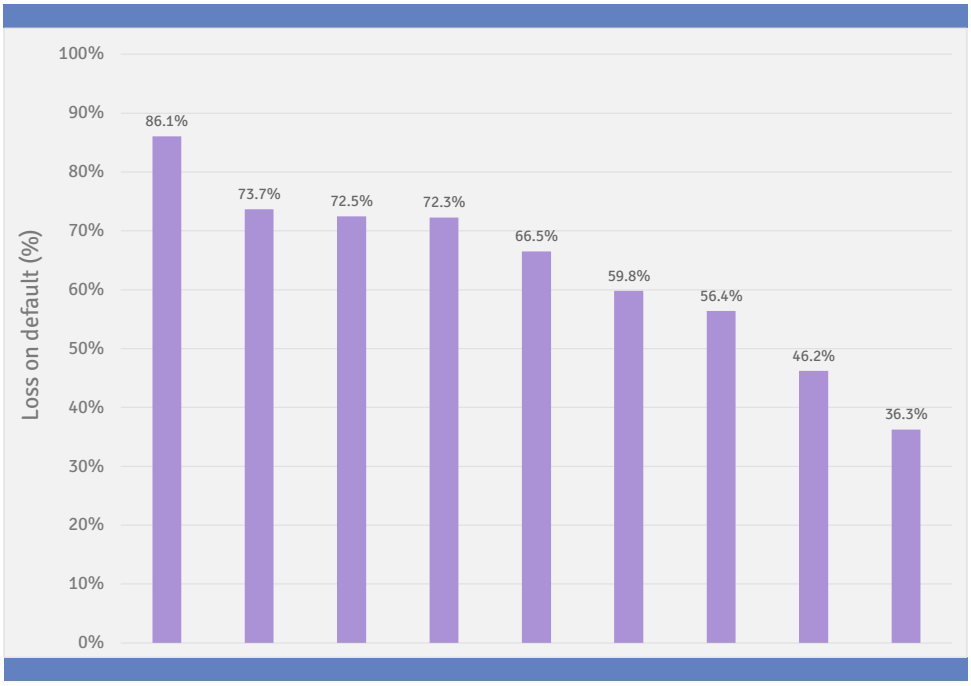
As can be seen in Figure 9 overleaf, the data shows that the loss on default percentage varies considerably across the individual cases, ranging from:

- 36% in the lowest case; up to
- 86% in the highest case.

What this shows is that the loss any debt investor would face in the event of a default is highly case specific. As such, it is important to consider with care, what the right point of comparison should be. Again, however, we note that the even the low end of the range is well above the loss on default proposed by EE of 20%.

[183] *'Annual Default Study: Corporate Default and Recovery Rates, 1920 – 2017.' Moody's (2016).*

Figure 9: Variation in Loss on default



Source: Economic Insight analysis of Moody's data

The liquidity risk premium

We do not discuss the liquidity premium in detail here, as it was addressed in relation to our assessment of the appropriate real RFR. However, our view is that it is clearly appropriate to adjust for illiquidity when applying indirect methods. As such, EEs' original December 2018 indirect estimates of the debt beta will be over-stated.

In relation to EEs' sensitivity analysis in its June 2019 report, we previously noted that a liquidity premium of 30 bps (based on the BofE's 2014 estimate) was applied. EE describe this as being *"for illustrative purposes".*[184]

In our view, further work is required to robustly identify the appropriate liquidity risk premium. Our analysis relating to the RFR showed that such premiums are highly time variant and can be related to the economic cycle. As such, 'crude' assumptions provide a poor basis for determining this parameter.

Overall perspective on assumptions relating to indirect methods

In our view, indirect methods can provide helpful evidence to inform the debt beta at RP3. However, it is important not to conflate their main advantage, practicality, with reliability. The results they produce are highly sensitive to the assumed values for other input parameters.

In terms of the existing evidence, our main concern is that only very a superficial analysis has been undertaken to inform these parameters. EEs' original assumptions appear to be only assumption-based and are implausible. NERA's counter proposals are more plausible and reflect better evidence, but are still partial.

[184] *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019); page 18.*

If the CMA intends to rely on indirect methods, we would encourage it to consider in much more detail the evidence and analysis that can be used to help set the assumptions relating to: (i) probability of default; (ii) loss on default; and (iii) the liquidity risk premium. Here, and consistent with our observations elsewhere in this paper, an obvious 'missing' piece is a clear, consistent and transparently articulated view of time horizons and assumed economic performance.

2.7.4.5 Summary of our assurance review relating to the debt beta

- There is some lack of clarity regarding how the CAA's proposed debt beta of 0.10 relates to the range of evidence it relies upon, and the relative weighting therefore. However, **based on our best interpretation of the CAA's consultant's advice, a debt beta of 0.10 seems to be over-stated, relative to an 'at face value' acceptance of the CAA's evidence and related recommendations.**

- **We consider that the CAA should place equal weight on the 'direct' (econometric) and 'indirect' (decompositional) methods.** This is consistent with PwC's advice to the CAA, but is at odds with EEs' advice (who advocate excluding the econometric approach). We think that EE are conflating the 'greater transparency' of the indirect method with greater robustness or certainty.

- **Whilst we consider the 'indirect method' to be a helpful approach in principle, the quality of the existing evidence base used to set the input parameters is extremely limited. Specifically, the 'probability of default'; 'loss on default'; and 'liquidity premium' have all been based on broad assumptions.** If the CMA is to make use of indirect methods, we would suggest it considers with care: (i) the relevant evidence sources and comparators, taking into account the risk faced by NERL's debt investors; and (ii) ensuring there remains a 'time-consistency' with the overall approach to the cost of equity. We do not 'pre-judge' what the appropriate values for these parameters would be, absent such evidence.

3. Review and assessment of evidence on the cost of debt

Here we provide our assessment of the existing evidence base relating to the cost of debt at RP3. We find that neither the approach to, nor allowance for, embedded debt are contentious. However, we consider that the CAA's proposed cost of new debt represents an implausible reduction in allowed debt costs in relative terms, particularly when compared to the water industry. This may be because the CAA has not properly balanced the characteristics of NERL's investments, which create an upward pressure on its financing costs relative to other sectors, against features which might otherwise lower financing costs. Relatedly, we find the CAA is mistaken in not applying an upwards adjustment to NERL's debt costs to reflect its shorter licence termination notice period. Without addressing these issues, NERL's allowed debt costs will be set below their efficient level. In relation to issuance and liquidity costs, the CAA's proposed figure of 0.1% appears low, relative to precedent that captures the totality of efficient issuance and liquidity costs. In addition, the assumptions upon which it is based are taken from the water industry, and are at odds with NERL's actual liquidity requirements and costs. Moreover, it remains unclear as to why allowances for issuance and liquidity costs have been reduced, relative to prior price determinations.

In this chapter, we evaluate the existing evidence relating to the cost of debt for NERL at RP3. As per the cost of equity, we consider both: (a) the evidence itself – i.e. its robustness; and (b) the relative weight attached to, and inferences drawn from, it. The chapter is structured around the elements of the cost of debt, as follows:

- cost of embedded debt;
- cost of new debt; and
- issuance and liquidity costs.

3.1 Overview of the respective positions of NERL and the CAA

In its Final Decision, the CAA set NERL an overall cost of debt of 0.86% (real, RPI, pre-tax). This compares to NERL's view that an appropriate cost of debt is 1.07% (on an equivalent basis). The following table summarises the key parameters assumed by both the CAA and NERL.

Table 24: Summary of finalised positions on the cost of debt

	CAA		NERL
	Draft proposals	Final Proposals	Response to Draft Proposals
Cost of embedded debt (real)	2.30%	2.30%	2.13%
Proportion of embedded debt	30.00%	30.00%	30.00%
Cost of new debt (real)	0.10%	0.10%	0.40%
Proportion of new debt	70.00%	70.00%	70.00%
Overall cost of debt (real)	0.76%	0.76%	0.92%
Issuance & liquidity cost allowance	0.10%	0.10%	0.15%
Overall cost of debt (real, pre-tax)	**0.86%**	**0.86%**	**1.07%**

Source: CAA; UK RP3 Decision Document – Appendix E.

3.2 Embedded debt

3.2.1 The CAA's position and supporting evidence

In its Final Decision, the CCA's assumed cost of embedded debt of 2.30% (real, RPI) is based on the nominal yield on NERL's existing bond (5.4%), deflated by the CAA's assumed RPI inflation of 3.0%, using the Fisher Formula, as shown below.

$$Rd\ (2.3\%) = \frac{1 - nD\ (5.4\%)}{(1 - i\ (3.0\%)} - 1$$

The CAA's position was unchanged from its Draft Proposals. The evidence it relied upon was as follows:

- The nominal yield of 5.4% on NERL's existing bond was as estimated by NERL itself. The CAA stated that, as PwC had previously reviewed the efficiency of this at RP2 and found no issues, it deemed it appropriate to retain this approach at RP3.[185]
- The CAA's assumed RPI inflation of 3.0% is a common assumption across its price control determination. In reaching this assumption, the CAA relied on evidence from the OBR; BofE; and the IMF.

3.2.2 NERL's position and supporting evidence

NERL's position in its response to the CAA's Draft Proposals is methodologically consistent with the CAA's approach (i.e. it is based on the yield on its existing bond). NERL proposed a lower cost of embedded debt of 2.13%, only because it used a different (higher) inflation forecast of 3.2% (based on analysis by NERA).

3.2.3 Our assurance review

We have limited observations to make regarding the cost of embedded debt. As follows:

[185] *'UK RP3 CAA Decision Document: Appendices.' CAA (August 2019); page 63.*

- We consider using the yield on NERL's bond to be an appropriate methodology – noting that there is no evidence to suggest that this was 'inefficient'.

- Consequently, the real cost of embedded debt is primarily determined by assumed RPI inflation. As this issue is addressed elsewhere, we offer no comments here regarding the approaches of the CAA / NERL.

3.3 New Debt

The table below summarises the positions of the CAA and NERL in relation to the cost of new debt, and the evidence upon which each is based. The numbers shown reflect each parties' own interpretation / surmising of the data, rather than our own view, which we address subsequently. In the following subsections, we expand on each evidence source in more detail. Issuance costs are addressed separately.

Table 25: summary of positions and evidence relating to the cost of new debt

	CAA (Final Decision)	NERL (Response to Draft Proposals)
Cost of new debt (RPI deflated)	**0.10%**	**0.42%**
Evidence sources (ranges shown)		
Bottom up analysis	-0.29%	0.42%
Top down analysis	0.49%	NA

3.3.1 The CAA's position and supporting evidence

3.3.1.1 Bottom up analysis

EE December 2018

EE (December 2018) developed a 'bottom up' analysis, based on the existing yield on NERL's bond, with various adjustments applied. EE stated that the latest point estimate for the yield at the time was 1.71% (nominal). The adjustments made were as follows:

- Firstly, EE adjusted for **maturity.** That is to say, as the existing bond had 5 years left to maturity, EE adjusted its yield to reflect differences between those of a 5 and 10 year bond. Using the BofE's yield curve data (as of August 2018), EE found this difference to be 40bps, which it then added to the NERL bond yield, to give an adjusted estimate of 2.11% (nominal).[186]

- Secondly, EE adjusted for **expected movements** in bond yields over RP3. Here, EEs' approach was based on assumed changes in the RFR, assuming the debt premium is constant over time. EE therefore calculated the 'difference' between yields on government bonds of differing lengths (which proxy the RFR) in order to

[186] *'Components of the Cost of Capital for NERL.' Europe Economics (December 2018); page 30.*

calculate the expected movement. They concluded that this implies a further uplift of 52bps.[187]

- Thirdly, EE then made a **downwards adjustment** to account for the fact that some of the above adjustment may reflect the impact of a 'liquidity premium', and so would overstate the expected increase in yields.[188] EE assumed an adjustment of 10bps for these effects. EE quoted two academic studies to 'inform' this assumption (but there does not seem to be a very clear connection between said studies and the specific adjustment applied). With this adjustment the premium, as per step two above, reduced to 42bps.

- Finally, EE made an adjustment for **license termination notice period.** That is to say, because NERL has a 'shorter' and decreasing notice period for license termination, EE considered this might increase the cost of new debt for NERL by a further 50bps.

Bringing the above together, EE concluded that its 'bottom up' analysis implied a final estimate for the cost of new debt of 3.03% on a nominal basis. Using the Fisher Formula as above, this implies **a real cost of new debt of 0.03%** (RPI deflated, using the CAA's assumed RPI of 3.0%).[189]

EE June 2019

In its June 2019 report, EE updated the above method for more recent data. Table 26 illustrates how its input assumptions, and results, changed.

Table 26: EEs' updated bottom up estimate of the cost of new debt (June 2019)

	Dec-18	Jun-19
Nominal yield on NATS bond	1.71%	1.62%
Maturity adjustment	0.40%	0.34%
Expectations adjustment	0.52%	0.54%
Liquidity premium adjustment	-0.10%	-0.10%
Change in licence termination notice period	0.50%	0.50%
Nominal cost of new debt	3.03%	2.90%
Inflation (RPI @ 3.0%)	3.00%	3.00%
Real cost of new debt (RPI deflated)	**0.03%**	**-0.10%**

Source: Economic Insight, derived from EE (assumes 10 yr maturity)

As can be seen from the above, EEs' updated analysis implied a reduction in the real cost of new debt to -0.10%. In its June report, EE described the above method as providing a lower bound estimate.[190]

187 *'Components of the Cost of Capital for NERL.' Europe Economics (December 2018); page 30.*
188 *'Components of the Cost of Capital for NERL.' Europe Economics (December 2018); page 30.*
189 *'Components of the Cost of Capital for NERL.' Europe Economics (December 2018); page 31.*
190 *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' (June 2019); page 3.*

EE also reported what the above would be, **assuming a 15 year maturity**. This gave a revised (slightly higher) figure of 3.15% (nominal). In turn, **this implies a real cost of new debt of 0.15% (RPI deflated).**[191]

3.3.1.2 Top down analysis

EE December 2018

EEs' December 2018 report also included 'top-down' evidence. That is to say, evidence on yields from 'comparative' bonds, with various adjustments made. Comparators included in EEs' report were as follows:

- **ENAV.** EE found that the yield on the ENAV bond was 1.93% (nominal). EE noted that this was close to the yield on NERL's bond, prior to its adjustments. In RPI terms, this implies a real cost of new debt of -1.04%. However, we find that if all of EEs' adjustments are applied, the RPI deflated cost of new debt implied by the ENAV bond rises to 0.24%.

- **Regulatory estimates.** EE reviewed estimates of the cost of new debt by regulators in relation to utilities more widely over the last five years. In RPI deflated terms, these ranged from 0.19% to 2.75%, but have been trending down over time.[192] EE identified the most recent evidence as being consistent with a real cost of new debt of 0.38% (RPI deflated).

- **'Similar' bond yields.** EE reviewed the yield on bonds with a 'similar' rating to NERL. Specifically, EE examined the yields on the iBoxx 10 year non-financials A and BBB series, and the non-financials utilities series - and used this to create an *'A and above utilities index'.* Here, EE found a nominal yield of 3.24%. Once expected interest rate movements and term length were adjusted for, EE found this implies a nominal yield of 3.46%. On an RPI deflated basis (using the CAA's assumed 3.0% RPI inflation) this, in turn, implies a figure of 0.45%.

EE June 2019

In its June 2019 revised report, EE also updated its top-down analysis. However, it focused primarily on the 'similar' bonds analysis (i.e. the third above comparator), which EE used to define an 'upper bound'. EE found that the nominal yield on its *'A and above utilities index'* is 3.08% (nominal). Once forward expectations and maturity were adjusted for, EE found this to be 3.32% on a nominal basis (reduced from 3.46% above). On an RPI deflated basis (using the CAA's assumed 3.0% RPI inflation) this implies a figure of 0.31%.

EE also quoted the above **on a 15 year maturity basis.** Here they found the nominal cost of debt implied would be 3.45%. In turn, **this implies a real cost of debt of 0.44% (RPI deflated).** [193]

[191] *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' (June 2019); page 5.*
[192] *See table 6.1 in 'Components of the Cost of Capital for NERL.' Europe Economics (December 2018); page 31.*
[193] *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' (June 2019); page 5.*

3.3.1.4 Weighting of evidence

In this section we describe how the CAA brought the various evidence together in order to arrive at its proposed cost of new debt.

IN WEIGHING UP THE AVAILABLE EVIDENCE, THE CAA DEPARTED FROM THE ADJUSTMENTS PROPOSED BY EUROPE ECONOMICS RELATING TO THE 'BOTTOM-UP' METHOD.

In its Final Decision, the CAA explained that it weighted the 'bottom up' and 'top-down' evidence from EE equally (the former giving a lower bound, the latter giving an upper bound). The CAA also stated that it considered it appropriate to assume a 15 year maturity when setting the cost of new debt. Hence, it made use of EEs' numbers on the 15 year basis. However, as the CAA made some adjustments to EEs' 'bottom up' method, the resultant range and final proposed real cost of new debt differ from those proposed by EE in its June 2019 report.

Focusing on the bottom-up method first, and assuming a 15 year maturity, the following table summarises the CAA's final decision, comparing the assumptions to those in the EE June 2019 report.

Table 27: EEs' updated bottom-up estimate of the cost of new debt and CAA decision

	EE June 2019 (10 yr maturity)	EE June 2019 (15 yr maturity)	CAA Final Decision
Nominal yield on NATS bond	1.62%	1.62%	1.62%
Maturity adjustment	0.34%	0.66%*	0.66%*
Expectations adjustment	0.54%	0.40%*	0.40%*
Liquidity premium adjustment	-0.10%	-0.10%	-
Change in licence termination notice period	0.50%	0.50%	-
Nominal cost of new debt	2.90%	3.08%	2.68%
Inflation (RPI @ 3.0%)	3.00%	3.00%	3.00%
Real cost of new debt (RPI deflated)	**-0.10%**	**0.08%**	**-0.31%**

Source: Economic Insight, derived from EE and CAA
**These differ from the left hand column because they assume a 15 year maturity.*

The key issues above relate to the CAA's decision to remove the: (i) downward adjustment for the liquidity premium; and (ii) upward adjustment for NERL's short licence termination notice period. The CAA explained this as follows:

- The adjustment for the liquidity premium was 'highly uncertain' and had not been made by other regulators.[194]
- The adjustment for the notice period premium lacked sufficient evidence and 'looked overstated'.[195]

[194] *'UK RP3 CCA Decision Document: Appendices.' CAA (August 2019). Appendix 3, page 62.*
[195] *'UK RP3 CCA Decision Document: Appendices.' CAA (August 2019). Appendix 3, page 62 – and table E.5.*

As can be seen, with the above adjustments omitted, the lower bound of the CAA's range is 2.68% (nominal), which the CAA rounds to 2.70% (-0.29% real, RPI after the CAA's rounding).[196]

In relation to the 'top down' evidence, which the CAA used to set the upper bound, the regulator slightly departed from the figure identified by EE, in that it excluded the downwards adjustment for the liquidity risk premium of 0.10%. On this basis, in its Final Decision, the CAA found that that top down evidence implied a cost of new debt of 3.48% (nominal).

Drawing the above together, the regulator takes the mid-point of the two methods to arrive at its proposed cost of new debt of 0.1%. The table below summarises the CAA's final weighting of the evidence.

Table 28: Summary of CAA's finalised position on the cost of new debt

15 year	Low	High	Mid-point
Nominal cost of new debt	2.70%	3.50%	3.10%
Inflation (RPI @ 3%)	3.00%	3.00%	3.00%
Real cost of new debt	-0.29%	0.49%	**0.10%**

Source: CAA Final Decision (rounded values quoted by CAA shown)

3.3.2 NERL's position and supporting evidence

In its Revised Business Plan, **NERL assumed a cost of new debt of 0.42%** (RPI deflated).[197] This was based on a 'bottom up' analysis by NERA, whereby (as per EE on behalf of the CAA above) the approach was to start from the yield on the existing NATS bond and then make adjustments. No 'top-down' evidence was included.

NERA provided 'bottom-up' estimates in both its March and September 2018 reports.[198] The methodology was common across both, with the only changes being revisions to input parameters to reflect more up to date data. Table 29 (See next page) summarises NERA's input assumptions and results, in a format consistent with that we have used to summarise EEs' analysis for the CAA.

[196] *'UK RP3 CCA Decision Document: Appendices.' CAA (August 2019). Appendix 3, page 63.*
[197] *'Appendices RP3 Business Plan 2020-2024.' NATS (October 2018); page 164.*
[198] *'The Weighted average Cost of Capital for NATS (En-Route) plc at RP3.' NERA (March 2018); and 'Updated Weighted Average Cost of Capital for NATS (En Route) plc at RP3.' NERA (September 2018).*

Table 29: NERA's bottom up estimates of the cost of new debt for NERL

	March 2018	September 2018
Nominal yield on NATS bond	1.55%	1.73%
Maturity adjustment	0.77%	0.78%
Expectations adjustment	0.78%	0.63%
Liquidity premium adjustment	-	-
Change in licence termination notice period	0.50%	0.50%
Nominal cost of new debt	3.60%	3.64%
Inflation (RPI @ 3.0%)	3.15%	3.20%
Real cost of new debt (RPI deflated)	**0.44%**	**0.42%**

Source: Economic Insight, derived from NERA

In its Revised Business Plan, NERL emphasised the importance of the premium for the change in the licence termination notice period. Here, NERL stated: *"the Department for Transport (DfT) reported that the CAA investigated these concerns on its behalf and had concluded that while other regulated industries had been able to issue bonds maturing beyond their licence termination notice period, there is a risk premium attached to such bonds of 50bps."*[199]

In its response to the CAA's Draft Proposals[200], NERL did not set out any updated position / new evidence relating specifically to the cost of new debt. However, it did highlight the following points:

- Firstly, that EEs' analysis as used in the Draft Proposals assumed a debt tenor of 10 years, whereas NERL argued a tenor of 10-15 was more appropriate / in line with regulatory depreciation. As we noted above, in its Final Decision the CAA assumed a tenor of 15 years.

- Secondly, NERL stated that it had assumed a different level of RPI inflation to the CAA.

[199] *Appendices RP3 Business Plan 2020-2024.' NATS (October 2018); page 164.*
[200] *'NERL's response to CAP1758: Draft UK reference period 3 performance plan proposals.' NERL (April 2019); page 57.*

3.3.4 Our assurance review

In this section we set out our assurance review. We structure our findings around the following points:

- the methods used by the CAA and NERL are similar and not contentious themselves;
- the CAA's estimate is illogically low, unprecedented and implies a marked reduction, relative to other regulated industries;
- the CAA's proposed cost of new debt is inconsistent with the recommendations of its advisors;
- the exclusion of a premium for notice period risk will understate NERL's efficient cost of debt; and
- there should be a downwards adjustment for liquidity risk – although this is uncertain.

3.3.4.1 The methods used by the CAA and NERL are similar and uncontentious

Briefly, we consider the use of 'bottom up' and 'top down' methods for setting the cost of new debt to be valid and in-line with approaches frequently used by regulators. Both the CAA and NERL rely on bottom up approaches and both are very similar – and we note there is no disagreement between the parties as to the overarching approach. They differ only in the *assumptions* made regarding what adjustments are applied (which we address in the subsequent subsections). Only the CAA also draws on top-down evidence. We think NERL's evidence would have benefited from the use of top-down comparators. However, again the principle of using this approach is not debated. So, in summary, at a high level, the 'method' used by both parties is reasonable and is not disputed.

3.3.4.2 The CAA's estimate is illogically low, unprecedented and implies a marked reduction relative to other regulated industries

Stepping back, it is worth noting that the CAA's 'lower bound' estimate for the cost of new debt is 2.70% in nominal terms, or -0.29% on an RPI deflated basis. This is unprecedentedly low in terms of regulatory determinations and estimates for the cost of new debt. This is important, because the CAA's proposed cost of new debt (0.1%, RPI deflated) is based on a mid-point of its lower and upper bound estimates.

For example, the table below summarises the regulatory estimates identified by EE and included in its December 2018 report. As can be seen, the lowest estimate for the cost of new debt was 3.4% in nominal terms and 0.2% on a real (RPI) basis. In other words, there is not a single observation in line with the CAA's lower bound of -0.29% (or even its central estimate of 0.1%; RPI, real).

Table 30: Regulator's estimates of the cost of new debt, as compiled by EE

	Feb 14	Feb 14	Dec 14	Dec 14	Oct 15	Sep 16	Sep 16	Jun 17	Dec 17
Regulator	CAA	CAA	Ofwat	UR	CMA	UR	UR	UR	Ofwat
Nominal cost of new debt	5.4%	5.6%	4.9%	4.7%	4.2%	5.7%	6.3%	3.4%	3.4%
RPI cost of new debt	2.5%	2.8%	2.0%	1.3%	1.6%	2.5%	3.0%	0.2%	0.4%

Source: as stated in EE December 2018 report (figures rounded to 1dp)

Since the above, in July 2019, Ofwat has published its Draft Determinations for the water industry. In it, the regulator found that the range for the nominal cost of debt was between 3.24% (low case) and 3.57% (high case), implying a mid-point of 3.36%.[201] In real (RPI) terms, this implies a range of 0.23% to 0.55%, with a mid-point of 0.35%. Again, therefore, we should highlight that **even Ofwat's 'low case' is well above the CAA's assumed cost of debt for NERL at RP3.** In fact, Ofwat's method includes a 'downwards adjustment' for historical outperformance of the water sector of 25bps,[202] which means this comparison understates the extent of the difference on a like-for-like basis.

Further to the above, there is nothing to suggest that the cost of new debt for NERL should necessarily be higher, or lower, than that set in the water sector per se. There are a number of considerations relevant to this, which tend to go in opposing directions. For example, it has previously been argued that NERL benefits from 'implicit government support', which (all else equal) should *lower* its financing costs relative to the fully privatised water sector. On the other hand, the nature of investment between air traffic services and the water industry differs markedly. The latter being characterised by 'heavy' infrastructure assets, with long asset lives and little-to-no volume risk. It is clear that the nature of NERL's investment is very different to this. The company is more asset light in general; and its assets tend to relate to 'smaller' and 'more intangible' items, such is IT and software – with shorter asset lives and less secure income. These differences in characteristics (one of which is NERL's shorter licence termination notice period – as we discuss subsequently) would tend to imply *higher* financing costs, relative to the water industry.

'What is hard to reconcile, however, is the very marked reduction in the cost of new debt proposed by the CAA for RP3 in relative terms, when compared to the water industry.'

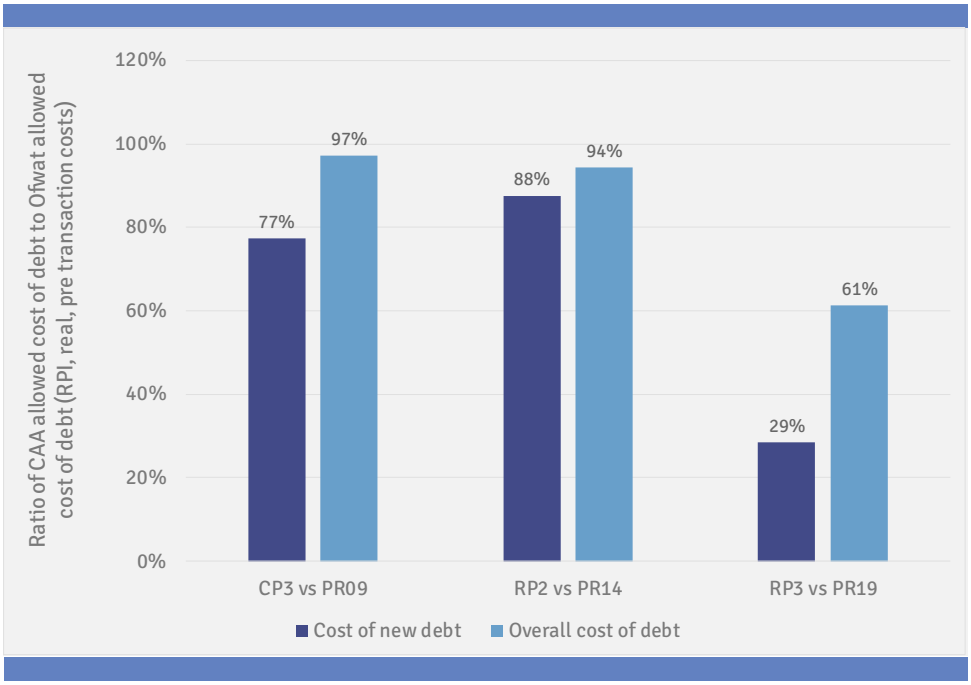
Given the above, what is hard to reconcile, however, is the very marked reduction in the cost of new debt proposed by the CAA for RP3 in relative terms, when compared to the water industry. We have examined the CAA's allowed cost of 'new debt' and overall 'cost of debt' going back to CP3. In each case, we have compared these to Ofwat's equivalent allowances, set at PR09; PR14; and PR19 respectively. For both the cost of 'new debt' and 'overall debt' we have calculated the ratio of the CAA's allowance to Ofwat's, so that we can see how the CAA's relative position has changed at RP3. To ensure the comparisons are like-for-like, they are based on RPI deflated

[201] *'PR19 Draft Determinations: Cost of Capital Technical Appendix.' Ofwat (July 2019); page 69.*
[202] *We do not agree that such an adjustment is sensible in the first place, as we do not think the WACC should be used as an 'error correction' mechanism for a failure to set incentives properly.*

numbers, with any allowances for transactions costs removed. Figure 10 shows the results of our analysis.

THE CAA HAS PREVIOUSLY SET THE COST OF NEW AND OVERALL DEBT FOR NERL AT A RELATIVELY SIMILAR (SLIGHTLY LOWER) LEVEL TO THE WATER INDUSTRY. AT RP3, IT IS NOW PROPOSING A MUCH LOWER ALLOWANCE IN RELATIVE TERMS. THIS IS IMPLAUSSIBLE.

Figure 10: Comparison of CAA and Ofwat cost of debt allowances over time



Source: Economic Insight analysis of regulatory determinations

As can be seen, at both CP3 and RP2, the CAA allowed a similar cost of new debt and overall cost of debt to that allowed by Ofwat. Specifically, we can see that:

- the CAA's cost of new debt was 77% and 88% of Ofwat's equivalent allowance; and
- the CAA's overall cost of debt was 97% and 94% of Ofwat's equivalent allowance.

Seen in this context, the change in the CAA's position at RP3 is stark. Specifically**, the CAA is now only proposing a cost of new debt equivalent to 29% of Ofwat's proposed allowance in the water industry.** Its cost of overall debt is only 61% of Ofwat's proposed allowance. In our view, this is not a plausible or credible position and appears to reflect the CAA's particularly 'low' estimate for its lower bound. In turn, our view is that, underlying this, the CAA has not carefully considered the relevant countervailing characteristics of NATS's investments and environment, which tend to create upward pressures on the cost of debt.

In light of the above, **we would suggest that the CMA needs to consider whether there might be any evidence or argument to suggest that the relative risk of NERL's debt (compared to other industries) has fallen markedly since RP2.**

3.3.4.4 The CAA's proposed cost of new debt is inconsistent with that recommended by its consultants

In EEs' June 2019 updated report, it recommended attaching equal weight to the methods used to determine its proposed 'lower' and 'upper' bounds. This implies:

- in nominal terms, a range of 2.90% to 3.32%[203]; and therefore
- on an RPI deflated basis, a range of -0.10% to 0.31%.

Following EEs' advice, the implied mid-point would actually be a real cost of new debt of 0.11% (RPI deflated), Putting to one side our above observations regarding the general 'plausibility' of the CAA's proposals, we nonetheless note that this figure is, itself, fractionally higher than the CAA's selected cost of new debt of 0.10%.

We are aware that there are a number of reasons for the above discrepancy and that the CAA has consciously decided to depart from its consultant's advice on certain methodological points. So, here we are simply observing that the CAA has elected to apply a cost of new debt below the level its consultants recommended.

3.3.4.5 The exclusion of a premium for notice period risk will understate NERL's efficient cost of debt

A key reason for the CAA's proposed cost of debt being atypically 'low' appears to be the exclusion of a premium for notice period risk. Here, we note that both EE (the CAA's advisors) and NERA (on behalf of NERL) included an adjustment for this, equivalent to 50bps. Therefore, the CAA's position is 'at odds' with both sets of advisors. Given this, it is important to consider further the key issues relating to this.

Overview of the issue

A minimum termination notice period (MTNP) refers the minimum amount of elapsed time between when a regulated company can be 'served notice' that its licence will be terminated and the termination actually occurring. In the water industry, there is a 25 year notice period, for example.

In the case of NERL, it cannot be served notice until 2021, and from that point there would be a 10 year notice period. Hence, its notice period is now 12 years and will decline to (and remain at) 10 years by 2021.

The above raises important issues relating to the ability and cost of raising finance. Namely, whether shorter MTNPs:

- make it harder for regulated companies to raise debt finance;
- affect the profile of debt raised; and / or
- increase the cost of debt finance.

Given NERL's short (and rolling) MTNP, the above is clearly a relevant consideration when setting the cost of new debt at RP3.

[203] *'Comments on NERA/NERL critiques of Europe Economics' WACC analysis.' Europe Economics (June 2019); page 4. Figures quoted here are cost of new debt before the 7bps allowance for issuance costs applied by EE.*

Existing evidence

The primary source of relevant evidence pertaining to RP3 is a 2015 report by EE[204], which was commissioned by the CAA specifically to address the above questions.

EEs' approach was to undertake a 'comparative analysis', examining how access to, and the cost of, debt varied across regulated industries with differing MTNPs. The comparators included in EEs' analysis were:

- electricity (25 year notice period);
- gas (25 year notice period);
- water (25 year notice period); and
- telecoms – BT (10 year notice period).

EE firstly explored the question of whether there was any relationship between the MTNP and the profile of debt, as measured by its maturity. Here, EE firstly plotted a time series of the proportion of debt issued expiring after the 'cut off' date. From this, the key points EE observed were: (i) that companies do issue debt that extends beyond the MTNP (therefore, it does not seem to be a 'cap' on the ability to raise debt); (ii) in practice NATS has no debt expiring beyond its MTNP; and (iii) macroeconomic factors / credit conditions may dominate any impact of the MTNP on the ability to raise debt.

'The MTNP has quite powerful implications for debt-raising.' –

Europe Economics

Whilst EE found that the ability to raise debt was not 'capped' by MTNPs, they also used econometric modelling to test whether there was a relationship between the MTNP and the profile of debt. Here, they found that, for each additional month until MTNP, a company's average debt profile will be longer by 0.83 months. They concluded: *"this would be consistent with the idea that the MTNP has quite powerful implications for debt-raising."*[205]

Next EE examined whether the cost of debt (as measured in bond yields across its comparator dataset) were impacted by MTNP. To do this, for bonds with a maturity that fell outside the MTNP, they calculated an 'event date' (the date at which the time to maturity changes from within, to beyond, the MTNP). They then tested whether, for each company's bonds, the yields in the period preceding the event date are significantly different from those after the event date. This was done using a panel dataset, with a dummy variable (taking the value 1 if the bond matures before the earliest day on which notice can be served). EE found bond yields were 0.47 percentage points lower if they mature within the MTNP.[206] Thus, EE found that MTNP has a relatively material impact on yields and the result is statistically significant.

EE subsequently further tested the above by introducing 'controls' for asset life. They did this in two alternative ways: (a) introducing the asset life variable as a separate standalone term; and (b) interacting the term with the dummy variable. EE found the inclusion of asset lives did not materially impact its estimate of the impact of MTNP on

[204] *'implications for debt – raising and the cost of debt of changing the minimum termination notice period for NERL's licence.' Europe Economics (September 2015).*

[205] *'implications for debt – raising and the cost of debt of changing the minimum termination notice period for NERL's licence.' Europe Economics (September 2015); page 13.*

[206] *'implications for debt – raising and the cost of debt of changing the minimum termination notice period for NERL's licence.' Europe Economics (September 2015); page 15.*

bond yields. Specifically, under these two approaches, the impact of MTNP on yields varied from 0.46 percentage points to 0.50 percentage points.[207]

EE summarised its conclusions as follows:

- Regulated companies do raise significant volumes of debt that matures beyond the MTNP. Therefore, this does not appear to 'limit' the ability to raise debt.
- However, the MTNP does impact the profile of debt. Typically companies with longer MTNPs have debt with a longer maturity profile.
- When debt is raised beyond the MTNP, it is "materially more expensive", by around half a percentage point.
- EE further stated that: *"it is plausible that when the proportion of a company's assets that are intangible is higher, the impact of bonds maturing beyond the maturity termination notice period is greater."*[208]

In addition to EEs' own evidence, its report referred to a document produced by Bank of America Merrill Lynch. In this document, the bank stated that NERL's shorter licence period: *"increases the cost of debt capital."*

Finally, we note that the CAA's advice to the DfT in 2016 relating to a potential change in the length of NERL's licence, stated: *"despite the difference in yields, the financing benefits to NERL of a 25 year notice period are likely to be relatively modest compared to the overall level of determined costs."*[209] That is to say, the CAA's position was that there is an impact on financing costs relating to notice period length. However, the regulator just noted that that this might be small, compared to NERL's overall determined costs. This is unsurprising, given NERL's cost structure. Consequently, it would appear that the CAA also accepts the 'in principle' need for an adjustment. Indeed, in the CAA's advice to the DfT, it did not challenge EEs' quantification of 50bps. Rather, it simply noted that in £m term, this would be a modest benefit, relative to the overall size of NERL's costs.

[207] *'implications for debt – raising and the cost of debt of changing the minimum termination notice period for NERL's licence.' Europe Economics (September 2015); page 17.*
[208] *'implications for debt – raising and the cost of debt of changing the minimum termination notice period for NERL's licence.' Europe Economics (September 2015); page 19.*
[209] *'Section 16 advice to the Secretary of State for Transport on extending the length of the notice provisions for termination in the Air Traffic Services licence.' CAA (2016).*

'IN PRINCIPLE', THERE SHOULD BE AN UPWARD ADJUSTMENT TO THE COST OF NEW DEBT TO REFLECT NERL'S SHORTER LICENCE TERMINATION NOTICE PERIOD.

Our views

1) There is a clear 'in-principle' need to adjust for NERL's shorter licence termination period

From an 'in-principle' point of view, we would expect there to be some form of premium for shorter termination periods. This follows from the fact that debt issued with a maturity beyond a potential termination point carries some additional risk (i.e. that the regulated company may lose its licence, increasing the risk of default, say). In turn, debt investors would expect to be compensated for that risk. This logic seems to be straightforward and should be uncontroversial.

EEs' 2015 report identifies some 'contrary' points to the above notion. However, these seem to be largely irrelevant to the question of *whether* there is a premium for MTNP. As follows:

- EE noted that even within a MTNP firms face risk and that the MTNP is not a guarantee of non-bankruptcy. We agree with this. However, it is irrelevant to the fact that the possibility of a licence being terminated represents an *additional risk*, over and above this.
- EE noted that other risk factors, such as financial mismanagement, may dwarf the risk associated with the MTNP, such that any impact it has might: *"fall well within the normal fluctuations in yields…. So it was little more than added noise."*[210] In principle, this is clearly possible. However, this is not an argument against there being an additional risk arising from a shorter notice period. Rather, it just seems to be highlighting potential difficulties in measuring it.
- EE also noted that the long lives of assets in regulated industries might provide 'de facto' collateral that further mitigates termination risk. We would agree with this, but again, it seems to be entirely separate from the issue of whether, on a 'like-for-like' basis, shorter termination periods tend to increase the riskiness of debt.

'The fundamentals of NERL's business model, and in particular, the more 'intangible' nature of its assets and shorter asset lives, would seem to make taking account of any risk premium for its shorter MTNP especially important.'

Further to the above, the fundamentals of NERL's business model, and in particular, the more 'intangible' nature of its assets and shorter asset lives, would seem to make taking account of any risk premium for its shorter MTNP especially important. Hence, we consider the CAA has erred by excluding this adjustment.

[210] *'implications for debt – raising and the cost of debt of changing the minimum termination notice period for NERL's licence.' Europe Economics (September 2015); page 4.*

2) Other than the submissions made for RP3, a range of other evidence is consistent with termination periods impact financing risk

Beyond submissions made at RP3, we have identified a range of other evidence that further supports the notion that termination periods impact financing risk. Examples of this include the following:

- Ofcom's 2010 methodology for the Renewal of the Independent National Radio licences contains some discussion of how companies / finance providers might perceive risk to vary, depending on licence length and notice periods. Ofcom explicitly states that variations in length might impact the appropriate financial terms for licences, stating: *"if information comes to light at any point before Ofcom's determination in any relevant case which suggests that an earlier or later end date for the licences is probable, then an adjustment may be made in this regard."*[211]

'The termination of the Licence and/or the transfer of the Company's business could have a material adverse impact on the financial condition and prospects of the Company and, consequently, on the Issuer's ability to meet its obligations.' –

Bond Prospectus for Thames Tideway

- When determining its approach to setting the annual licence fee (ALF) for the 900 and 1800 MHz bands, Ofcom drew on a comparative analysis for the value of spectrum at various auctions around the world. As part of this, Ofcom specifically adjusted for licence duration, stating that this was: *"to reflect the difference in value an operator would place on having access to spectrum for a shorter (or longer) period, which itself depends on the difference in future cash flows they expect to earn. As the risk of these expected cash flows should be reflected in this adjustment, in the 2015 statement we considered it appropriate to make this adjustment using the WACC"*[212]

- The Bond Prospectus for Thames Tideway includes a discussion of relevant risks. Within this, a whole section is dedicated to the risk around licence termination, which includes setting out the licence termination notice period. It states: *"the termination of the Licence and/or the transfer of the Company's business could have a material adverse impact on the financial condition and prospects of the Company and, consequently, on the Issuer's ability to meet its obligations (including the payment of principal and interest) under the Bonds."*[213]

- The Department for Transport's impact assessment of potential changes to NERL's licence termination period also explicitly acknowledged the in principle impact of this on financing costs: *"precisely quantifying the value of this lost flexibility, including the compensation of debtors and shareholders in the case of premature licence termination, is difficult, though a longer notice period would intuitively increase the compensation owed* [i.e. because the risk is reduced]."[214]

In addition to the above examples, responses to the DfT's 2016 consultation 'Modernising the Licensing Framework for Air Traffic Services' provide further relevant evidence. In particular, in response to the question: *'Do you agree with our proposal to lengthen the licence notice period?'* four respondents commented directly on financing costs. Each response is consistent with the principle that a longer notice

[211] *'Renewal of the Independent National Radio licences.' Ofcom (2010); page 23.*
[212] *'Annual Licence Fees for 900 MHz and 1800 MHz frequency bands: annexes.' Ofcom (December 2018); page 9.*
[213] *'Multicurrency Programme for the Issuance of Bonds.' (2018) Page 36.*
[214] *'Updating the licence modification process for the en-route air traffic licence: IA No: DfT00368.' DfT (2011); page 13.*

period would reduce debt costs for NERL (i.e. therefore, that NERL's existing shorter notice period currently means its debt costs are 'higher'). Specifically:

- Consistent with our previous summary, the CAA itself acknowledged that financing costs would be lower (the CAA's argument was more that the impact of this was small in relative terms).
- The Department for Infrastructure in NI stated that lengthening the licence period would provide: *"additional flexibility to ensure efficient financing of its investment programme."*
- British Airways' view was that: *"BA does agree with the general principle, articulated in the consultation document, that extending the licence from the current rolling 10-year notice period (from 2021) to 15-years should allow NERL to secure debt financing on better terms."*
- Virgin Atlantic stated: *"we note the incentive for NERL to be able to finance longer term investments at a cheaper rate."*

WITHOUT AN UPWARD ADJUSTMENT TO THE COST OF NEW DEBT TO REFLECT NERL'S SHORTER TERMINATION NOTICE PERIOD, ITS ALLOWED COSTS WILL BE BELOW THE EFFICIENT LEVEL.

In summary, we consider that the 'in principle' need for an upwards adjustment to NERL's cost of debt to reflect its shorter termination period is not only obvious as a point of economic theory, but is widely acknowledged. As such, without such an adjustment, the logical implication is that NERL's allowed costs will be below the 'efficient' level.

3) In relation to NERL's cost of debt at RP3, the best existing evidence on the notice period uplift is the EE estimate, but it has some shortcomings

If the 'need' for an adjustment for NERL's shorter termination period is clear, the practical question becomes 'what' should it be? At present, our understanding is that the best available estimate of this remains EEs' analysis, which advocated an upwards adjustment to NERLs cost of new debt of 0.50% (50bps).

We have reviewed EEs' methodology and approach. In general, we consider it to be reasonable. Specifically, we think the use of econometrics where yields are regressed against explanatory factors, including a variable that identifies whether debt maturities are within the termination point or not, is sound. In addition, we note that the regression results themselves have reasonable statistical properties. Specifically: they have relatively high adjusted R squares (>0.6); the individual parameters are statistically significant; and the individual parameters are appropriately signed.

As with any such analysis, it has some limitations. These include the fact that the sample size and time period is somewhat limited. In addition, it would seem plausible that other factors, not captured in the models, impact relative yields. Given this, it seems possible that additional work and analysis might produce a more comprehensive evidence base.

Our recommendations

The CMA should make an upward adjustment to the cost of NERL's new debt to allow for a premium for its licence termination period. The CMA could do this by relying on EEs' estimates. Alternatively, the CMA may wish to consider undertaking new work in this area, where the objective would be to improve the robustness of the evidence

base for said adjustment. Without any such adjustment at all, it is clear that NERL's cost of new debt will be understated.

The CMA should further consider this in the broader context of there being a need to carefully consider the features of NERL's investments and related risk exposure for debt investors. As we previously set out, whilst certain features (implicit government support) might lower NERL's debt costs relative to other regulated sectors, other features would seem to increase its relative debt costs. Seen from this perspective, any analysis that seeks to specifically attribute differences in debt yields to individual factors (such as EEs' work) will by definition be subject to uncertainty. However, such analysis nonetheless serves an invaluable purpose in demonstrating that yields can vary depending on factors that are intrinsic to the nature of the business and so are outside of efficient management control. Thus, the more general point is to ensure that NERL's allowed costs of new debt properly reflect said factors.

3.3.4.6 Exclusion of the liquidity premium

We noted above that the CAA also excluded the small downward adjustment of 0.1% that EE recommended in relation to the liquidity premium. The CCA said that this was because the size of any adjustment was highly uncertain; and that similar adjustments had not been made by other regulators.

Our views on this are as follows:

- 'In principle' we agree with EE that a downward adjustment for liquidity is appropriate.
- However, we also agree with the CAA's view that the size of the adjustment is difficult to determine. Indeed, we discussed this issue previously in relation to the RFR. This, is, however, not a good reason not to make the adjustment.
- Related to the above, EEs' assumption of a -0.1% adjustment is based on a highly simplistic analysis. If the CMA were to adjust for this, we would recommend it look at the evidence on liquidity risk premia in much more detail. A key issue is ensuring the internal consistency of any adjustment with other assumptions made.
- The complexity of identifying the 'right' adjustment (an argument the CAA relies upon) is another reason why, when determining the RFR, it is important to make use of evidence based on both index-linked and nominal gilts. Hence, **there seems to be a tension between the CAA's position on the cost of new debt and its approach to the risk free rate.**

3.5 Issuance and liquidity costs

Below we summarise the positions of the CAA / NERL in relation to issuance and liquidity costs; and the evidence that each relies upon. This is presented based on the interpretations each of the parties applies to the evidence, rather than it reflecting our own views. In the following subsections we briefly explain the underlying evidence, before setting out our assurance review.

Table 31: Summary of positions and evidence relating to issuance and liquidity costs

	CAA (Final Decision)	NERL (Response to Draft Proposals)
Issuance and liquidity costs	**0.10%**	**0.15%**
Evidence sources		
Regulatory precedent	0.10%	0.15%
Analysis of liquidity and issuance costs for utilities	0.07%	NA

3.5.1 The CAA's position and supporting evidence

In its Final Decision, the CAA confirmed its proposal to allow 0.10% for issuance (transaction) and liquidity costs of debt. The CAA explained that this is based on both an analysis of liquidity and issuance costs for utilities (by EE, which indicates a value of 0.07%) and on regulatory precedent. (which indicates a value of 0.10%). In addition, the CAA notes that its proposed issuance costs of 0.10% lies between EEs' figure and that proposed by NERL, of 0.15%.[215]

3.5.1.1 Analysis of issuance and liquidity costs

EEs' December 2018 report contained evidence on issuance and liquidity debt costs, based on previous analysis the consultancy had undertaken on behalf of Ofwat.

EE summarised that this shows typical issuance costs for a utility are in the region of 3-6 basis points (bps). This is informed by an analysis of average issuance costs for water companies and includes 37 issuances in total. This shows a long-term average issuance cost of 4.68%; and an average since 2000 of 3.05%.

EE further stated that firms bear costs of maintaining liquidity (access to revolving facilities). EE assumed that the costs of such facilities is itself a good approximation of liquidity costs. EEs' December 2018 report actually contains no evidence / analysis itself of this. Rather, their view that issuance costs are between 3.5% to 4.5% seems to reflect Ofwat's position, as follows: *"according to the Ofwat analysis the cost of undrawn credit facilities is around 35-45 bps and on average firms were assumed to have the credit facilities for the amount of around 10 per cent of the value of their debt. This implies the liquidity cost of around 3.5-4.5 bps."*[216]

[215] *'UK RP3 CAA Decision Document: Appendices.' CAA (August 2019); page 67.*
[216] *'Components of the Cost of Capital for NERL.' Europe Economics (December 2018); page 79.*

Combining the above gives a total range of 6.5 bps to 10.5 bps for issuance and liquidity costs. In reaching a recommended point estimate, as regards *issuance costs*, EE stated that NERL's debt was 'less complex' than that of water companies, indicating the lower end of its range (3%) was appropriate. In relation to *liquidity,* EE assumed that NERL would have a lower need for revolving credit facilities than water companies, and so take the lower end of this range (i.e. 3.5%). Overall, EE found that issuance and liquidity costs for NERL would be 0.065% (6.5 bps), rounded up to 0.07% (7 bps).

EEs' April 2019 report contained no additional evidence relating to issuance and liquidity costs.

3.5.1.2 Regulatory precedent

In its Final Decision, the CAA cites recent regulatory precedent as being consistent with an overall allowance of 0.10% (10 bps) for issuance and liquidity costs. Specific precedent quoted by the CAA includes:

- Ofwat in its PR19 Draft Determinations;
- Ofcom in its business connectivity market review; and
- PwC's advice to the CAA on the next price control for HAL.[217]

3.5.2 NERL's position and supporting evidence

In its response to the CAA's Draft Proposals, NERL reiterated that it believed a total allowance for transaction / liquidity costs should be 0.15% (15 bps). NERL's position is primarily based on its observation that there has not been any evidence put forward to explain why the allowance should be reduced from that set at RP2.[218]

The above is consistent with NERA's reports[219], which both propose an allowance of 0.15%. NERA stated that this reflects both the RP2 allowance and NERL's actual transaction costs (although an analysis of the latter is not contained in said reports).

3.5.3 Our assurance review

In the following we set out the results of our assurance review. We have organised this around the key issues that emerged from our assessment of the evidence. These are as follows:

- the size of NERL's credit facilities;
- the cost of NERL's facilities; and
- the interpretation of regulatory precedent.

---

217 *'UK RP3 CAA Decision Document: Appendices.' CAA (August 2019); page 67,*
218 *'NERL's response to CAP1758: Draft UK reference period 3 performance plan proposals.' NERL (April 2019); page 66.*
219 *'The weighted average cost of capital for NATS (En Route) plc at RP3.' NERA (March 2018); and 'Updated weighted average cost of capital for NATS (En Route) plc at RP3.' NERA (September 2018).*

3.5.3.2 The size of NERL's credit facilities (liquidity costs)

EEs' analysis appears to be based on relatively high level observations relating to the water industry. Specifically, we note that EE finds that credit facilities cost between 35 to 45 bps and that firms need such facilities up to around 10% of their debt. Thus, EE get to their range of an implied liquidity cost of 3.4 to 4.5 bps. However, an analysis of NERL's accounts suggests that these assumptions are not suitable for NERL.

Specifically, NERL's 2019 report and accounts set out details of its facilities. As can be seen in the following table, this shows it has a revolving credit facility of £40m and an overdraft facility of £10m. Its total borrowings are £335m. Consequently, the size of its revolving credit facility alone is 12% of debt – and this increases to 15% if overdrafts are included. Hence, EEs' assumed 10% figure from the water industry is plainly 'too low'. **Put simply, the total 'size' of NERL's facilities is being understated under EEs' approach – hence, so too will its implied liquidity costs.**

Indeed, as can also be seen from the table, if one assumes that EEs' cost estimates for said facilities are appropriate, applying these to the actual size of NERL's facilities implies an appropriate uplift for liquidity of between 4.2bps and 6.7bps (compared to EEs' proposed range of 3.5-4.5bps).

EEs' ESTIAMTES OF LIQUIDITY COSTS ASSUME FIRMS HAVE A CREDIT FACILITIY EQUAL TO 10% OF THEIR DEBT. HOWEVER, NERL'S FACILITIY IS LARGER, IMPLYING THE ADJUSTMENT FOR LIQUIDITY MAY BE UNDERSTATED.

Table 32: NERL's required liquidity costs given actual facility size

Calculation step	Result
Total bank facilities (£m)	£400
Revolving term facility (£m)	£350
Revolving credit facility (£m)	£40
Overdrafts (£m)	£10
Total borrowings (£m)	£335
Revolving credit / total debt (%)	12%
Revolving credit + overdraft / total debt (%)	15%
EE low estimate (bps)	35
EE high estimate (bps)	45
Min liquidity uplift (bps)	**4.2**
Max liquidity uplift (bps)	**6.7**

Source: Economic Insight analysis of NERL's 2019 accounts

The above would only not be an appropriate basis for determining NERL's liquidity costs if one believed it was holding an 'inefficiently large' credit facility at present. We are not aware of any existing evidence to inform this one way or another. Hence, **we recommend the CMA determines liquidity costs with reference to the actual size of NERL's facilities – but in doing so, it may wish to consider further the efficiency of these.**

3.5.3.3 The cost of NERL's facilities

The above analysis also assumes that EEs' proposed range of 35bps to 45bps for liquidity costs (based on the water industry) is itself appropriate in the first place. However, there are reasons to suppose this is not the case. Specifically, smaller companies tend to need to hold additional cash and / or incur higher costs for holding said cash. Indeed, Ofwat accepted the principle of this in its recent Draft

Determinations for PR19, stating: *"we addressed the question of additional cash holding costs for smaller companies in our Initial Assessment of Plans. Overall, we remain unconvinced that the potentially relatively higher cash holding costs for smaller companies outweigh the benefits from the observed higher share of lower-cost floating rate debt compared to larger companies"*[220] [emphasis added].

Put simply, Ofwat accepts the principle that these costs may be higher for smaller companies. In practice, it did not apply an 'across the board' uplift for smaller companies specifically relating to this, due to the regulator's continued application of its 'consumer benefits test' for the WACC. However, (i) we do not agree with the principle of said test, because our view is that if the 'efficient' costs of a regulated company are genuinely higher for reasons outside of management control, it is by definition in consumers' interests to allow them (and, moreover, non-inclusion would seem to contradict relevant financeability duties); and (ii) the CMA has also rejected the principle of the customer benefit test for the same reason.[221]

Following from the above, it is clear that, relative to the large water companies on whom EEs' estimates is based, NERL is 'smaller' – and hence would seem to have higher cash holding costs. Consequently, it seems flawed as a matter of principle to apply the same assumptions as those based on water companies.

3.5.3.4 Interpretation of regulatory precedent

Both the CAA and NERL have made reference to regulatory precedent to support their views on issuance and liquidity costs. Accordingly, it is important to be clear as to what the precedent actually shows and the correct interpretation of this. In the following, we therefore briefly summarise the precedent mentioned in the context of RP3 to date, in chronological order.

CAA RP2 Performance Plan (June 2014)

The CAA ultimately allowed for 0.15% (15 bps) relating to debt transaction costs at RP2. This was on the basis that it was the same amount allowed by the CAA for Heathrow / Gatwick at Q6.[222] Having reviewed the CAA's relevant Q6 determination document, we have found that this 0.15% in turn consisted of:

- 0.10% (10bps) relating to book-runner and other fees on bond transactions; plus
- 0.05% (5bps) for Gatwick relating to its smaller issuance sizes and infrequent issuance program.[223]

We further reviewed the related PwC report on which the CAA's position was based. From this, it is clear that the 0.15% allowance related to transaction costs alone. This is because PwC took the view that liquidity costs did not need to be allowed for, stating: *"we have not made any allowance for any liquidity facilities or Revolving Credit*

[220] *'Draft Determinations: Cost of Capital Technical Appendix.' Ofwat (August 2019); page*
[221] *See 'Bristol Water plc: A reference under section 12(3)(a) of the Water Industry Act 1991 - Appendices 5.1 – 11.1.' CMA (2015); pages A10(1)-13 - A10(1)-14.*
[222] *'UK-Ireland FAB RP2 Performance Plan – Supporting Document.' CAA (June 2014); page 243.*
[223] *'Estimating the cost of capital: a technical appendix to the CAA's Final Proposal for economic regulation of Heathrow and Gatwick after April 2014.' CAA (2013); page 42,*

Facilities. We consider that any finance department operational costs (e.g. regular bank fees and charges) should be included in the assessment of operational costs."[224]

Relating to the above, our view is that efficient liquidity costs must be allowed for, in order for regulators to be compliant with their financeability duties. At face value, PwC's advice appears consistent with this. Namely, PwC appears to be saying that, if efficient liquidity costs are allowed for within assessed operating costs, there is no need to also include them in the cost of debt. In principle, we would agree with this. However, the pertinent question that then arises is whether, in fact, if liquidity costs are not included in the cost of debt, they are being transparently allowed for elsewhere in regulatory determinations. At present, it seems that there is no explicit allowance for such costs within NERL's allowed opex.

CMA redetermination of Bristol Water's PR14 Price control (October 2015)

In its 2015 redetermination of Bristol's PR14 price control, the CMA made an allowance of 0.1% for issuance costs, stating: *"we considered that an uplift of 0.1% for issuance costs remains appropriate for both actual and notional embedded debt costs, as well as for new debt."*[225] In addition to this, the CMA made an allowance for liquidity of 0.1% to 0.2%, stating: *"we considered the evidence outlined above was consistent with an estimated cost of 0.1 to 0.2% for actual embedded cash holding costs."*[226] Thus, in total, the CMA found that issuance and liquidity costs combined amounted to an uplift of 0.2% to 0.3% (percentage points).

Ofcom Business connectivity market review (December 2018)

In its Business Connectivity Market Review, Ofcom made an allowance for issuance costs for BT. This was based on an analysis of actual issuance costs incurred by BT, and the CMA's decision relating to Bristol Water (above). Ofcom concluded: *"taking account of this and the evidence on BT's actual debt issuance costs, we consider it appropriate to include an allowance of ten basis points for debt issuance."*[227] We note that Ofcom's allowance related specifically to issuance costs and the regulator did not consider the question of liquidity. BT is a much larger organisation than NERL and, as previously explained, the impact of liquidity requirements might be much smaller relative to its overall debt costs (i.e. the impact of ignoring liquidity might have been minimal in BT's case, but could be highly important for NERL).

Ofwat PR19 Draft Determinations (July 2019)

As previously noted, Ofwat has provisionally set an allowance of 0.1% for issuance and liquidity costs combined at PR19 in its draft determinations. However, we note that: (i) this precedent does not appear to an 'additional' source of evidence, as EEs' recommendation for the CAA at RP3 is based on this exact same analysis (which it undertook for Ofwat); and (ii) as previously noted, Ofwat acknowledges that smaller companies may face additional liquidity costs, but it is assessing these on a case-by-case basis, and so they do not form part of its 0.1% figure.

---

[224] *'Estimating the cost of capital for designated airports A report prepared for the Civil Aviation Authority (CAA).' PwC (October 2013); page 44.*

[225] *See 'Bristol Water plc: A reference under section 12(3)(a) of the Water Industry Act 1991 - Appendices 5.1 – 11.1.' CMA (2015); pages A10(1)-13 - A10(1)-12.*

[226] *See 'Bristol Water plc: A reference under section 12(3)(a) of the Water Industry Act 1991 - Appendices 5.1 – 11.1.' CMA (2015); pages A10(1)-13 - A10(1)-13.*

[227] *'Business connectivity market review: Annexes 1-22.' Ofcom (December 2018); page 224.*

Bringing the above together, Table 33 summarises the precedent mentioned by the parties, highlighting the appropriate interpretation of this.

Table 33: Summary of our review of regulatory precedent relied on by the parties

	Issuance costs	Liquidity costs	Combined
CAA RP2 (June 2014)	0.15%	Not included in cost of debt, but only on the basis that efficient liquidity costs should be allowed for elsewhere (in operating costs).	Not considered.
CMA Bristol Water (October 2015)	0.10%	0.1% - 0.2%	0.25%
Ofcom Business Market Connectivity Review (December 2018)	0.10%	Not considered.	Not considered.
Ofwat PR19 Draft Determinations (July 2019)	0.03% - 0.06%	0.035% - 0.045% (However, Ofwat accepts they may be higher for smaller companies and considers this case-by-case).	0.10% (but higher for smaller companies in principle).

Source: Economic Insight review of regulatory determinations

As can be seen from the above, although two of the precedents imply issuance costs of 0.10%, none of them imply *combined* issuance and liquidity costs as low as 0.10%.[228] In fact, the only precedent where both are set out is the CMA's redetermination for Bristol Water, which implies a combined allowance of 0.25%. The CAA's position at RP2 actually implies a combined allowance of >0.15%, although no combined figure is estimated. Similarly, both Ofcom's and Ofwat's positions imply that, if efficient liquidity costs *were* estimated and included, the combination of these and transaction costs must be >0.10%.

In light of the above, in terms of the inferences the CAA and NERL have sought to draw from the precedent, our observations are as follows:

- The CAA's view that the precedent is supportive of a *combined* allowance of 0.10% for issuance and liquidity costs appears to be based on a partial analysis. Specifically, the CAA places weight on both its and Ofwat's recent positions, which are both based on the exact same analysis. The CAA further does not seem to recognise the detail of what each previous estimate related to, or why.

[228] *Whilst Ofwat positions its 0.10% allowance is relating to transaction and liquidity costs, it also acknowledges that liquidity costs will be higher than this implies for smaller companies. The regulator simply chooses not to allow for this 'across the board', due to its customer benefits test.*

- For its part, NERL relies entirely on the CAA's previous position at RP2. However, it does not consider in detail 'why' the CAA previously adopted that position and, therefore, whether it remains valid for RP3.

Regulatory precedent can be useful to informing the issue of transaction and liquidity costs. However, to the extent that the CMA wishes to make use of it, our review points to a need to very carefully examine: (i) precisely **what is included** in any such previous estimates; (ii) **the assumptions** that underpin these; and (iii) the likely **read-across to NATS.**

3.5.3.5 Summary of our assurance review relating to issuance and liquidity costs

In summary, the key points relating to issuance and liquidity costs arising from our review are as follows:

- **There is an 'in principle' need to make an allowance for efficient issuance and liquidity costs at RP3.** In addition, such costs may vary by company size and specifically, would be expected to be somewhat larger for smaller companies.

- **Regulatory precedent implies that the combination of issuance and liquidity costs must be >0.10%** (i.e. above the figure proposed by the CAA for NERL at RP3). Indeed, with the exception of Ofwat's proposals at PR19, the precedent actually establishes that transactions costs alone are at 0.10% or above. The need to allow for liquidity in addition to this is not only strong 'in principle' but, as above, is especially important for smaller companies, such as NERL.

- **EEs' estimates of liquidity costs for NERL are understated, because they are based on 'broad' figures from the water industry.** The size of NERL's credit facilities as a proportion of its debt is markedly higher than the proportion assumed by EE. In addition, NERL's facility costs may also be higher than those incurred by water companies, but this is not considered.

- More recent proposals by regulators, including Ofwat and (at RP3) the CAA, are pointing to a reduced combined allowance for issuance and liquidity. However, there does not seem to have been any clear articulation of 'why' these allowances have been reduced, or any evidence-based reason for this.

4. Conclusions and recommendations

This final chapter of our report sets out our conclusions and recommendations. Our overall assessment of the quality of the evidence base identifies some shortcomings with both the CAA's and NERL's information – although our concerns are more material regarding the CAA's. When we look at the overall evidence on the WACC for RP3, we are particularly concerned that the CAA's proposed vanilla WACC of 2.68% incorporates a significant reduction in the cost of equity, which seems to run contrary to economic intuition (embedding both a 'large' and 'sudden' reduction in TMR and an implied reduction in systematic risk). We also had concerns regarding the WACC proposed by NERL in its Revised Business Plan. However, its updated estimate of 4.21% (vanilla) is more intuitively sound, representing a slight decrease relative to the WACC at RP2. Following our review, we have identified a range of issues that we recommend merit further consideration during the CMA's redetermination of the price control. Finally, we offer some brief perspectives on Brexit and its implications for the WACC. Here, no definitive conclusions can be drawn. However, our view is that Brexit uncertainty means care must be taken not to apply an 'overly mechanical' approach to the WACC, particularly when drawing on shorter-term evidence.

4.1.1 Our overarching assessment and implications

4.1.1.1 Overarching assessment

Our assurance review has incorporated a thorough assessment of the existing evidence base. Overall, we consider that NERL and the CAA have clearly undertaken substantial work relating to the WACC. However, both suffer from various limitations. In the following table we summarise our view of the robustness of the evidence developed, for each component of the WACC, where: red = *'low robustness';* amber = *'medium robustness';* and green = *'high robustness'.*

Table 34: Evidence robustness rating

	CAA	NERL
Risk free rate		
Total market returns		
Asset beta		
Debt beta		
Embedded debt		
Cost of new debt		
Issuance and liquidity costs		

Source: Economic Insight

4.1.1.2 Implications

When one considers the totality of the evidence base, our judgement is that there are certain 'in principle' reasons to expect the WACC to be somewhat reduced at RP3, relative to RP2. These mainly relate to the cost of debt, as market data points to a reduction overall. On the cost of equity, the story is more complex. Specifically, *some* reduction in TMR might be logical, but this very much depends on the time-horizon one applies and expected UK economic performance over that horizon. We find a 'short-term' view might correlate with a reduction. However, from any perspective, 'large' or 'sudden' changes in TMR cannot be rationalised. Similarly, it is hard to rationalise a reduction in systematic risk at this time.

From the above, NERL's position in its Revised Business Plan might be considered questionable, in that it implied an increase in the WACC overall, relative to RP2 (4.51% vanilla, versus 4.25% at RP2). However, its revised position in response to the CAA's Draft Proposals mitigates such concern – with an updated vanilla WACC of 4.21%, representing a slight decline relative to RP2.

The CAA's overall position in its Final Decision seems much more problematic – as this implies a large reduction in the vanilla WACC relative to RP2, from 4.25% to 2.68%. The problem with the CAA's position is that, in addition to a reduction in the cost of debt (which is to be expected, albeit a matter of degree), it embeds a very large reduction in the cost of equity, which is difficult to reconcile to economic intuition. This is a consequence of the CAA assuming both a very large and sudden reduction in TMR and a reduction in NERL's asset beta. Setting aside detailed method points, both seem implausible.

4.1.3 Recommended issues for consideration by the CMA during its redetermination

The scope of our review has not included developing our own assessment of an appropriate WACC. Indeed, we are mindful that this will of course be a key area of focus for the CMA during its redetermination – and so the CMA will need to reach its own view on this matter. However, our review has identified a number of 'key issues' that we think should be carefully considered as part of the redetermination process. The hope is that, given the considerable complexity surrounding the WACC, this may assist the CMA in weighing up which topics to focus on. These are summarised below in Table 35.

Table 35: Recommended issues for consideration by the CMA

WACC Parameter	Our recommended areas for consideration
Risk free rate	• Consider evidence from both yields on index-linked and deflated nominal gilts.
Total market returns	• Evaluate any proposed TMR in the context of a time-consistent view of the UK economy. • Check consistency of methods against above. • Check consistency of other price control assumptions against above. • Consider intuition for 'direction' and 'speed' of implied changes in TMR. • Consider the 'rate of change' in TMR implied relative to prior determinations.
Asset beta	• Ensure selection of comparators is rooted in a clear risk framework and comprehensive risk analysis. • Check beta estimation window is consistent with broader WACC approach. • Derive betas predominantly from European indices (potentially investigate further evidence on ability to diversify beyond UK). • Apply relevant adjustments for relative risk to final comparators, as appropriate. • Consider changes in systematic risk since RP2 when determining final beta value.
Debt beta	• Consider evidence from both 'indirect' and 'direct' methodologies. • Ensure input parameters for any indirect method are determined with care, based on clear criteria, so that they properly reflect the relative risk faced by NERL.
Cost of embedded debt	• NA.
Cost of new debt	• Identify intuitive factors that impact relative cost of debt (up or down) relative to other industries. • Check relativities of implied cost of debt compared to other industries. • Include adjustment for shorter licence termination notice period. • Include adjustment for liquidity.
Issuance and liquidity costs	• Ensure that 'efficient liquidity' costs are included in addition to issuance costs. • In quantifying efficient liquidity costs, ensure the methodology reflects the 'efficient scale' of liquidity requirements for NERL.

Source: Economic Insight

4.1.1 Perspectives on Brexit and its impact on the WACC

At the time of writing there remains considerable uncertainty regarding 'Brexit'. It further remains unclear as to what extent this uncertainty might dissipate during the CMA's redetermination process. The impact of Brexit and Brexit uncertainty on the WACC is complex – and so too is a consideration of the appropriate policy response when setting price controls. As our work for NERL is primarily focused on evaluating the existing evidence base, we do not, therefore, opine on this in any detail here. Nonetheless, because of its unescapable importance, we briefly offer some perspectives on this issue in the following passages.

4.1.1.1 Impacts on capital markets

There has been considerable discussion that Brexit has, and will continue to provide, increased pressure for quantitative easing. All else equal, this will tend to keep the real yields on government gilts depressed (i.e. continued negative real returns). Similarly, this would point towards a downward pressure on the cost of debt. However, in the context of Brexit uncertainty, the question is whether and how this should be taken into account, given the forward-looking nature of the WACC.

Of relevance to this, a report by Duff & Phelps (2016)[229] highlights concern regarding the assumed permanence of any such policies. Hence they advocate a 'normalisation' method to setting the RFR, such that it is set at a level that is more likely to reflect the sustainable average (i.e. higher) return of risk free, long-term, bonds.

ONE LOGICAL IMPACT OF BREXIT IS AN INCREASE IN REQUIRED EQUITY RETURNS.

4.1.1.2 Perspectives on the impact on expected equity returns

One widely discussed business response to Brexit and its associated uncertainty has been a 'pausing' of investment in the UK. For example, based on an analysis of data from fDi Markets, the Financial Times reported a 19% reduction in foreign direct investment in the three years to June 2019.[230] Similarly, UK based firms already 'invested' in the country have delayed or cancelled previously planned investment. For example, the results of Deloitte's July 2019 CFO survey revealed that, not only has investment fallen markedly since the referendum, but 47% of CFOs continue to expect to further reduce their capital investment.[231]

The logical interpretation of the reported drop, or delay, in investment, is that investors perceive Brexit as a 'new' risk, for which they require compensation, implying a higher required equity return. Indeed, we note that in its report on the possible impacts of Brexit, Frontier Economics made a similar point: *"It seems that many investors are interpreting this uncertainty over prospects for the UK economy as a new and material risk, and that this is causing them to raise their required rate of return. In other words, any investment hiatus could be interpreted as a signal that the required cost of equity for investors has increased following Brexit."*[232]

---

229 *'Brexit: The Impact on Cost of Capital.' Duff & Phelps (September 2016).*
230 *'Brexit has chilling effect on UK inward investment.' Financial Times, 21st August 2019.*
231 *'Deloitte CFO Survey: Political and economic uncertainty compounds Brexit fears.' Deloitte; July 2019.*
232 *'Paying the full WACC: the impact of Brexit on the cost of capital.' Frontier Economics (August 2016); page 4.*

4.1.1.4 Beta and systematic risk

It seems to us likely that Brexit could increase demand risk around international travel, thus increasing systematic risk exposure for airports and air traffic control providers in particular. All else equal, this should intuitively create upward pressure on NERL's beta at RP3.

On the other hand, Brexit uncertainty may also increase overall market volatility, which creates a downward pressure on beta (i.e. because beta reflects the correlation between the volatility of an individual stock and the market overall). Hence, the 'net' impact depends on whether the impact on NERL (primarily through demand risk) is greater, or less, than the impact on volatility for the market as a whole.

A key challenge when setting the WACC at RP3 is that the effects of the above may not be fully apparent in the data (i.e. if there remains uncertainty regarding the form / timing of Brexit, then so too there will remain uncertainty as to its impact on demand risk for NERL).

THE OVERALL IMPACT OF BREXIT ON THE WACC IS HARD TO DETERMINE – WE ADVOCATE PERHAPS FAVOURING A LONGER-TERM VIEW AND AVODIING AN OVERLY MECHANICAL APPROACH.

4.1.1.5 Summary

The overall impact of Brexit and Brexit uncertainty on the WACC is difficult to determine with any precision. On balance, it perhaps points to some further downward pressure on the cost of debt, but upward pressure on the cost of equity.

There is no simple way for the CMA to take account of this when setting the WACC as part of its redetermination. However, our overall take is that it perhaps provides a further reason to be wary of adopting an 'overly mechanical' approach to the WACC. In addition, whilst, overall, we consider a 'time-consistent' approach to the WACC is more important than the precise choice of time horizon, Brexit uncertainty perhaps provides a reason to be wary of attaching undue weight to short-term data. Ultimately, Brexit considerations will likely need to be factored in through more qualitative means (for example, judging 'where' in an evidence range to pick a number).

WE MAKE ECONOMICS RELEVANT

Economic Insight Limited

125 Old Broad Street
London
EC2N 1AR
0207 100 3746
www.economic-insight.com