CEPA
economics matters

Response to CAA H7 Initial Proposals: Cost of Capital

IATA

17 December 2021

FINAL REPORT

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1. SUMMARY OF RESPONSE

CEPA has continued to provide advice and support to IATA as part of the H7 regulatory determination process on issues in relation to the cost of capital. This report is our response to the CAA's H7 Initial Proposals.

1.1. BACKGROUND

The return that Heathrow earns for providing airport services is a key component of passenger charges. Every 100 basis points on the pre-tax WACC increases charges by around £2.40 per passenger[1]. Use of CAPM[2] requires the exercise of judgement over a range of components. Each of those decisions ultimately impacts passenger charges. It is necessary to step back from the detailed calculations and consider the results in the round, ensuring consistency with previous judgements (or a strong rational for departure) and that the WACC calculation is intuitively sensible overall.

Setting the WACC in the regulated sectors can be contentious. Positions taken by the water and energy sector regulators have been appealed recently. The covid-19 pandemic has undoubtedly made a difficult regulatory task harder. Nowhere has the impact of the pandemic been more adverse commercially than in relation to international travel. Airlines and airports have experienced a reduction in passengers that has never been experienced before. But, as the sector starts to emerge from the worst effects of covid, the regulatory settlement determined by the CAA must balance the interests of airlines/passengers and the airport in a way that facilitates a sustainable recovery. The overarching conclusion of our analysis is that the CAA's Initial Proposals fail to achieve an equitable balance.

1.2. KEY ISSUES

Our analysis demonstrates that the CAA's determination substantially over-estimates the cost of capital for Heathrow, meaning that consumers will likely experience a significant rise in flight costs when demand remains substantially depressed. The CAA's approach consistently overstates the degree of risk faced by Heathrow. Whilst we agree that the Covid-19 pandemic will influence investors' perceptions of risk, and that information from the past 18 months must be reflected in the CAA's estimates, the CAA's approach generates an outcome that is both over generous and inconsistent with the evidence. For example, proposed remuneration for the cost of debt is excessive both in the context of Heathrow's own debt costs and relative to efficient debt costs across the aviation industry.

The CAA and CEPA estimates of the cost of capital are very different.

The result of the CAA aiming up across many parameters is that its range is significantly higher than the CEPA range for H7 (see Section 3). Figure 1.1 shows there is no common ground between CEPA, the CAA and HAL on cost of capital estimates, and that in itself is somewhat unusual.

We have identified a range of specific reasons for the CAA's over-estimate (as outlined in Section 2). We expect that the CAA will respond to each of the issues that we raise in its Final Determination. We also expect that the CAA will move closer to the CEPA range following consideration of further risk mitigations for Heathrow. At this stage it has not quantified the impact of Traffic Risk Sharing (TRS). Given its view of the magnitude of Heathrow's risk, we would expect the CAA to reach a proportionally higher estimate of the downward effect of risk mitigations on the cost of capital.

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[1] Based on an average RAB of £16.5bn and average annual passenger volumes of 68m over H7, as per Initial Proposals.

[2] The capital asset pricing model (CAPM) is used to determine a theoretically appropriate required rate of return on an asset.

Figure 1.1: Views on the real RPI vanilla WACC for H7
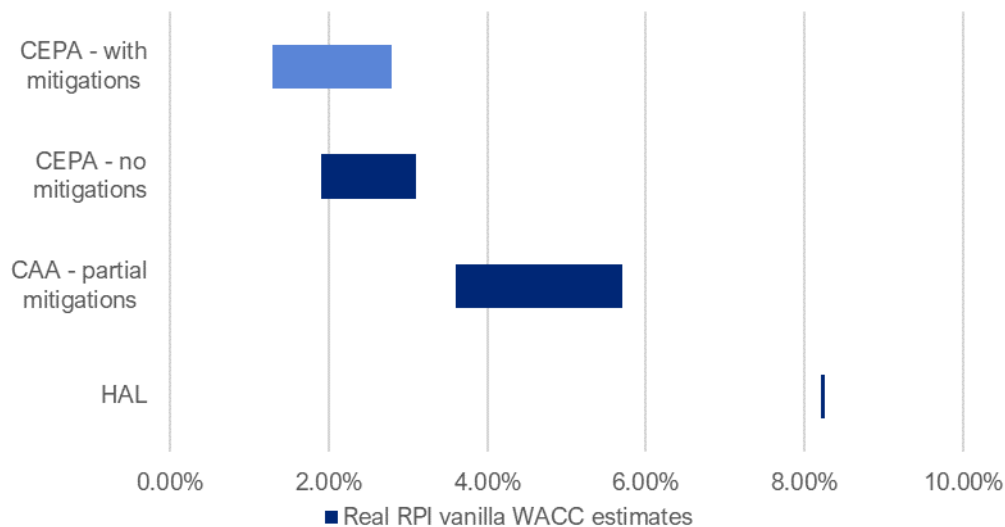
Note: CEPA's estimate of the cost of capital is discussed in Section 3 of this report, the CAA estimate reflects their H7 Initial Proposals (with mitigations only on the covid impact); the HAL figure is a point estimate from their September 2021 RBP update.

Overall, we consider that the CAA has erred in the numerical application of its own methodology and in the application of regulatory judgement. The impact of the choices that that CAA has made consistently increase the return provided to Heathrow and those choices fail to demonstrate a balanced and objective assessment of the evidence that fulfils the CAA's primary duty to further the interests of airport users.

The CEPA approach is grounded in aviation sector precedent and references other regulated sectors as appropriate.

In its Initial Proposals the CAA characterises CEPA and HAL being at extreme ends of a range[3]; that is a misleading simplification.

Our analysis is consistent with the history of regulatory precedent in the airports sector as applied by the CAA itself as well as the CMA (and previously the CC). We take account of developments in UK regulatory approaches, updated evidence on risk and interest rates and the influence of the covid pandemic. In contrast Heathrow's approach is not at the high end of a similarly well evidenced range, it is simply unsupported by appropriate precedent and would provide an unjustified and excessive return. The approach suggests the aviation sector no longer resembles anything like the past and the negative impacts of covid will be a permanent feature of the future. We therefore focus our analysis on the CAA's calculations.

The CAA's approach involves assessing a 'pre-covid' asset beta and a 'covid-impacted' asset beta. Our 'pre – covid' (2020) view of the cost of capital follows precedent. The CAA's does not. For example, it has not advanced convincing arguments or evidence explaining why its view of Heathrow's 'pre-2020' cost of capital has increased substantially relative to Q6, when across other sectors the pre pandemic cost of capital was consistently falling.

We set out analysis indicating a covid pandemic impact, which reflects the available evidence and is consistent with the fact that crisis events – even those as significant as this – ultimately tend to relatively muted long-term impacts on cost of capital parameters; it is those forward-looking impacts over relevant investment horizons that should be considered in a WACC calculation. The CAA has chosen to rely upon an approach that overstates the long-term magnitude of cost of capital impacts and has had insufficient regard to equally valid evidence consistent with lower

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[3] For example, the CAA states (paragraph 9.28) that "*We do not consider that either of the approaches proposed by HAL and CEPA (on behalf of airlines) to estimating HAL's asset beta represent an appropriate way forward. The positions are essentially at opposing ends of a spectrum of possible approaches.*"

impacts. It has also failed to account for the significant uncertainty that surrounds any enduring impact on cost of capital: its approach is unnecessarily quick to revise Heathrow's cost of capital allowance in a way which will be difficult to adjust as new evidence emerges.

The CAA has departed from precedent without setting out its justification and the evidence used.

CAA's approach drives a counterintuitive outcome in that the aviation WACC premium over and above energy and water sector returns has increased significantly for H7 relative to Q6, despite risk being allocated away from Heathrow in the H7 regulatory regime.

A key reason why the CAA and CEPA ranges do not overlap is that the CAA has departed from its own well-established regulatory approach without justification – this is especially true for the (pre-pandemic) asset beta and assumed debt tenor. In our view, the CAA's asset beta estimate relies on a partial evidence base and unsubstantiated judgements on relative risk. The estimate excludes relevant evidence without explanation.

To provide a sense of the impact of the changes to the CAA's approach, our high-level estimate of the pre-pandemic vanilla WACC (i.e. excluding the impact of risk mitigations and the pandemic impact on the asset beta), based solely on a rolled forward CAA Q6 methodology, would be 1.6-2.8%[4]. This would result in a 185-305bps reduction to the Q6 vanilla WACC of 4.65%. Such a reduction would be consistent with changes in the cost of capital in other regulated sectors in the period pre pandemic (see Figure 1.2)[5]. These are reductions supported by the CMA following full redeterminations (in the case of PR19) and specific merits-based appeals (in the case of RIIO-2).

Figure 1.2: Evolution of the cost of capital across regulated sectors[6]
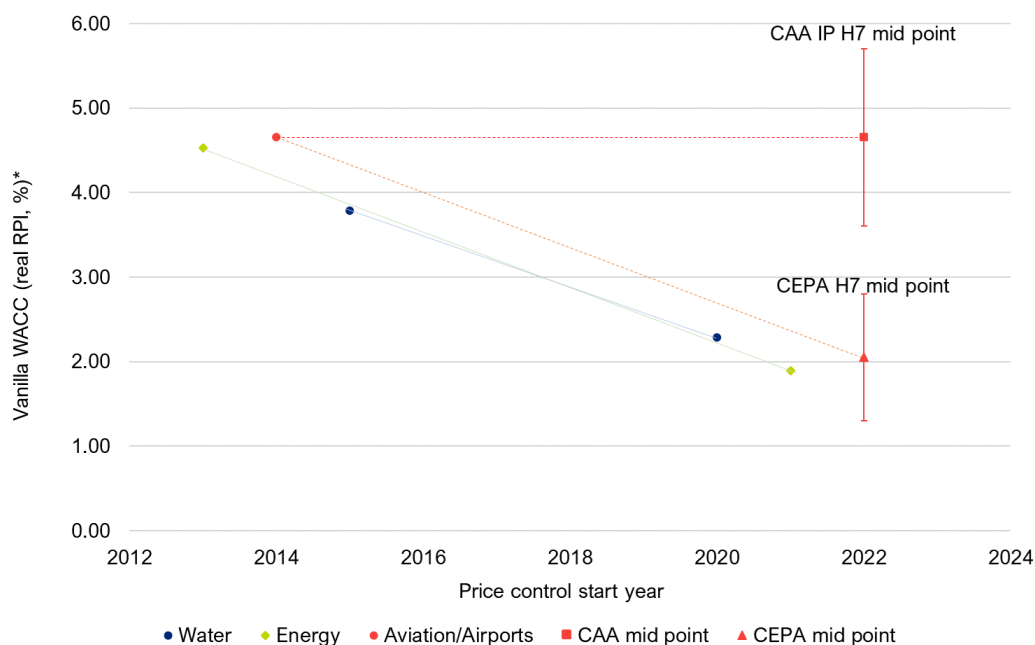
Source: CEPA analysis

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[4] We present how we have estimated this figure in Appendix A. We have attempted to best replicate the CAA's approach, noting that judgement was applied.

[5] We note that higher inflation expectations in the inflation-indexed H7 price control is a reason to potentially expect greater falls in the real cost of capital.

[6] Energy decisions presented include RIIO-GD1/T1 and RIIO-GD2/T2. For the GD/T decisions, we use the average of the five separate decisions i.e. one WACC in GD and four WACCs across ET/GT. We use the quoted WACC, noting that this reflects the starting cost of debt only in RIIO-GD1/T1. We use the CMA PR19 redetermination for our latest data point in the water sector.

The CAA's H7 Initial Proposal mid-point vanilla WACC is 4.65%[7]. This is exactly the Q6 WACC. Other regulators applied 180-230 bps reduction in WACC over similar time periods[8]. Our calculations find that the reduction in the asset beta and cost of capital from risk mitigations is greater than any increase from the covid pandemic impact.

In effect, the CAA has revised its view of Heathrow's (pre-pandemic) efficient cost of capital upwards by at least 180 bps on a roll-forward equivalent basis – this is separate to any covid impact. Given this material change in the resultant cost of capital under the CAA's new approach, its basis should have strong justification. As we discuss later in the report, we do not consider that the CAA has met that evidential threshold.

Table 1.1 shows how the CAA's amended approach has repositioned Heathrow's equity risk. The premium that an investor in Heathrow would receive in H7 relative to regulated energy and water networks has increased by 560 bps over energy and 420 bps over water, relative to the previous price control decisions in those sectors.

Table 1.1: Differences in allowed cost of equity estimates

	Heathrow cost of equity versus…[9]	
Price control[10]	**Energy**	**Water**
Q6	0bps	120bps
H7 – CAA's Initial Proposals mid-point	560bps	540bps[11]

Source: CEPA analysis

The impact of the covid pandemic explains only a limited component of this increased premium.

The natural conclusion is that CAA's reinterpretation of Heathrow's cost of capital is due to the covid pandemic and the evolution of market evidence. Yet that is not the case in practice, explicit adjustments for the covid pandemic explain only a small proportion of the difference between the Q6 roll-forward estimate and the H7 Initial Proposals (excluding the covid impact and risk mitigation impact). As shown in Figure 1.3, when we consider our estimate of the rolled forward Q6 approach with current data, we find that adjustments for covid (namely, in relation to the asset beta) explain a small proportion of the difference between the Q6 rolled forward estimate (in Appendix A) and the CAA's estimate.

There have also been significant changes to the wider regulatory framework that have allocated risk away from Heathrow – the precedent (and revisiting of historic risk allocation) created by a RAB adjustment, an asymmetric adjustment allowance and significant protections in the form of TRS. This is counterintuitive; a fall in risk should lead to a reduction in the cost of equity.

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[7] Note that mid-point estimate is used for illustration; the CAA has not set out where in the range it will end up.

[8] The lower bound is as per the rolled forward Q6 approach. The upper bound is slightly lower than under the rolled forward Q6 approach – this is because of Heathrow's assumed debt tenor. The shorter tenor means that reductions in the cost of debt feed through more quickly into a lower cost of debt, and cost of capital.

[9] The Q6 post-tax cost of equity (real, RPI) is 6.84%. The CAA H7 Initial Proposals post-tax cost of equity range of 6.6-11.8% gives a mid-point of 9.2% i.e. 238bps above the Q6 mid-point.

[10] We compare Q6 to the PR14 and RIIO-GD1 cost of equity. We compare H7 to the CMA's PR19 redetermination and Ofgem's RIIO-GD2 cost of equity. We apply a 0.90% CPIH-RPI wedge to adjust between real CPIH and real RPI figures.

[11] This would increase to 600bps if Ofwat's final determination was used rather than the CMA redetermination for appellants (3.8% rather than 3.2%).

Figure 1.3: Drivers of the change in the CAA cost of capital
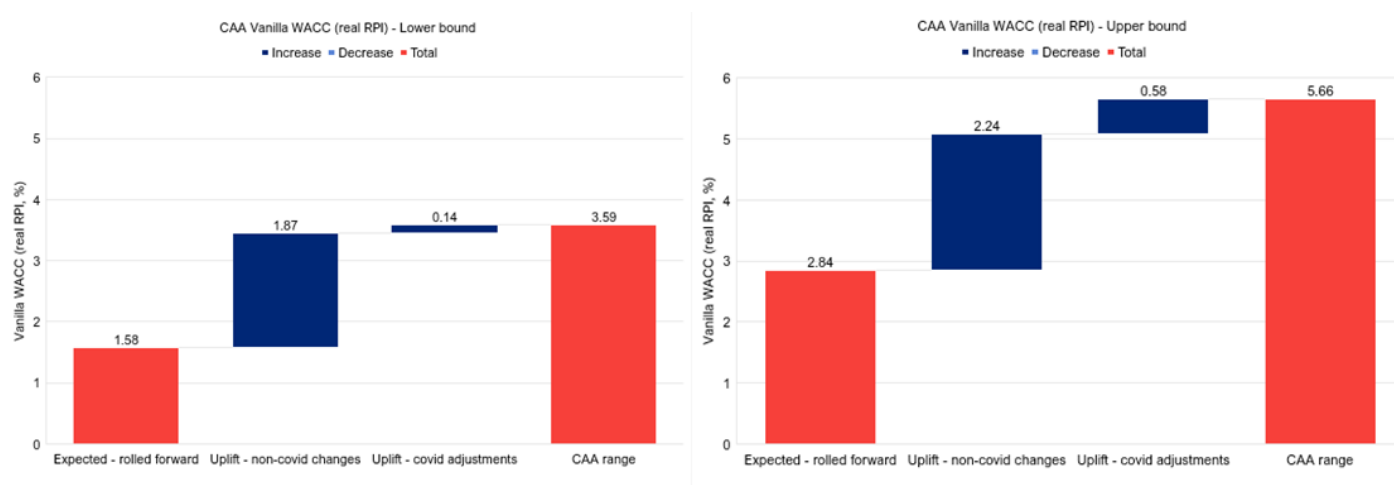
Source: CEPA analysis. Note: non-covid changes cover a number of different components, some of which are discussed in Section 2.

Key drivers of the change in the cost of capital are not related to covid impacts on the evidence base. Instead, they reflect changes CAA has made to the methodology for estimating the asset beta and the cost of debt. For example, on the pre-pandemic asset beta the CAA has excluded the lower part of the evidence base without reason, and made unsubstantiated judgements on relative risk[12]. On the cost of debt, the CAA has increased the assumed debt tenor and adopted an artificially low view of inflation to deflate nominal yields. These are not related to covid.

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[12] We discuss in Section 2 examples of this, including inconsistent treatment of risk factors for excluding comparators.

1.3. SUMMARY AND CONCLUSIONS

We focus our work in this report on the key differences between our conclusions and those contained in the CAA's Initial Proposals. The detailed differences between our range and CAA's range by parameter are set out in Table 1.2 below – differences exist for many parameters.

Table 1.2: H7 Cost of Capital comparison – CEPA and CAA Initial Proposals

Parameter	CAA Low	CAA High	CEPA Low	CEPA High
Notional gearing	62%	61%	60%	60%
Risk-free rate	-1.80%	-1.80%	-2.44%	-2.44%
TMR	5.20%	6.50%	5.20%	6.00%
Asset beta – no risk mitigations	0.54	0.74	0.46	0.52
Asset beta – partial risk mitigations[13]	0.52	0.67	-	-
Asset beta – with risk mitigations	-	-	0.38	0.48
Cost of Embedded debt	2.00%	2.00%	-0.31%	0.47%
Cost of New debt	-0.30%	-0.30%	-1.64%	-1.58%
Post-tax cost of equity	6.6%	11.8%	4.0%	6.7%
Pre-tax cost of debt	1.72%	1.73%	-0.48%	0.16%
Vanilla WACC	3.6%	5.7%	1.3%	2.8%
Pre-tax WACC	4.4%	7.1%	1.8%	3.6%

Source: CAA Initial Proposals, CEPA analysis

Table 1.2 shows that we utilise a similar notional gearing to the CAA, and whilst we have different views on market parameters, there is significant overlap in the evidence we have used and identifiable reasons why our views differ. Our estimates of asset beta and the cost of debt depart significantly from the CAA's and drive major differences in passenger charges.

- The difference in view between the CEPA and the CAA on the asset beta contributes to a difference of 100-160bps on the vanilla WACC (130-210bps on a pre-tax WACC basis)[14].

- The difference in view on the cost of debt leads to a difference of 100-140bps on the vanilla (and pre-tax) WACC; the vast majority of this is driven by the cost of embedded debt.

- We also reach different conclusions to the CAA on other parameters, the impact of these is less material individually for the cost of capital and are discussed further in Section 3.

We focus our more detailed analysis in the sections which follow on the two items of most material difference – the asset beta and the cost of debt.

In summary we recognise that the CAA has a challenging task in an environment with large changes in financial data arising from the impacts of covid. Both Heathrow and airlines operating out of Heathrow have faced material financial hardship during the past 18 months. However, in setting the WACC the CAA is not trying to compensate for past events, but to set an appropriate forward-looking allowance for 2022-26. Both Heathrow and airlines will suffer if

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[13] This category reflects the downwards adjustment to the calculated covid impact only to reflect the impact of the TRS.

[14] Calculations are based upon changing the CAA assumptions on the parameter to the CEPA estimates.

excessive charges are set; adversely impacting demand in a period where attracting customers is likely to be top priority. We conclude that there is much for the CAA to revisit between Initial and Final Proposals if it is to fulfil its primary duty to airport users.

2.   REVIEW OF CAA APPROACH

We focus on the asset beta and cost of debt in this section; those are the two parameters that have the greatest materiality in terms of the misalignment of the cost of capital range. Across those two parameters, we have identified seven areas where we consider that the CAA has made an error in methodology or interpretation on the cost of capital included in the H7 Initial Proposals.

A summary of the issues and the actions we invite the CAA to take for the Final Proposals is contained in Section 2.3.

2.1.   ISSUES REVIEW - ASSET BETA

2.1.1. Issue 1: The CAA has overestimated empirical betas used to calculate a pre-pandemic asset beta range

Sub-issue 1a: The CAA and its advisers have incorrectly rounded relevant asset beta estimates

The CAA's pre-pandemic estimate of 0.50-0.60 is based on analysis from Flint Global on comparator betas, both at the outset of the pandemic and in August 2021. The CAA present Flint's original analysis in Table 9.3 of Initial Proposals. The figures presented include a range of 0.47-0.60, with three data points below 0.50 and none above 0.60, as presented below. Flint proposed a range of 0.50-0.60, noting that they had not been asked to assess relative risk in forming this range – an error we discuss later in this section.

Table 9.3: Summary of asset beta estimates presented in Flint June 2020 report

	Fraport	ADP	AENA
2-years, daily frequency			
Spot	0.58	0.59	0.57
2-years average	0.56	0.56	0.60
5-years average	0.49	0.54	
5-years, daily frequency			
Spot	0.50	0.56	0.52
2-years average	0.47	0.53	
5-years average	0.48	0.53	

Source: Flint analysis of Thomson Reuters data as of 28 February 2020

Flint and the CAA exclude values below 0.50, despite the evidence including values from 0.47 to 0.60. It is not clear why the three data points below 0.50 are rejected in the range formed i.e. almost a quarter of the data points shown.

A low asset beta estimate of 0.47 rather than 0.50 reduces the pre-tax cost of equity by c.55bps, using other CAA assumptions. A longer-term estimate, e.g. at least 5yrs, should not be rejected simply because it is not available for all three comparators used (AdP, Fraport and Aena). The use of longer-term evidence, where available, is more likely to restrict the impact of 'noise' in natural short term beta fluctuations.

As noted by the CAA, the CMA PR19 determination considered longer term beta estimates (i.e. ten year beta estimates) as part of its approach. Greater weight on longer-term beta estimates for airports would further support use of a point in the lower part of the 0.47-0.60 range, based on empirical beta estimates for these three comparators. We consider that the lower end of this range is better supported than the top end.

The CAA would be wrong to exclude the evidence if the reason for doing so is that Aena has been listed for a shorter period of time. Aena's relatively short period as a listed comparator should not be grounds to disregard

longer term evidence for other comparators that have been listed for longer. A better interpretation would be to judge the estimate from Aena to be less robust, given the absence of data over a full economic cycle.

If the CAA does not reduce its lower bound evidence to reflect their own evidence, we would wish to understand why this data is not included. We would also propose that longer term evidence is given most prominence in establishing a range, not the least.

Sub-issue 1b: The CAA's pre-pandemic asset beta range does not overlap with regulatory precedent when accounting for the debt beta used in Initial Proposals; the rejection of a decade of precedent is not explained

The asset betas applied for Heathrow at Q5 and Q6 used a range of 0.42-0.52. The estimates have remained appropriate and have demonstrably been financeable in practice. Earlier in the process, the CAA appointed PwC to provide an estimate of the H7 cost of capital. PwC's advice was to retain the 0.42-0.52 range, indicating that Heathrow's risk profile had not materially changed versus Q6 and reiterating that Heathrow faced lower systematic risk than Fraport and AdP[15]. This is shown in Table 2.1.

Table 2.1: Evolution of asset beta assumptions

	Low	High	Point	Debt beta
Q5 CAA	0.42	0.52	0.47	0.10
Q6 CAA	0.42	0.52	0.50	0.10
H7 PwC	0.42	0.52	n/a	0.10

The significant departure from this established (pre-pandemic) asset beta range in the Flint analysis (and subsequent CAA Initial Proposals) is not explained, though we note that it its original report Flint stated that it was not asked to consider relative risk. In our view this is a driver of this error.

The relative risk adjustment at Q6 of 0.09 equates to around a £500m impact over the H7 five-year price control[16]. The analysis Flint has included in its August 2021 report on relative risk (covered in Section 4.2 pg. 19-21) is superficial. It omits important considerations; for example it appears to place no weight on Heathrow's single till regime and presents few relevant statistics (such as indicators of passenger volatility). We consider that more detailed assessment would be beneficial and would bring some transparency to CAA's choice of range.

Given that the CAA is now utilising a slightly lower debt beta assumption in the H7 Initial Proposals relative to Q5 and Q6, the equivalent asset beta is also slightly lower – moving from a 0.10 debt beta to a 0.075 debt beta reduces the asset beta by 0.015 at 60% notional gearing. Therefore the appropriate point of reference from regulatory precedent is 0.405-0.505, when accounting for a consistent debt beta assumption.

The CAA's H7 pre-pandemic asset beta range of 0.50-0.60 barely overlaps any part of this range which is drawn from precedent over multiple price controls.

We would ask the CAA to explain the departure from precedent as a minimum – for example, the CAA's view on whether the Initial Proposals approach gives a higher answer than its own precedent because of comparator selection, empirical betas or relative risk assessment[17].

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[15] PwC (2017) Estimating the cost of capital for H7, November 2017.

[16] We have used the high estimates of the CEPA range; with a downwards adjustment for the impact of risk mitigations, this may equate to a 1.5% difference in the cost of equity, which at 60% gearing is a 60bps difference in the WACC. Based on a £16.5bn RAB, this difference is c.£100m/ year.

[17] We would highlight that changing comparators without undertaking critical relative risk analysis increases concerns around the scope for cherry picking.

Sub-issue 1c: The CAA has failed to consider relevant methodological approaches that support a lower beta

The CAA and its advisers calculate betas relative to a pan-European index – the Eurostoxx 600 index. The nature of airports mean that risks faced are not solely national and there is precedent for the use of broader indices. This does not mean that national or world indices do not have value – we have considered evidence from domestic indices (and world indices) as a cross-check on our approach. Arguments around the pandemic impact have highlighted country-specific factors that influence risks faced by an airport.

The CAA has not given any weight to betas calculated against domestic indices for the main comparators selected, despite this being its preferred approach for the Q6 determination[18]. As shown in our November 2020 report, the impact of using a European relative index rather than domestic indices is to increase asset betas by 0.07-0.12 for AdP and Fraport over various time horizons, and to increase Aena's asset beta. Shorter term asset betas are also c.0.10 higher from selecting the Eurostoxx index as the relative index, rather than a world index[19].

A reasonable and balanced approach would consider all relevant evidence in making a decision. Consideration of domestic and world indices would point to an estimate at the lower end of (or even below) the broader 0.47-0.60 range Flint set out (see sub-issue 1a), prior to assessing relative risk[20].

We had also previously noted that using a market value of debt rather than a book value of debt for the de-levering and re-levering process has theoretical support. While there are limitations on data availability, the sustained fall in debt yields means that the use of this approach would likely lead to lower beta estimates, with de-levering and re-levering. Ofgem considered both book and market values of debt for RIIO-ED2, with the CMA appeal not overturning such an approach. The CAA does not appear to have considered this.

We recommend that the CAA consider a fuller set of evidence in formulating a range for the pre-pandemic asset beta and then in selecting a point estimate from that range.

Sub-issue 1d: The CAA has incorrectly rejected evidence from suitable comparators that were used at Q6

We agree with the CAA that there are no perfect comparators for Heathrow for H7. Given the differences been the comparator airports and Heathrow, we would propose that broader comparators be included unless there are clear reasons to exclude. We are not convinced by the justification provided by the CAA to minimise or exclude evidence on comparators. This includes Sydney Airport, Vienna, Copenhagen and to a lesser extent Auckland. All four of these comparators were utilised in the development of the Q6 cost of capital by the CAA[21].

For Sydney, the two central critiques relate to the composition of the domestic index and the form of regulation. The CAA use evidence from the UK stock market in 1900 to set the Total Market Return[22]; the Australian stock index today is clearly at least as suitable. The CAA is also using a European index for estimating betas, which has a different composition to the UK index. If problematic, the CAA could also estimate beta using a global index as a cross-check.

We do not consider it appropriate to exclude evidence from Sydney on the basis of its regulatory framework. The regulatory framework can be considered as one factor in a comprehensive relative risk analysis, and there may be other relative risk factors that offset differences in risk resulting from the regulatory framework. Sydney operates

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[18] See PwC (2013) Estimating the cost of capital in Q6 for Heathrow, Gatwick and Stansted: A report prepared for the Civil Aviation Authority (CAA), April 2013.

[19] See Appendix D of CEPA November 2020 report.

[20] With a lower top end of the range if less weight is placed on shorter-term 2yr asset beta estimates.

[21] PwC (2013) Ibid.

[22] With empirical betas used to calculate specific equity premia that are calculated against European stock indices without adjustment.

under a monitoring regime, with the threat of more formal regulation should there be issues. The evidence on the overall directional impact of the form of regulation – when combined with other factors such as volatility in passenger numbers – is not clear cut as a result of selection bias (a point we raise more generally in relation to the CAA's relative risk analysis). Observing a lighter touch regulatory regime is not necessarily evidence of lower exposure to risk, where, in general, lighter touch regimes may be associated with the existence of competitive pressures. If the CAA considers that there is less risk, this directional factor can still be included within broader relative risk analysis – excluding relevant information does not appear the right approach.

For Auckland, the similarities to Heathrow are less than Sydney, but the issues raised are similar[23]. For the domestic index, Auckland is jointly listed on the Australian stock exchange and the same arguments apply on the form of regulation. The share of non-aviation activities is also similar to Fraport.

One measure of liquidity is the bid-ask spread. Where stocks are not frequently traded/ liquid, the beta estimates may not be representative of the risk faced. Vienna and Copenhagen do have a higher bid-ask spread. A higher spread should not necessarily be grounds for excluding a comparator; there needs to be an objective measure for deselection to avoid the risk of cherry-picking evidence. Copenhagen's bid-ask spread and free float percentage are worse than Vienna, but it is unclear that this should lead to zero weight being placed on a comparator, given the lack of perfect comparators. Our analysis finds that the bid-ask spread for the five-year period to 31 October 2021 was 0.83% for Copenhagen and 0.71% for Vienna[24]. We note that companies with a bid-ask spread of <1% have been considered to be liquid in other regulated settings – including for Ofcom and for the German energy regulator[25]. It is not clear that attaching zero weight to these comparators is a proportionate response.

The size of the airport at Vienna has also been referenced as a factor in giving this less weight; the Enterprise Value is very similar to ENAV, which has been used by the CMA in setting the asset beta for NERL. While the volume is traffic is clearly a different scale to Heathrow, it should not pose fundamental problems in estimating beta.

In principle, the choice of comparators should not matter where effective relative risk analysis is conducted and directional adjustments are applied to robust empirical estimates. However, the CAA has placed weight on comparators with higher empirical betas and not applied a downwards relative risk adjustment to reflect the lower systematic risk faced by Heathrow from the higher asset beta comparators that remain in their sample.

In addition, we note that the CAA's Initial Proposals state that they place "limited weight" on what it considers to be less suitable comparators. In fact, as can be seen in its justification of proposed ranges, it places no weight on comparators other than Aena, AdP and Fraport. Based on ruling out lower points in the range (sub-issue 1a) it places only limited weight on Fraport – for which there is evidence of betas of 0.47-0.49, as per the Flint report.

We would ask the CAA to reconsider the basis for excluding comparators and improve the transparency around how their pre-pandemic range was arrived at. This will necessarily require assessments of relative risk.

Sub-issue 1e: The CAA's choice of Aena as the primary comparator is inconsistent with other evidence; it is at least as flawed as AdP, Fraport or Sydney

The CAA has signalled that Aena is the most comparable airport to Heathrow. However, this assessment is internally inconsistent given arguments raised to reduce weight on or exclude other comparators.

The differences between Aena and Heathrow are noticeable. Aena and Heathrow's traffic mix is very different. This likely contributes to large observed differences in traffic volatility. Aena's traffic volatility is significantly higher than at Heathrow on a pre-pandemic basis.

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[23] We note that Auckland is not included in CEPA's preferred narrow sample of seven airport comparators; the CAA does not reference the challenge of interpreting between domestic indices with the New Zealand stock exchange, the Australian stock exchange and world stock exchanges in its logic for placing no weight on Auckland.

[24] Our calculation approach involves subtracting the bid price from the ask price, dividing by the mid price.

[25] See NERA (2016) Update of the Equity Beta and Asset Beta for BT Group and Comparators, March 2016. Link.

We present in Figure 2.1 a summary of our November 2020 relative risk analysis across eight airport comparators. This highlights clear differences between Heathrow and Aena that the CAA has not fully considered.

Figure 2.1: Comparison of risk characteristics at listed airports & airport groups
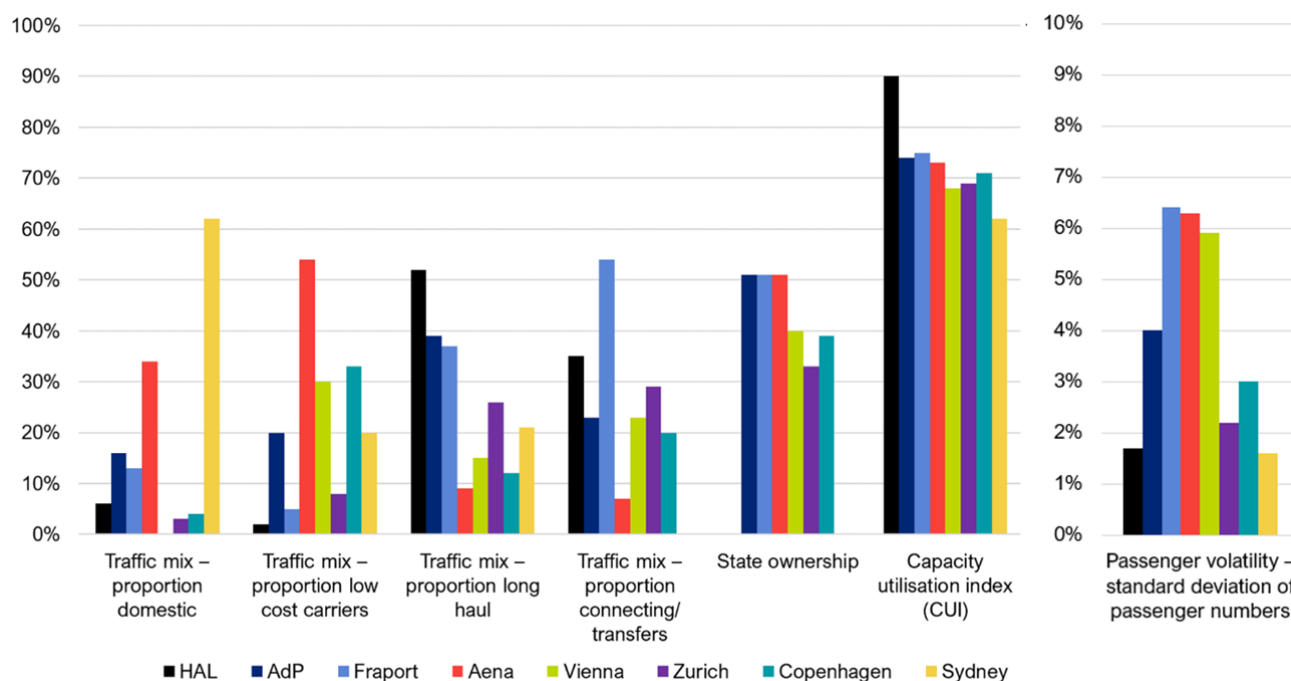
Source: CEPA (2020). Note: Please note that some metrics e.g. capacity utilisation index, are based upon the 'home' airport, not full airport group.

The CAA and Flint are selective in their treatment of traffic mix. The high proportion of domestic flights at Sydney Airport (62%) is seen by the CAA as problematic. Aena has 34% domestic traffic in a much smaller country; with many of the flights within Australia being more akin to pan-continental travel for Aena. More localised travel from Aena's airports are highlighted when considering long-haul travel; 21% of flights from Sydney are long-haul versus only 9% at Aena. This compares to 52% long-haul flights at Heathrow, where only 6% of flights are domestic. It is far from clear that Aena is a more appropriate comparator than Sydney based on traffic factors – yet one airport is given no weight and the other retains its status as the most appropriate comparator.

The dominance of low cost carriers (LCCs) was discussed at the Q6 determination by Oxera, with these airlines seen to have more flexible models that increase revenue volatility at a given airport[26]. This was in the context of Gatwick Airport, where the CAA allowed for a higher asset beta to reflect higher traffic volatility and assessment of relative risk – adjusting to reflect relative risk has been part of regulatory determinations in the past and should be considered for H7 (for Heathrow relative to other comparators). Aena has over 50% of low-cost carriers; even if the CAA disagrees with the directional impact suggested here, it should be reflected in relative risk analysis and the weights placed on comparator airports.

Consistency issues also arise in relation to AdP and Fraport, where diversification is seen as problematic and consequently less weight is placed on the two airports. The fact that Aena operates its own portfolio of 69 airports is not seen as a reason to place less weight on it as a comparator, or to make a directional adjustment for relative risk.

For Aena, we also consider the traffic profile around the last global crisis event, the Global Financial Crisis. Aena's traffic fell significantly more so than Heathrow, AdP or Fraport, with material issues around the sovereign debt of

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[26] See Pwc (2013) Ibid.

Aena's partial owner, the Spanish government – see Figure 2.2. Similar concerns may exist around subsequent crises.

This should raise further questions around the suitability of Aena as the primary comparator to Heathrow, particularly for the pre-covid beta. The shorter period of being listed and legislation around preventing increases in charges over a ten-year period (thereby limiting protection against downside risk) also raises practical questions over adopting Aena as the most suitable comparator.

*Figure 2.2: Traffic volumes around the Global Financial Crisis*
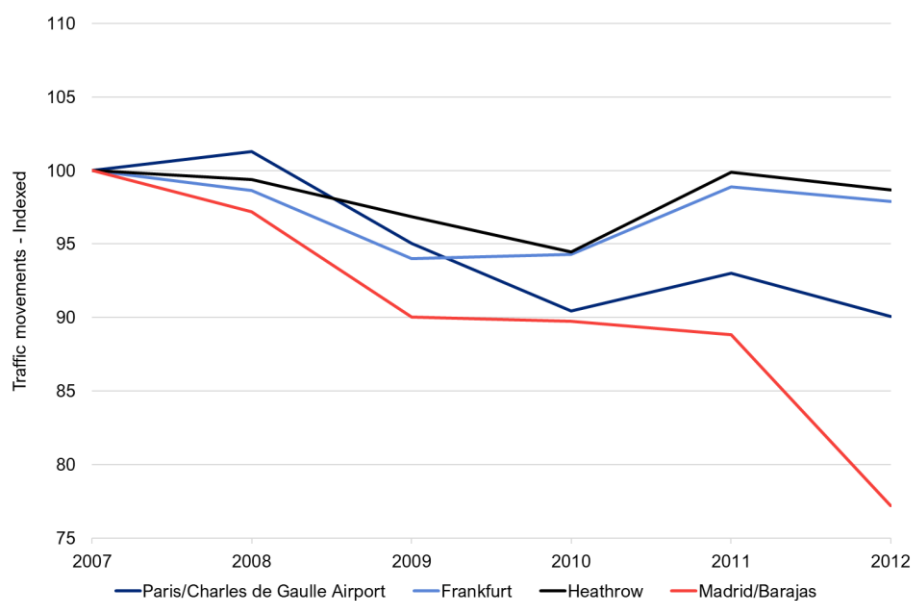
Source: Annual reports.

A fuller relative risk assessment conducted by the CAA will help address some of the issues highlighted around Aena as a central comparator. We would ask that the CAA undertakes this exercise and reflects the findings in comparator selection and in making representative adjustments to the asset beta to reflect relative risk.

Sub-issue 1f: The CAA makes unsubstantiated and contradictory judgements on airport relative risk in order to arrive at its proposed range

At Q6, the CAA presented a clear view on the relative risk of Heathrow compared to the two comparators considered as primary evidence – AdP and Fraport. This is shown in Figure 2.3.

Figure 2.3: CAA Q6 relative risk adjustment
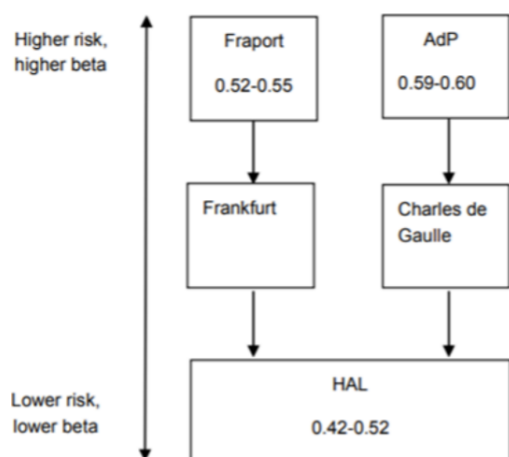
Source: CAA

Frankfurt and Charles de Gaulle represent the main airport within each airport group. The CAA had considered these airports to be less risky than the airport group i.e. the listed entity. The mid-point of that range represents a c.0.09 downwards adjustment from AdP and Fraport beta estimates to reflect relative risk.

In our view, a number of key features of Heathrow are consistent with this pre-pandemic view of relative risk:

- It typically operates (much) closer to capacity than other international airports.

- It has very low volatility in passenger numbers compared with other international airports.

- Its single till regime transfers some commercial risk to airport passengers.

- It has low exposure to LCCs and benefits from its status as a hub airport.

The CAA does not appear to have advanced any reasons why these features have changed and hence why Heathrow ought now to be considered riskier than at Q6. As noted previously, the CAA's previous financial advisers for H7, PwC, did not find reasons that Heathrow should be considered riskier than at Q6.

Furthermore, evidence from the two main comparators at Q6 now indicates a lower starting point beta. This is confirmed by evidence from the CAA's current advisers, Flint, and our own analysis.

- Flint's analysis shows Fraport's asset beta in the period up to the pandemic being 0.47-58 and AdP's asset beta being 0.53-0.59. As such, the empirical beta estimates for the two comparators have fallen slightly since the Q6 regulatory determination[27].

- Figure 2.4 shows the asset betas of the two comparators in the five years prior to the Q6 determination and in the five years prior to the outbreak of the pandemic; the starting point of empirical betas prior to relative risk analysis cannot be higher than at Q6.

Figure 2.4: Asset betas pre-Q6 vs pre-pandemic
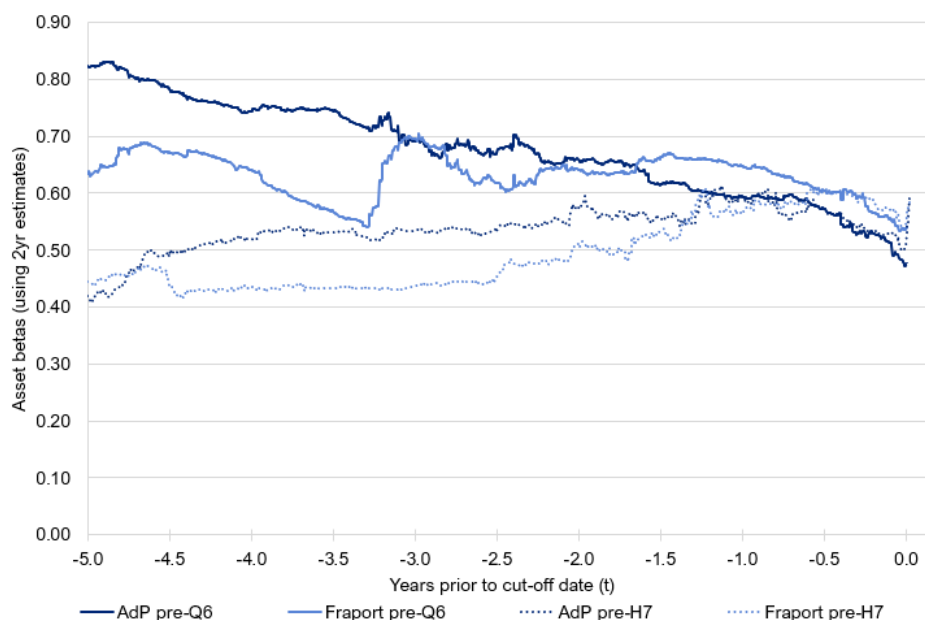
Source: Bloomberg, CEPA analysis.

Not only has comparator evidence for AdP and Fraport evolved to suggest, if anything, lower beta estimates; there are also reasons to consider that the riskiness of those two comparator groups relative to Heathrow has increased in recent years.

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[27] Taking a simple unweighted mean across the four estimates gives a decrease of 0.02.

Our November 2020 report highlighted the traffic volatility at the main 'home' airports relative to the broader groups for the three comparators focused on by the CAA, with the broader group representing the listed entity and the basis for empirical beta calculations. Comparing Heathrow to Charles de Gaulle or Frankfurt airports alone would give a misleading picture, as Table 2.2 shows with respect to traffic volatility.

Table 2.2: Traffic volatility by airport – standard deviation of passenger numbers

	Heathrow	Aena	AdP	Fraport
Passenger volatility[28]	1.7%	6.3%	4.0%	6.4%
			1.2% (Paris) & 10.8% (other)	2.7% (Frankfurt) & 9.7% (other)

Source: CEPA (2020)

If the CAA continues to assume that non-home airports are likely to be riskier than home airports, greater proportions of non-home airports in a portfolio increases the asset beta. The share of the home airports AdP and Fraport have decreased since Q6. In relative risk terms, all other things equal, Heathrow should be considered even less risky than AdP and Fraport, than was assessed at Q6 i.e. a greater downwards adjustment to the comparator asset betas should be implied.

The CAA instead uses the greater weight on non-home airports to state that they place less weight on AdP and Fraport as comparators; the implication is that greater weight is placed on Aena. As Aena is riskier than AdP and Fraport (as per CMA NERL), this approach compounds the problem through a higher beta and lacks internal consistency. It also highlights again a key limitation of Aena as a comparator for Heathrow: traffic across its portfolio of airports is many multiples more volatile than Heathrow on a pre-pandemic basis.

Adopting the same relative risk adjustment as at Q6 within the CAA's own empirical beta estimate at H7 would indicate a mid-point estimate of 0.45 for H7 (i.e. 0.54 less 0.09). Instead, the CAA has now assumed a 0.50-0.60 pre-pandemic asset beta. The mid-point pre-pandemic asset beta of 0.55 is subsequently a full 0.10 higher than would be expected from adopting the same adjustment as at Q6.

The CAA has not set out what explains the 0.10 difference to what would be expected. Indeed, the CAA's logic implies that, if anything, a larger downwards adjustment should lead to a lower pre-pandemic asset beta for H7 than the Q6 range with AdP and Fraport's diversification. We would invite the CAA to set out why it rejects precedent and why it has not applied any downwards adjustment to reflect relative risk.

Sub-issue 1g: The CAA has made errors in process; the CAA have not addressed those errors that bias the asset beta upwards

We consider that the CAA has made procedural errors that have contributed to the pre-pandemic asset beta being artificially high. The CAA failed to ask Flint to assess relative risk in its original report – this created a reference point for the asset beta that was incomplete.

The CAA then misinterpreted the CMA NERL determination's implications for Heathrow, stating that Flint's asset beta range in it June 2020 paper contained '*consistent relative risk assessment, namely, that HAL exhibits similar risk exposure to Aéroports de Paris; a greater level of risk exposure than Fraport and lower risk exposure than AENA.*' This is flawed for two key reasons: i) Flint did not conduct relative risk analysis, and ii) the CMA NERL decision did not provide a view on Heathrow's risk relative to these comparators.

Unfortunately these procedural errors have likely influenced thinking to date and we suspect that the CAA will be hesitant to depart from existing H7 positions. However, we would still invite the CAA to re-assess whether decisions

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[28] Aena has 69 airports, with 23 outside of Spain. Fraport has 31 airports, with 29 outside of Germany. AdP has 125 airports across 50 countries.

were made with an incomplete evidence base or using incorrect assumptions. If so, there remains an opportunity to rectify.

Sub-issue 1h: An objective view of relative risk continues to position Heathrow towards the lower end of other airports and airport groups

One of the errors noted above is the absence of a proper relative risk analysis. The CAA has not changed its view of the asset beta, despite conducting its own relative risk analysis for the first time for Initial Proposals.

However, this relative risk analysis is incomplete. The CAA and Flint use a limited set of characteristics to assess the riskiness of comparator airports and airport groups and do not discuss likely beta implications of differences in characteristics for comparators relative to Heathrow i.e. no directional risk impacts are included.[29] If Heathrow is less risky than chosen listed comparators, the approach adopted by the CAA can only lead to an upward bias.

Our November 2020 report set out our view of relative risk across different factors, as shown below.

Table 2.3: CEPA assessment of relative risk across comparator airports (November 2020)

	AdP	Fraport	Aena	Copen-hagen	Zurich	Vienna	Sydney
Passenger volatility	↑↑	↑↑	↑↑	↑	=	↑↑	=
Mix effects	↑↑	↑	↑	=	↑=	=	=
Capacity constraints	↑	↑	↑	↑	↑	↑	↑
Single till	↑	↑	↑	↑	↑	↑	↑
Reg framework	↓	=	↑=	↓ =	↑ =	=	↓
Growth & development	↑	↑	=	↑	↑	↑	=

Note: an upwards arrow indicates greater risk for the comparator airport than for Heathrow Airport. Two arrows are used to highlight a greater risk differential than a single arrow.

We would have expected the CAA to set out a risk hierarchy of airports, and/ or make a directional comparison to Heathrow. Instead, it provides an opaque description of airports and a selective reference to characteristics that limit weight placed on comparators. As discussed in sub-issue 1a, the discussion of placing less weight on comparators is misleading.

The CAA's analysis also places too great a focus on the 'home' airport in many cases, rather than the airport group. It is the latter that is the basis for valuation and beta estimates, not the former.

The CAA and Flint do not appear to have considered passenger volatility in their analysis. Given the weight placed on volume risk in the CAA's assessment of systematic risk, this is a key factor worthy of consideration and an area where Heathrow is demonstrably lower risk (as highlighted above).

Mix effects refer to the portfolio of airports and whether a listed comparator is a 'pure play' mature single airport asset in a high-income country with no international operations within a broader group. This is used solely to reduce weight on comparators, rather than to understand the implications for reference to Heathrow. For Aena, there are international operations and more than half of traffic is from airports other than Madrid and Barcelona. The differences in traffic mix are also not explained in terms of directional impacts (as discussed above).

Capacity constraints do have relevance, given the CAA's assumption that holding periods are likely to be 20yrs. The CAA's own traffic estimates suggest that capacity constraints will be relevant within H7, not just subsequent control periods.

We do not consider that the impact of Heathrow's single till is given sufficient weight in the analysis conducted by the CAA and Flint; indeed, it appears to have been given no weight. The single till is an important risk mitigant for

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[29] Flint has presented a range of statistics relating to comparator airports in Appendix 3 of its report, but these do not appear to have been incorporated into the analysis of relative risk.

Heathrow compared to other airports – as highlighted by the Covid pandemic. Where commercial revenue projections fall significantly, the CAA typically adopts lower projections (subject to challenge). With the RAB unchanged, the effect of this is to allow Heathrow to seek to recover value through passenger charges that it would otherwise have expected to earn from commercial activities. Under a dual till regime this commercial revenue would simply be lost.

There is reference to the regulatory framework, but given that this applies predominantly to the main airports in each group[30], we consider that this factor is overemphasised. It appears to be the factor given primary weight in the CAA and Flint's analysis. However, it should not be considered in isolation: the regulatory regime an airport is subject to is inter-related with other drivers of risk such as its degree of market power. The regulatory framework alone cannot be considered an adequate indicator of risk. Airports with different regulatory regimes might plausibly have similar ultimate exposure to risk; airports with comparable regimes might plausibly have different risk exposure if underlying determinants of risk are different. Furthermore, as we have noted, one of the main features of Heathrow's regulatory regime – the single till – appears to have been overlooked.

Other relevant features seemingly not considered by the CAA and Flint for H7 including the scale of the capex programme, the introduction of cost of debt indexation, an asymmetric risk allowance and continuation of traffic shocks in volumes. As discussed separately, the impact of TRS will need to be reflected in the beta.

While relative risk analysis is challenging, a more complete review of the evidence and assessing directional risk impacts is central to beta estimation. This is something that the CAA has undertaken in previous price controls, the CAA's original consultants PwC undertook this analysis earlier in H7 and CEPA has provided its analysis (over a year ago).

We would invite the CAA, after developing its relative risk analysis, to state firm conclusions on the relative risk of Heathrow (pre-pandemic and for H7) and justify why this is the case. We would reiterate that the CAA should make appropriate directional adjustments to the asset beta to reflect that judgement.

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[30] We note that the regulatory framework applies on a national basis in Spain for Aena; though they have other international assets.

2.1.2. Issue 2: The CAA's proposed range for the impact of the Covid-19 pandemic on beta is biased upwards

We understand ourselves to be in broad agreement with the CAA regarding the overall approach to capturing evidence on beta drawn from the Covid-19 pandemic. We appear to agree that:

- It is appropriate to reflect evidence prior to the pandemic, to avoid its long-term impact being overstated.

- It is appropriate to reflect evidence both during and after the pandemic, since this is likely to continue to inform investors' expectations to a degree.

- A robust estimate of the long-term beta for Heathrow Airport can be obtained as a weighted average of those two sources of evidence, with the weights dependent on the expected future frequency and duration of similar magnitude events.

In spite of these apparent points of common ground, we have produced fundamentally different – indeed, non-overlapping – estimates. We present evidence indicating that whilst a long-term beta impact of 0.02 is plausible, based on equally credible assumptions the adjustment required may be very small indeed, less than 0.01. This should not be taken to mean that we favour placing no weight on pandemic evidence. Rather, we produce a calculation consistent with the observable pandemic evidence that would imply an adjustment small enough to be negligible for practical purposes.

By contrast, the CAA is satisfied that the evidence is only consistent with an impact of 0.04-0.14. This is based on one of the two methodologies proposed by Flint; namely the 'reweighting observations' approach. If the alternative methodology developed by Flint, the 'cross-check' method was adopted the resulting range of 0.01-0.04 is more comparable to the CEPA proposals of a 0.01-0.02 adjustment.

The CAA has placed zero weight on the cross-check method. The difference in resulting impacts from the two approaches is driven by the statistical features of both models. As a starting point, OLS regressions already afford a significant weight to more extreme observations. The 'reweighting observations' core approach from the CAA compounds this issue and assumes that the same level of shock events as witnessed in 2020 will occur in market evidence by the end of 2022. This leads to an upwards bias in the CAA's estimates. We discuss sub-issues below.

Sub-issue 2a: The CAA has failed to interrogate evidence provided to it regarding the long-term pandemic impact on beta and relies exclusively on an approach to 'reweighting' betas that exacerbates other technical issues

There is a major difference between the CEPA estimate (0.01-0.02) and the CAA estimate (0.04-0.14) of the covid adjustment required to adjust upwards the pre-pandemic asset beta, despite agreement on many inputs to the calculation.

A key difference is the statistical method used to calculate the covid impact. Our preferred approach is more consistent with Flint's cross-check method that ultimately is not given any weight by the CAA. The CAA has failed to critically evaluate the approach and highlight that it has considered the relative merits of both approaches and understood the drivers of the difference. The point is material and we would have expected greater discussion of how to treat evidence around shock events from the CAA.

Under Flint's 'reweighting observations' method, data points are consolidated into a dataset that is then subject to a subsequent OLS regression. The statistical features of the OLS regression means that not all data points are given equal weight; those more extreme observations are very influential in the overall beta estimate. The approach looks to minimise squared errors, leading to this dynamic.

We can clearly see this when looking at the 2yr and 5yr beta estimates published by Flint/ the CAA. For the four-company sample, the 2yr average asset beta is 0.81 whilst the 5yr average asset beta is 0.79 i.e. only a 0.02 difference. How can this be squared with the steep rise in (rolling) asset beta observations we witness in March 2020 and November 2020, given that over the half of the sample period in the 5yr asset beta is during a period of significantly lower asset betas?

In simple terms, the 1.5yrs of pandemic evidence overpowers earlier observations prior to the pandemic, which we can calculate using rolling 2yr estimates. Asset betas were much lower preceding the pandemic; we estimate that the impact of the pandemic on the asset beta is 0.32 by comparing the two periods. If we are developing an approach that compares two periods with distinctly different risk profiles to understand a temporary period of heightened sensitivity, we would wish to avoid pre-pandemic evidence being polluted in the way observed here.

To illustrate the differences in approach, we might think of whether a one-year average of a five-year beta gives the same answer as a five-year average of one-year betas. Intuitively the approaches would be expected to give the same answer, but they do not due to the statistical features of the OLS regression using pooled data.

In many circumstances, any differences from the two approaches would be innocuous. However, when there is a period with a 'shock' event, the results may be very different. If, as an example, there is a shock event every five years – using a five-year asset beta would be expected to give a much higher asset beta than one-year (or any shorter) asset betas averaged over the same period (as the shock evidence remains in the sample and dominates the 5yr results).

We consider that the CEPA approach is commensurate with the nature of the exercise – identifying a structural break in the data and thinking about how to combine measurements from distinct periods.

From a sense-check perspective, the CAA's upper estimate of the covid impact is 0.14 on the asset beta. This compares to a measured impact of c.0.3 on asset betas during the pandemic. The CAA is therefore assuming that up to c.50% of the covid impact during the crisis is enduring in setting a forward-looking asset beta at H7. This position is incompatible with the logic presented by the CAA on how to treat the pandemic evidence.

If we think about what justifies the inclusion of an uplift, the CAA are stating that the frequency is no different to the past (given use of historic pandemics to estimate frequency). By definition, that approach also implies that the scale of the pandemic is equivalent[31]; otherwise we would expect to see the historic pandemics used to assess frequency discarded as not being of the same magnitude as the current covid pandemic[32]. This leaves limited possibilities – does the CAA approach imply that investors have ignored this possibility and underestimated the systematic risk of Heathrow by up to a third?

Given the implications on the asset beta, we would ask the CAA to set out why it considers its approach is more robust than the approach adopted by CEPA, and recognise the implications of the statistical choices adopted.

Sub-issue 2b: The CAA's primary approach gives significant power to outliers/ high-leverage points in the sample – the cross-check method is preferable and more intuitive

The empirical estimates conducted for beta use OLS regressions. Where errors are normally distributed, the OLS represents the maximum likelihood estimator. However, relative movements in share price over the period concerned do not appear to be normally distributed, therefore this assumption does not hold in practice and OLS regression does not represent the maximum likelihood estimator.

A key question is how to treat those co-variates that sit far removed from the range of other co-variates in the sample. This co-variate may be referred to as an 'outlier' or 'high leverage point.'

In some contexts, we remove outliers because we think that the data may be spurious. However, to remove the data observations completely would miss material drivers of share price and company valuation over the long-term. None of our proposed approaches look to remove these data points from the sample.

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[31] For the aviation industry specifically in the relevant context for Heathrow.

[32] Market evidence from the covid pandemic is used for assessing the magnitude of the event; relying on smaller scale pandemics to assess frequency will necessarily overestimate the calculated covid impact under the CAA's approach.

However, a high leverage point can significantly change the intercept and slope of the overall regression. Under OLS regression, these high leverage points carry significant weight in the overall sample.

This is why we observe Flint's 2yr and 5yr asset betas for the four airport comparators being very similar – a small number of daily observations carry such significant weight that including an additional 3yrs of data makes very little difference to the beta. These additional data points carry very little weight individually and therefore have a small impact on the beta across the full sample.

When we observe rolling asset beta estimates using OLS regressions, we see that that the beta is 'sticky' around a shock event; until the high leverage point(s) drop out of the sample, the beta remains elevated (or depressed). The subsequent beta can look very different when this happens. For example, if a daily observation point includes a 20% stock price increase and a 1% market increase, this implies a raw equity beta of 20. This will then carry a very significant weight for a stock whose long-term raw equity beta has been less than 1.

We previously referred to evidence from National Grid during the Global Financial Crisis around 2008-2010 in our November 2020 report – both for the raw equity beta and asset beta. This highlights this phenomenon around a shock event. This is presented as Figure 2.5.

Figure 2.5: Example of National Grid asset beta evolution around the GFC

The impact of influential observations has been discussed recently in Australian economic regulation. We note the below quote in an expert report for the ACCC and AER[33]:

"Influential observations can distort parameter estimates, and these include outliers and some observations with high leverage. Ordinary outliers are observations where the dependent variable takes an extreme value relative to the values of the regressors, causing a large standardised residual. The least-squares estimator gives heavy weight to outliers, causing them to have a strong influence, on parameters, especially the intercept. High leverage points are observations where a regressor (or regressors) takes a value far outside the range of its other values. These observations can be good if the dependent variable value for this observation is close to the regression line. They are bad if the dependent variable takes a value far from the regression line. In that case both the intercept and slope are strongly influenced by the bad leverage point. Because of their influence in distorting the slope estimate, bad leverage points need not result in a large outlier residual. The LAD estimator, used by the AER as a crosscheck, gives less weight to outliers compared to OLS, but does not necessarily mitigate the effects of bad leverage points."

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[33] Economic Insights pty (2021) Methodological issues in estimating the equity beta for Australian network energy businesses, June 2021.

The report above references a Least Absolute Deviation (LAD) estimator, which reduces the weight of outliers compared to OLS. There are robust regression models that can be used as alternatives to least square regressions when the data is contaminated by data points with influential observations or outliers. Figure 2.6 from Flint's report on beta shows that this is undoubtedly the case with Aena and the covid pandemic. This is also true of other comparators.

Figure 2.6: Daily share price movements versus market index for AENA pre-covid (left) and since covid (right)
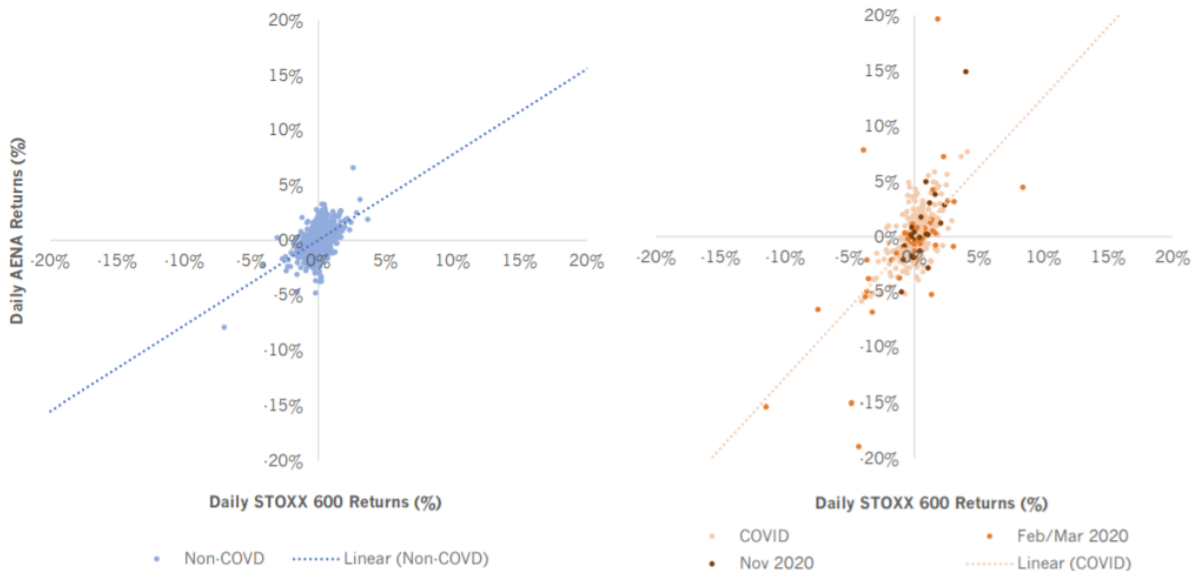
Source: Flint analysis of Thomson Reuters data as of 18th June 2021.

Using a different model of regression is one method to avoid the problem with OLS regressions placing too much weight on high leverage points.

We can consider an analogy of beta decomposition analysis. The weights given to both high and low betas under this approach are equivalent to their share of the business; a higher asset beta business unit is not given a higher weight than its proportionate share of the business. While a different context, this implies that the same approach would be taken by investors on a time series basis.

We can also observe this same phenomenon when considering the impact a company of a material different scale has on benchmarking results.

We would invite the CAA to consider the impact of their choice of model on the results. If the CAA agree with our logic, it should place all or at least a greater weight on a linear approach, more akin to Flint's cross-check method.

Sub-issue 2c: The CAA disregard evidence that could overcome some statistical issues around estimation – including using shorter estimation windows

If the CAA wish to continue to rely on OLS regressions to draw inferences for the enduring impact on asset betas, we would propose that alternative methodologies are available to better understand the enduring impact of the pandemic. Previous CEPA reports have discussed two further methodologies:

- Using shorter estimation windows.
- 'Winsorization'.

Both approaches look to overcome some of the issues discussed with weights under OLS regression. Shorter estimation windows seek to avoid polluting data through pooling. Winsorization looks to cap the maximum co-variate relationship (in a symmetric fashion). In neither case is data excluded from the analysis.

We have proposed that shorter estimation windows could be used to test the hypothesis that the increase in two-year betas should be assumed to be enduring. We did not state that the asset beta itself should be calculated using very short-term betas, but that the above example should be informative. Our preferred approach continues to be

to reflect long term empirical betas – more specifically rolling averages of (e.g. 2yr) beta estimates, given scope for 'noise' in the beta estimate. Shock events need to be considered carefully.

For the pandemic impact, we used 90 working day asset betas as the shortest time horizon we had considered. 90 working days equates to c.18 weeks. The CAA and Flint conducted calculations based on 6 week beta estimates, one third of the length of our estimates.

Using fewer data points increases the standard error – the CAA and Flint reject using shorter time horizons (i.e. less than 2yrs) because of higher standard error in 6 week betas. No threshold is assumed for what represents acceptable standard errors, nor are these presented in the CAA's or Flint's analysis.

We disagree that this evidence should be completely disregarded – given the implications for beta, this issue needs careful consideration that the CAA has not yet demonstrated. We present below updated evidence using 90 working day asset betas for the three comparators that the CAA places most weight on – AdP, Fraport and Aena[34]. We see that asset beta estimates have been falling for the past six months of this sample, when assessing this evidence. The latest asset beta estimates shown for the three comparators are now almost half of what the CAA is assuming for their view of the H7 asset beta[35].

*Figure 2.7: Asset betas using 90 working day periods for three airport groups*

When the CAA limits itself to looking at 'sticky' longer term beta estimates, it omits to consider evidence that has value. Limiting analysis to periods no longer than 2yrs is restrictive – for example, relying on the below chart from Flint below, which provides little insight for how betas would evolve after a shock event (see Figure 2.8).

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[34] The finding of a materially reduced asset beta does not change when looking at the broader eight comparator sample.

[35] We confirm that the view we adopt of the AdP, Fraport and Aena asset betas are higher than the recent spot estimates from 90 working day asset betas.

Figure 2.8: Flint 2yr equity betas for comparators
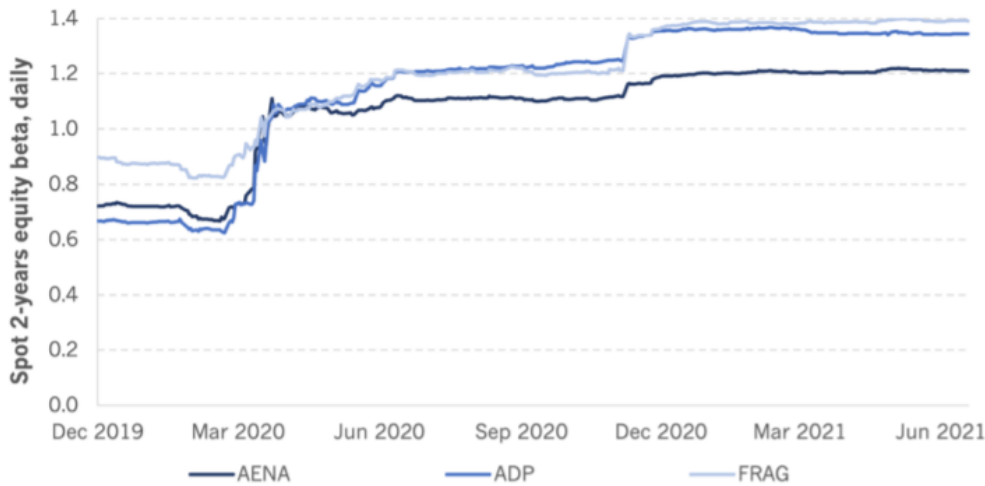
Source: Flint analysis of Thomson Reuters data as of 18th June 2021.

We would ask the CAA to reconsider the evidence we have previously presented, in the manner in which it was intended to be used. If the evidence is to be rejected due to concerns over standard errors, we would ask the CAA to set out the threshold applied for making such a decision and ensure that the standard errors are calculated for 90 working day calculations, not just 30 working day observations. Other time periods e.g. 6-month betas may also be useful for informing the CAA's thinking.

Sub-issue 2d: The CAA does not provide any evidence consistent with a 1 in 20-year pandemic frequency or satisfactorily rule out longer frequencies

The pandemic frequency must reflect the likelihood of a pandemic occurring with the same <u>magnitude</u> of event for the aviation industry in high income countries to reflect the risk faced by Heathrow (and comparators). An assumption of the same magnitude of event occurring every 20yrs (or once in four price controls) would fundamentally change the aviation industry and is not supported by data[36]. This assumption leads to an overestimate of the enduring impact on betas from pandemic events.

While the frequency of major, covid-like pandemics in future is unknown, a briefing note provided from CEPA to the CAA indicated a '1 in 30 year' lower bound frequency was more consistent with the evidence since the launch of commercial airline travel. This is consistent with the only data that the CAA refers to in its Initial Proposals that relates to pandemic frequency, which notes the existence of "three pandemics in the 20th century". This would be consistent with a 1 in 33 year frequency.

The CAA's explanation appears to be that based on uncertainty over pandemic frequency it is unable to rule out frequent pandemics. It does not apply this principle consistently. There have been <u>no</u> other events of comparable magnitude affecting the world in the era of widespread air travel. It is therefore equally hard to rule out the possibility that the covid pandemic represents an exceptionally rare event that may not recur for a century or more.

The CAA also fails to consider improvements over time that would reduce frequency. Advances in vaccination, treatment and sanitation have mitigated the impact of 'flu pandemics. The relevance of 20th century pandemics is therefore challenging to extrapolate. The replicability of the Covid-19 crisis is also unclear with policy responses having been tested and lessons learned.

We would request that the CAA clearly sets out why a 1 in 20 year frequency can be considered plausible for a pandemic event of the same magnitude in a high-income Western European country, and does not apply a lower

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[36] In addition, the CAA has assumed a three-year duration in its modelling of the asymmetric risk allowance – this means that 1 in every 6.67yrs should be considered to be impacted a pandemic impact of the same magnitude i.e. three year impacts, based on a pandemic beginning on a 1 in 20 basis.

evidential burden that it applies elsewhere in the cost of capital. We would expect that the CAA's lower bound estimate necessarily needs to assume a less frequent occurrence of the same magnitude event[37].

Sub-issue 2e: The midpoint of Covid impact estimates may not be representative

In both our and the CAA's approach, a key driver of the assessed impact of Covid on long-term beta estimates is the expected frequency of pandemics. The impact of this key assumption may, under some methodologies, be non-linear. In this case the midpoint of an overall range may not be representative.

The issue arises due to the sensitivity of the midpoint to the underlying upper end, in particular, of the range of frequencies considered. Based on our approach, for a sufficiently low frequency (say 1 in 60 years) the resulting Covid impact is close to zero. At higher frequencies, however, the resulting Covid impact is sensitive to the difference between, for example, 1 in 20 years and 1 in 30 years. As a result a broad range of assumptions for the pandemic frequency creates a broad but also upwardly-biased range for the resulting Covid impact. This statistical artefact may mean that other statistics, such as the geometric mean, may be more suitable as the basis for selecting a point estimate.

The CAA has used a 3.5% frequency assumption for estimating the asymmetric risk allowance, below the linear midpoint (i.e. 1 in 28.6 years). We consider this to be problematic and unsupported – the simple midpoint of the CAA's range would be 1 in 35 years; as set out above, even this midpoint could create an overly generous covid impact due to the statistical properties of such an approach.

We would welcome the thoughts of the CAA on this issue, given that it is not discussed in Initial Proposals. Should the CAA agree with our logic, we would request that this is reflected in the assumptions adopted on the asset beta and more generally in the price control.

Sub-issue 2f: The CAA/ Flint's development of an upper bound with a pandemic duration of 30 months is speculative and overemphasises the pandemic evidence's shock effect

The CAA has used 17 months of evidence from February 2020 to establish a lower bound for the covid pandemic impact. This is based on actual evidence and includes two major shocks in March 2020 and November 2020.

To establish an upper bound, the CAA/ Flint has applied weights to utilise the 17 months of evidence and convert this into 30 months. This is entirely speculative and has the effect of repeating the March 2020 shock of the pandemic outbreak and the November 2020 shock of vaccine development in the near-term future at the same magnitude. We noted above issues with assessing the impact of the covid pandemic in empirical beta estimates.

We consider that the definition of 'duration' is very important here. Traffic volumes remaining suppressed does not necessarily mean that the asset beta should be assumed to be elevated. In fact, we can see empirically from 90 working day beta calculations that making such an assumption would be a mistake. Duration should be considered to mean the period under which there is heightened sensitivity to the covid pandemic impacts on a stock's relative volatility.

Assuming the same level of shock event in the space of the next year has a major impact on the beta uplift estimate derived and is inconsistent with their own analysis of pandemic frequency. In addition, the CAA provides no justification as to why a 30-month assumption should be the right one. While there may be other shocks, the approach adopted is very likely to overemphasise the impact of the pandemic on the asset beta due to the way in which the following 13 month period has been constructed (even if that period was reflective of the period around which there is heighted sensitivity on the beta).

We would propose that the CAA reconsiders the approach for assessing the covid impact above what its lower bound estimates suggest and ensure that its methodology is consistent with the appropriate view of duration.

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[37] We note that a partial adjustment towards the CEPA lower bound frequency e.g. 1 in 25 years, makes a material difference in the asset beta and cost of equity.

Sub-issue 2g: The CAA approach is inconsistent with evidence on share price recovery

The CAA and Flint's analysis reflects that pre-pandemic beta estimates reflect a world in which there are no covid-like events. When a covid-event happens, this necessarily increases the beta, as investors had underestimated/ mis-specified risks.

We do not consider that this is the right mindset to adopt. Financial crises may be useful comparators; investors will be conscious that financial crises occur and have material impacts. Volatility in share prices when a shock occurs does not mean that investors did not foresee any financial crises, merely that the timing was unknown and that near-term company valuations are affected by the timing of those downturn events.

If we return to corporate finance theory, the value of a company reflects the discounted stream of future cashflows. Company valuations can be informative on the discount rate applied i.e. the cost of capital.

Airport comparator valuations reflect the stream of cashflows and the discount rate. The fact that company valuations have recovered to close to pre-pandemic valuations suggests that, despite significant falls in near-term profitability, there have been no material changes in the discount rate applied. While we cannot be precise on the discount rates used by all investors, this is a valid cross-check against beta evidence.

We find that six of the eight broader comparators have valuations comfortably above those from January 2019.

Figure 2.9: Enterprise Values of comparator airports
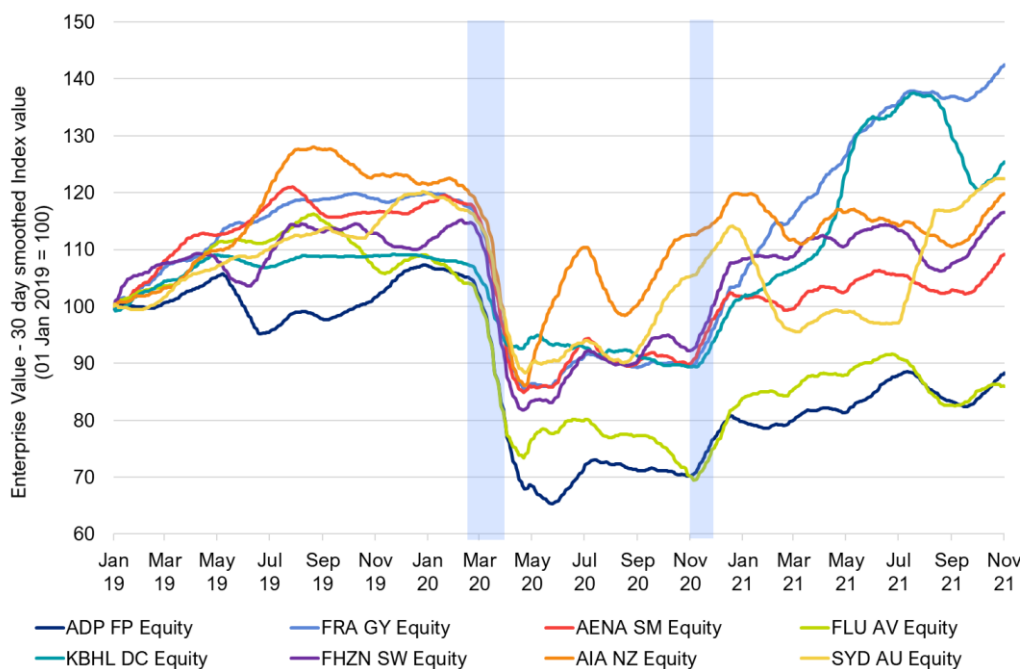
Source: Bloomberg

From a more intuitive perspective, the news of successful vaccine development in November 2020 led to upward spikes in betas for listed comparators. Adopting the beta estimate indicates that investors require a significantly higher return; yet this reflects a positive shock in company valuations to offset the earlier negative shock following the outbreak of the pandemic. Investors with equity holdings over a twenty-year horizon are relatively insulated from short-term volatility.

We would invite the CAA to assess its approach to the covid impact in this broader context and not create a 30 month duration in the way it has. Reduction in company value does not undermine adopting this mindset, where that is driven by expected profits and traffic volumes.

2.1.3. Issue 3: The CAA fails to (yet) include the impact of risk mitigation measures in the asset beta

Sub-issue 3a: The CAA has failed to develop its own view of the impact of risk mitigations – the TRS impact on asset beta should be quantified

We agree with the CAA and Flint that the risk mitigations introduced for H7, in particular TRS, should reduce the systematic risk faced by Heathrow for H7.

The CAA has not yet indicated the impact the mitigations should have on beta within its Initial Proposals, noting that this impact will be included in some form for Final Proposals – the CAA has indicated that this may only be through the WACC point estimate, rather than elsewhere. Given the impact of volume risk on betas, the TRS has a core role in affecting systematic risk and as such should definitely be reflected in the asset beta, not simply the point estimate. There are several challenging decisions for a regulator to make, but this does not mean such fundamental decisions should be delayed.

For TRS, a mechanism has been introduced that allocates risk away from Heathrow onto the airlines. The key principle is that the proportionate reduction in risk should be reflective of the views between Heathrow prior to the TRS (with covid impact) and the appropriate asset beta for a utility facing no/ very little volume risk.

The approach we set out in Section 3 for assessing the impact of the TRS would have the following impacts:

- A reduction in the asset beta of 0.04-0.08, using CEPA's estimate of the pre-pandemic asset beta and the impact of the covid pandemic.

- A reduction in the asset beta of 0.10-0.13, using the CAA's estimate of the pre-pandemic asset beta and the impact of the covid pandemic.

We can also consider the asset beta proposals set out in Heathrow's updated RBP. The inclusion of a RAB adjustment of £2.5bn was seen to lead to an asset beta 0.17 lower than would otherwise have been the case (with a higher base assumption for the covid-impacted asset beta for Heathrow). The CAA's calculations of the impacts of the TRS (linked to the asymmetric risk allowance) find potential TRS benefits through a H8 RAB adjustment to be of a similar financial scale to the H7 RAB adjustment proposed by Heathrow.

With the cost of equity impact of a change in the asset beta potentially being up to 200bps using the CAA's other assumptions i.e. the 0.10-0.13 adjustment, including the impact solely within the calculation of any point estimate is insufficient. The evidence available in our view is at least as strong as any evidence in designing an asymmetric risk allowance, so challenges in quantification should not preclude an estimate being made.

We would invite the CAA to properly assess the impact of TRS on the asset beta for H7 and clearly set out any underlying assumptions it has relied upon[38].

Sub-issue 3b: The logic for the asymmetric risk allowance is unclear and as a result is poorly calibrated

The CAA has proposed the introduction of an asymmetric risk allowance. We understand that this is intended to remove the scope for risks being skewed to the downside from outturn traffic volumes. The 'shock factor' contained in traffic forecasts is judged by the CAA to be sufficient to deal with 'medium frequency, low impact shocks seen prior to 2020.' It is the 'low frequency, high impact shock' that has led to this allowance.

Issues with overall approach - principles

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[38] For example, if the TRS is expected to be only in place for H7 and not thereafter, we would expect this assumption to be stated explicitly by the CAA. If this is the case, any associated implications would need to be drawn out – for example, the asymmetric risk allowance expected to be included in subsequent price controls.

The CAA has taken an approach that is centred around cashflow impacts during a price control. The input for the cost of capital should however reflect the value of the company over the life of an investment. By focusing on cashflows, the CAA adopt an approach that exacerbates risk and feeds into a greater concern over asymmetry than is warranted. If the scale and frequency of a pandemic shock is as expected, the company value may remain unchanged. The period in which the shock occurs will still have a downwards impact on revenues, but company value is what matters for the cost of capital – cashflow volatility is a different concept.

We note that implicitly the CAA is not suggesting that these high impact shock events are necessarily more frequent than has been the case. Historic evidence is used to assess frequency – the frequency in the past is being used as the proxy for frequency in the future.

The CAA's focus on within period cashflow volatility means that they do not consider the upside value potential available to an airport. This can include option value from future capacity expansion.

We are not aware of precedent to support this approach. SONI and ESO regulatory determinations do not support such an approach; while low probability, high impact events are considered e.g. Black Start costs for the ESO, the regulatory approach involved the provision of contingent capital to reflect the asset-light nature of the firms. Heathrow is far from an asset-light company and the adjustments were not to provide an additional return for skewness or asymmetry.

The introduction of the allowance aims to mitigate a source of risk for Heathrow. The risk mitigation needs to be reflected in the cost of capital. The CAA must be careful that the passenger does not end up paying three times – firstly in bearing the risk through a fixed ex-ante allowance, secondly through the beta term being unadjusted, and thirdly through the costs imposed when the risk does materialise[39].

Issues with overall approach - practical

The proposal seemingly seeks to remove all downside risk from these low frequency, high impact shock events from Heathrow in its entirety (on an ex-ante basis). We do not consider that the CAA has justified such an approach, given the implications of this for H7 and for future price controls[40].

The TRS mechanism itself works to remove some of the asymmetry that would exist at H7. Traffic forecasts are uncertain, but may reasonably average at around 10% under capacity for the H7 price control. Where outturn traffic is more than 10% above the forecast, Heathrow only obtains 0-10% of the marginal passenger charges above this threshold, with airlines in principle retaining 90-100% of this outperformance. However, there is unlikely to be scope for this, in light of the gap between the traffic forecast and the capacity constraint. Conversely, where traffic falls by more than 10% below forecast, Heathrow receive protection of 90-100%. Airlines bear all/ the vast majority of the downside under the proposed arrangements.

Financeability analysis also creates a positive asymmetry in a regulated company's favour. There can be adjustments upwards to the cost of capital that reflect challenges in meeting financeability thresholds, even when that cost of capital is commensurate with the level of risk faced. However, there are no downward adjustments made to the cost of capital where the regulated company easily surpasses minimum thresholds for given credit metrics.

With the traffic shock factor, the TRS and operating below the capacity constraint, any asymmetry should now be lower than it has been in the past. There has not been evidence that the cost of equity (or cost of capital) was insufficient in previous price controls.

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[39] We note that the CAA is not able to control how these ex-ante funds are used by Heathrow; it appears unlikely that these would be held as cash in a separate reserve to cover future pandemics, especially if that may not happen for another 50-60 years.

[40] We note that if the TRS is not in operation and traffic forecasts are higher than at present, the financial impact of this asymmetric risk allowance is multiples of its proposed H7 level.

The CAA has also not considered whether any of the observed covid impact they have included in beta reflects potential concerns around this asymmetry and whether there is scope for this to reflect double-counting, should investors place material weight on this asymmetry.

Calculation of the adjustment

In terms of the calculation of the amount of the asymmetric risk allowance, where this is used, we consider that this should reflect the discussion of frequencies discussed in relation to sub-issue 2d. Assuming that slightly more than 1 in 10yrs is impacted by a pandemic shock event, i.e. with traffic c.50% below forecast levels, should not be used as the central assumption.

Impact on WACC

The asymmetric risk allowance signifies that the CAA expects HAL to be insulated from those effects of a low frequency, high impact event. This protection must be reflected as part of the risk profile of the airport; the introduction of the asymmetric risk allowance and the TRS does reduce the risk faced by Heathrow relative to Q6 and relative to other airport comparators.

- The first-best risk insulation mechanism for airports is to be protected from any losses that occur. A second-best solution is to allow re-openers or change to assumptions to limit the future impact of this.

- Airport comparators used for the asset beta, based on our research, do not contain those first-best mitigations. Some airport comparators may contain those second-best mitigations, however there are limits in the extent to which airports can increase charges to reflect lower assumed passenger volumes.

Overall, we would invite the CAA to re-assess the basis for the asymmetric risk allowance, set out the precedent it considers to be relevant and to ensure that risk mitigations are suitably reflected in the cost of capital.

## 2.2. ISSUES REVIEW - COST OF DEBT & NOTIONAL GEARING

2.2.1. Issue 4: The decision to change the assumed debt tenor is unsupported by evidence, misapplies precedent and causes harm to consumers

Sub-issue 4a: Comparator airports/ airport groups, used for beta, have materially shorter term debt than the CAA's new assumption on debt tenor

For the Q6 price control, the CAA used a GBP 10-15yr benchmark[41]. For H7, the CAA is now proposing to move to a 10yr+ benchmark, with average tenor of c.20 years.

We consider that comparator airports used for estimating the asset beta are relevant evidence for assessing the appropriate debt tenor. These comparator airports have tenors of debt that are substantially more consistent with a 10-15yr index than a 10yr+ index. We presented the below information to the CAA in February 2021 (Figure 2.10).

Figure 2.10: Average debt tenor for comparator airports
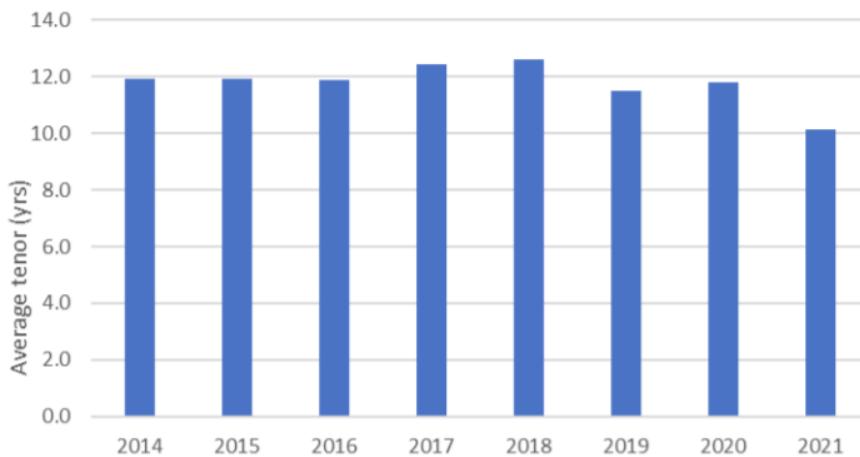
Source: Bloomberg, Annual reports.

The CAA appear to accept that these airport groups have shorter tenors of debt. The CAA suggests that '*There could be various reasons why comparator companies issue at shorter tenors than HAL.*' (para 9.167) No evidence is provided to support the reasons discussed, with the ultimate effect being to exclude relevant information on debt tenors from comparators.

One of these reasons put forward by the CAA is that the comparator airports could face restrictions on their ability to issue longer term debt due to lower liquidity at the longer end of the yield curve in non-sterling markets. The comparators represent large airports or airport groups with international exposure. Heathrow itself issues debt in many different currency denominations, not simply sterling markets.

The CAA also places no weight on the assumed ten-year debt tenor set for Dublin Airport for the same reason i.e. European debt markets. We do not consider that the evidence presented by the CAA justifies placing no weight on this evidence. Practical market evidence used for comparator airports is more representative than theoretical assessments drawn from determinations in other sectors with major differences.

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[41] The CAA considered both notional and actual debt costs. Where a notional approach was adopted, the assumed tenor was 10-15yrs.

We consider that the CAA should change its approach to fully reflect an assumed 10-15yr debt tenor. If it does not adopt this assumption, we would welcome the CAA setting out its logic for not reflecting this at all in the range, given the evidence set out by CEPA[42].

Sub-issue 4b: The CAA has incorrectly assumed that energy and water precedent should necessarily apply in the aviation sector

Rather than utilise airport data on debt tenor, the CAA relies upon regulatory determinations in energy and water. The choices on tenor in those sectors have been informed by debt tenor in their industry, rather than based on a comparison to other sectors.

Asset life is just one factor that might impact on debt tenor. Volume risk and the potential for changing forms of economic regulation in future due to market power assessments mean that it is credible that airports would look to issue shorter term debt than energy and water networks.

We do not consider that comparable asset lives in the sectors justifies a change in approach from Q6, going against airport comparator evidence.

Changing to a longer debt tenor after yields have fallen risks creating a one-way bet, whereby caution from the CAA leads to an overestimated cost of debt. There is also an issue of regulatory consistency to consider – if rates rise in a sustained fashion, would the CAA continue to apply the 10yr+ tenor that gives a lower cost of debt?

If the CAA expects asset lives to dominate the discussion of embedded debt and does not change their assumed debt tenor, we would welcome a statement on what factors could change the assumed debt tenor in future.

2.2.2. Issue 5: The CAA's own cross-check of actual debt costs highlights the generosity of their proposed approach

Sub-issue 5a: The CAA's comparison of notional and Heathrow's actual debt costs are based upon different inflation assumptions

The CAA has compared its notional approach on the cost of debt (using a 20yr collapsing average of 10yr+ indices) to Heathrow's estimated embedded debt costs over H7[43]. Heathrow's actual debt costs are based on RPI inflation of 2.9% each and every year in H7, whilst the CAA use a 2.6% assumption more broadly – in order to be consistent it should require Heathrow's effective nominal debt costs to be expressed using that same 2.6% assumption.

Heathrow's assumed actual debt costs are therefore higher than the CAA considers that they will be (given the impact of accretion on the overall nominal cost of debt). The CAA should make this adjustment before comparing the two measures to be internally consistent, even if this does not change their interpretation.

Sub-issue 5b: Heathrow's actual debt costs are 3.60% at end-June 2021, compared to 4.83% from the CAA's notional approach at the same point in time – the similarity between actual and notional debt costs does not exist today

Based on latest evidence, Heathrow's actual nominal cost of debt is significantly below the nominal cost of debt derived from the CAA's preferred notional approach. At the end of June 2021, Heathrow's stated cost of debt is 3.60%, compared to 4.83% for a twenty-year average of the iBoxx GBP non-financial corporate A and BBB rated 10yr+ indices. There is a gap of 123bps i.e. the CAA's approach at this point in time is 123bps higher than Heathrow's actual debt costs in nominal terms.

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[42] We note that, especially on embedded debt, the CAA is not restricted from combining multiple indices that it considers to be suitable.

[43] As per Table 6, Section 5.6 of Heathrow's RBP update, July 2021.

Heathrow's actual debt cost of 3.60% is built up of a cash interest cost of 2.64% and an inflation accretion element of 0.96%. This excludes the impact of swap portfolio reprofiling – whereby Heathrow has reduced debt interest costs during the pandemic.

For H7, Heathrow has provided the below table on expected cash interest costs and inflation accretion in H7.

Embedded Debt	2022	2023	2024	2025	2026	Average
Cash Interest %	2.61%	2.64%	2.47%	2.49%	2.71%	2.58%
Interest including accretion with RPI of 2.9%	4.12%	4.56%	4.54%	4.69%	5.07%	4.60%

Source: Heathrow

The CAA's use of a 10yr+ index is inconsistent with current debt costs; the expected increases in Heathrow's forecast actual embedded debt costs over H7 improve the consistency. The information on forecast embedded debt costs is (based on information provided to us) opaque; the CAA must be convinced that any forecasts are credible. Departing from the 10-15yr index also means that future debt costs are more reliable than historical and current actual debt costs, where the 10-15yr benchmark and Heathrow's actual debt costs have been very similar on average over the past decade. In our view, reliance on future expected costs opens the possibility of gaming from the regulated company to a greater extent that relying upon outturn historical and current data.

The CAA should be particularly wary of this possibility, given that Heathrow's cost of debt is rising materially through H7 with a fixed inflation assumption – the nominal debt cost in 2026 is c.150bps higher than the nominal cost of debt as of end-June 2021[44]. The rolling average of benchmark indices are showing falling nominal interest costs. We are cautious about relying too heavily upon those forecast costs and prefer to assess historical costs.

We present in Figure 2.11 how our preferred notional benchmark index (the red line) compares to Heathrow's actual cost of debt costs over time (the dark blue line). This begins in 2011 when Heathrow first published information on their actual debt costs including accretion. We now have a decade of evidence to support our proposed benchmark.

The CAA's preferred benchmark (a twenty year average of the iBoxx 10yr+ indices) is shown as the light blue line. Given the iBoxx indices contains data back to 1998, the 20yr trailing average is only available from 2018. The series gives an estimated nominal cost of debt c.100bps higher at present than our own preferred benchmark.

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[44] This may partly be explained by differences in inflation, though interest costs are rising by c.100bps under a fixed inflation assumption in H7.

Figure 2.11: Comparing Heathrow's actual debt costs to notional benchmarks[45]

- Heathrow Actual CoD with accretion
- iBoxx 10yr+ indices, 20yr trailing average
- iBoxx 10-15yr indices, 12.5yr average
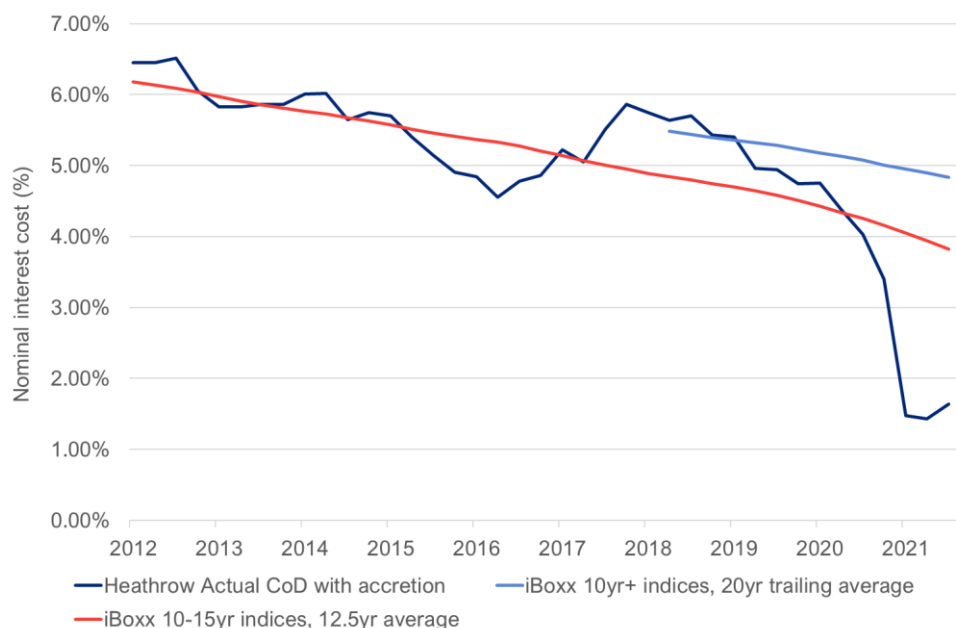
Source: Markit iBoxx, Heathrow debt investor reports, CEPA analysis

If the CAA continues to place material weight on Heathrow's forecast embedded debt costs, we would expect to see that a detailed assessment of those costs has been undertaken by the CAA, with Heathrow making the data available in a transparent form. Understanding why Heathrow's costs are rising so materially, when benchmark yields are falling would be relevant information for stakeholders. If this is the driven by Heathrow's own decisions, should passengers be responsible for managing this risk? Will the CAA manage the risk such that this doesn't become a one-way bet?

Sub-issue 5c: Heathrow's actual debt interest costs at 3.60% - a figure that is significantly above that quoted to debt investors – is potentially a conservative view of the notional company's debt costs, given the inclusion of junior debt and higher levels of gearing for Heathrow itself

The use of 3.60% to reflect Heathrow's actual nominal cost of debt as of end-June 2021 is potentially an inflated estimate of Heathrow's actual cost of debt for the regulated company. We understand that the figure includes junior debt and reflects higher levels of gearing for Heathrow, impacting on the credit rating and the overall cost of debt.

We are also reliant on information from Heathrow in relation to the impact of swap portfolio reprofiling. The nominal cost of debt quoted by Heathrow to its debt investors in June 2021 is 1.64%; a figure that includes accretion and the impact of hedging (but excluding any adjustment for swap reprofiling).

We would like to see at Final Proposals that the CAA has considered relevant factors and discussed the read-across between the notional company and the Heathrow actual company.

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[45] We note that the most recent estimates of Heathrow's actual cost of debt will be impacted by swap interest reprofiling.

2.2.3. Issue 6: The CAA's approach is inconsistent, adopting a biased estimate of the real cost of debt

Sub-issue 6a: There is an absence of clear justification why the CAA takes the lowest inflation figure available i.e. OBR forecasts (leading to the highest real cost of debt)

Inflation is another area where we have concerns over whether the CAA has adopted reasonable and balanced view of available evidence. The resulting choice of approach on inflation gives a higher cost of capital – consistent with issues we have expressed elsewhere in our report.

The three measures of inflation shown included OBR estimates indicating 2.6% RPI inflation over H7, a CPI target plus wedge approach (2.9% over H7) and breakeven inflation (3.2%). The CAA adopted the lowest estimate, derived from the OBR approach, with a reference to ensuring costs are financeable; we are unsure if this should be interpreted to mean that the lowest measure of inflation provides greater protection through a higher cost of debt.

The CAA has also said that '*We will take account of the latest available OBR forecasts and update our estimates accordingly at Final Proposals*.' The OBR's Economic and Fiscal Outlook from October 2021 has updated the forecasts of RPI inflation. Over 2022-26, RPI inflation is now forecast to be 3.4%. We assume that this inflation assumption will be included in the CAA's updated proposals, given the CAA's stated position. This would bring down the real cost of debt by 80bps; we would expect this to be reflected in Final Proposals if the CAA does not change its approach.

Sub-issue 6b: Failure to use breakeven inflation is inconsistent with applying an index-linked premium for equivalence of debt costs

The CAA has applied a 5bps uplift to ensure that they '*did not penalise HAL unduly by preventing it from recovering costs associated with issuing index-linked debt*'. In our view, this implies that they are looking to achieve pricing equivalence between two forms of debt – index-linked and nominal debt.

Based on this equivalence principle, breakeven inflation over the assumed tenor and trailing average period is the appropriate inflation measure to use for embedded debt. Breakeven inflation represents the on the day implied difference between nominal and index-linked gilts. This can be applied to debt to create ex-ante equivalence of expected cost.

Applying an OBR forecast for the price control only leaves scope for significant differences in cost for index-linked and nominal debt, potentially causing over- or under-recovery.

Breakeven inflation may also be more representative of the suitable inflation measure to use for the cost of new debt indexation mechanism; this avoids adjusting the real cost of debt when the real yields have not changed i.e. movements in nominal yields driven solely by movements in expected inflation. Using a fixed inflation assumption would reduce the benefits from indexation in minimising forecast error in period with elevated uncertainty around inflation. We would invite the CAA to reconsider the approach to adopt for deflating yields as part of the cost of new debt indexation mechanism.

If the CAA continues to assume 20yr tenor debt with a 20yr trailing average, the 20yr breakeven inflation measure is the correct reference. It is unclear which breakeven inflation measure the CAA have published and over which horizon. We would welcome clarity on the selected approach.

Sub-issue 6c: The CAA's approach to the halo effect and an index-linked premium shows the asymmetric and inconsistent approach adopted throughout the cost of capital by the CAA

We have already highlighted that the approach taken by the CAA consistently errs towards a higher cost of capital. The CAA state that since 2008, Heathrow's Class A debt has been issued on average 29bps below the corresponding iBoxx indices, based on a sample of 21 bonds. This compares the spread on the day of issue to

spreads from the iBoxx index. The evidence is seen to be insufficient to apply a 'halo' effect i.e. a downwards adjustment, given the limited number of bonds and variation.

 The CAA applies the same approach in comparing spreads at issue to the iBoxx index, this time only for index-linked debt. The sample size contains only 5 bonds this time. Yet the evidence is seen as sufficient to apply an upwards adjustment of 5bps, despite there being material variation and the sample size being less than a quarter of that for the bonds used to assess a halo effect. The approach also involves an additional assumption in selecting the right inflation estimate to apply, so is subject to even greater uncertainty.

Where a sample size of 21 is seen to be too small to make a downwards adjustment and a sample size of 5 is seen as sufficient to make an upwards adjustment, we have concerns that the approach may not be balanced. For consistency, we do not think that this uplift is justified. Additional discussion of the evidence in both of these contexts would be valuable for our understanding.

Sub-issue 6d: Using an unweighted mean assumption for inflation over H7 misestimates the real cost of new debt

Current OBR forecasts have RPI inflation being significantly above recent historical trends at the start of H7, falling back towards the trend over the course of the price control. Where inflation is not steady, there are implications for estimating a real cost of new debt. This is driven by the fact that debt issued in the first year of the price control is relevant for each and every year of the price control; debt issued in the final year of the price control would only be given one-fifth of the weight.

An example may help explain this point. Let us assume that RPI inflation is 5% in the first year of H7 and the rate of inflation falls by 100ppts each year i.e. RPI inflation is 1% in the final year of H7. This creates a mean H7 inflation of 3.0%. For simplicity, let us assume a fixed nominal cost of new debt of 5.0%. If we apply a 3% RPI inflation assumption for each year, we overestimate the real cost of new debt by 200bps in the first year and underestimate the cost of new debt by 200bps in the final year of H7. Given the weightings that would apply, these do not 'net off' and using unweighted mean inflation of 3% leads to overestimation of the real cost of debt by 67bps over H7. A weighted inflation estimate is required to accurately estimate the real cost of new debt[46]. We propose that the CAA adopts this assumption, should inflation not be updated as part of any indexation mechanism.

2.2.4. Issue 7: The CAA's approach to estimating notional gearing is unsupported by market evidence and precedent, leading to a higher cost of capital

Sub-issue 7a: The CAA incorrectly ignores the implications on the cost of capital and financeability from a higher assumed notional gearing level
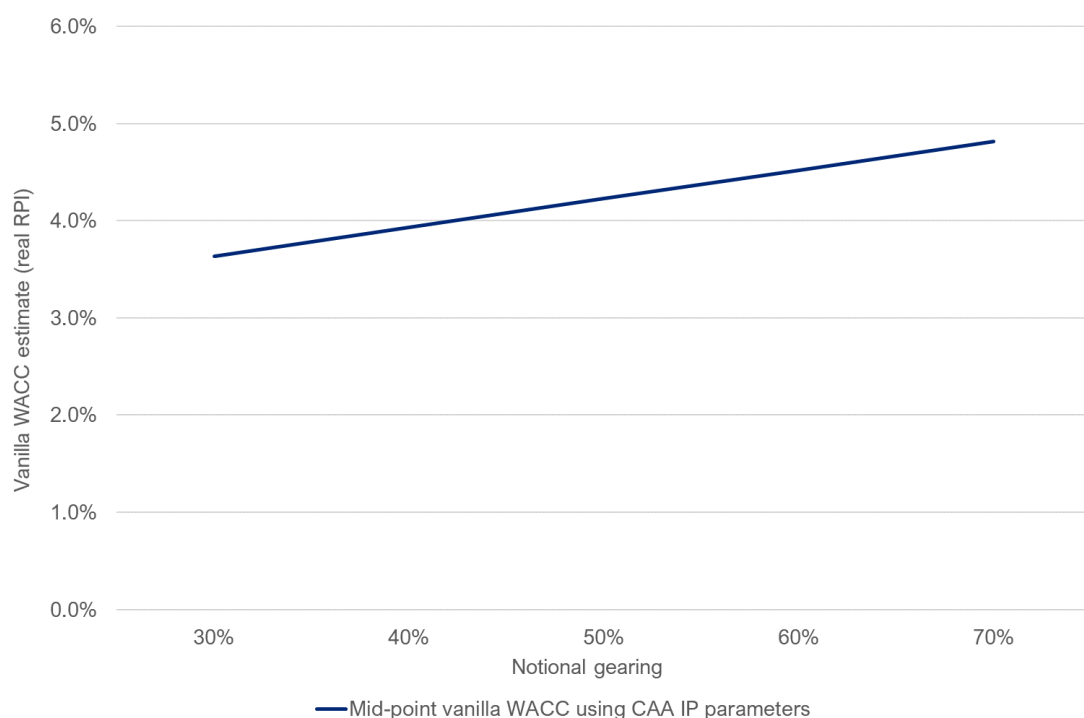
The choice of notional gearing has implications for the overall cost of capital and the assessment of financeability. The CAA simply suggests that corporate finance theory suggests that there should not be an impact on the cost of capital from gearing (para 8.28). The parameter choices from the CAA clearly show that it does have an impact on the cost of capital in H7, so the issue should not be sidestepped.

Using notional gearing of 30% to align with comparator gearing, rather than the CAA's 61-62% assumptions brings down the vanilla WACC by c.100bps (from 4.6%). This has major implications for returns, as shown in Figure 2.12.

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[46] The weighting approach would give 5pts weight to Yr1 inflation, 4pts weight to Yr 2 inflation etc. In the example above, the weighted inflation estimate would be 3.67% rather than the unweighted mean of 3.0%.

Figure 2.12: Relationship between vanilla WACC and notional gearing, using CAA parameter assumptions

Source: CEPA analysis

Higher notional gearing also leads to more challenging financeability metrics. This is a further impact from the choice of notional gearing which the CAA fails to acknowledge. We would invite them to do so, especially in light of CMA NERL precedent where a 30% assumption was used, in part to avoid a higher cost of capital being set from higher notional gearing.

Sub-issue 7b: The notional gearing level is incompatible with the assumed level of risk in the sector and comparator levels of gearing, contrary to CMA NERL precedent

The approach taken by credit rating agencies assumes that less risky companies are able to cope with higher levels of gearing. The CAA suggest that Heathrow is significantly riskier than energy and water networks, yet adopt a notional gearing assumption in excess of those sectors. We consider that lower notional gearing is more consistent with the CAA's view of risk across sectors.

The notional gearing assumption is also materially above levels of gearing witnessed for airport comparators. The CMA NERL determination used a 30% notional gearing assumption to reflect gearing of beta comparators. Regulators have discussed at depth issues with re-levering betas and the approach adopted in the NERL determination minimised the risk from errors in re-levering.

Adopting the same approach for H7 would lead to significantly lower levels of gearing. Our estimates for the average gearing level of our preferred seven comparators in the ten-year period to end-October 2021 is 26%. We would invite the CAA to include greater discussion of the lower levels of notional gearing that might be assumed;

Sub-issue 7c: The CAA's approach to adjusting gearing based on outturn performance is asymmetric in approach and unsupported by precedent

The CAA has based notional gearing on historic performance in the Q6 price control. This approach assumes that the 60% notional gearing assumption was the right starting point; this is despite the CAA rejecting large parts of the approach they adopted at the Q6 price control, and the resulting estimate is materially out of line with comparator gearing.

Notional gearing has not been adjusted in previous price controls for periods of outperformance; the approach appears one-sided and we are unaware of supporting precedent for such an approach. We think that changing notional gearing assumptions on past performance has the potential to have negative implications for regulatory stability going forward.

We would ask the CAA to reconsider the suitability of a notional gearing assumption based on prior performance, especially given the implications on the resulting notional gearing level and comparison to other regulated sectors.

Sub-issue 7d: The effect of this approach is to no longer set an independent forward-looking cost of capital; underperformance in the past price control leads to a higher cost of capital in the next price control

The cost of capital is intended to be forward-looking. It is not intended to look to compensate for past losses. Where the cost of capital is not independent of notional gearing, the CAA approach means that this will no longer be the case.

Underperformance in the Q6 period has led to a higher notional gearing assumption in H7. This has increased the cost of capital. While the materiality is low, this type of ex-post reassessment of the suitability of regulatory determinations has been rejected in other contexts e.g. the CMA decision on the RIIO-2 outperformance wedge. Ofgem attempted to lower the cost of capital for past outperformance; the CAA is here looking to increase the cost of capital for past underperformance – this approach should not be retained.

2.3. SUMMARY

Table 2.4 provides a list of the seven issues set out in this section of the report. For each of the issues, we set out the list of actions that we are inviting the CAA to take. In our view, these actions would help the CAA arrive at a more suitable estimate of the cost of capital and increase transparency to stakeholders around their approach. Across its approach, we would ask the CAA to state clearly which empirical evidence it has used and why.

The table is naturally only a summary of the points discussed in more detail in the report. We welcome engagement with any of the issues set out, not limited to the potential actions below.

Table 2.4: Summary of issues highlighted by CEPA and actions invited

#	Issue
	Asset beta
1	**The CAA has overestimated empirical betas used to calculate a pre-pandemic asset beta range** We would invite the CAA to: • Reduce the asset beta lower bound to incorporate its own empirical evidence. • Place greater weight on longer term evidence. • Explain material departures from precedent in the pre-pandemic asset beta (the H7 range barely overlaps with Q5 and Q6 asset betas). • Consider a broader evidence base, including evidence on domestic relative indices and the market value of debt for re-levering. • Reconsider the basis for excluding comparators. • Increase transparency around how the pre-pandemic range was arrived at (including any relative risk assessment). • Address issues posed in relation to suitability of Aena as an unadjusted comparator. • Conduct a fuller relative risk assessment focused on the listed airport groups and on all potential drivers. • State firm conclusions upon Heathrow's relative risk (both pre-pandemic and after risk mitigations) and justify why the judgement was arrived at. • Reflect relative risk in a downwards adjustment to the asset beta. • Explain why it considers the Q6 downwards adjustment for relative risk is no longer valid.
2	**The CAA's proposed range for the impact of the Covid-19 pandemic on beta is biased upwards** We would invite the CAA to: • Recognise the statistical properties of the primary approach and the impact this has on their own calculations. • Adopt an approach, such as CEPA's ('linear') approach, that treats pre-covid and covid-impacted beta measurements as two distinct time periods. • Re-assess evidence using shorter beta estimation windows. • Set out the threshold for standard errors becoming problematic and whether that precludes other time periods below 2yrs from being included. • Decrease the assumed frequency of a similar magnitude pandemic event. • Utilise a figure above the straight mid-point of the frequency range. • Remove the upper bound for duration i.e. 30 months, in light of repeating the same magnitude events occur in the following 13 months and an absence of evidence to support this.
3	**The CAA does not (yet) include the impact of risk mitigation measures in the asset beta** We would invite the CAA to: • Assess the impact of the TRS on the asset beta, clearly setting out any underlying assumptions relied upon. • Revisit the logic behind the asymmetric risk allowance, including any precedent it considers relevant. • Include the impact of all risk mitigations within the cost of capital.

#	Issue
	Cost of Debt & Gearing
4	**The decision to change the assumed debt tenor is unsupported by evidence, misapplies precedent and causes harm to consumers** We would invite the CAA to: • Change the debt tenor assumption to 10-15yrs[47]. • State which factors could change the assumed debt tenor in future, if asset lives are assumed to be constant and this represents the main driver of the proposed debt tenor.
5	**The CAA's own cross-check of actual debt costs highlights a flaw in its proposed approach** We would invite the CAA to: • Adopt consistent views of inflation when assessing Heathrow's actual debt costs and the inflation assumption used for H7. • Demonstrate that Heathrow's forecast future embedded debt costs had been properly assessed and all underlying assumptions are known by the CAA (should this be given weight in the CAA's assessment). • Explain the driver of Heathrow's significantly increasing interest costs when benchmarks are showing material falls over time. • Explore relevant factors e.g. the impact of higher gearing and junior debt, on actual debt interest costs.
6	**The CAA's approach is inconsistent, adopting a biased estimate of the real cost of debt** We would invite the CAA to: • Reduce the real cost of debt to reflect updated views of inflation, whether this be the OBR forecasts or breakeven inflation. • Reconsider the inflation underlying the CAA's proposed cost of new debt indexation mechanism to ensure benefits are maximised. • Provide clarity around the breakeven inflation measure considered in the CAA's thinking. • Remove the small upwards adjustment for inflation risk to apply a consistent approach with the halo effect evidentiary threshold. • Use a weighted inflation estimate for the cost of new debt, should inflation not be updated as part of any indexation mechanism.
7	**The CAA's approach to estimating notional gearing is unsupported by market evidence and precedent, leading to a higher cost of capital** We would invite the CAA to: • Acknowledge the impact of notional gearing on the cost of capital, using the CAA's other parameter estimates • Set out why a lower notional gearing assumption should not be considered. • No longer include a notional gearing assumption based on prior performance, given CMA precedent.

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[47] We would propose placing all weight on this assumed tenor. If not, partial weight could be placed on the indices to improve the proposed approach.

3. CEPA ESTIMATE OF THE H7 COST OF CAPITAL

In this section, we provide an independent estimate of the appropriate H7 cost of capital. The cost of capital estimate represents a real RPI figure, including the impact of the covid pandemic and the risk mitigations proposed by the CAA in their Initial Proposals.

We last provided an estimate of the cost of capital in November 2020. This incorporated evidence until the end of July 2020. The changes proposed to the regulatory framework were not known at this time. The logic for our parameter choices and calculations remains consistent with our November 2020 report.

Table 3.1: WACC estimate (real, RPI)[48]

Parameter	CEPA Low	CEPA High
Notional gearing	60%	60%
Risk-free rate	-2.44%	-2.44%
Total Market Return	5.20%	6.00%
Equity Risk Premium	7.64%	8.44%
Debt beta	0.075	0.075
Pre-pandemic asset beta – no covid impact	*0.45*	*0.50*
Pre-pandemic asset beta – with covid impact	*0.46*	*0.52*
Asset beta, with risk mitigations	0.38	0.48
Equity beta	0.84	1.09
Post-tax Cost of Equity	4.0%	6.7%
Cost of embedded debt	-0.31%	0.47%
Cost of new debt	-1.64%	-1.58%
Weight on new debt	20%	20%
Transaction costs	0.1%	0.1%
Cost of Debt	-0.48%	0.16%
Tax	23.8%	23.8%
Pre-tax Cost of Equity	5.2%	8.8%
Vanilla WACC	**1.3%**	**2.8%**
Pre-tax WACC	**1.8%**	**3.6%**

Notional gearing

We adopt a 60% notional gearing assumption, fixed over the price control. We consider that this is at the top end of what can be justified for H7, but adopt it for this report given the CAA's regulatory precedent and to aid comparability to other cost of capital (and cost of equity) estimates. We do not adjust notional gearing based on performance in previous price controls.

We note that the use of a notional gearing assumption based on comparator gearing levels would be supported by CMA NERL precedent. This would lead to a materially lower notional gearing assumption, which then flows through into a significantly lower cost of capital.

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[48] Based on evidence up to 31 October 2021.

We note that Flint in June 2020 proposed to the CAA H7 notional gearing of 52.5-60.0%. This reflects lower gearing exhibited by other comparator airports/ airport groups. Adopting the CAA's other parameters shows a clear positive relationship between the level of notional gearing and the cost of capital; there may also be subsequent financeability implications (higher gearing generally reduces relevant financeability metrics).

Risk-free rate

Our approach to the risk-free rate is based on a six-month average of 20yr index-linked gilt (ILG) yields. We adopt a point estimate, rather than a range for this parameter. The exclusive use of 20yr ILG yields is consistent with the approach adopted by Ofgem in the RIIO-GD2 and T2 decisions. The CMA found that it was reasonable for Ofgem to rely on ILGs as a proxy for the risk-free rate. As per the CMA's approach in recent determinations, no forward adjustment is applied. This gives a (real RPI) risk-free rate of -2.44%.

We consider that this estimate is balanced, with arguments for utilising corporate AAA bonds giving a higher risk-free rate and reference to a 10yr ILG giving a lower figure. Both of these approaches have been applied in CMA precedent, though we do not make any adjustment from ILG yields.

Total Market Return

CEPA's estimate for the TMR is 5.20% to 6.00%, as per the range in CEPA's November 2020 report. The range is based on historical evidence; placing most weight on ex-post evidence and favouring use of CPI-deflated returns[49].

As shown in Table 3.2, our TMR estimate is consistent/ slightly higher than recommendations made by the CAA's advisers during H7 and the CMA NERL decision. The CMA PR19 decision extended the top end of the TMR range and represents the range the CAA has adopted in its Initial Proposals.

Table 3.2: Real RPI TMR estimates

Report	Low TMR	High TMR
PwC, Aug 2019	5.10%	5.60%
CMA NERL, Mar 2020	5.00%	6.00%
Flint, Jun 2020	5.00%	6.00%
CMA PR19, Mar 2021	5.20%	6.50%
CEPA, Nov 2020 & Dec 2021	5.20%	6.00%

Source: regulatory decisions

Debt beta

We adopt a debt beta for Heathrow of 0.075, while using a debt beta of 0.05 to estimate comparator betas. This difference reflects the higher level of gearing for Heathrow compared to other comparators and such an approach is consistent with Q6 precedent (though Heathrow's debt beta is slightly lower than the 0.10 used for Q6).

The 0.075 debt beta is consistent with the CMA determination at PR19 and the debt beta used by Ofgem for RIIO-GD2 and T2 (which the CMA did not overturn).

Pre-pandemic asset beta

Our assessment of the pre-pandemic asset beta is based on an empirical assessment of listed comparator airports and airports group, supplemented by relative risk analysis.

Our assessment of the pre-pandemic asset beta is driven by multiple pieces of assessment, which we present below (fuller details can be found in CEPA's November 2020 report).

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[49] We note that placing more weight on ex-ante evidence would reduce the TMR, whilst including RPI-deflated returns would be likely to increase the TMR.

Empirical asset betas from available listed comparators

One reference point is the full universe of listed airport comparators. We considered 24 listed airports and airport groups, with the interquartile range presented in Figure 3.1.

*Figure 3.1: Interquartile range for 24 listed airport comparators*
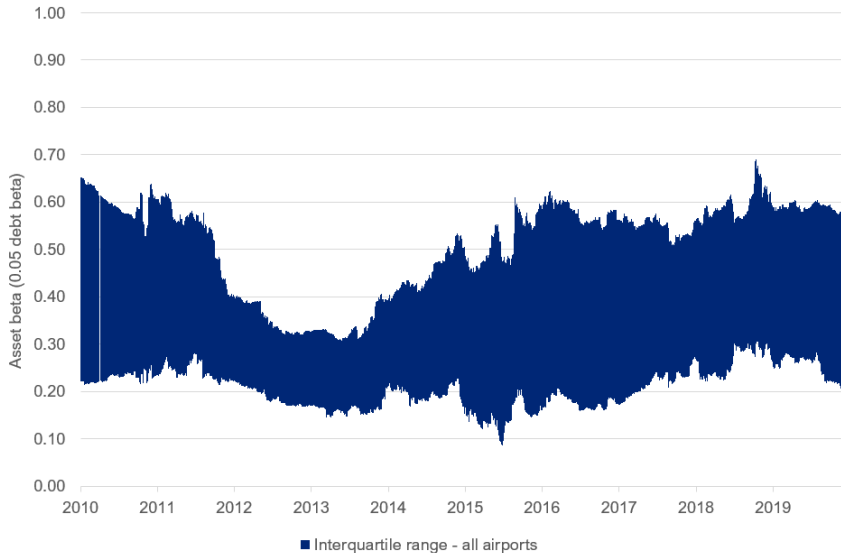
Source: Bloomberg, CEPA analysis

The median value over the ten-year period from the start of 2010 to the end of 2019 was 0.38 for all comparators, with a broader interquartile range of 0.2-0.6 for the asset beta. This compares to the CAA's 0.5-0.6 range.

Empirical betas from refined preferred comparators

We conducted a systematic process to assess the applicability of listed airports and the robustness of the underlying evidence for each. This left us with seven core comparators, including four airport groups (AdP, Fraport, Zurich and Aena) and three listed airports (Vienna, Copenhagen and Sydney). Auckland was not included in this sample. Our assessment did not find any perfect comparator for Heathrow; each comparator exhibited differences.

Figure 3.2: Interquartile range for 7 listed airport comparators
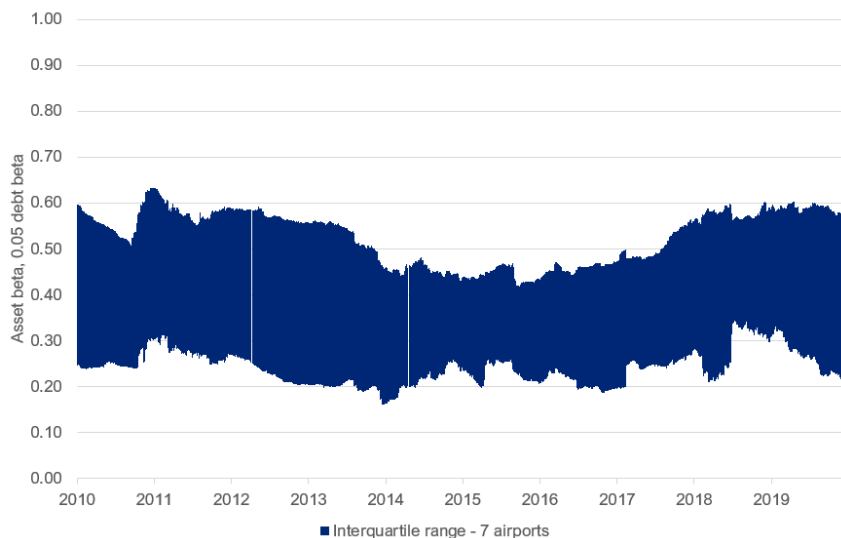
Source: Bloomberg, CEPA analysis

When narrowing down the sample, we obtain a relatively similar picture to the broader set of 24 comparators i.e. the interquartile range is again 0.2-0.6 over the past decade. With a smaller number of comparators, we have conducted detailed relative risk assessment.

	AdP	Fraport	Aena	Copen-hagen	Zurich	Vienna	Sydney
Passenger volatility	↑↑	↑↑	↑↑	↑	=	↑↑	=
Mix effects	↑↑	↑	↑	=	↑=	=	=
Capacity constraints	↑	↑	↑	↑	↑	↑	↑
Single till	↑	↑	↑	↑	↑	↑	↑
Reg framework	↓	=	↑=	↓ =	↑ =	=	↓
Growth & development	↑	↑	=	↑	↑	↑	=

Note: an upwards arrow indicates greater risk for the comparator airport than for Heathrow Airport. Two arrows are used to highlight a greater risk differential than a single arrow.

We find that Heathrow sits at the bottom of the relative risk hierarchy, when including the seven preferred comparators. Sydney Airport has many similarities with Heathrow, with our pure play airports (Copenhagen, Zurich and Vienna) being equally or more representative than the airport groups (AdP, Fraport and Aena). There are differences for each comparator though and directional relative risk adjustments should be considered.

The assessment above does not include any impact of the TRS mechanism on the asset beta or risk mitigations introduced at H7. However, the introduction of the asymmetric risk allowance, use of a RAB adjustment and the inclusion of traffic shocks in passenger forecasts provides even more comfort that Heathrow will continue to sit towards the bottom of the relative risk hierarchy once those mitigations are included in the asset beta.

Empirical betas from CAA's preferred three comparators

The CAA had previously set out a preference for relying upon AdP, Fraport and Aena. The empirical asset betas sit towards the top end of the range presented for the broad and CEPA preferred comparator sets.

In Figure 3.3 we present asset betas for AdP, Fraport and Aena. The shorter time for Aena being listed means that longer term estimates cannot be calculated, as it can for other comparators.

Figure 3.3: Asset betas for AdP, Fraport and Aena
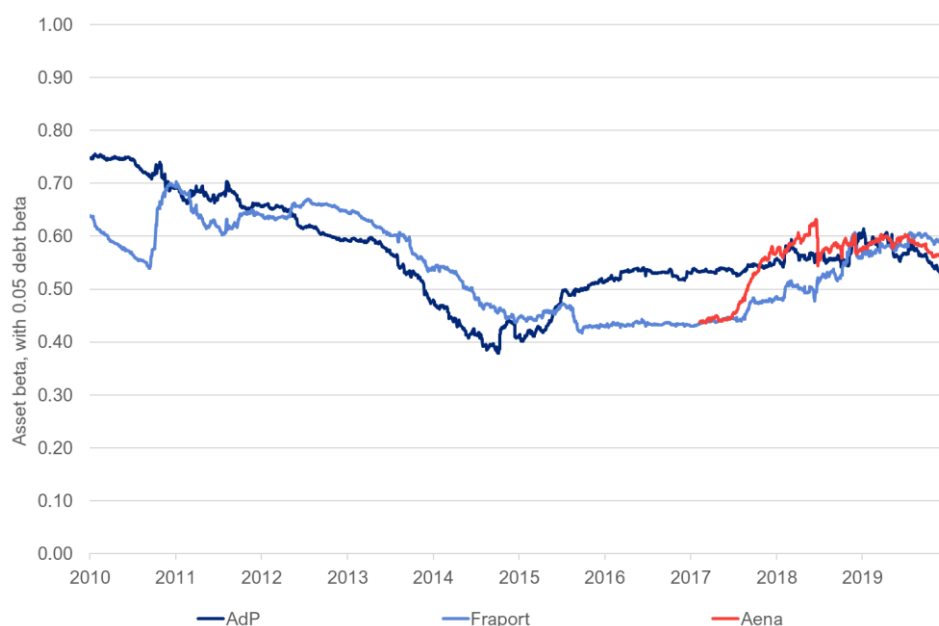
Source: Bloomberg, CEPA analysis

Our preferred approach is to consider longer term empirical estimates. Most recent two-year asset betas have been around 0.50-0.60, with five-year estimates and longer estimates being slightly lower than this. The CMA NERL determination only has relevance for the empirical betas of the airports, as the decision did not assess the risk of those comparators relative to Heathrow.

We discussed at length in Section 2 the relative risk adjustment applied for the Q6 price control and evidence from PwC to the CAA for H7, pointing to a similar or larger downwards adjustment. The Q5 and Q6 asset beta ranges of 0.42-0.52 remains a relevant point of comparison. The asset betas for AdP and Fraport are also lower to the end of 2019 than would have been the case when setting the Q6 cost of capital in 2013, which could justify a 0.02 downwards movement to the range.

Our November 2020 report included an asset beta range of 0.45-0.50 from a broader range of 0.40-0.50, including early evidence from the impact of the pandemic (i.e. including data up until the end of July 2020). We did not at that stage split the pre-pandemic asset beta range from any explicit covid uplift.

In limiting our data to that up to the start of the pandemic, as per the CAA's methodological approach, our empirical data is lower than if data from during the pandemic is included. However, we continue to adopt an asset beta range of **0.45-0.50** to reflect our cautious best estimate of the pre-pandemic asset beta[50].

Once adjusting for the debt beta, this represents the top half of the asset beta range used for the Q5 and Q6 CAA determinations.

Covid impact on asset beta

We agree with the CAA's approach of considering the impact upon beta and the likely frequency of a pandemic like event. Our proposed approach is aligned with the cross-check method applied by Flint, namely, to apply linear weights to reflect the difference between a pre-pandemic beta and the effects of the pandemic.

The pre-pandemic beta estimate and the pandemic impacted beta are calculated using OLS regressions which already afford significant weight to those high leverage points (as discussed in Section 2).

Impact

We focus on outturn data only for our preferred narrow set of seven comparators.

We have used an average of 2yr asset betas for calculating betas in the period between the start of 2010 and end-February 2020[51]. We use 90 working day betas for the period from 1 March 2020 and the end of October 2021.

Table 3.3: Comparison of asset betas for our preferred narrow set of comparators

	1 Jan 2010 to 28 Feb 2020	1 Mar 2020 to 31 Oct 2021	Difference
Average asset beta	0.39	0.71	0.32

Source: Bloomberg, CEPA analysis

This evidence implies that asset betas have increased by 0.32 during the pandemic, over the latest 20 month period. This compares to a difference of 0.27-0.35 based on Flint's cross-check method[52]. Our results are very similar.

We note that the impact has been calculated based on our preferred seven comparators – this is consistent with how we have estimated our pre-pandemic asset beta. It is plausible that the impact is different for Heathrow relative to the comparators – on one hand, Heathrow may have greater insulation from pandemic risk with the single till and the 'retreat to the hub' in London airports. On the other hand, the absence of the capacity constraint for Heathrow

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[50] This is centred around the mid-point of the Q5 and Q6 asset beta ranges.

[51] Using a 90 working day horizon over the same period would generate an asset beta of 0.44 i.e. a smaller impact.

[52] See Flint (2021) Support to the Civil Aviation Authority: Estimating Heathrow's beta post-COVID-19, August 2021.

during the pandemic may increase the impact witnessed. We do not make any directional adjustment i.e. we assume that the comparator impact is reflective of the impact that would be faced by Heathrow.

Pandemic frequency

Pandemic frequency should reflect the impact of events of the same magnitude for an airport in the context of Heathrow in a high-income country.

As discussed in Section 2, we consider that an assumption of a 30-60 year frequency better reflects the available historic evidence on the likelihood of an equivalent pandemic event; this longer frequency is difficult to rule out given that there has never been a process that simultaneously has hits the air transport and general economy as the covid pandemic has done. Historic crises that could plausibly be of a similar magnitude predate widespread air travel, so their relevance is necessarily speculative.

Duration of impact

We denote 'duration' as the period under which there is a heightened sensitivity to the covid pandemic from an empirical beta estimation perspective. This can be considered separately to any implications for traffic i.e. recovery from the lower base level of passenger numbers.

A 20-month (i.e. 1.67yr) duration reflects actual outturn data. We note that assuming longer durations would necessarily be speculative and the materiality of the duration is relatively low under our preferred approach[53].

We assess the impact over the 20-month period in aggregate, though in reality there are multiple sub-periods with significantly different asset betas. It would be incorrect to characterise the period as being one period with a stable and elevated beta; this is not the case when we look at shorter term beta estimates.

Bringing this together

Our estimate of the covid impact on beta reflects the impact on empirical betas, expected frequency and duration. We do not include the impact of risk mitigations for the adjustment at this stage of the analysis to avoid the risk of double counting.

If we multiply the individual factors together, we obtain an impact on beta:

Uplift = 0.32 x 1.67 x (1/x), where x = the number of years for a pandemic.

This gives an uplift of 0.01 using a 60yr frequency and 0.02 for a 30yr frequency. This creates an uplift of 0.01-0.02 i.e. an asset beta range with covid uplift of **0.46-0.52**.

We would note that the CAA's approach assumes that pandemics are expected to occur at the same frequency as in the past, and that the pandemic is necessarily of a similar magnitude. Therefore applying only a small uplift for the covid impact is not counter-intuitive.

Risk mitigation impact on asset beta

As set out in Section 2, we consider that volume risk represents a core part of investors' views of systematic risk at airports and leads to a higher asset beta than for equivalent assets that do not bear volume risk. The introduction of TRS – allocating volume risk to airlines from Heathrow – must lead to a reduction in the asset beta for H7, if we assume that residual volume risk is a key determinant of airports beta.

Our approach to calculate the TRS impact covers the following steps:

- Step 1: Estimate the relevant Heathrow asset beta, with covid impact.

- Step 2: Estimate the suitable counterfactual asset beta for a network business with minimal volume risk.

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[53] The 0.02 upper adjustment is unchanged when assuming a duration up to 27 months under our assumptions (given rounding). The risk mitigation impact would also reduce any covid impact by between 25% and 64%.

- Step 3: Subtract the asset beta in Step 2 from the asset beta in Step 1.

- Step 4: Estimate the proportion of the difference in assets that can be ascribed to residual volume risk.

- Step 5: Estimate the proportion of the residual volume risk mitigated by the TRS mechanism.

We provide our provisional assessment of the impact of the risk mitigations below. We consider that the framework can be used by the CAA to develop their estimate as part of Final Proposals.

Step 1

We have calculated our Heathrow asset beta for H7 (including the covid impact) of 0.46-0.52.

Step 2

Our approach involves selecting a suitable counterfactual asset beta for a network business with minimal volume risk.

We consider that this does not contradict CMA NERL precedent as utility network asset betas are not being used to directly estimate the beta for an airport, but to understand the impact of relevant risk mitigations around volume risk.

We utilise regulatory decisions in GB energy and water companies for this step in our analysis. Both sectors face limited demand risk, have the same home country risk profile as Heathrow and rely on listed comparators. These comparators are assessed against a UK stock index, which is the relevant market for the CAA's other cost of capital parameters. The CMA determinations in both sectors give us confidence that the estimates are reasonable and robust. In reaching its decision, Ofgem also assessed European energy comparators.

For PR19, the asset beta was 0.335; the CMA and Ofwat arrived at the same point estimate. Ofgem used a 0.349 asset beta for the RIIO GD2/ T2 determinations (affirmed by the CMA). Both figures assume a 0.075 debt beta, consistent with our assumptions here. The average of the two asset betas is 0.342.

We are conscious that the point estimates for both sectors are drawn from part of a broader range, though we consider that these are relevant point estimates for us to use. We utilise the average asset beta of 0.342 as the relevant counterfactual for this step.

Step 3

The differences in the asset beta are 0.118 using our low estimate for Heathrow and 0.178 using the high estimate for Heathrow.

Step 4

We assess here how much of the difference in asset betas can be ascribed to residual volume risk i.e. volume risk faced within price control periods prior to regulatory resets.

The Step 3 differential may be an underestimate of the residual volume risk impact where there are additional factors that would lead to GB water and energy networks being seen as less risky than Heathrow. This might include a more high-powered incentive regime in the utility sectors, both in terms of costs and on performance incentives, or longer-term challenges in relation to decarbonisation. If this is the case, we would want to use a larger figure than set out in Step 3.

Conversely, other risk factors indicate that the risk difference between Heathrow and regulated utilities is driven by factors other than residual volume risk. This could include the financial implications of non-aeronautical activity and longer-term valuation effects (around the value of growth options). We can also consider counterparty risk i.e. the value of the TRS in mitigating downside risk is based on airline passengers being willing and able to pay future charges to achieve the RAB compensation foreseen. In this case we would want to use a smaller figure than set out in Step 3.

In our low estimate calculations, we use an unadjusted Step 3 differential, recognising that there are factors operating in both directions. In our high estimate calculations, we assume that only half of the calculated Step 3

differential reflects residual volume risk. This percentage is uncertain and should be considered illustrative, but highlights that there are multiple factors that influence beta.

Step 5

The CAA has calculated the impact of another pandemic on Heathrow's returns with and without the TRS mechanism in place, finding that the TRS would mitigate 64% of Heathrow's total cashflow losses from another future pandemic (para 9.71). We use this 64% reduction of residual volume risk in our low estimate.

When calculating the adjustment to reflect the interaction of the TRS with the uplift assumed for the covid impact, the CAA adopt only 50% of the calculated covid impact. The CAA notes that there is uncertainty over the future form of the TRS beyond H7. We use this proportion for our high estimate in Step 5. Further analysis may be beneficial for refining these inputs.

Results

We present the results of our analysis below in Table 3.4. We note that this analysis is illustrative.

Table 3.4: Asset beta range build-up

Step	Low estimate	High estimate
1 – Heathrow asset beta	0.460	0.520
2 – Counterfactual asset beta	0.342	0.342
3 – Difference [2] – [1]	0.118	0.178
4 – Proportion of difference due to volume risk	100%	50%
5 – TRS proportion reduction	64%	50%
Final result[54]	**0.38**	**0.48**

Our final range for the asset beta is therefore **0.38 to 0.48**. This equates to a reduction of 0.04-0.08 relative to our pre-pandemic range with covid impact.

We note that substituting the CAA's Initial Proposal assumptions for Step 1 would lead to a reduction of 0.10-0.13 in the asset beta, given the higher starting point. The CAA's adjustment to the covid impact equates to 0.02-0.07, reflecting that their approach already moves them in this direction.

We note that our estimates should be considered provisional at this stage and the input assumptions may be refined ahead of Final Proposals. We also note that the reduction in asset beta focuses only on the TRS and does not include a downwards adjustment from other risk mitigations for H7 that are more challenging to estimate quantitatively e.g. the asymmetric risk allowance. This should still be considered within relative risk analysis and estimating beta.

Overall asset beta

The CAA previously set an (debt beta adjusted) asset beta range of 0.405-0.505 for Q5 and Q6 for Heathrow. Our range of 0.38-0.48 therefore spans much of the asset beta range that has been in place since Q5; a period where Heathrow has been able to attract investment into its business. There are also significant risk mitigations developed for H7, as discussed in Section 2.

The reduction in the asset beta range reflects CEPA analysis that any decrease from the risk mitigation mechanisms at H7 more than offsets any increase from the covid pandemic.

Comparison to CAA position

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[54] This is calculated based on the Step 1 result, less Step 3 x Step 4 x Step 5.

Our pre-risk mitigation asset beta range of 0.46-0.52 compares to the CAA (partial) pre-risk mitigation range of 0.52-0.67. The CEPA high estimate is therefore equivalent to the CAA's low estimate.

If we consider our post-risk mitigation asset beta range of 0.38-0.48 to a CAA range that uses a 0.10-0.13 downwards adjustment on asset beta (to reflect risk mitigations), the CAA range is 0.41-0.64[55]. There is overlap in the 0.41-0.47 part of the range.

Cost of equity

The cost of equity reflects the risk-free rate, equity beta, and equity risk premium. Our post-tax cost of equity estimate therefore lies between 4.0% to 6.7%. There is very limited overlap with the CAA's cost of equity range of 6.6% to 11.8% estimate, but our range sits fully above that of the water and energy companies at around 3.7%.

The residual volume risk faced by Heathrow after risk mitigations e.g. traffic-risk sharing, means that there is a higher cost of equity to reflect additional systematic risk – however this gap is lower than it would otherwise have been without TRS.

Table 3.5: Real RPI Post-tax cost of equity estimates[56]

Price control decision	Cost of equity (post-tax RPI)
Ofgem RIIO GD2 & T2	3.65%[57]
Ofwat PR19	3.18%
CMA PR19 redetermination	3.79%
CEPA H7	4.0% to 6.7%
CAA H7	6.6%- 11.8%

The mid-point of the CEPA range is c.170bps higher than the costs of equity adopted by the GB energy and CMA water redetermination for the current round of price control determinations, when including risk mitigations.

If we had not considered risk mitigations in the asset beta, our cost of equity would have sat at 5.5% to 7.6% i.e. up to 400bps above the GB energy and CMA water determinations at the top end of our range.

When we look at the previous set of regulatory determinations, the CAA's cost of equity for HAL at Q6 (6.8%) was equivalent to the RIIO GD1 & T1 cost of equity (6.7-7.0%) and approximately 120bps above Ofwat's PR14 cost of equity (5.65%).

Our cost of equity estimate for H7 is higher than decisions in energy and water; the gap is higher than previous price controls, despite substantial risk mitigations being brought in for H7.

The CAA's H7 mid-point cost of equity is 9.2%. This is now 550bps higher than the cost of equity for RIIO GD2 & T2 (which was confirmed by the CMA), and 540bps higher than the CMA's PR19 decision (600bps above Ofwat's PR19 determination). We do not consider that such a premium over energy and water can be justified.

Cost of embedded debt

As per our November 2020 report, we focus upon iBoxx GBP non-financial corporate indices with 10-15yr tenor and broad A / BBB credit ratings. We utilise 10yr and 15yr collapsing trailing averages, consistent with the assumed tenor. We deflate these nominal yields using 'on the day' estimates of inflation, based on 10yr and 15yr breakeven inflation.

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[55] Our calculations for the Step 5 adjustment utilises the full 0.04-0.14 covid impact upwards adjustment before the downwards adjustment to avoid scope for double counting.

[56] We have not made any adjustments for gearing; gearing levels are broadly comparable across the determinations presented in the table, meaning that the cost of equity is comparable.

[57] Based on 4.55% real CPIH estimate, with 90bps deducted for the CAA's preferred CPIH-RPI wedge.

The 10-15yr index is consistent with the CAA's Q6 benchmark tenor and aligned with the average tenor of debt from the comparator airports.

This gives us a range for the cost of embedded debt of -0.31% to +0.47%.

Cost of new debt

Our cost of new debt is based upon a six-month average of real yields formed by using nominal yields from the 10-15yr benchmark used for embedded debt, deflated by 10yr and 15yr breakeven inflation.

No further adjustments are made.

The range for the cost of new debt is consequently -1.64% to -1.58%.

Weight on new debt

We adopt 20% weight on new debt, as per our November 2020 report. This is based on the assumed tenor and scope for a more limited investment programme.

Fees

As per our November 2020 report, we include 10bps for transaction costs and fees, as per the CAA's estimate for Initial Proposals. This applies to both the cost of embedded debt and the cost of new debt.

This gives a real RPI cost of debt of -0.48% to +0.16%.

Vanilla and pre-tax WACCs

The resulting cost of capital range is 1.3% to 2.8% on a real RPI vanilla WACC, or 1.8% to 3.6% on a pre-tax WACC basis.

Financeability

We have not assessed financeability using the above cost of capital estimates. The CAA should have regard to the financeability of the overall settlement, using reasonable assumptions and with a focus on the notional company. As noted above, we consider that the cost of capital should be developed independently, with any necessary adjustments for financeability considered thereafter.

Appendix A INDICATIVE Q6 ROLL FORWARD WACC

The precise approach adopted by the CAA at Q6 involved judgement. We have tried to best approximate the approach taken by the CAA. This does not imply that we consider that the approach was correct; the estimate has been conducted to understand, indicatively, where the CAA would end up with the same approach.

Table A.1: Indicative estimate of Q6 roll-forward, estimates based on evidence as of 31/10/21

Parameter	Approach	Low	High
Notional gearing	Retain gearing estimate, based on precedent	60%	60%
Risk-free rate	5yr and 10yr average of 10yr ILGs	-2.3%	-1.5%
TMR	Adoption of adjusted Q6 range (reflecting 25bps downwards adjustment to Final Proposals to Licence)	6.0%	6.5%
Asset beta	Empirical betas for AdP + Fraport (using Flint evidence), with commensurate relative risk adjustment	0.40	0.50
Debt beta	Figure as per Q6	0.10	0.10
Equity beta	Calculation	0.85	1.18
Inflation	Figure as per Q6	3.0%	3.0%
Cost of embedded debt	Use of iBoxx A/ BBB 10-15yr GBP index, 5yr non-collapsing average	-0.59%	-0.59%
Cost of new debt	Current yields on above benchmark index, with adjustment to reflect 0.8x expected increase in movements in gilts	-0.89%	-0.89%
Fees	Figure as per Q6	0.15%	0.15%
Weight on new debt	Figure as per Q6	30%	30%
Post-tax CoE	Calculation	4.8%	7.9%
CoD	Calculation	-0.53%	-0.53%
Vanilla WACC	Calculation	1.6%	2.8%

This compares to the vanilla WACC range of 3.6-5.7% adopted in the Initial Proposals. The roll-forward range is also slightly lower than CEPA's November 2020 vanilla WACC range of 1.7-3.0%.

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