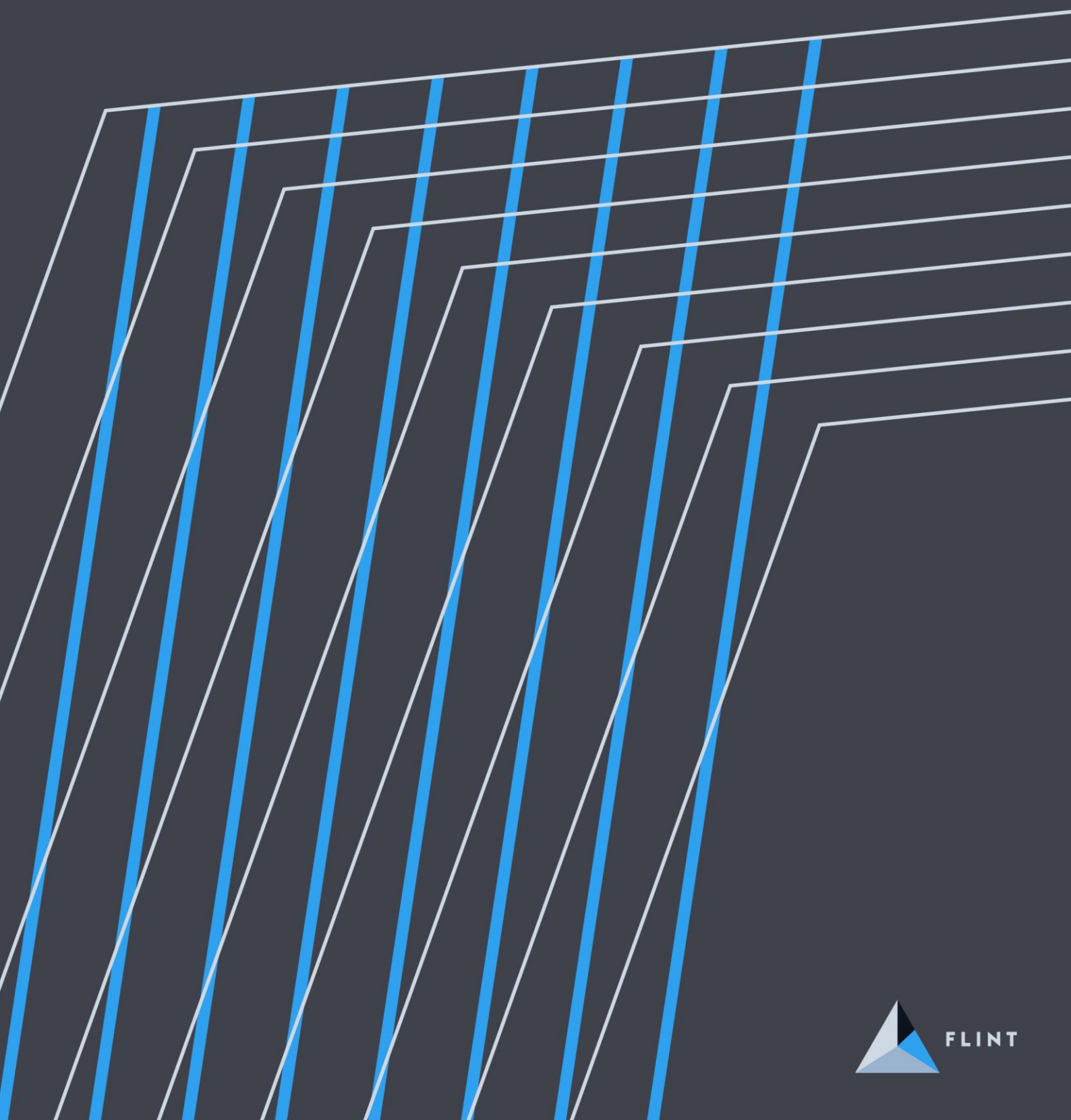
# Support to the Civil Aviation Authority:
# H7 Updated Beta Assessment



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# Executive summary

## Background

In October 2021, the CAA published its Initial Proposals for Heathrow Airport Limited's (HAL's) H7 price control review. Alongside this, the CAA published Flint's August 2021 report on estimating Heathrow's beta post-COVID-19.

In our earlier report, we proposed that the CAA estimated the asset beta for HAL in two parts:

- A baseline beta – which captures the balance of risks faced by Heathrow which are unrelated to COVID-19 (effectively based on a 'pre-COVID' beta).
- A 'COVID adjustment' – to be added to the baseline beta, reflecting the risk of events similar to COVID-19 that may occur in the future.

## Stakeholder comments

The CAA has received comments from stakeholders on aspects of the Initial Proposals, including the approach to estimating the WACC allowance, and our approach to estimating the beta. In this report we address the comments made and indicate how we intend to reflect these in our analysis. We also consider new data that is available to us since publication of our earlier report.

Comments from stakeholders related to several aspects of our approach; our overall methodology for estimating the impact of potential future similar ('COVID-like') events on beta, our interpretation of the data, choice of parameter values within our model, and our choice of comparator airports.

The views presented by stakeholders differ greatly. Comments from HAL and its adviser, Oxera, supported a higher beta than we had proposed. LACC and its adviser, CEPA, pointed to a lower beta.

## Updated approach

We have reviewed stakeholders' feedback and considered whether the alternatives proposed were superior to our preferred approach. In light of the comments received we have decided to:

- Retain our overall approach to the H7 beta. We continue to adopt a methodology of 're-weighting' recent daily share price data. The range of results that we recommend reflects 'COVID like' events occurring with a frequency between one-in-20 years and one-in-50 years.
- Retain our international airport comparator set.
- Update our source data, to reflect more recent evidence (available since August 2021) on the impact of COVID-19, but also reflect a longer pre-pandemic time series. The more recent daily evidence points to lower observed betas than those seen at the height of the COVID-19 pandemic. This feeds through to reduce our COVID adjustment.
- Adapt our analysis to better reflect a range of possible future COVID-like events and their potential impact on beta, informed by the experience of COVID-19.

## Revised beta estimates

Our recommendation for the baseline asset beta remains unchanged at 0.50 to 0.60.[1]

Our revised results indicate a lower 'COVID adjustment' than we estimated in August 2021.We now recommend a 'COVID adjustment' to the asset beta of between 0.02 and 0.11. This compares to a range of 0.04 to 0.14 that we estimated in August.

**TABLE 1: FLINT UPDATED H7 ASSET BETA RECOMMENDATION**

| | Lower Bound | Upper Bound |
|---|---|---|
| **Baseline beta (Apr 2020)** | 0.50 | 0.60 |
| *Previous beta adjustment for COVID (Aug 2021)* | *0.04* | *0.14* |
| **Updated beta adjustment for COVID (Feb 2022)** | 0.02 | 0.11 |

Source: Summary of Flint analysis.

## Impact of traffic risk sharing (TRS)

As in our previous report, we do not explicitly address the specific implications of the CAA's proposed traffic risk-sharing (TRS) mechanism for the H7 beta. This is beyond the scope of our work.

However, we note that the CAA's TRS proposals have evolved since our previous report. The mechanism proposed by the CAA would have material implications for the future risks borne by Heathrow's investors, even at benign times. We re-emphasise our earlier view that – should the TRS proposals be enacted as currently proposed – this will necessitate a downward adjustment both to our COVID adjustment and our baseline beta.

The adjustment should reflect the mechanistic nature of the CAA's TRS proposal, and the fact that similar arrangements are not at present in place for any of the airports in our comparator group. The technical assessment of such adjustments is highly challenging. However, in the absence of clear technical evidence the CAA may need to exercise judgement in this regard in arriving at its final H7 proposals.

[1] Note that, as before, our recommended range for the baseline beta does not include an assessment of the relative risk of Heathrow compared to the comparator airports.

# 1. Introduction

In October 2021, the CAA published its Initial Proposals for Heathrow Airport Limited's (HAL's) H7 price control review. Alongside this, the CMA published Flint's August 2021 report on estimating Heathrow's beta post-COVID-19.[2]

Ahead of Final Proposals, the CAA has asked us to update the analysis in our August 2021 report and respond to stakeholder comments on our report. We address both requests in this report.

**Structure of this report**

This report is structured as follows:

- Section 2 summarises stakeholders' alternative positions on the beta for Heathrow in H7,
- Section 3 discusses our overall approach to estimating the impact of COVID on Heathrow's beta,
- Section 4 discusses our decisions on the parameters used to calculate our COVID adjustment,
- Section 5 responds to stakeholder views about our comparator selection,
- Section 6 presents our updated results, and
- Section 7 discusses the impact of the Traffic Risk Sharing mechanism on Heathrow's H7 beta.

[2] Flint Global (August 2021), Estimating Heathrow's beta post-COVID-19, hereafter "**Flint August 2021 report**".

# 2 Summary of stakeholder positions

In response to the CAA's Initial Proposals in September 2021 and Flint's August 2021 report published alongside it, the CAA received feedback from stakeholders on the proposed beta for H7.

Heathrow Airport Limited (HAL) argued the proposed beta was too low,[3] and commissioned a report from Oxera which proposed an alternative approach to estimating the beta.[4] LACC, AOC and IATA (collectively, the "Airline Community"), commissioned a report from CEPA, which considered the proposed beta was too high, and also proposed an alternative approach.[5]

The main arguments raised by the respondents, along with associated beta values proposed, are illustrated in Table 2 below. The table also includes proposals presented earlier in the H7 process.

[3] HAL (Dec 2021), Economic regulation of Heathrow Airport Limited: H7 Initial Proposals (CAP2265) - Heathrow's response, hereafter "**HAL response**".
[4] Oxera (Dec 2021), Cost of capital issues for the H7 price control, hereafter "**Oxera report**".
[5] CEPA (Dec 2021), Response to CAA H7 Initial Proposals: Cost of Capital, hereafter "**CEPA report**".

**TABLE 2: SUMMARY OF PROPOSALS PUT FORWARD BY STAKEHOLDERS AND FLINT/CAA'S 'INITIAL PROPOSALS' APPROACH**

| Overall approach | Empirical technique | Comparators and basis of definition of range | Data source | Beta window | Proposed asset beta (no TRS) |
|---|---|---|---|---|---|
| **HAL (Dec 21), Economic regulation of Heathrow Airport Limited: H7 Initial Proposals, Heathrow's response** | | | | | |
| Proposed beta based on recently observed raw data | Backward looking estimates (OLS) | ADP, AENA, Zurich and Fraport (range defined by individual companies) | March 2020 – November 2021 | 21 months | 0.65-0.95 *(p.280)* |
| **Oxera (Dec 21), Cost of capital issues for the H7 price control** | | | | | |
| ***Historically observed betas*** | | | | | |
| Proposed beta based on 'conventional CAPM' using post pandemic data | Backward looking estimates (OLS) | ADP, AENA, Zurich and Fraport (range defined by AENA or average) | March 2020 – November 2021 | 21 months | 0.80-0.94 *(p.16)* |
| ***Option implied post COVID betas*** | | | | | |
| Proposed beta based on implied volatilities (IV) from stock and index options | Extrapolation of historic observed relative stock/index volatility to infer implied post-COVID and near-term future ('IV based') betas | As above | 2016-2021 | 21 months (with 12m 'forward look') | 0.66-0.81 *(p.16)* |
| ***Option implied COVID impact*** | | | | | |
| *Observed change in beta implied by IV model* | *Comparison of 'IV based' betas (as derived above) pre- and post-pandemic* | *As above* | *2016-2021* | *21 months (with 12m 'forward look')* | *[Increase in asset beta of] 0.11-0.12 (p.16)* |
| **Flint (Apr 20), Support to the Civil Aviation Authority: Business as Usual WACC for H7** | | | | | |
| Proposed betas based on short and long-term observed raw data | OLS approach. | ADP, AENA, and Fraport (range defined by individual companies/average) | Feb 2010 – Feb 2020 | 2 years and 5 years | 0.50-0.60 *(p.21)* |
| **CAA (Oct 21), Economic regulation of Heathrow Airport Limited: H7 Initial Proposals, Section 2: Financial issues Flint (Aug 21), Support to the Civil Aviation Authority: Estimating Heathrow's beta post-COVID-19** | | | | | |
| Proposed beta by combining:<br>i) a baseline beta (ex COVID-19) and;<br>ii) a COVID adjustment | OLS using re-weighted observations, to estimate the prospective beta risk | ADP, AENA, Zurich, Fraport, Vienna and Sydney (range defined by AENA /selected averages) | June 2016 – June 2021 | 17 months (pre-COVID) and 43 months (during COVID) for adjustment. | 0.54-0.74 *(p.54, CAA)* |

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| Overall approach | Empirical technique | Comparators and basis of definition of range | Data source | Beta window | Proposed asset beta (no TRS) |
|---|---|---|---|---|---|
| **CEPA (Nov 20, pre-IP), H7 cost of capital estimation** | | | | | |
| Proposed betas based on long-term observed raw data | OLS approach. | ADP, AENA, Zurich, Fraport, Vienna, Copenhagen and Sydney; also ENAV and GB regulated network companies (range defined by airports and GB utilities, with judgment applied on the bottom end to reflect the impact of COVID on airports empirical betas, and relative risk) | July 2008 – July 2020 | 2 years, 5 years and 10 years | 0.45-0.50 *(p.6, Nov 20)* |
| **CEPA (Jun 21, pre-IP), Way forward – technical appendix** | | | | | |
| Suggested approaches to understand how to calibrate a COVID-specific beta adjustment in the CAA framework. | Proposed (but did not provide) analysis of:<br>i) shorter beta windows<br>ii) limited impact of 'outliers' (Winsorization) | | | | |
| **CEPA (Dec 21, post-IP), Response to CAA H7 Initial Proposals: Cost of Capital** | | | | | |
| Proposed long-term beta COVID beta impact based on simple averaging of observed pre-pandemic beta and post-pandemic betas. | Linear re-weighting of short-window (90 day) beta estimates in line with assumed pandemic frequency and effect. | ADP, AENA, Zurich, Fraport, Vienna, Copenhagen and Sydney; also GB regulated network companies (range defined as above) | January 2010 – October 2021 | 2 years (pre-COVID) and 90 days (during COVID) for adjustment. | 0.46-0.52 *(p.9)* |
| Criticism of OLS approach and impact. | LAD / Winsorization | | | | N/A |

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# 3. The impact of COVID on Heathrow's beta – our approach

## 3.1 Overall approach – re-weighting source data

**Summary of our approach (August 2021 report)**

Regulators generally consider that it is best practice to rely on recent long-run historical stock data when setting the regulatory asset beta for businesses that are not themselves listed. However, as all stakeholders agreed, the COVID-19 pandemic prevents us from simply relying on long-term historical asset betas observed as of the point at which the CAA makes its H7 determination. Recent asset beta evidence from comparators is characterised by periods of very different beta behaviour and evidence is clear that the risks faced by airports has been very different during the COVID-19 pandemic compared to before.

In our August 2021 report, we set out our recommendation for an H7 beta for Heathrow comprised of a 'baseline beta' and a 'COVID adjustment'.

In essence, our approach reflected the idea that that the COVID-19 pandemic has changed investors' perceptions of the systematic risks that an airport such as Heathrow may face in the future, while recognising that recently observed betas (i.e. since the COVID-19 pandemic) overrepresent the extent to which perceptions of that risk has changed.

Instead, we developed an estimate of the impact of COVID-like events on beta which aimed to capture the likelihood and risk of possible future COVID-like events, alongside the lower systematic risks likely to be observed during more benign periods, as a balanced view of the future prospects faced by airport investors over the long-run.

Our baseline beta was designed to reflect the long-run systematic risk faced by Heathrow if an event like COVID-19 were never to happen again. Our COVID adjustment, meanwhile, estimated the effect on Heathrow's long run beta that would be observed if events similar in nature to COVID-19 occurred again in the future.

We calculated our results by deconstructing recent historical share price data for comparator airport stocks and reweighting these data to provide estimates of forward-looking betas that reflect possible duration and frequency of similar events in the future.

**Stakeholder views**

As we summarise in Section 2 above, stakeholders have put forward alternative estimates of Heathrow's beta, derived using alternative approaches to that we used in our August 2021 report.

Alongside these alternatives, stakeholders also comment on the appropriateness of our overall approach:

- HAL argues that since the resulting CAA/Flint estimate for the beta for H7 is materially below the spot betas calculated from recent market data, it is "*inconsistent with contemporaneous*

*market data*" and hence incorrect.[6] HAL also argues that our approach wrongly assumes betas will revert to a lower level from January 2022, and that there is no market evidence that the asset beta of airports will fall over the course of H7.[7]

- HAL's consultant, Oxera, argues that Flint's method of reweighting data contradicts the assumption that capital markets are efficient, and that share prices and returns drawn from the most recent period best reflect market expectations of future risks and returns.[8]

- Responding on behalf of LACC, AOC and IATA (collectively, the "Airline Community"), CEPA argues that the CAA (and Flint) has "*failed to interrogate evidence*" that the long-term pandemic impact on betas is lower than implied by Flint and the CAA's analysis.[9] However, CEPA also states that it broadly agrees with our overall approach to estimating a beta for H7 based on a weighted average of COVID-affected data since the pandemic, and non-COVID affected data from before the pandemic.[10]

**Response to points raised**

***Estimating long-run forward looking asset betas remains our preferred approach***

We disagree with HAL's argument that our beta estimate for H7 is incorrect because it does not match recent market data. We consider that, given the effect of COVID-19 on betas, recent market data cannot be relied upon as an unadjusted indicator of forward-looking betas. Recent data from comparators offer very different estimates of betas depending on the estimation window used (as we discuss in Section 3.3 below).

We also disagree with HAL's assertion that recent comparator evidence based on data since the COVID-19 pandemic began (which produce higher betas) are more relevant to the balance of systematic risks that Heathrow will face over H7 than comparator evidence from the period immediately prior to the pandemic (which produces lower betas).

In regulatory precedent, the question of how to reflect the effect of COVID-like events on asset betas was first raised in the CMA's PR19 redetermination in the water sector in March 2021. The CMA concluded:[11]

> "*While we consider that the pandemic represents a systematic event which should not be excluded from our estimates, we also recognise that this type of economic crisis is relatively rare and that it is likely to be over-weighted in our range of beta estimates, which cover the last 2-, 5- and 10-year periods.*"

We consider that our approach (of reweighting daily stock data to reduce the impact of COVID-19 on the resulting betas) better captures the balance of risks faced by Heathrow, reflecting that

[6] HAL response, para 7.1.6.
[7] HAL response, paras 7.5.7 to 7.5.10.
[8] Oxera report, p. 9.
[9] CEPA report, p. 21.
[10] CEPA report, p.21.
[11] CMA (March 2021), Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations, p. 870, para 9.493.

COVID-like events will happen in the future, but cannot be expected to happen as often as once in every 5-year period.

Therefore we also disagree with HAL and Oxera's suggestion that the efficient market hypothesis should lead us to simply rely on recent betas, and ignore evidence that betas calculated using only data since March 2020 "*overweight*" risks associated with COVID-like disruption.

Oxera argues that "[Flint's] methodology assumes it is possible to create a forecast of risk that is more accurate than the forecast implied directly from recent market data and reflected in beta estimates".[12]

Oxera's argument appears to rely on the assertion that a beta calculated based on historic share price movements offers the best forecast of the beta that will be observed from future share price movements. This assertion is invalid.

While the efficient market hypothesis states that asset prices reflect all available information, it does not follow that asset betas estimated at a point in time (made up of *historical* data) accurately reflect all available information about the *future* balance of systematic risks faced by investors.

We also note that it is common practice for regulators to place-weight on asset betas which do not contain the most recent data (e.g. through the use of a 5-year rolling-average of 5-year betas) – therefore our recommendation for an forward-looking beta for H7 that does not match the most recently observed comparator betas is not a departure from common regulatory practice.

We therefore remain of the view that our approach is appropriate for estimating a beta as the basis for allowed returns during H7 in the challenging circumstances in which the effect of COVID-19 and future-COVID like events on the systematic risk faced by airports is fundamentally uncertain.

***Our beta estimate reflects ex-ante uncertainty about when COVID-like events will occur***

HAL argues that Flint's approach assumes that the beta for Heathrow will immediately "*revert to a long-term post pandemic value from 1st January*".[13] This characterisation of our analytical framework is not correct.

In the future, short-term observed values for airport betas are likely to be higher during periods of COVID-like events and lower outside of these periods. Our modelled beta captures the relative frequency of such events, and the associated share price behaviours.

As we described in our last report:[14] "*Our beta calculations offer a view of the long-term systematic risks faced by airport investors. We consider that these estimates are appropriate for setting charges during H7 (and in future price controls). Importantly, they are not an attempt to forecast the 2- or 5-year beta that may prevail over a given period*."

While our approach is, in effect, a forecast of a beta over a long future horizon, we believe it is also an appropriate representation of the balance of systematic risk that HAL faces at any point in time. Prior to a COVID-like event occurring, investors do not know whether the next event will happen in that period or not, and (ahead of time) there is no obvious reason to think it is more likely to

[12] Oxera report, p. 9.
[13] HAL response, para 7.5.3.
[14] Flint August 2021 report, p. 4.

happen in some periods than others. Given the uncertainty about when a COVID-like event will occur ex ante, our approach therefore captures a forward-looking balance of systematic risks that an investor faces at any point given the *probability* of a COVID-like event implied by the assumed frequency (i.e. once every 20 to 50 years).

Furthermore, even if it were possible to reliably identify ex-ante how airport betas will behave in the aftermath of the COVID-19 pandemic, it is not possible to meaningfully predict when the next COVID-like event will occur. The CAA (and other stakeholders) do not consider it likely that COVID-like events will happen as frequently as once every ten years. An alternative approach which attempts to 'predict' the 5-year beta that will prevail during any given price control period may adopt a 'mode' or 'most likely' view. If COVID-like events are infrequent, then any given price control period is therefore likely (on the balance of probabilities) to cover a benign period of time. This would fail to offer a fair bet to Heathrow's investors, under-representing the beta they would face in the long-run.

***It is important to account for risks associated with future COVID-like events in the regulatory beta for H7***

We disagree with CEPA's implied view that share price recovery of comparator airports indicates that COVID-19 has had a limited effect on airports systematic risk, and that apparent share price volatility simply reflected investors reaction to new information about the timing of risks that they already foresaw.[15] First, the fact that share prices may or may not have subsequently recovered does not tell us anything about the systematic risks observed during the COVID period and whether or not these are relevant to the future risks faced by airports. Second, while it may be the case that observed risks during the pre-pandemic period reflected risks and changes in prospects for airports through that period, it does not follow that the share price reactions and pronounced beta response characterised during the COVID period was observed with due weight. Our method adjusts for both.

## 3.2 Statistical method (OLS)

**Summary of our approach (August 2021 report)**

As described above, we calculated our COVID adjustment by constructing 're-weighted betas' for comparator airports based on pre-COVID and COVID-affected daily share price data. Our preferred method for estimating these betas was to use an OLS regression (as is commonly used by UK regulators and other practitioners), but with alternative weights applied to different subsets of historic data. The effect is to 'dial down' the influence of the observed, COVID-affected data (e.g. to represent an event occurring once in a 50-year period).

**Stakeholder views**

HAL and the Airline Community offer opposing views on the directional effect of our OLS approach on the size of resulting reweighted betas:

- HAL considers that our approach *understates* the effect of COVID-19 on investors perception of risk, by failing to adequately recognise risk aversion.

[15] CEPA report, p. 28.

- The Airline Community concludes that shortcomings of the OLS estimation method lead us to *overstate* the effect of COVID on beta.

HAL argues that our approach assumes that investors' response to risk is linear, when in fact investors could place greater weight on high-risk periods due to risk aversion:[16]

> *"[Flint's approach] weights the low-risk and high-risk periods equally in proportion to their assumed duration. Such an approach is inconsistent with standard financial theory and evidence that shows investors are risk averse. As such, investors would be expected to give more weight to periods of higher risk than periods of lower risk. Given this, an equal weighting of the pre-pandemic and pandemic betas is not consistent with recognised financial theory."*

Meanwhile, CEPA argues Flint's approach to 'reweighting' betas exacerbates technical features of the OLS estimation method, and as a result overestimating the effect on beta:[17]

> *"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."*

CEPA suggests that an alternative estimator may be more appropriate, and cites the Least Absolute Deviation (LAD) estimator, which the Australian Energy Regulator used as a crosscheck in its beta analysis in 2021.[18] CEPA says that the alternative 'cross-check method' which we presented in our August 2021 report is preferable and more intuitive.[19]

CEPA also argues that we have disregarded evidence that could overcome some statistical issues with our preferred estimation method.[20] CEPA says the CAA has failed to consider relevant methodological approaches that support a lower beta and overcome 'statistical issues' in our preferred approach. In particular CEPA makes reference to the use of shorter estimation windows, and 'Winsorization'.

**Response to points raised**

***There is comprehensive regulatory precedent for the use of OLS regression in the UK. OLS is the method most extensively used in the field of corporate finance.***

As a starting point for estimating the COVID adjustment, we set out to rely on the same empirical technique relied upon for estimation of the beta elsewhere. Recent and historical regulatory precedent strongly supports the use of the linear OLS method, and it has been used in all recent regulatory decisions in the aviation sector, by both the CAA and the CMA – and in other UK regulated sectors by both sectoral regulators and the CMA.

In fact, in its redetermination for NERL at RP3, while the CMA considered other methodological choices around its estimate of comparators' betas (estimation window, use of daily/weekly data

[16] HAL response, para 7.1.7 and 7.5.12.
[17] CEPA report, p. 21.
[18] CEPA report, p. 23.
[19] CEPA report, p. 22.
[20] CEPA report, p. 24.

etc.), it did not consider any alternatives to OLS as means for estimating the observed betas.[21] In its most recent redetermination in the water sector, the CMA chose to rely on an OLS estimator without any discussion of alternatives,[22] despite stakeholders specifically recommending alternative estimation techniques.[23]

While we considered alternative regression techniques, the simplicity and ease of interpreting OLS regression results made it most appropriate to our overall analytical framework (i.e. reweighting pre-COVID and COVID-affected data ). Also, by relying on the same estimator for both our baseline beta (estimated prior to the COVID-19 pandemic) and our COVID adjustment, interpreting our results is simple and intuitive, and it is straightforward to identify the change in our earlier (OLS based) estimates of Heathrow's beta that arises due to the effect of COVID.

***A linear OLS regression captures the extent to which volatility observed during COVID periods tends to dominate estimates of a longer-run beta***

We disagree with HAL's view that using a linear OLS method means we assume investors perception of risk is linear. The weights we apply to COVID-affected and non-COVID affected data reflects their relative *frequency of appearance* in a long-run dataset used to estimate the beta. It does not give rise to a linear influence in defining the beta. As set out above, periods of heightened volatility have a larger impact on our modelled beta than periods which are relatively benign. HAL is therefore wrong to argue that the OLS method imposes or assumes an equal 'influence' on our beta estimate arising from periods of low volatility and high volatility.

In fact, as CEPA highlights, a feature of the OLS method is that it allows the estimate of a combined beta (across COVID-affected and non-COVID periods) to be more influenced by observations from the COVID-period, since this is a period characterised by more extreme movements in stock and market returns.

Conversely, we disagree with CEPA's argument that the OLS approach places *undue* weight on 'extreme observations' during the COVID period: The tendency for individual (daily) observations that are further away from the mean to have a bigger impact on the overall regression line is not purely a feature of the period of increased volatility experienced during COVID-19, but also beta estimates more generally.

We also disagree with CEPA's general characterisation of 'extreme observations' as 'outliers' which 'contaminate' the beta estimate. In usual circumstances, we would agree that a forward-looking estimate based on historical data should remove 'outliers' that are believed to be characterised by significant error – and/or are not representative of anticipated future movements in stock returns. However, in these circumstances, the extreme observations experienced during the COVID-19 pandemic do not merit exclusion on these grounds. On the contrary, they do form part of our 'best estimate' of the market's future response to COVID-like events in the future and should therefore be duly reflected (with appropriate weight) in a forward-looking beta estimate.

[21] CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, final report, para. 13.84.
[22] CMA (March 2021), Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations, para 9.479.
[23] CMA (March 2021), Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations, para 9.443.

CEPA additionally suggests that an approach such as 'Winsorization' could be used to eliminate the COVID 'outliers'. We do not agree. Such techniques are generally used to cleanse datasets by eliminating or adjusting extreme datapoints which (associated with their extremity) are suspected to be subject to error. This is not the case with regard to our dataset. The extreme datapoints related to COVID are not believed to be characterised by error and no evidence has been presented to suggest that this might be the case. We therefore consider that such an approach is not appropriate here.

***Our alternative cross-check method provides insightful results, but is based on a less appropriate estimation method***

CEPA argues that we should place greater weight on the results of our cross-check (or averaging) method. Our cross-check method takes simple (arithmetic) averages of two betas using the same dataset as our preferred method and based on equivalent weights to represent COVID-like events of lower frequencies (such as once every 20 to 50 years).

We agree with CEPA that the results of our cross-check method differ from our preferred method because the cross-check method does not capture the strength of the statistical relationship between more-extreme observations (in the COVID-period) and the observations from the more benign pre-COVID period. However, the adoption of an average of widely differing betas from adjacent time-periods is not an established regulatory technique.

Importantly, the cross-check method also loses some of the inherent statistical properties of the data used. Specifically, our preferred approach captures both the scale and strength of the beta relationship experienced during the different periods of our two (COVID and non-COVID) datasets. The approach of averaging betas only captures the scale of the beta.[24]

We note there is a risk that our OLS estimation technique is biased by the variation in relative movements in different time periods (COVID-affected and non-COVID affected). However, it is not possible to conclude that the result arising from the cross-check method resolves any biases, since it is not possible to meaningfully test and compare the statistical properties of its simple averaging technique.

## 3.3 Short term prospects for betas

In addition to the comments about our approach to which we have responded above, stakeholders also discuss whether or not the beta we recommended in our August 2021 report adequately accounts for the short-run effect of COVID-19 on Heathrow's beta during H7. In this subsection, we discuss and respond to these comments.

[24] To use a simple illustration: for two (adjacent) six-month periods with six-month betas of 0.5 and 1, the averaging method would lead to an estimated 1-year beta of 0.75. However, taking an OLS regression of the full 1-year dataset would likely obtain a beta different from this. The 1-year beta could be higher or lower than 0.75 because of the characteristics of the daily data in one of the six-month periods that have greater or lesser influence on the overall OLS beta estimate.

### Stakeholder views

Both HAL and the Airline Community question the consistency of our assessment of the beta with evidence on the likely level of asset betas in the immediate aftermath of COVID-19, and present divergent evidence about the likely behaviour of asset betas in the short-term:

- Firstly, HAL and Oxera refer to evidence from information and technology sectors showing that sudden increases in asset beta as a result of an external shock may be sustained for a prolonged period of time and "do not follow the pattern of steady mean reversion", citing, for instance, that IT stocks had higher betas for "*several years*" after the 2001 dotcom crash.[25]

- Second, Oxera (HAL's consultants) advocates the use of information derived from markets for alternative traded assets – namely traded equity options – to infer views of beta values that may prevail in the (near) future. Oxera presents an alternative estimate of the beta relying on option-implied volatilities (IVs) for comparator airport stocks relative to the market index, based on the relative volatility implied from traded options prices over the recent period. This analysis offers a retrospective view on expected volatility, and beta, over the forthcoming 6-month and 1-year periods, but since the beginning of the pandemic. Oxera argues that this evidence supports a higher beta during H7.[26]

- Finally, CEPA (on behalf of the Airline Community) suggests that the Flint/CAA approach is inconsistent with evidence on share price recovery, since evidence from comparator airports suggest most have already recovered any loss in value that occurred due to COVID-19.[27] CEPA also appears to suggest it is wrong to assume that betas prior to the COVID-19 crisis reflect a world where investors did not foresee the possibility of a COVID-like event, and that the resulting share price volatility instead reflected investors reacting to new information about the *timing* of such events.[28]

### Response to points raised

#### *Conflicting evidence on the short-run behaviour of comparator betas shows the prospective short-term evolution of Heathrow's beta to be uncertain*

HAL (and Oxera) refers to evidence on prospective volatility (derived from traded option prices), using this to estimate prospective betas. The Oxera analysis suggests that, in November 2021, investors did not *expect* the volatility of airport stocks relative to the market index to fall in the near-term. From this data they extrapolate that betas will remain high. Specifically interpreted, Oxera's evidence supports the case that short window (6-12 month), backward looking betas will remain high in the 12-months to November 2022.

Meanwhile CEPA presents evidence that airport values have largely recovered from the COVID-19 shock, and have been close to their pre-COVID levels since November 2020, around the time of positive news about the development of COVID vaccines.[29] CEPA also presents 90-day beta

[25] HAL response, para 7.5.17, Oxera report p. 9.
[26] Oxera report, p. 11-16.
[27] CEPA report, p. 28.
[28] CEPA report, p. 28.
[29] CEPA report, p.28.

estimates which show a marked decline in these short window beta estimates over the course of 2021 (for Fraport, ADP and AENA), particularly in Autumn 2021.

Ostensibly, it is surprising that alternative methods produce such conflicting conclusions. This may simply be illustrative of the differences that may be observed ex-ante vs. ex-post. It may equally be illustrative of the general uncertainties and data challenges associated with beta estimation over short windows, and the level of error, or noise, evident in any dataset.

Importantly, Oxera and CEPA's conclusions rely on quite different datasets:

- As we understand, Oxera estimates 6-month and 12-month backward looking daily betas, inferred at a point in time, *but relevant to dates in the future*. They are based on traded options that reflect anticipated volatility over the forthcoming 6- and 12-month period. They are therefore properly thought of as a prediction of the expected value of the backward looking 6-month or 12-month beta in 6 months' or 12 months' time, respectively.

- On the other hand, CEPA's approach relies on backward looking short-window (90 day) betas. CEPA are thus able to observe and 'remove' the particularly prominent spike periods during 2020 when COVID-19 was a major driver of elevated systematic risk patterns. By focusing on more recent values of the 90-day beta, CEPA are able to present this as a 'post-COVID' beta.

There are methodological challenges of both (and indeed, all) approaches that may influence the result obtained. They are not necessarily weaknesses that systematically bias the results obtained, however.

CEPA's method relies on short-term beta estimates with relatively few observations and are not as statistically robust as longer-term beta estimates (such as 2-year and 5-year betas estimated using daily data). There has been extensive discussion of the merits of longer horizon betas in regulatory decisions in the aviation and other sectors, which we will not repeat here.

Oxera's approach also uses relatively short data windows, but relies on two further assumptions:

- First, that implied volatilities can be used to infer best estimates of the actual volatility[30] over the 6- or 12-month period of the option contract, and

- Second, that the (proportionate) split of this between systematic and non-systematic risk in future share price movements will be the same as it has been in the past.[31]

While these are not obviously unreasonable assumptions, both are hard to evidence with confidence.

[30] This assumption would need careful consideration in thinly traded options markets, for example.
[31] This may not be the case, for example, in the event where the market is 'pricing in' a view on near term future volatility that is (to a greater degree than in the past) potentially unsystematic in nature (for example, the outcome of a financially significant state aid decision to be made within the 6m/12m period, or a government policy on specific travel restrictions).

***Recent comparator betas suggest that, in the later months of the COVID-19 pandemic, airports have no longer shown higher observed systematic risks***

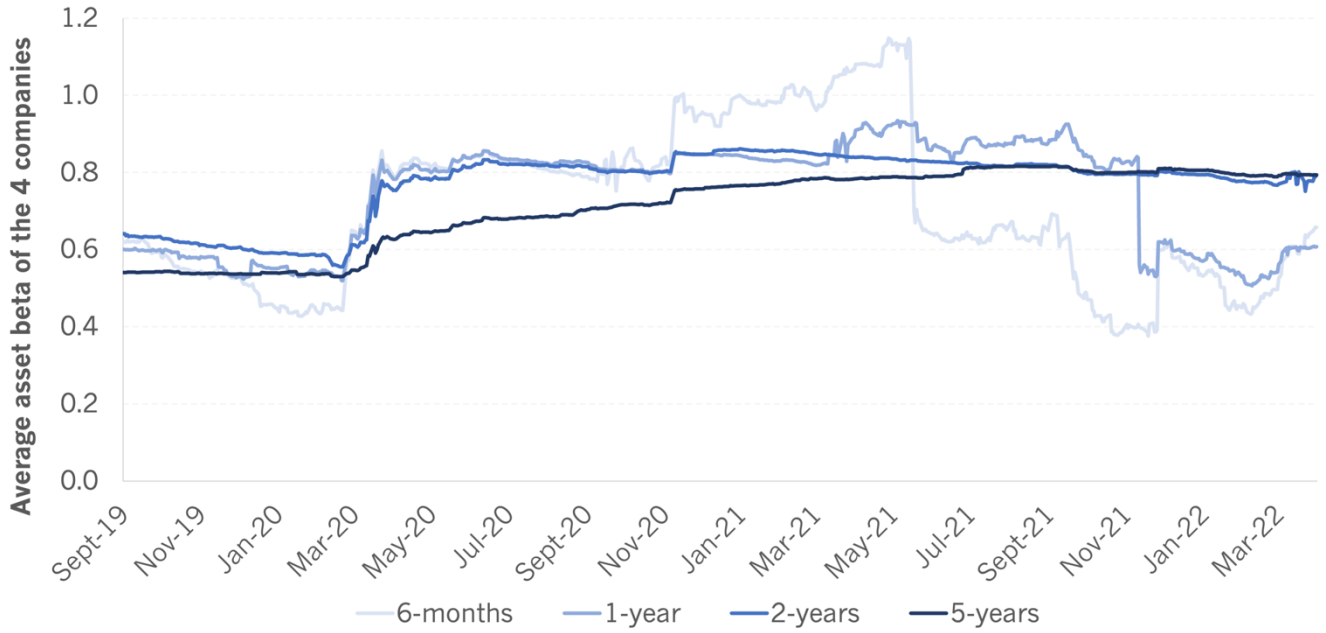
HAL's and Oxera's arguments and evidence might imply that, within our 'COVID adjustment', we should capture not only the impact of future COVID-like events on long-term systematic risks but also the 'tail' or residual effect of COVID-19 on systematic risks in the short term.

As we identified in our August 2021 report, there was some emerging evidence that COVID-19 was no longer dominating airport betas (though we were cautious in placing too much weight on this evidence, as it relied on short-window estimates of the beta, which are statistically unreliable).

Since our August 2021 report, however, this pattern of lower betas has continued. It can also be observed in slightly longer-window estimates of the beta. Figure 1 below shows rolling estimates of the average asset beta for our four primary comparator stocks for betas estimated over different estimation windows, between six months and five years.

The short-window betas (6-month and 1-year) confirm our earlier observation that – after prominent shocks in the data (occurring around March 2020 and November 2020, associated with the onset of the pandemic and the initial positive news about vaccine efficacy, respectively) – backward looking beta values are now showing markedly lower values than those observed earlier in the pandemic. Meanwhile, the continued heightened beta for longer window estimates (2-year and 5-year) observed in early 2022 suggest that these betas are dominated by the effect of the early stages of COVID-19 – and not because of equivalently sustained high volatility through 2021.

**FIGURE 1: ASSET BETAS FOR 4-COMPANY COMPARATOR SET OVER DIFFERENT ESTIMATION WINDOWS**




Note: the 4-company comparator set includes AENA, ADP, Fraport and Zurich.
Source: Flint analysis of Thomson Reuters' data as of 31st March 2022.

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***Comparator evidence does not provide grounds to make an upwards (or downwards) adjustment to the H7 beta to account for expectations about the short-run balance or weight of risks***

HAL also suggested Flint had given insufficient weight to the ongoing effects of the COVID-19 pandemic, and that the increase from the pre-pandemic asset beta is likely to persist into the H7 price control "*as evidenced by the sustained increase in airport stock IVs relative to index IVs*".

We acknowledge that it is conceivable that there may be an unanticipated resurgence of the COVID-19 pandemic (e.g. caused by a variant which evades vaccines and increases mortality, or triggers further significant travel constraints). This could lead to further periods of heightened systematic risks in the short term. We do not consider that there is reliable evidence to support a quantitative upward adjustment to reflect this possibility, however – particularly in light of the opposing ex-post evidence.

In a similar vein we also choose not to project forward or place undue weight on the unusually low beta values observed in recent months – neither projecting these into the future, nor attempting to assimilate the actual recent empirical share price data into a specific 'best guess' beta forecast for the H7 period. We note that this may have the opposite effect, i.e. implying a lower beta for Heathrow for H7. Oxera's evidence on betas in the IT sector, while illustrative of the challenge of predicting the short-run behaviour of the beta in the context of H7, does not provide grounds for us to adjust our beta estimate upwards – particularly since recent 6-month and 1-year betas at airport comparators suggest lower levels of volatility in recent periods. We also note that the long-run beta estimate resulting from our analysis does not imply a mean reversion to the pre-COVID beta – instead it reflects a long-run level of systematic risk that is higher than the 'pre-COVID' beta.

In light of the widely divergent stakeholder views, alternative approaches and inconsistent evidence, we do not consider that the CAA should make an adjustment to the proposed H7 beta to account for any residual effects of COVID-19.

# 4. Parameters of our COVID adjustment

In order to implement the approach described above, we must make a series of choices about key parameters in our model.

1. First, we must decide on the overall historical dataset upon which we rely. In our August 2021 report, we used a 5-year dataset, of daily observations, running from June 2016 to June 2021.

2. Second, we must classify data into 'COVID-affected' and 'non-COVID affected' subsets. In our August 2021 report, we assumed all data between February 2020 and June 2021 was affected by COVID-19, leading to a single 'COVID window' running from February 2020 to June 2021.

3. We must also make assumptions about the frequency at which COVID-like events might occur in future. In our August 2021 report, we suggested the CAA focusses on results within the range once every 20 to 50 years.

4. Finally, we must make an assumption about the duration and nature of possible future COVID-like events. In our August 2021 report, we adopted a lower bound reflecting a duration of 17-months and matching the actual evidence on airport betas observed as a result of COVID-19 up to the time of our report. We also modelled an upper bound, based on COVID-like events assumed to reflect a similar set of future share price and index relationships as our lower bound, but prevailing for a prolonged duration of 30-months.

## 4.1 Dataset

In our August 2021 report, we relied on a 5-year daily dataset, running from June 2016 to June 2021. This comprised 17 months that we classified as COVID-affected data and 43 months (c. 3.5 years) of non-COVID data.

In our August 2021 report, we argued that a 5-year combined daily dataset was reasonable. A shorter 2-year dataset would have unduly restricted the amount of non-COVID data, and a longer 10-year window would not have been possible for our preferred comparator (AENA – which was not listed 10 years ago). We also avoided 10-year windows to prevent the possibility "*either that our selected comparators exhibited different risks in the past than they do today or that perceived systematic risks in the aviation sector have generally changed over the period*".[32]

We explained that a combined 5-year dataset provided a suitable foundation for our analysis, and that a 3.5 year pre-COVID dataset "*sits helpfully within the beta estimation windows (of 2-, 5-, 10-years) emphasised by the CMA and CAA in previous decisions*".[33]

Stakeholders did not comment on our choice of data window for estimating the COVID adjustment.

[32] Flint August 2021 report, p. 17.
[33] Flint August 2021 report, p. 17.

**We include additional data which has become available since our August 2021 report**

Since the publication of our August 2021 report, we now have access to a further nine months of more recent daily data for all comparators (through to 31st March 2022). We now include this additional data in our beta estimation window, since it is appropriate to take advantage of evidence provided by the most recent data as part of our assessment.

**It is possible to rely on a slightly longer pre-COVID dataset for our analysis**

For this updated analysis, we have considered whether a longer window of pre-COVID data would be appropriate. In our August 2021 report, we restricted our consideration to estimating 'round' betas of either 2-years, 5-years or 10-years. But given the methodology we use to weight observations into a 'long-window' beta, it would be equally possible to rely on a longer duration of pre-COVID data, while still constructing re-weighted betas to represent different time periods, e.g. a 5-year beta (for a COVID-like event once every five years).

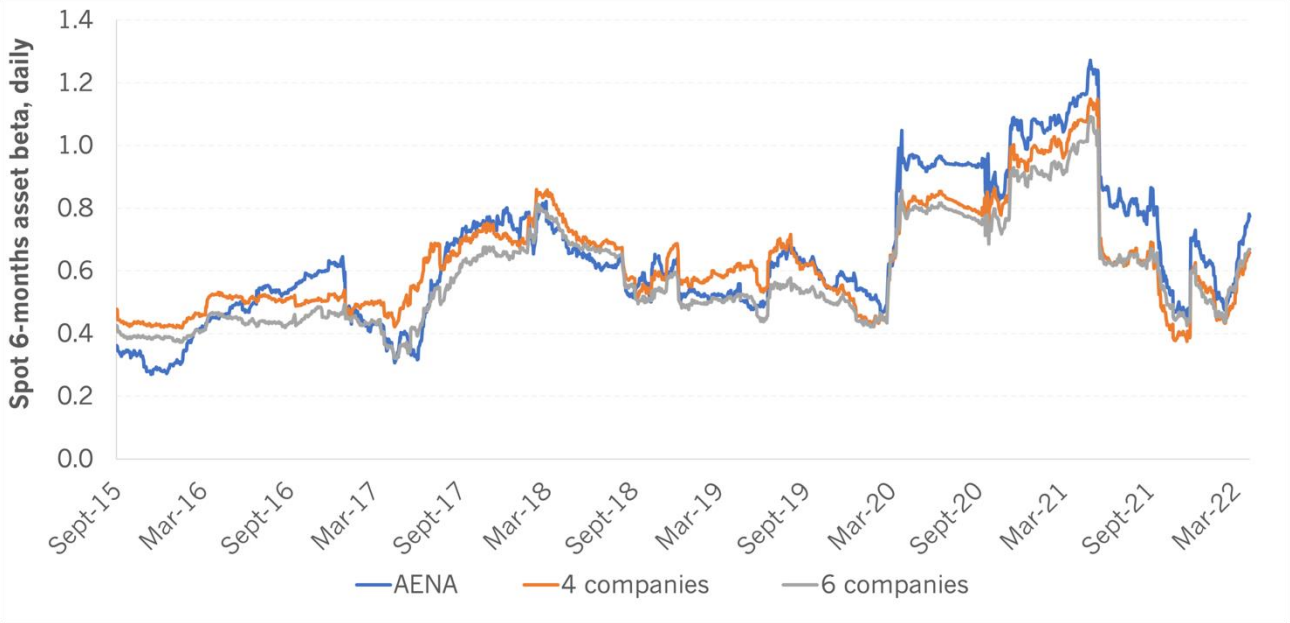
It would be possible to rely on five-years of 'pre-COVID' data for all comparators, because AENA (the comparator with the shortest listing history) has been listed since February 2015. We also note that, as reflected in our baseline (pre-COVID) beta, some relevant regulatory precedent supports relying on a trailing average of 2-year and 5-year betas over a 5-year period – such an approach therefore places weight on data that is older than 5 years.

**Using a longer pre-COVID dataset does not appear to compromise our analysis**

In light of these considerations, we choose to now include five years of pre-COVID data, which combined with two years of data since the onset of the COVID-19 pandemic, provides a 7-year dataset from which we construct our re-weighted betas.[34] We are not aware of obvious step-changes in the (pre-COVID) systematic risks faced by the comparators (or the aviation sector as a whole) that would lead us to reject using this slightly older data, as reflected in the CMA's choice to rely on the same data in its NERL decision.[35] We also note that short-term estimates of the beta (shown in Figure 2 below) for the period prior to pandemic do not suggest any prominent structural break in the data that would justify its exclusion. We also note that the inclusion of additional observations in our dataset may usefully improve the statistical reliability of our beta estimates.

[34] Precisely, our dataset begins on 12th February 2015, since this is the first date for which AENA data is available. This means our total dataset is 12 days short of 7-years duration.
[35] CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, final report, para. 13.96.

**FIGURE 2: 6-MONTH ROLLING COMPARATOR BETAS**




Note: Sydney beta is included up to the point where Sydney was delisted from the ASX, on 9 February 2022.
Source: Flint analysis of Thomson Reuters' data as of 31st March 2022.

The effect of adding an additional two years of data to our pre-COVID dataset is set out in Table 3 below. As the table shows, the 'pre-COVID' beta for most companies falls slightly, reflecting that, prior to the pandemic, the backward-looking beta estimates for most of the airport comparators had risen in the recent past.

**TABLE 3: BETA FOR THE PRE-COVID DATA WINDOW**

| | AENA *Madrid* | ADP *Paris* | Fraport *Frankfurt* | Zurich | Vienna | Sydney | AENA | 4 company | 6 company |
|---|---|---|---|---|---|---|---|---|---|
| **Pre-COVID dataset** | | | | | | | | | |
| **Previous report** | 0.60 | 0.54 | 0.51 | 0.67 | 0.25 | 0.56 | 0.60 | 0.58 | 0.52 |
| **Earlier data** | 0.40 | 0.55 | 0.44 | 0.50 | 0.16 | 0.47 | 0.40 | 0.47 | 0.42 |
| **This report** | **0.52** | **0.54** | **0.48** | **0.58** | **0.21** | **0.51** | **0.52** | **0.53** | **0.47** |

Note: the dataset for the previous report covers the period from June 2016 to January 2020, earlier data from February 2015 to June 2016, and this report joins the dataset from the previous report with the earlier data, covering February 2015 to January 2020.
Source: Flint analysis of Thomson Reuters' data as of 31st March 2022.

## 4.2 COVID-19 affected data window

In this section, we consider the window of data in which we assume COVID-19 has affected comparator airports' betas. Stakeholders did not comment specifically on our classification of data into COVID-affected and non-COVID affected, beyond comments discussed in Section 3.3 above, about whether recent (and forecast) data exhibits COVID-19 behaviour.

**We continue to treat all share price data since 1st February 2020 as a single 'COVID window'**

In our August 2021 report, we chose to use a start date of 1st February 2020, "*to ensure that all data affected by emerging COVID-related news is included in our COVID window*".[36] Stakeholders' did not comment on this element of our methodology and suggested similar assumptions about the point at which COVID first affected betas in their alternative methodologies. We also note our finding that the results of our approach are not sensitive to this assumption.

We also continue to rely on a single COVID-19 window. This approach avoids subjective assessment of precise sub-periods when COVID-related news has exerted particularly significant influence over share prices. While we note the evidence that the COVID-19 period was characterised by specific sub-periods of heightened volatility (see Figure 2 above), share prices in the periods in between such 'spikes' remain potentially heavily influenced by COVID-related news. We consider that it is not, therefore, unlikely, that future COVID-like events would also contain similar periods.

**We include more recent (and newly available) data in our 'COVID window'**

In our August 2021 report, we assumed that COVID-19 continued to affect comparator betas until June 2021, the end point of the dataset that we were using at that time.

In Section 3.3 above, we discuss stakeholder views and evidence on the extent to which COVID-19 continues to affect airport betas and the implications of this evidence for our approach. As we set out above, there is emerging evidence that observed asset betas in recent months may have reverted towards pre-COVID levels (when estimated over shorter windows) along with evidence that airport valuations have shown meaningful recovery from the adverse shock experienced during the COVID-19 pandemic, as presented in CEPA's report.[37]

It is also the case, however, that COVID-19 related news continued to exhibit prominent influence on share prices and stock market indices throughout 2021, and in early 2022, with outbreaks of COVID leading to restrictions in Europe in Autumn and Winter, and most prominently, in December, related to initial fears associated with the emergence of the Omicron variant.[38] This included news about the imposition and relaxation of travel restrictions that were of continued significance for aviation stocks.[39] We further note that more recent stock market data (i.e. early 2022) may have also been significantly affected by the Ukraine conflict and economic concerns related to inflation and growth, i.e. relatively unusual events of significant impact, but unrelated to COVID-19. However, COVID-related news also continued to be prominent at points in this period, for instance, related to the removal of travel and testing restrictions in European countries in early 2022, and news associated with lockdowns in China in March 2022.[40]

Oxera's evidence supports the view that – throughout the pandemic, and up to the beginning of November 2021 – there remained a market consensus expectation of a period of continued volatility, based on the observed price of equity options. Oxera's analysis suggests that this may indicate a near future expectation of heightened systematic risk – and that periods of higher betas

[36] Flint August 2021 report, p. 16.
[37] CEPA report, p. 28, Figure 2.9.
[38] See, for example, Financial Times (20 December 2021), Stocks and oil drop further as Omicron variant prompts recovery concerns.
[39] Financial Times (4 January 2022), Travel and leisure stocks surge as Omicron disruption fears fade.
[40] See, for example, Financial Times (14 March 2022), China stocks suffer worst fall since 2008 as Omicron spooks investors.

might be expected – though this conclusion also relies on simplifying assumptions about the make-up of the prospective volatility.

In light of this range of evidence, which points in differing directions, we consider it is most appropriate to use a COVID-window that contains all of the evidence observed since the onset of the COVID-19 pandemic, allowing for the fact that COVID information may remain influential over share prices until at least the present time. It is difficult, on common sense grounds, to support an argument that this is no longer the case, despite the recent short window beta evidence. We therefore extend our COVID window to include the most recent data through to 31st March 2022.

Table 4 below sets out the effect of including this additional data in our 'post-COVID' beta. As the table shows, including an additional nine months of data decreases the beta of our comparators, observed over the (longer) COVID-window, by between zero and eight basis points, depending on the comparator. However, since we use the post-COVID data alongside pre-COVID data to form reweighted betas, the effect of this change is limited, since the additional nine months of post-COVID data will be included in our reweighted beta estimates *at the expense of* otherwise placing correspondingly higher weight on pre-COVID data which exhibits similar betas to those seen in the last nine months across the comparator set.

**TABLE 4: ASSET BETA ESTIMATES FOR COVID-19 AFFECTED DATA WINDOW**

| Period of estimate | AENA *Madrid* | ADP *Paris* | Fraport *Frankfurt* | Zurich | Vienna | Sydney | AENA | 4 company | 6 company |
|---|---|---|---|---|---|---|---|---|---|
| **17-months** | 0.95 | 0.87 | 0.65 | 0.81 | 0.90 | 0.58 | 0.95 | 0.82 | 0.79 |
| **26-months** | **0.90** | **0.79** | **0.65** | **0.76** | **0.86** | **0.56** | **0.90** | **0.77** | **0.75** |

Note: the 17-month estimate refers to the period from February 2020 to June 2021; the 26-month estimate refers to the period from February 2020 to March 2022, and for Sydney to February 2022, when it was delisted from the ASX.
Source: Flint analysis based on Thomson Reuters data as of 31st March 2022.

## 4.3 Frequency of COVID-like events

In our August 2021 report, we presented results for a wide range of different frequencies of COVID-like event from once every five years through to once every 100 years. We focussed our reporting on results within the range of one-in-20 years to one-in-50 years,[41] and recommended a COVID adjustment for the beta based on results from this range.[42] This assumption was consistent with the CAA's approach to other parameters of its price cap.

### Stakeholder views

In relation to the CAA's asymmetric risk allowance, HAL argues that an expected frequency of between one-in-20 years and one-in-50 years is consistent with Heathrow's previous assessment of the return frequency of similar events, and consistent with the UK Government's 2020 national risk register assumptions.[43]

[41] Flint August 2021 report, p.17.
[42] Flint August 2021 report, p.37.
[43] HAL response, para 8.2.7.

In its report, Oxera does not disagree with our proposed range of frequencies but argues that HAL's evidence (in its RBP) would support placing greater weight on the one-in-20 year end of our range, since it is consistent with an expected return period for pandemics every 30 years.[44]

CEPA, however, argues that the "*lower-bound frequency*" (of one-in-20 years) is poorly evidenced, and that the CAA has "*failed to rule out longer frequencies*".[45] It argues that its evidence supports a lower bound frequency of around once every 30 years, due to there being three pandemics in the 20th century, and because "*improvements over time*" will reduce the frequency of similar events in the future.

**Response to points raised**

We continue to focus our analysis on COVID-like events with a frequency of between one-in-20 and one-in-50 years. We disagree that CEPA's evidence supports a maximum frequency of once every 30 years. CEPA argues that, since pandemics have happened approximately once every 30 years in the 21st century, combined with improvements (e.g. "*advances in vaccination, treatment and sanitation*") over time, mean that a 1-in-20 year frequency should not be considered credible.[46]

Firstly, that three pandemics have happened in the 20th century does not rule out the possibility that pandemics were *likely* to happen more frequently. Instead, this evidence seems to support a broad range of potential frequency either side of a one-in-30 year event. Secondly, while CEPA cites factors which may reduce the frequency or probability of COVID-like events in the future, there are other factors that may lead them to be more common. We do not attempt to capture these exhaustively, but note two examples: firstly, the growth in international travel over time may have increased the tendency for disease outbreaks to spread more quickly and more extensively around the world (particularly compared to the 20th century average), and secondly, it is plausible that the experience of the COVID-19 pandemic may increase the tendency for authorities to introduce travel restrictions and associated measures that will lead less-severe outbreaks of disease in the future to have 'COVID-like' effects on the aviation sector and markets more widely.

CEPA argues that our results are particularly sensitive to the upper bound frequency assumption;[47] but we do not consider that CEPA's evidence shows that our upper bound frequency is less credible, or more speculative than, our lower bound frequency assumption.

In light of these stakeholder views, we continue to focus our presentation of results on COVID-like events of between 1-in-20 and 1-in-50 years, and recommend that the CAA sets a COVID-adjustment from within this range.

[44] Oxera, p. 9.
[45] CEPA report, p. 26.
[46] CEPA report, p. 26.
[47] CEPA report, p. 27.

## 4.4 Assumed nature of future COVID-like events

**Overview of our assessment and approach to future COVID-like events**

In order to implement the approach we have set out above (and in our August 2021 report), we must decide how we *blend together* the COVID-affected and non-COVID data in our re-weighted beta estimates.

It is not possible to predict the nature of the effect on airport betas due to future COVID-like events. This is why we rely on historical, observed beta behaviour as a result of COVID-19, i.e. the only such event that has occurred in recent history and during which we can observe the effect on airport betas. In our August 2021 report, we presented a set of results based on a COVID-like event in the future exhibiting a similar effect on share prices and betas as COVID-19 had (to date). We used this to represent our lower bound.

However, it is possible to use our model to generate results which reflect different future-COVID like events. While there are a variety of dimensions by which we could attempt to adjust the observed COVID-19 data to capture events of a different nature (or specifically, events which lead to a different effect on share prices and observed betas), we chose to use the *duration* of future COVID-like events as a representative mechanism through which we conduct sensitivities related to the nature of future COVID-like events, compared to the actual COVID-19 experience to date.

We considered that adjusting the duration of COVID-like events is a useful mechanism for this purpose, because it is computationally straightforward, whereas manipulating the observed historical data to account for e.g. a COVID-like event which exhibits more or less volatility would rely on complex and subjective assumptions. That is not to say that future COVID-like events will not have a more or less severe effect on share prices and the resulting betas, but that we do not form any quantitative assessment of whether or not they will be more or less severe.

In our August 2021 report, our lower bound result was based on future COVID-like events exhibiting similar properties to COVID-19, and assumed to last 17 months (i.e. exactly equivalent to the duration of the COVID-19 pandemic to date at the time of our report).

Our previous upper bound was modelled using an assumed duration of 30 months, i.e. assuming a future COVID-like event would last 2.5 years (i.e. approximately one further year than we had observed to date). The upper bound event was characterised by share price movements, and a relationship of these with the index, consistent with the observed COVID-19 experience to date – but simply assumed to prevail for a longer period.

Thus our upper bound can be thought of as effectively assuming a future event that might be 60-70% more 'impactful' – modelled by assuming a 60-70% longer duration, but similar share price and index behaviour, versus that observed for COVID-19 at the point of our report.

**Stakeholder views**

HAL and its advisors, Oxera, do not comment on the duration assumptions of the COVID adjustment; instead HAL's arguments suggest that it expects the effect of the COVID-19 pandemic on systematic risk to persist throughout H7.

CEPA's response (on behalf of the Airline Community) appears to support our lower bound assumption, which is "*based on actual evidence*", but argued that the 30-month upper bound is "*speculative and overemphasises the pandemic evidence's shock effect*".[48]

CEPA argues that the duration of our upper bound should be based on the effect of COVID-like events on betas, rather that the duration of the pandemic itself; and that "*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*".[49]

**Response to points raised**

As discussed in Section 3.1 above, we do not agree with HAL that the effect of COVID-19 on betas should be assumed to be permanent.

We agree with CEPA that the 'duration' of future COVID-like events parameter should be set to capture the duration of a COVID-like event's effect on betas – not necessarily the duration of the event itself.[50] However, in our August 2021 report, we already defined our upper bound based on our estimate of the duration of COVID-effect on airports' betas arising in a future event, and not the duration of any future event itself: and we noted that beyond a certain point, any prolonged period of travel disruption would likely be "*integrated into investors' expectations as the confidence in expected impact grows*".[51] We therefore believe that our model is specified in alignment with CEPA's suggestion.

We disagree with CEPA's view that sensitivities around the duration of future COVID-like events is inconsistent with our assumptions about the frequency of COVID-like events: the uncertainty that exists about how often similar events will happen in the future is not directly related to the uncertainty about how-long (and to what extent) these future events will affect share prices, index values and the systematic risk of airport stocks.

However, as we set out in Section 3.2 above, more recent data provides evidence that COVID-19 has not been dominant in driving airport betas and this is reflected in the data upon which our estimation of forward looking betas relies. Therefore, we continue to focus our decision on the possible duration of future COVID-like events.

**Our updated approach**

Since additional time has passed since our August 2021 report, we now have additional information about the COVID-19 pandemic's effect on betas. We have therefore been able to re-evaluate our assumptions about the duration of future COVID-like events, and assimilate some of the stakeholder feedback.

As a starting point, we estimate a 'base case' result, which assumes that future COVID-like events will have similar impact to that observed during COVID-19. We model this, as before, by assuming that a future event might last as long, and demonstrate similar share price behaviours, as during

[48] CEPA report, p. 28.
[49] CEPA report, p. 28.
[50] As discussed in Section 3, while the COVID-19 pandemic is not over, evidence suggests it may be no longer affecting the comparator airports' asset betas.
[51] Flint August 2021 report, p. 26.

the observed 26-month window between February 2020 and March 2022, when COVID-19 has been prominent.

We note that the beta observed over the 26 months between February 2020 and March 2022 (i.e. our assumed 'COVID window') is lower than that which was observed in the 17-month window upon which we relied in our August 2021 report. This reflects evidence that, while COVID-19 continues to affect share price (and market) movements during 2021 and early 2022, the proportionate impact of COVID-19 on share prices in the later stages of the pandemic appears to have declined.[52]

As discussed previously, future COVID-like events will not exhibit exactly the same behaviour as COVID-19. Therefore, we base our modelling of the COVID-adjustment on future COVID-like events of differing impact. We continue to do so by using modelled event duration as a proxy for impact. We therefore model a range of notional durations of future COVID-like events, as a means of capturing the scope for future events to differ from COVID-19 in terms of their nature and effect on risk in the aviation sector.

We base our upper bound on COVID-like events with a modelled duration that is 1.5 times the duration of our observed 26-month COVID-window, i.e. 39 months. Compared to our August 2021 report, we extend the upper bound (from 30 months) to 39 months. As in our August 2021 report, this represents an assumption of a future COVID-like event affecting the beta for around 1.5 times the duration of COVID-19's effect on airport betas. Our observed COVID-window (and hence our 'base case' assumption about future COVID-like events) is characterised by two periods of especially heightened volatility (in March/April 2020, and again in late 2020) – see Figure 1. However, outside of these periods, the data is characterised by more benign price behaviour. Therefore, an upper bound of 39 months might similarly be considered equivalent to assuming that a future COVID-like event would experience a third 'spike' of heightened volatility, which might represent, for example, a further period of lockdown and travel restrictions or a new variant with potential additional and hitherto unanticipated economic impact.

In our August 2021 report, we estimated our lower bound based on the actual observed COVID-19 pandemic to date, at that point. In light of the stakeholder responses, we now consider the possibility that future events might be less impactful than COVID-19.[53] We therefore base our updated lower bound on a similar (but downward) adjustment to our base case, by assuming a similar impact on share prices but for a shorter period. Our modelled lower bound assumes two thirds of the duration of our 'base case', i.e. that future COVID-like events may be one third shorter than the observed duration of COVID-19 to date.

In summary;

- We anchor our lower bound assumption to the possibility that a future event might be shorter (or less impactful) than COVID-19. This could be the case if future events are less severe in

[52] In effect, because the additional seven months of COVID-affected data exhibits lower levels of volatility than the earlier COVID-affected data, it is included in the reweighted long-window beta estimates at the expense of non-COVID data which shares similar apparent beta characteristics – leading to limited change in the overall beta estimates.

[53] Specifically, CEPA suggested that our upper bound was "speculative" compared to a lower bound "based on actual evidence". However, as discussed above, we consider that it is necessary to capture the extent to which future COVID-like events may be different from COVID-19. By adopting a lower bound we now avoid any bias that may arise from assuming an upper bound based on COVID-like events which are longer than COVID-19.

underlying nature, or if, for instance, airports and the wider economy are better equipped to deal with future COVID-like events. Our lower bound effectively assumes an impact around one third lower than that of COVID-19.

- We continue to anchor our upper bound assumption to the possibility that a future event might last longer (or prove more impactful) than COVID-19. Our upper bound effectively assumes a potential impact one and a half times greater than that of COVID-19. Until the news of vaccine development emerged in November 2020 this seemed plausible and therefore remains a reasonable, if cautious, alternative view.

## 4.5 Overall conclusion and implications for our COVID adjustment

Table 5 below summarises the dataset we have used in order to estimate our recommended COVID adjustment. In our August 2021 report, we relied upon a dataset of five years of recent data, of which c.1.5 years were COVID-affected, and c.3.5 years were 'pre-COVID'.

We now rely on a larger c.7-year aggregate dataset. We take account of an additional c.1.5 years of pre-COVID data (from 12th February 2015) since we consider it is useful in defining a more robust foundation for the assessment of 'pre-COVID' systematic risk conditions for our comparator airports than the slightly more recent data relied upon in our last report.

We also incorporate the nine additional months of data since our previous cut-off date in our August 2021 report, and consider it too represents 'COVID-affected' data. However, in doing so we note the evidence from recent short-window betas which are more in line with the beta levels observed pre-COVID than those observed during the earlier part of our COVID-period.

**TABLE 5: HISTORICAL DATASET OF DAILY DATA USED TO CONSTRUCT OUR RE-WEIGHTED BETAS**

| | Previous report (Aug 21) | This report (May 22) |
|---|---|---|
| **Dataset** | | |
| **Start date** | 16th June 2016 | 12th February 2015 |
| **End date** | 18th June 2021 | 31st March 2022 |
| **Assumed COVID-19 affected data** | | |
| **Start date** | 1st February 2020 | |
| **End date** | 18th June 2021 | 31st March 2022 |

Source: summary of Flint assumptions.

Table 6 below summarises our assumptions about future COVID-like events. These assumptions underpin our updated COVID adjustment range.

As in our August 2021 report, we present results using our preferred approach for a wide range of frequencies of future COVID-like events. Consistent with other parameters in the CAA's WACC, we focus our summary presentation on results within the range of one-in-20 years and one-in-50 years, and recommend the CAA rely on a COVID adjustment beta based on results from within this range.

Since our August 2021 report, we have also updated our assumptions about the duration of potential future COVID-like events. We now consider a lower and upper bound based on the

assumption that future events will last (and affect asset betas for) for between 17 months (1.4 years) and 39 months (3.2 years).

We note, however, that when both these revised assumptions are combined with the more benign recent share price behaviour the effect is to *reduce* both our overall lower bound and upper bound estimates of the COVID impact compared to our August 2021 report – as we show in Section 6 below.

**TABLE 6: ASSUMPTIONS ABOUT FUTURE COVID-LIKE EVENTS TO BOUND OUR COVID ADJUSTMENT RANGE**

| | Previous report (Aug 21) | This report (May 22) |
|---|---|---|
| **Frequency of future COVID-like events** | | |
| **Lower frequency** | Once every 20 years | |
| **Higher frequency** | Once every 50 years | |
| **Duration of future COVID-like events** | | |
| **Lower bound** | 17 months | 17 months |
| **Upper bound** | 30 months | 39 months |

Source: summary of Flint assumptions.

# 5. Choice and use of comparators

For both the baseline and COVID-adjustment components of our H7 beta estimate we rely on historical share price evidence from listed comparator airport stocks. Table 7 below summarises the comparators we relied upon for each component in our August 2021 report:

**TABLE 7: SUMMARY OF COMPARATORS USED TO INFORM HEATHROW'S H7 BETA**

| Baseline beta | COVID adjustment |
|---|---|
| AENA | AENA |
| ADP | ADP |
| Fraport | Fraport |
| | Zurich |
| | Sydney |
| | Vienna |

Note: We grouped our comparators in the COVID adjustment intro three sets: AENA alone; the average of AENA, ADP, Fraport and Zurich, and the average of all six companies.

HAL and CEPA (on behalf of the Airline Community) offered different views on the choice of comparators, in summary:

- HAL argued that we should rely on Fraport, ADP, AENA, and Zurich, and not place any weight on Sydney or Vienna; and
- CEPA suggested that we had wrongly excluded Copenhagen and Auckland airports from our comparator set, and placed insufficient weight on airports which CEPA considers to be most comparable to Heathrow, in particular Sydney.

In this report, we do not restate our overall assessment of comparators, which we set out in our April 2020 and August 2021 reports for the baseline beta and COVID adjustment respectively. In this report, we focus on the specific stakeholder comments on our choice and use of comparator evidence. Where it is unclear if a stakeholder's comment concerns the baseline beta or the COVID adjustment, we discuss our use of the comparator in both elements of our analysis.

## 5.1 Exclusion of Auckland and Copenhagen

Our choice of comparators for calculating the COVID adjustment was informed by the list of eight listed airport stocks which the CAA suggested to be potentially appropriate for Heathrow. We considered it was appropriate to consider a wider set of comparators than we relied upon prior to the pandemic.[54] However, from the CAA's shortlist of eight stocks, we did not rely on Auckland and Copenhagen, in large part because of the questionable reliability of traded price information, or the inability to identify an appropriate diversified index.[55]

[54] Flint August 2021 report, p. 18.
[55] Only a small percentage of shares in Copenhagen are free-float. The New Zealand stock market exhibits limited diversification, while other potential stock market indices for Auckland are potentially unreliable for other reasons. This reduced our ability to estimate reliable betas for these comparators - Flint August 2021 report, p. 19.

### Stakeholder views

CEPA argues that "*some*" weight should be placed on Copenhagen's beta in the CAA's determination, because its relatively low bid-ask spread and proportion of free-floating shares are not sufficient grounds to exclude it entirely, and that its bid ask spread is similar to Vienna airport.[56]

CEPA also considers it was wrong "*to a lesser extent*" to exclude Auckland from our assessment.[57] It argues that "*the issues raised*" for Auckland are similar to those it sets out for Sydney Airport (see Section 5.2 below), i.e., that the composition of the domestic index could be resolved by using a broader index and the difference in the form of regulation compared to Heathrow is not sufficient grounds to exclude it.[58] CEPA also notes Auckland's "*share of non-aviation activities is also similar to Fraport*".

In its response, HAL notes our consideration of a wider set of comparators in light of the COVID pandemic and does not object to the exclusion of Copenhagen and Auckland from our comparator set.[59]

### Response to points raised

#### *Inability to reliably estimate Copenhagen's beta means it is not a useful comparator for Heathrow*

As we set out in our August 2021 report, we chose not to use Copenhagen as a comparator because its very small share of free-float (at 1% – compared to at least 10% for other comparators – and at least 25% for five of the remaining comparators) renders its beta estimate unreliable.[60] The statistical confidence of its beta estimate was lower than the other comparators. We considered that alternative methods for addressing low liquidity (such as relying on weekly or monthly returns instead of daily returns) were inappropriate, given our method requires us to isolate the effect of COVID-19 on airports' betas over the recent period, which we consider is better measured using daily data.

CEPA suggests that Copenhagen's bid-ask spread is only slightly higher than Vienna's (an airport that we include in our wider comparator set), implying this justifies an equivalent treatment for both stocks. However, the bid-ask spread is only one of a number of measures of share-price liquidity. Given the very small proportion of free-floating shares at Copenhagen, which is materially lower than for our other comparators, we remain of the view that its beta cannot be estimated reliably, and we do not include it as a comparator.

#### *Auckland's beta cannot be reliably estimated and it is a poor comparator for Heathrow*

In our August 2021 report, we set out why the circularity of Auckland's relationship with its index means its beta cannot be estimated reliably.

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[56] CEPA report, p.14.
[57] CEPA report, p. 13.
[58] CEPA report, p.14.
[59] HAL response, para 7.4.4
[60] Flint August 2021 report, p. 19 and p. 40-41.

CEPA suggests that this issue could be avoided by relying on an international index, but as we set out in our August 2021 report, while European markets are relatively integrated, local indices are more appropriate for Sydney and Auckland which are less integrated markets.[61] We also note that the sensitivity of Auckland's beta to the choice of index further suggests that its beta cannot be relied upon.

CEPA is wrong to suggest we exclude Auckland on the grounds of its regulatory framework; we exclude it mainly due to the unreliability of its beta estimate and not due to its limited comparability to Heathrow. However, we note that, even if it were possible to estimate a reliable beta for Auckland, we would not have considered it a close comparator to Heathrow and given it limited weight. First, New Zealand (and Auckland Airport's) experience during the COVID-19 pandemic was very different from Europe (and Heathrow's). Second, because Auckland operates in such a different geographical market it is likely to be exposed to different risks compared to larger European airports even in more benign times, as the CMA concluded in its redetermination for NERL in 2020.[62]

We also note (from annual reports) that a significant proportion (>25%) of Auckland Airport's recent capital expenditure appears to have been on property development activities that are not closely related to aviation activities - potentially giving rise to a further aspect of difference.[63]

Moreover, in a footnote, CEPA writes:[64]

*"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."*

We understand this to mean that CEPA supports our (and the CAA's) decision not to include Auckland as a comparator but argues we should have excluded it for different reasons. As such, we do not comment further.

## 5.2 Use of Sydney and Vienna in our wider comparator set

As we set out in our August 2021 report, having decided against the use of Auckland and Copenhagen, we focussed the presentation of our analysis on the effect of COVID-19 compared to pre-COVID betas for three sets of comparators:[65]

- AENA only, the group with the most comparable main airport, Madrid-Barajas, and overall group operational features that appear most similar to Heathrow.
- The average of the four airports that we consider most comparable to Heathrow: AENA, ADP, Fraport and Zurich.

[61] Flint August 2021 report, p. 40.
[62] CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, final report, p. 186, para. 13.75.
[63] Auckland airport (2021), Financial Report 2021, p.15.
[64] CEPA report, p. 14, footnote 23.
[65] Flint August 2021 report, p. 22.

- An average of a wider set of all six retained comparators: AENA, ADP, Fraport, Zurich, Vienna and Sydney.

In this subsection, we respond to stakeholder comments on the weight placed on Sydney and Vienna airport in forming a view of Heathrow's beta for H7.

**Stakeholder views**

CEPA argues that it is wrong to exclude Sydney from the comparator sets "*on the basis of its regulatory framework*". It argues that the Australian stock index is as suitable as the UK index (and suggests a global index can act as a cross-check). CEPA argues that any differences in its regulatory regime should be assessed "*as one factor in a comprehensive relative risk analysis*", and that the "*overall impact of the form of regulation – when combined with other factors such as volatility in passenger numbers – is not clear cut*".[66] It adds that lighter-touch regulation may be associated with higher competitive pressures.[67]

CEPA suggests more weight should be placed on Vienna Airport's beta, arguing that: [68]

- Regulators (including Ofcom and the German energy regulator) have considered similar bid-ask spreads to be sufficiently liquid in other regulatory decisions, and
- Vienna Airport's smaller size (than Heathrow) is not of concern, as it is similar to ENAV, a comparator which it says was used by the CMA for its NERL redetermination, and that "*smaller traffic volumes should not pose fundamental problems in estimating beta*".

HAL, meanwhile, argues that it is wrong to place *any* weight on Sydney and Vienna, because:[69]

- They were rejected by the CMA as comparators (in its NERL redetermination),
- There are significant differences compared to Heathrow, and
- A "*liquidity constraint*" affects the quality of the beta estimate.

HAL argues that these comparators inappropriately reduce the lower bound of the CAA's range.

**Response to points raised**

It is not clear whether stakeholder comments relate to the use of these comparators to inform our baseline beta or our COVID adjustment. Therefore, we discuss the inclusion of these comparators for each component separately below.

***It is appropriate to place some weight on Sydney and Vienna's beta response to the COVID pandemic, but they are less appropriate than the four major European airport groups***

In our August 2021 report, we explain why we shared the CAA's view that it is appropriate to consider a wider set of comparators for the purpose of understanding the impact of COVID-19 on

[66] CEPA report, p.13 – 14.
[67] CEPA report, p.13 – 14.
[68] CEPA report, p.14.
[69] HAL response, para 7.4.4

airports' betas.[70] By relying on average of the 'COVID-effect' across a wider comparator set ensures that we reduce the effect of specific changes in investors' perception of risk at individual airports that might be company-specific and not relevant to Heathrow.

As such, CEPA is wrong to suggest we 'exclude' or place 'zero weight' on Sydney and Vienna airport.[71] As we set out in our August 2021 report, we rely on them as part of our wider comparator set for estimating the effect of COVID on Heathrow's beta. In practice, we find that the COVID-adjustment implied by our four-company comparator set is very similar to the COVID-adjustment implied by our wider, six-company comparator set, but that does not mean we exclude them.

For the same reason, HAL is incorrect to say that the inclusion of these comparators reduces the CAA's estimate of Heathrow's beta at H7: as we set out in Table 4 of our August 2021 report,[72] the range implied by our wider, six-company comparator set was within the range implied by our preferred set of comparators. This remains the case after our update of the dataset discussed in Section 4 above.

We set out in our last report why we consider these two airports to be less appropriate comparators than AENA, ADP, Fraport and Zurich, and why we chose to place less weight on them. We remain of this view.

In summary:

- Vienna is significantly (around six-times) smaller than Heathrow, meaning it may be exposed to different risks. CEPA argues that the CMA's use of ENAV as a comparator in its NERL redetermination suggests it is wrong to place less weight on Vienna – however:
  - As part of its NERL decision, the CMA considered that issues resulting from Vienna's smaller size may "*distort*" its beta estimate, leading its beta estimate to be a (lower) outlier compared to other comparators, and consequently rejected its use.[73]
  - Moreover, ENAV was the only other European air traffic control business evaluated by the CMA in its comparator set for NERL. Thus, whilst smaller, it was the closest to a 'pure play' comparator for NERL. It was therefore entirely reasonable that the CMA retained ENAV despite this understood weakness. We do not face the same problem of scarcity of airport comparators for Heathrow.
- The regulatory regime at both Vienna and Sydney are very different from Heathrow's. Whereas Heathrow operates under formal 5-year price controls, we understand from the CAA that Vienna operates under a price cap without specified duration or regular reset points, while Sydney Airport is not subject to any formal regulatory price control at all.
- Sydney's traffic mix is dominated by domestic traffic, and, since the impact of COVID-19 in Australia was very different to in Europe, the impact of COVID on its systematic risks is less comparable to Heathrow.

[70] Flint August 2021 report, p.18.
[71] CEPA report, p.14.
[72] Flint August 2021 report, p. 28.
[73] CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, final report, p.186, para 13.74.

- We also place less weight on Vienna and Sydney due to the lower reliability of their beta estimates than our remaining four comparators. The Sydney market index is less diversified and geographically differentiated from our other European comparators.[74] Vienna has a relatively low proportion of free-float and its beta estimate is less statistically significant.

***Differences at Sydney and Vienna mean they are also inappropriate comparators for our baseline (pre-COVID) beta for Heathrow***

CEPA considers that Sydney and Vienna should be used to inform the CAA's baseline, pre-COVID estimate of Heathrow's beta. While it is appropriate to rely on a wider set of comparators for estimating the effect of COVID-19 on betas, we do not consider the same factors should necessarily lead us to use the same comparators for our baseline beta. For the reasons set out above, we do not consider that Sydney and Vienna are as comparable to Heathrow as the large, European airports upon which we rely for our pre-COVID beta estimates.

CEPA suggests that more weight could have been placed on Sydney airport's beta, in particular, and that differences compared to Heathrow (e.g. in its regulatory framework) could have been accounted for by an assessment of its relative risk. However, as CEPA itself explains, the directional impact of Sydney's form of regulation on its risk is not clear – since Sydney's lighter regulation may be a consequence e.g. of its competitive environment.[75] This makes qualitative assessment of its relative risk unreliable. We also note that its distinct geographical market increases the probability that it faces different risks to a European airport such as Heathrow, as the CMA concluded in its NERL redetermination.[76]

Since the cut-off date in our August 2021 report, we note that Sydney has also been subject to takeover and its stock is no longer traded.[77] News associated with the potential takeover of Sydney airport is likely to have had significant influence over its share price activity both since August, and beforehand – potentially further undermining the informative value of Sydney as a comparator.

## 5.3 Use of AENA, ADP, Fraport and Zurich as main comparators

In this subsection, we discuss stakeholder comments related to the four-company comparator set (AENA, ADP, Fraport and Zurich) we use for our COVID adjustment, and discuss our use of AENA, ADP and Fraport to inform our estimate of the pre-COVID – or baseline – beta for Heathrow.

**Stakeholder views**

CEPA considers that Heathrow's beta is at lower end of the range implied by our comparators, because, CEPA argues, it faces relatively lower risks across a range of factors.[78]

[74] We discuss our choice of market index further in Section 5.5 below.
[75] CEPA report, p.13-14.
[76] CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, final report, p. 186, para. 13.75.
[77] See, for example: Reuters (3 February 2022), Sydney Airport shareholders approve $17 bln takeover; Financial Times (15 July 2021), Sydney Airport rejects $17bn bid as investors target infrastructure; Sydney Airport – Suspension from Quotation Market Announcement (9 Feb 2022).
[78] CEPA report, p. 19-20.

CEPA argues that our beta estimate for Heathrow at H7 is upwards-biased because we rely on evidence from Fraport and ADP without adjusting their betas downwards to account for "*higher risk*" faced by ADP and Fraport.[79]

CEPA suggests that, at Q6, the CAA set a beta c.0.09 below that implied by ADP and Fraport, and that failure to apply a similar adjustment is inconsistent with regulatory precedent, implying a similar downward adjustment remains appropriate at H7.[80]

Oxera, HAL's consultant, argues that Flint and the CAA have failed to give sufficient weight to differences in airports' traffic mix, which is an important determinant of airports' 'vulnerability' to COVID-19.[81]

Oxera and HAL argue that, because Heathrow has a smaller share of domestic travel than the comparator airports, and because domestic travel recovers faster than non-domestic travel, it points towards "*an asset beta higher than the mid-point of the asset beta range for comparator airports*."[82]

**Response to points raised**

***Use of a four-company average for our COVID adjustment is a pragmatic approach to assessing the impact of COVID on Heathrow***

Stakeholders do not comment on the appropriateness of including AENA, ADP, Fraport and Zurich in our main comparator set for our COVID adjustment. Instead, their comments relate mainly to the relative weight we place on each comparator and/or whether we should adjust our estimate upwards or downwards to account for differences in risk faced by Heathrow.

For the purpose of inferring the change in risk faced by Heathrow during a COVID-like event, we do not consider it appropriate to overinterpret differences in the results emerging for each of the individual comparators, each of which have material differences compared to Heathrow, and where the 'beta response' to COVID-19 cannot be entirely attributed to differences in observable features (such as regulatory regime and nature of the airport's traffic). Hence we place greater reliance on the response to COVID-like events reflected across the comparator sets as a whole.

We also note that the range of implied "*COVID-effect*" for the individual airports (set out in Table 12 and Table 16) does not align with CEPA's view of relative risk.[83] The airports which CEPA considers more comparable to Heathrow experienced both the largest (Vienna) and smallest (Sydney) increase in beta during the COVID-19 pandemic, with the three airport groups that CEPA considers least comparable showing increases in beta around the middle of this range.

***Use of AENA, ADP and Fraport for the baseline beta***

CEPA argues that our baseline beta is exaggerated because we fail to adjust it downwards for the higher risks faced by the comparators on which we rely, AENA, ADP and Fraport.

[79] CEPA report, p. 16-17.
[80] CEPA report, p. 17.
[81] Oxera report, p. 5.
[82] Oxera report, p.6; HAL response, para. 7.4.16.
[83] CEPA report, p. 45.

In deriving our baseline beta (of 0.5 to 0.6), and as we set out in our April 2020 report, we did not carry out an assessment of the relative risk of Heathrow and its comparators. As such we did not make a recommendation about where Heathrow's beta was likely to lie within our range.

An assessment of Heathrow's relative risk remains beyond the scope of this report, though we note that relative risk analysis of this type is very challenging and of potentially limited reliability. Identification of a coherent and comprehensive set of drivers of systematic risk, and the quantification of their individual effect, involves speculation – and as such may create the risk of false conclusions and/or spurious accuracy. Because of this we do not share CEPA's definitive conclusion on the effect on systematic risk of differences between Heathrow and the comparators upon which we rely for our baseline beta, though we recognise the need for the CAA to exercise judgement within an identified range.

However, we note the following:

- While we rely on 'pre-COVID' data from comparator airports to set the baseline beta, it is not intended to capture the risks faced by Heathrow *prior* to the pandemic (i.e. during Q6). Instead, it is intended to capture the balance of risks that Heathrow faces in the future (i.e. during H7) *other* than those associated with future COVID-like events (which we capture through our COVID adjustment).

- Since Heathrow is likely to be less capacity constrained over the course of H7 than it was prior to the pandemic, the effect of Heathrow's capacity constraint on its exposure to systematic risk may be reduced.

- Similarly, it is not clear that differences in passenger volatility observed prior to the pandemic will persist under post-pandemic circumstances, even in relatively benign times.

- Increases in the share of holdings in non-European airport businesses at the comparators (ADP and Fraport in particular) may have reduced the reliability of relative risk analysis. On the one hand, the comparator beta's may be driven higher due to the effect of smaller (riskier) airports in less-developed markets (as suggested by CEPA). On the other hand, because these holdings are in economies outside the EU, their contribution to the observed group beta (measured against a European index) may work in the opposite direction.

- Finally, pre-COVID conclusions about the extent to which lower exposure to low-cost airlines and short-haul traffic are less clear since the pandemic due to permanent changes in travel behaviour (e.g. changes in business travel). We note Oxera's suggestion that low-cost airline traffic at comparator airports recovered quicker after the COVID-19 pandemic – suggesting that, post-COVID, the directional impact of this difference is the opposite to that assumed by CEPA .

We also disagree with CEPA's suggestion that the CAA's analysis at Q6 justifies a downwards adjustment to the H7 baseline beta of 9 basis points.[84] Specifically CEPA refers to relative risk analysis that it says the CAA carried out at Q6 to find an asset beta for Heathrow from comparator stocks (specifically ADP and Fraport).

[84] CEPA report, p. 17 and 18.

First, while we did not carry out a relative risk analysis in our April 2020 report, we did discuss why we considered the CAA's H6 beta range for Heathrow was no-longer supported by more recent evidence.[85] We also note that it is now even less appropriate to place weight on an estimate of Heathrow's beta implied by the observed beta for BAA from before its delisting in 2006 (i.e. 16 years ago – and relying on backwards-looking share price data that is even older).

Second, we disagree with CEPA that the CAA's analysis at H7 even implies a 9 basis point downward adjustment applied at the time. We understand that CEPA derives its 9 basis point estimate from Figure 7.3 of the CAA's Q6 Final Proposals WACC Appendix.[86] However, while the midpoint of the beta ranges of Fraport and ADP are indeed c. 0.09 higher than the midpoint of the range shown for Heathrow (0.47), after considering all evidence, the CAA in fact concluded that HAL's beta was likely to be higher than the midpoint of the range shown in the figure *"and likely to be in the region of 0.5".*[87]

## 5.4 Use of AENA (Madrid) as our preferred comparator airport

In our August 2021 report, we recommended that the CAA uses AENA as the preferred comparator for the COVID adjustment, finding it was the most comparable airport to Heathrow and exhibited the most similar group characteristics.

**Stakeholder views**

CEPA disagrees with our use of AENA as our preferred comparator, arguing that is "*at least as*" flawed as ADP, Fraport or Sydney,[88] and sets out a series of reasons why AENA faces different risks to Heathrow:[89]

- AENA and Heathrow have a very different traffic mix, and hence different traffic volatility. In particular, AENA has a higher share of domestic traffic, and a smaller share of long-haul travellers. CEPA argues that similar factors led Flint to reject the use of Sydney airport. AENA also has more low-cost carriers compared to Heathrow.

- AENA group is highly diversified (across 69 airports), which makes it "*as incomparable*" to Heathrow as ADP and Fraport, while Flint (and the CAA) considered that ADP and Fraport's diversification leads them to be less risky than Heathrow.

- AENA's traffic fell more than Heathrow, ADP or Fraport following the 2008 Global Financial Crisis, and CEPA adds that there were "*material issues around the sovereign debt of AENA's partial owner, the Spanish government*".[90]

HAL's consultant, Oxera states that its own analysis finds "*AENA remains the most comparable company to HAL in the sample, due to the similarity of regulatory framework and other operational features*".[91] It argues, however, that AENA's relatively high share of domestic traffic would have

[85] Flint April 2020 report, p. 18.
[86] CAA, CAP 1115, p. 73.
[87] CAA, CAP 1115, para. 7.72
[88] CEPA report, p. 14.
[89] CEPA report, p. 14-16.
[90] CEPA report, p. 15.
[91] Oxera report, p. 16.

lessened the effect of COVID-19 compared to Heathrow, because domestic traffic recovered faster than international traffic.[92]

**Response to points raised**

***Use of AENA in our assessment of the COVID adjustment***

We disagree with CEPA's view that AENA is an inferior comparator compared to ADP and Fraport. We set out a series of reasons in our August 2021 report why we consider that it was the most similar comparator particularly in relation to factors which are likely to have affected its systematic risk (and hence its beta) during COVID-19.

We acknowledge the differences between AENA and Heathrow that CEPA sets out in its response, but these simply demonstrate that there is no perfect listed comparator airport (or airport group) – not that it is wrong to place greater weight on AENA than on ADP, Fraport and Zurich.

Like any comparator, AENA has differences in traffic mix compared to Heathrow. While CEPA implies the different traffic mix at AENA exaggerates risks faced by Heathrow, Oxera argues it 'insulated' AENA from the effect of the pandemic compared to Heathrow. These differing views are a good example of the difficulty in considering the effect of traffic mix on airports vulnerability to COVID-like events in isolation. We have therefore interpreted differences in traffic mix alongside other airport and group characteristics, as detailed in our August 2021 report.

We also note that, since COVID-19 affected Australia differently to Europe (in 2020 in particular), considerations around the high domestic traffic for Sydney are not equivalent to considerations concerning the high share of domestic traffic for European airports.

As discussed in Section 5.3 above, we disagree with CEPA's suggestion that a higher share of low-cost airlines and a smaller share of long-haul traffic necessarily implies that Heathrow was less exposed to the COVID-19 pandemic than AENA.

CEPA argues that AENA group's diversification across multiple airports makes it equally as incomparable to Heathrow as ADP or Fraport. We disagree. As we set out in our last report, we estimate around 80% of AENA's shareholdings to represent EU airports, higher than ADP and Fraport, at around 45% and 50% respectively.[93]

For the purpose of estimating the effect of COVID-19 on betas, we chose to place greater weight on comparators whose beta predominantly reflected European continental airport businesses, since their experience of COVID-19 is more likely to be similar to Heathrow than airports in other continents. The similarity of macro-economic influences and geographical similarities suggest that the European comparators are likely to be more relevant, both pre-COVID and post-COVID.

We also note here the potential implications of the use of the STOXX 600 as the relevant index against which our comparator betas are calculated. Other things equal, the (recently increased) inter-continental diversification of the other European airport groups may have led to a reduction in observed betas for these groups relative to that which might be observed for the principal airport alone (when measured against the STOXX 600). That said, the exact influence of diversification on

[92] Oxera report, p. 7-8.
[93] Flint August 2021 report, p. 44-46.

the group beta is very difficult to establish, because of a number of other considerations related to the diversified airport holdings in other regions.

We do not understand the relevance of CEPA's observations about the fall in traffic at AENA's airports after the 2008 recession – nor its comment about Spanish sovereign debt. We note, however, that AENA's fall in traffic during 2020 was similar to Heathrow and our other comparators.

***Use of AENA in our baseline beta***

CEPA argues its evidence raises questions about the "*suitability of AENA as the primary comparator to Heathrow, particularly for the pre-COVID beta*".[94] CEPA is wrong to suggest that we relied on AENA as the primary comparator for our baseline beta. While we considered that similarities between the regulatory regime and operational features prior to the COVID-19 pandemic likely made it a better pre-COVID comparator for Heathrow, our analysis into the pre-COVID beta predates our assessment of AENA as the primary comparator for the COVID adjustment. Instead, we simply noted, in our August 2021 report, that the range of its betas "*sit close to both ends of our existing range in any case*"[95], and made no adjustment to account for AENA's higher beta.

## 5.5 General comments on baseline beta comparator evidence

In this section we address CEPA's general comments about our baseline beta. We respond to CEPA's assessment of relative risk in relation to individual comparators, in Sections 5.1 to 5.5 above.

**Stakeholder views**

CEPA argues that our preferred comparator set resulted in a too high baseline beta, because it placed weight on comparators with higher empirical betas without the offsetting downward adjustment from an appropriate relative risk assessment.[96]

CEPA argues that our use of a European index (the STOXX 600) rather than domestic indices overstates asset betas (e.g. by 0.07-0.12 for ADP and Fraport), and similarly that a global index would reduce beta estimates by around 0.10.[97] CEPA also argues that delivering comparator betas using the market value of debt, rather than the book value of debt, would likely have reduced comparator beta estimates.[98]

Finally, CEPA argues that we have 'incorrectly rounded' our asset beta range, and that by recommending a baseline beta of 0.50 to 0.60, Flint (and the CAA) excluded longer term evidence which points towards the bottom of our pre pandemic beta range.[99]

[94] CEPA report, p. 16.
[95] Flint August 2021 report, p. 32.
[96] CEPA report, p.14.
[97] CEPA report, p. 13.
[98] CEPA report, p. 13.
[99] CEPA report, p. 11.

**Response to points raised**

***Our baseline beta relies on the three most comparable airports to Heathrow, and avoids relying on both higher and lower outliers***

We disagree with CEPA that our reliance on AENA, ADP and Fraport for the baseline beta is biased towards comparators with higher betas. Instead, it relies on the comparators we consider most similar to Heathrow, and excludes comparators with betas which are higher (e.g. Zurich) and lower (e.g. Sydney).

We disagree with CEPA's suggested alternative comparators for the baseline beta and set out our rationale for each individual comparator in the subsections above.

We note that our rationale for rejecting additional comparators (in the pre-COVID beta) is consistent with those employed by the CMA in its redetermination for NERL. While we acknowledge that HAL and NERL do not operate the same businesses, the CMA's main considerations are also applicable in the case of Heathrow, namely:[100]

- that investors in larger airports groups are more likely to be guided by expectations around longer-term trends in the aviation sector
- betas for smaller airports are more likely to be affected by company-specific factors and liquidity problems that distort betas; and
- that "*very geographically distinct markets*" in New Zealand and Australia cannot be assumed to have "*comparable investors with a comparable view on systematic risk*"; and
- that "*outliers*" in terms of beta estimate compared to the other comparators should be excluded.

***We consider the European index is the most appropriate index for our analysis***

CEPA argues that the use of the STOXX 600 index exaggerates comparator betas compared to domestic indices. We disagree and set out in our previous reports why we prefer to rely on the STOXX 600 index.[101]

While CEPA suggests that our choice of index *biases* our estimate of Heathrow's beta upwards, the CMA argued in its NERL redetermination that the use of domestic indices would likely understate the beta of comparators:[102]

> *"In the case of the four firms in our sample, we found a consistent pattern that international betas relative to the Eurostoxx 600 index were higher than domestic betas. This suggested that the effect of systematic risk on 'shocks' to the share prices were more highly correlated to the European indices than to the domestic indices, and this in turn indicated that these were likely to be more relevant indices. The use of a European index for stocks based in eurozone countries meant that*

[100] CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, final report, para. 13.73 to 13.75.
[101] See, for example, Flint August 2021 report, p. 40.
[102] CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, final report, para. 13.94.

*currency risk was not a significant concern. On this basis we concluded that the international betas were likely to be more reliable as a measure of beta for the relevant firms."*

We note that, since a number of our European comparators have significant holdings in non-EU countries, the betas for the airport groups' stocks may instead be biased-downwards by our use of a European index – since movements in the value of non-EU airports may (other things equal) exhibit lower observed betas when measured using the STOXX 600 index, and thus 'drag down' the observed beta for the combined business as a whole. That said, we recognise the potential for other things not to be equal – for example, potential lower maturity of other airports within the group. Evaluation of the net effect of such inter-continental diversification is complex.

***We rely on the book value of debt for de-levering comparators equity betas***

CEPA suggests that our use of the book value of comparators' debt rather than the market value overstates beta estimates. However, as CEPA itself concluded in its own analysis, there is not reliable and consistent market data on the value of debt at comparators.[103] Therefore we continue to rely on the book value of comparators' debt.

***For our baseline beta, we place greater weight on more recent data than older data***

CEPA is wrong to state we reject longer term evidence (e.g. implied by 5-year betas) in forming a view on the baseline beta. Our range, of 0.50 to 0.60 encompasses spot estimates of the 5-year beta for all three comparators, including Fraport.

While our recommended range indeed did not encompass the 2- and 5-year trailing average of Fraport's 5-year beta, we showed in our April 2020 report that the average beta value for a 5-year trailing average (across all comparators) lay within our 0.50 to 0.60 range.[104] We also set out in our April 2020 report that our range reflected that (prior to the COVID-19 pandemic) betas for comparators were rising over time, leading us to place slightly greater weight on more recent data.

[103] CEPA (16 November 2020), H7 cost of capital estimation, p. 22.
[104] Flint April 2020 report, Figure 2, p. 20.

# 6. Flint's proposed pre-TRS beta range

As discussed in Section 3 above, we continue to consider that Heathrow's H7 beta is best captured by two components:

- A baseline beta – which ignores the impact of COVID-19 (effectively a 'pre-COVID' beta), and
- A 'COVID adjustment' – to be added to the baseline beta, reflecting the risk of events similar to COVID-19 that may occur in the future.

## 6.1 Summary of our updated recommended range

Our view of Heathrow's baseline beta is unchanged, and we retain our April 2020 (pre-COVID) beta range of 0.50 to 0.60. As discussed, our pre-COVID range is based on observed pre-COVID betas for AENA (Madrid), ADP (Paris) and Fraport (Frankfurt), the set of comparators which we consider are most similar to Heathrow prior to COVID-19, and without an assessment of Heathrow's relative risk compared to the three comparators.

For the beta adjustment for COVID, we retain our preferred approach of reweighting source data, in line with the August 2021 report, relying on comparator evidence from six airports, placing greatest weight on AENA, and placing least weight on Sydney and Vienna. However, we include additional data which has become available since our August 2021 report and rely on a slightly longer pre-COVID dataset for our analysis, as discussed in Section 4. This increases the COVID window in our analysis to around two years and the pre-COVID window to around five years.[105]

Under these assumptions, we find that a COVID-like event happening every 20 to 50 years would lead to an increase in asset beta of between 0.02 and 0.11, relative to the pre-COVID value, based on reweighted beta evidence from sets of comparator airport stocks (as described in more detail below). This compared to an estimated effect of between 0.04 and 0.14 in our August 2021 report. The reduction in implied COVID adjustment compared to last report can primarily be explained by the decrease in observed asset betas at comparator airports over the course of 2021, as shown by betas estimated over the 9-month period of additional data added at the end of our estimation window.

**TABLE 8: FLINT UPDATED ESTIMATES OF PRE-COVID-19 ASSET BETA AND COVID ADJUSTMENT**

| | Lower Bound | Upper Bound |
|---|---|---|
| **Baseline beta** | 0.50 | 0.60 |
| **Beta adjustment for COVID** | 0.02 | 0.11 |

Source: Summary of Flint analysis.

[105] We use a start date of 12th February 2015 for all comparators, when the first datapoint for AENA is available. For Sydney, our cut-off is 9th February 2022, i.e. the last day it was listed; to compensate for this shorter window of COVID-affected data compared to other comparators, we slightly increase the weight on Sydney's COVID-affected datapoints to simulate a beta for a slightly longer assumed COVID window (through to 31st March 2022).

These beta estimates refer to an unmitigated beta range. Appendix 1 providers further detail on our updated analysis.

As we describe in Section 7 below, Heathrow's beta for H7 should be adjusted downwards to account for the effect of the new Traffic Risk Sharing (TRS) Mechanism that CAA proposes to introduce.

## 6.2 Our updated COVID adjustment

### Overview

Table 9 below summarises our proposed COVID adjustment for COVID-like events of frequency between one-in-20 years and one-in-50 years, across our lower bound (24-month) and upper bound (36-month) duration, and across our three comparator set.

As the results show, the minimum implied COVID adjustment for each comparator set is two basis points – set by a once every 50 year COVID-like event of 17-month duration. The maximum implied COVID adjustment, which is set by more frequent (once ever 20 year) and longer (39-month) COVID-like events is marginally (one basis point) higher for our preferred comparator (AENA) than our four-company and six-company comparator sets.

**TABLE 9: SUMMARY OF UPPER AND LOWER BOUND COVID ADJUSTMENT**

| Frequency of COVID one in X years | AENA | 4 company | 6 company |
|---|---|---|---|
| **Base case, 26-month duration** | | | |
| **20** | 0.08 | 0.07 | 0.07 |
| **50** | 0.03 | 0.03 | 0.03 |
| **Lower bound, 17-month duration** | | | |
| **20** | 0.05 | 0.05 | 0.05 |
| **50** | 0.02 | 0.02 | 0.02 |
| **Upper bound, 39-month duration** | | | |
| **20** | 0.11 | 0.10 | 0.10 |
| **50** | 0.05 | 0.05 | 0.04 |
| **Overall range** | | | |
| **Min** | **0.02** | **0.02** | **0.02** |
| **Max** | **0.11** | **0.10** | **0.10** |

Source: Flint analysis based on Thomson Reuters data as of 31st March 2022.

Our final range (0.02 to 0.11) is asymmetric around our 'base case' result (0.03-0.08). Reflecting potential future events of greater impact than COVID-19 pushes up the upper bound of our range significantly compared to our base case. This is less true in reverse – the impact of potentially *less* significant future events has only a limited impact on our lower bound. The asymmetry suggests that the potential for future COVID-19 events to be more severe than COVID-19 may exert a larger effect on the forward-looking estimate of an airport's beta than the potential for future COVID-like

events to be shorter (or lower impact) than COVID-19, with direct implications for the cost of capital.[106]

In line with the parameters set out in Section 4, we have also updated our cross-check method. The updated results for the adjustment are 0.01 to 0.06, only slightly above the August 2021 results of 0.01 to 0.04. We however emphasise our preference towards our primary approach due to the reasons discussed in Section 3.

**TABLE 10: COMPARISON OF RESULTS, COVID ADJUSTMENT FOR EVENTS BETWEEN ONE IN 20 AND ONE IN 50 YEARS**

| | Preferred approach: Reweighting observations | | Cross-check approach: Beta weighting | |
|---|---|---|---|---|
| | **Minimum value** | **Maximum value** | **Minimum value** | **Maximum value** |
| **Base case duration** | 0.03 | 0.08 | 0.01 | 0.04 |
| **Lower bound duration** | 0.02 | 0.05 | 0.01 | 0.03 |
| **Upper bound duration** | 0.04 | 0.11 | 0.02 | 0.06 |
| **Overall** | **0.02** | **0.11** | **0.01** | **0.06** |

Source: Summary of Flint analysis.

[106] Specifically, based on data from COVID-19, and within the broad range under consideration in this exercise, the marginal effect (on the beta) of a proportionate increase in the assumed duration of future COVID-like events increases as duration increases.

# 7. Risk sharing mechanisms

Consideration of the CAA's proposed risk sharing mechanisms is not explicitly within the scope of our work. Nonetheless, because it is closely related to the exercise of risk assessment and beta estimation and as in our previous report, we offer views on some of the related stakeholder responses and associated issues below.

In our previous report we stated that:

> *"Our estimates do not address the CAA's proposal to introduce a new mechanism for traffic risk-sharing at H7. We have consciously developed them as being representative of Heathrow's systematic risk without any such sharing arrangements. The beta eventually adopted by the CAA for H7 will need to be moderated in line with the form of risk sharing that is implemented."*

We did not offer meaningful quantitative analysis on how such an exercise might be undertaken. At that time, we understood that the TRS was designed mainly to provide protection from 'extreme' risk events – and therefore our discussion of the proposal was largely focused on the potential moderation of the COVID-adjustment.

We did, however, indicate that such an adjustment would be appropriate, in particular to the COVID-adjustment, while noting that any adjustment to the pre-COVID beta would be more complex.

**Stakeholder views**

HAL and the Airlines Community both comment on the effect of the TRS on the CAA's beta estimates:

- HAL suggested that the comparator airports all already benefit from some form of risk sharing, and so observed betas already reflect the impact of the TRS.[107]
- Oxera suggested that the impact of the TRS is overestimated as the CAA has not accounted for the in-period increases in cost of capital during and after pandemic-magnitude events.[108]
- CEPA argued that the CAA has failed to develop its own view of the impact of risk mitigations – suggesting the TRS impact on asset beta should be quantified.[109]

**Response to points raised**

***Comparators do not benefit from risk sharing like that offered by the prospective TRS***

Regarding HAL's suggestion, we recognise that the responses of regulators in jurisdictions related to our comparator set may have offered some protection from COVID-19. However, these responses have varied and have not offered mechanistic protection – other than to a limited degree in one instance to our knowledge (i.e. the limited traffic risk sharing that applied at ADP prior to the

[107] HAL response, para. 7.6.
[108] Oxera report, p.16.
[109] CEPA report, p. 30.

pandemic – referred to in our previous report).[110] Moreover, while other regulators may in some instances have acted to offer relief from the extreme financial downsides associated with COVID-19, we believe it unlikely that this is meaningfully reflected in the observed comparator betas due to its sporadic or 'one-off' nature.

Based on information provided by the CAA, we are also unaware of any proposals from other regulators that either have offered or will offer meaningful and predictable mechanistic protection from risk during benign times. Some regulators may have adopted measures (such as shortened price control periods) than *enable* the possibility to provide greater protection from risk, but they do not guarantee this.

We therefore do not agree with HAL's suggestion that the comparator betas already implicitly reflect the protections offered by the proposed TRS – either within our estimated COVID adjustment, or the baseline beta.

***Adjusting the RAB under the TRS to reflect the 'in period' WACC would be unduly complex***

Oxera's suggestion that the impact of the TRS is overestimated by the CAA, if we have understood this correctly, is linked to a belief that protection from adverse cash flow effects and the subsequent reinstatement of value into the RAB at the start of the next control period should be linked to an ex-post observed (rather than the ex-ante estimated) cost of capital.

Thus, when the TRS comes into effect, Oxera suggests this must be because risks are higher (or lower) than expected, and therefore the cost of capital has gone up (or down). It appears to be a technical point, of significant complexity but limited materiality – and also one that would need to apply symmetrically.

***The proposed TRS – if implemented – would in principle warrant a moderation of the COVID adjustment, and the adoption of a lower baseline beta***

CEPA's basic point regarding the impact of risk mitigations, and the need to consider adjustments to the comparator betas to reflect the TRS, has merit – and aligns with the views indicated in our August 2021 report.

Moreover, since our previous report, and in light of the development of the TRS proposals now being put forward by the CAA, our earlier views have been reinforced. The design of the TRS points to potentially significant protection for HAL investors from 'normal' risks than would have been borne by them in the past, as well as protection from more 'extreme' risks, of the type we have seen during the COVID-19 pandemic.

No such arrangements are or were in place for the comparators. This implies that both the baseline beta and the COVID-adjustment that we have calculated may overstate the risks that will be borne by Heathrow's investors in the future. Both the baseline beta and the COVID-adjustment should be moderated to reflect this.

[110] Flint August 2021 report, p. 34.

***In practice the required adjustments may be complex and difficult to evidence***

In our previous report we indicated a potential approach that might be used to moderate the COVID adjustment only, based on the extent to which the present value of cash flows was protected by the TRS. We also noted that the assessment of any adjustment to the pre-COVID, or baseline, beta would be more challenging.

We remain of this view. While the justification for an adjustment to the baseline beta is clearer than it was previously, the quantification of this is not a simple exercise. Benchmarking to the comparator set or to other regulated companies – for example, based on observed historic cash-flow volatility – may in theory offer a useful indication of the possible scale of adjustment required. However, even simplified approaches such as this may involve complex practical challenges – analysis of and potentially limited historical financial data and reliance on speculative assumptions about the future.

While we would caution against an unduly technical approach, we also recognise that the adjustments required to the beta for H7 may be significant. Given the scale of protection afforded by the TRS, and in the absence of extensive technical evidence, this may necessitate material judgement on the part of the CAA.

# Appendices

## Appendix 1: Our updated COVID adjustment

### Updated base case results

Table 11 and Table 12 below set out the detailed results of our analysis across a range of frequencies of future COVID-like events of 26-month duration.

**TABLE 11: REWEIGHTED ASSET BETA ESTIMATES FOR OUR ASSUMED FREQUENCY OF COVID-LIKE EVENTS OF 26-MONTH DURATION**

| | AENA *Madrid* | ADP *Paris* | Fraport *Frankfurt* | Zurich | Vienna | Sydney | AENA | 4 company | 6 company |
|---|---|---|---|---|---|---|---|---|---|
| **2.2-year raw beta** | 0.90 | 0.79 | 0.65 | 0.76 | 0.86 | 0.56 | **0.90** | **0.78** | **0.76** |
| **7.1-year raw beta** | 0.70 | 0.72 | 0.63 | 0.70 | 0.51 | 0.53 | **0.69** | **0.69** | **0.63** |
| **Frequency of COVID-like event (1 in X years)** | | | | | | | | | |
| **20** | 0.59 | 0.63 | 0.55 | 0.64 | 0.34 | 0.52 | **0.59** | **0.60** | **0.54** |
| **50** | 0.55 | 0.58 | 0.51 | 0.61 | 0.26 | 0.52 | **0.55** | **0.56** | **0.50** |

Note: Assumes debt beta of 0.05. '4 company' column takes a simple average of AENA, ADP, Fraport and Zurich. '6 company' column takes an average of all six comparators. Sydney cut off is 9 February 2022, when it was delisted from the ASX.
Source: Flint analysis based on Thomson Reuters data as of 31st March 2022.

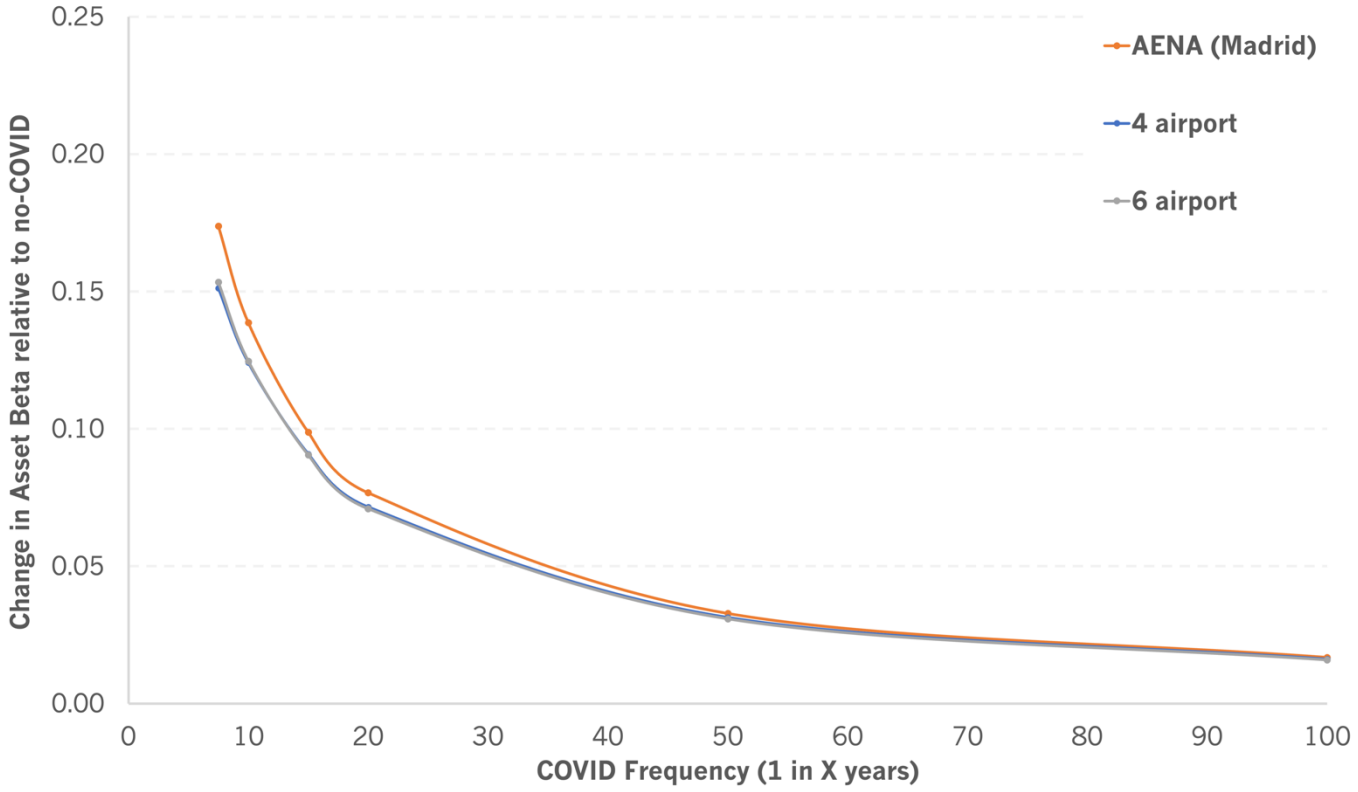
**TABLE 12: ESTIMATED COVID ADJUSTMENT FOR OUR ASSUMED FREQUENCY OF COVID-LIKE EVENTS OF 26-MONTH DURATION**

| | AENA *Madrid* | ADP *Paris* | Fraport *Frankfurt* | Zurich | Vienna | Sydney | AENA | 4 company | 6 company |
|---|---|---|---|---|---|---|---|---|---|
| **Frequency of COVID-like event (1 in X years)** | | | | | | | | | |
| **20** | 0.08 | 0.08 | 0.07 | 0.05 | 0.13 | 0.01 | **0.08** | **0.07** | **0.07** |
| **50** | 0.03 | 0.04 | 0.03 | 0.02 | 0.06 | 0.00 | **0.03** | **0.03** | **0.03** |

Note: Assumes debt beta of 0.05. '4 company' column takes a simple average of AENA, ADP, Fraport and Zurich. '6 company' column takes an average of all six comparators. Sydney cut off is 9 February 2022, when it was delisted from the ASX.
Source: Flint analysis based on Thomson Reuters data as of 31st March 2022.

Figure 3 below illustrates these same results as a graph for our three comparator sets.

**FIGURE 3: CHANGE IN ASSET BETA RELATIVE TO NO-COVID AT DIFFERENT FREQUENCIES OF COVID-LIKE EVENTS FOR OUR COMPARATOR SET**




Note: Assumes debt beta of 0.05. '4 company' column takes a simple average of AENA, ADP, Fraport and Zurich. '6 company' column takes an average of all six comparators. Sydney cut off is 9 February 2022, when it was delisted from the ASX.
Source: Flint analysis based on Thomson Reuters data as of 31st March 2022.

## Lower bound results

Table 13 and Table 14 below set out the detailed results of our analysis across a range of frequencies of future COVID-like events of 17-month duration.

**TABLE 13: REWEIGHTED ASSET BETA ESTIMATES FOR OUR ASSUMED FREQUENCY OF COVID-LIKE EVENTS OF 17-MONTH DURATION**

| | AENA *Madrid* | ADP *Paris* | Fraport *Frankfurt* | Zurich | Vienna | Sydney | AENA | 4 company | 6 company |
|---|---|---|---|---|---|---|---|---|---|
| **Frequency of COVID-like event (1 in X years)** | | | | | | | | | |
| **20** | 0.57 | 0.60 | 0.53 | 0.62 | 0.30 | 0.52 | **0.57** | **0.58** | **0.52** |
| **50** | 0.54 | 0.57 | 0.50 | 0.60 | 0.25 | 0.52 | **0.54** | **0.55** | **0.50** |

Note: Assumes debt beta of 0.05. '4 company' column takes a simple average of AENA, ADP, Fraport and Zurich. '6 company' column takes an average of all six comparators. Sydney cut off is 9 February 2022, when it was delisted from the ASX.
Source: Flint analysis based on Thomson Reuters data as of 31st March 2022.

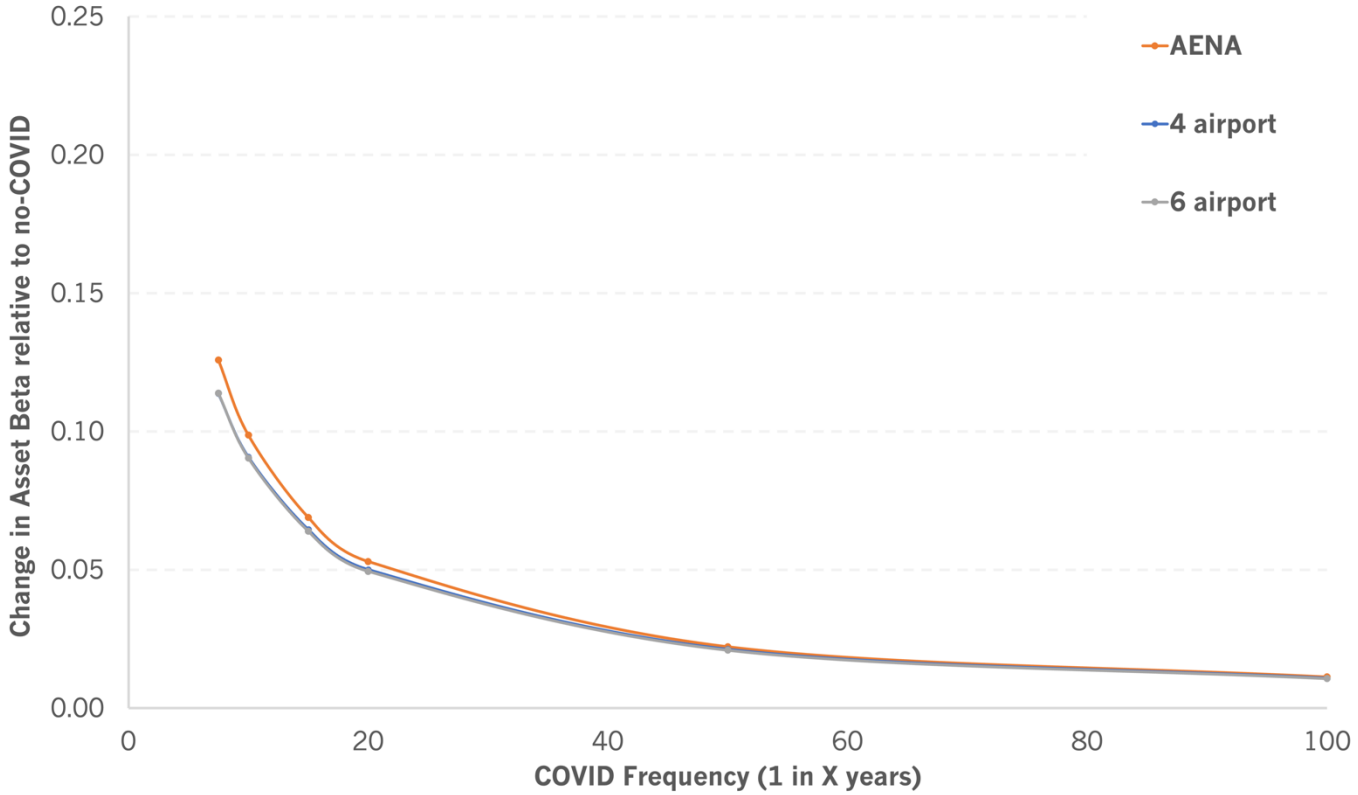
**TABLE 14: ESTIMATED COVID ADJUSTMENT FOR OUR ASSUMED FREQUENCY OF COVID-LIKE EVENTS OF 17-MONTH DURATION**

| | AENA *Madrid* | ADP *Paris* | Fraport *Frankfurt* | Zurich | Vienna | Sydney | AENA | 4 company | 6 company |
|---|---|---|---|---|---|---|---|---|---|
| **Frequency of COVID-like event (1 in X years)** | | | | | | | | | |
| **20** | 0.05 | 0.06 | 0.05 | 0.04 | 0.09 | 0.01 | **0.05** | **0.05** | **0.05** |
| **50** | 0.02 | 0.03 | 0.02 | 0.02 | 0.04 | 0.00 | **0.02** | **0.02** | **0.02** |

Note: Assumes debt beta of 0.05. '4 company' column takes a simple average of AENA, ADP, Fraport and Zurich. '6 company' column takes an average of all six comparators. Sydney cut off is 9 February 2022, when it was delisted from the ASX.
Source: Flint analysis based on Thomson Reuters data as of 31st March 2022.

Figure 4 below illustrates these same results as a graph for our three comparator sets.

**FIGURE 4: CHANGE IN ASSET BETA RELATIVE TO NO-COVID AT DIFFERENT FREQUENCIES OF COVID-LIKE EVENTS FOR OUR COMPARATOR SET**




Note: Assumes debt beta of 0.05. '4 company' column takes a simple average of AENA, ADP, Fraport and Zurich. '6 company' column takes an average of all six comparators. Sydney cut off is 9 February 2022, when it was delisted from the ASX.
Source: Flint analysis based on Thomson Reuters data as of 31st March 2022.

### Updated upper bound results

Table 15 and Table 16 below sets out the results for our upper bound, COVID-like events of 39-month duration.

**TABLE 15: REWEIGHTED ASSET BETA ESTIMATES FOR OUR ASSUMED FREQUENCY OF COVID-LIKE EVENTS OF 39-MONTH DURATION**

| | AENA *Madrid* | ADP *Paris* | Fraport *Frankfurt* | Zurich | Vienna | Sydney | AENA | 4 company | 6 company |
|---|---|---|---|---|---|---|---|---|---|
| **Frequency of COVID-like event (1 in X years)** | | | | | | | | | |
| **20** | 0.63 | 0.66 | 0.58 | 0.66 | 0.39 | 0.53 | **0.63** | **0.63** | **0.57** |
| **50** | 0.56 | 0.60 | 0.53 | 0.62 | 0.29 | 0.52 | **0.56** | **0.58** | **0.52** |

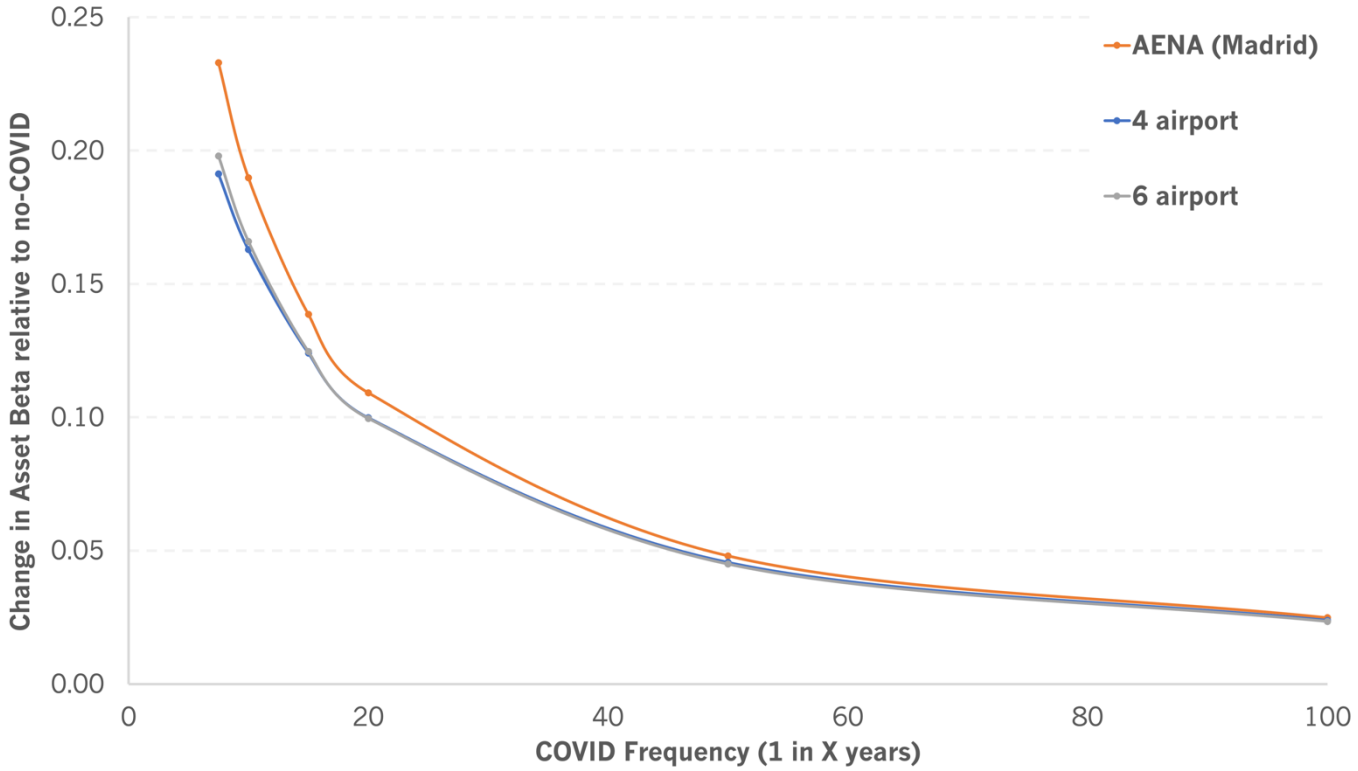
Note: Assumes debt beta of 0.05. '4 company' column takes a simple average of AENA, ADP, Fraport and Zurich. '6 company' column takes an average of all six comparators. Sydney cut off is 9 February 2022, when it was delisted from the ASX.
Source: Flint analysis based on Thomson Reuters data as of 31st March 2022.

**TABLE 16: ESTIMATED COVID ADJUSTMENT FOR OUR ASSUMED FREQUENCY OF COVID-LIKE EVENTS OF 39-MONTH DURATION**

| | AENA *Madrid* | ADP *Paris* | Fraport *Frankfurt* | Zurich | Vienna | Sydney | AENA | 4 company | 6 company |
|---|---|---|---|---|---|---|---|---|---|
| **Frequency of COVID-like event (1 in X years)** | | | | | | | | | |
| **20** | 0.11 | 0.12 | 0.10 | 0.07 | 0.19 | 0.01 | **0.11** | **0.10** | **0.10** |
| **50** | 0.05 | 0.05 | 0.05 | 0.03 | 0.08 | 0.01 | **0.05** | **0.05** | **0.04** |

Note: Assumes debt beta of 0.05. '4 company' column takes a simple average of AENA, ADP, Fraport and Zurich. '6 company' column takes an average of all six comparators. Sydney cut off is 9 February 2022, when it was delisted from the ASX.
Source: Flint analysis based on Thomson Reuters data as of 31st March 2022.

**FIGURE 5: CHANGE IN ASSET BETA RELATIVE TO NO-COVID AT DIFFERENT FREQUENCIES OF COVID-LIKE EVENTS FOR OUR COMPARATOR SET**




Note: Assumes debt beta of 0.05. '4 company' column takes a simple average of AENA, ADP, Fraport and Zurich. '6 company' column takes an average of all six comparators. Sydney cut off is 9 February 2022, when it was delisted from the ASX.
Source: Flint analysis based on Thomson Reuters data as of 31st March 2022.

# Appendix 2: Updated cross-check method

Based on the revised assumptions set out in Section 4, we have also re-estimated our results using the cross-check method we presented in our August 2021 report.

As for our main approach, we:

- Use a panel of daily observations over 7-years ending at our cut-off date, 31st March 2022;[111]
- Split our dataset into non-COVID and COVID data, before and after 1st February 2020 respectively; and
- Consider a range of assumptions about the frequency and duration of COVID-like events.

Whereas our primary approach reweights individual daily observations to simulate long-term betas, this alternative approach changes the relative weights on two separate beta estimates, which we combine to form an average. These two underlying betas, based on our three comparator sets, are shown in the tables below.

[111] Precisely, our dataset begins on 12th February 2015, since this is the first date for which AENA data is available. This means our total dataset is 12 days short of 7 years and 2 months duration.

### TABLE 17: ASSET BETA ESTIMATES FOR COVID AND NON-COVID PERIODS

| *Period of estimate* | AENA | 4 companies | 6 companies |
|---|---|---|---|
| **COVID Beta (2.2 years of data)** | 0.90 | 0.77 | 0.75 |
| **Non-COVID Beta (5 years of data)** | 0.52 | 0.53 | 0.47 |

Note: Assumes debt beta of 0.05. '4 company' column takes a simple average of AENA, ADP, Fraport and Zurich. '6 company' column takes an average of all six comparators. Sydney cut off is 9 February 2022, when it was delisted from the ASX.
Source: Flint analysis based on Thomson Reuters data as of 31st March 2022.

### TABLE 18: REWEIGHTED COVID BETA ESTIMATES, FOR OUR ASSUMED FREQUENCY OF COVID-LIKE EVENTS, FOR EVENTS LASTING 17 MONTHS

| | AENA *Madrid* | ADP *Paris* | Fraport *Frankfurt* | Zurich | Vienna | Sydney | AENA | 4 company | 6 company |
|---|---|---|---|---|---|---|---|---|---|
| **Frequency of COVID-like event (1 in X years)** | | | | | | | | | |
| **20** | 0.54 | 0.56 | 0.49 | 0.60 | 0.25 | 0.52 | **0.54** | **0.55** | **0.49** |
| **50** | 0.53 | 0.55 | 0.49 | 0.59 | 0.23 | 0.52 | **0.53** | **0.54** | **0.48** |

Note: Assumes debt beta of 0.05. '4 company' column takes a simple average of AENA, ADP, Fraport and Zurich. '6 company' column takes an average of all six comparators. Sydney cut off is 9 February 2022, when it was delisted from the ASX.
Source: Flint analysis based on Thomson Reuters data as of 31st March 2022.

### TABLE 19: REWEIGHTED COVID BETA ESTIMATES, FOR OUR ASSUMED FREQUENCY OF COVID-LIKE EVENTS, FOR EVENTS LASTING 26 MONTHS

| | AENA *Madrid* | ADP *Paris* | Fraport *Frankfurt* | Zurich | Vienna | Sydney | AENA | 4 company | 6 company |
|---|---|---|---|---|---|---|---|---|---|
| **Frequency of COVID-like event (1 in X years)** | | | | | | | | | |
| **20** | 0.56 | 0.57 | 0.50 | 0.60 | 0.28 | 0.52 | **0.56** | **0.56** | **0.50** |
| **50** | 0.53 | 0.55 | 0.49 | 0.59 | 0.24 | 0.52 | **0.53** | **0.54** | **0.49** |

Note: Assumes debt beta of 0.05. '4 company' column takes a simple average of AENA, ADP, Fraport and Zurich. '6 company' column takes an average of all six comparators. Sydney cut off is 9th February 2022, when it was delisted from the ASX.
Source: Flint analysis based on Thomson Reuters data as of 31st March 2022.

### TABLE 20: REWEIGHTED COVID BETA ESTIMATES, FOR OUR ASSUMED FREQUENCY OF COVID-LIKE EVENTS, FOR EVENTS LASTING 39 MONTHS

| | AENA *Madrid* | ADP *Paris* | Fraport *Frankfurt* | Zurich | Vienna | Sydney | AENA | 4 company | 6 company |
|---|---|---|---|---|---|---|---|---|---|
| **Frequency of COVID-like event (1 in X years)** | | | | | | | | | |
| **20** | 0.58 | 0.58 | 0.51 | 0.61 | 0.31 | 0.52 | **0.58** | **0.57** | **0.52** |
| **50** | 0.54 | 0.56 | 0.49 | 0.60 | 0.25 | 0.52 | **0.54** | **0.55** | **0.49** |

Note: Assumes debt beta of 0.05. '4 company' column takes a simple average of AENA, ADP, Fraport and Zurich. '6 company' column takes an average of all six comparators. Sydney cut off is 9 February 2022, when it was delisted from the ASX.
Source: Flint analysis based on Thomson Reuters data as of 31st March 2022.