

Support to the Civil Aviation Authority: NR23 Updated Beta Assessment

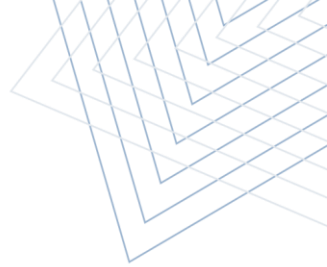
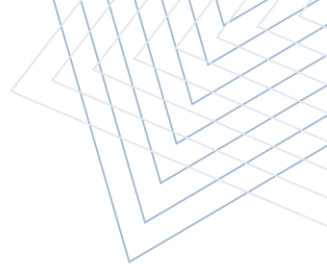


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Executive summary

Introduction

The Civil Aviation Authority (CAA) is setting a price control for NATS En Route plc (NERL) for the NR23 period (2023-2027).

In October 2022, the CAA published its Initial Proposals. Alongside this, the CAA published a report, produced by Flint in May 2022, on estimating NERL's beta following the COVID-19 pandemic. Ahead of Final Proposals, the CAA has asked us to update our analysis considering more recent evidence and stakeholder comments.

Our updated approach

In our earlier report, we recommended that NERL's beta is best captured by two components, a baseline beta (capturing prevailing risks unrelated to COVID-19) and a COVID adjustment (capturing risks associated with COVID-19-like events).

We consider that our overall approach from our May 2022 report remains appropriate and continue to recommend a beta for NR23 made-up of the same two components.

In updating our analysis, we have considered stakeholder comments on our May 2022 report and reviewed recent data. Since our last report, we have around one year's additional share price data.

We conclude that the recent data is sufficiently 'clean' of COVID-19 effects to inform our re-assessment of the baseline beta and the COVID adjustment for NERL at NR23. We draw this conclusion from evidence that airport betas have generally reverted towards pre-COVID-19 levels, from the heightened level observed following the pandemic. Figure 1 below illustrates this and our updated classification of the data.

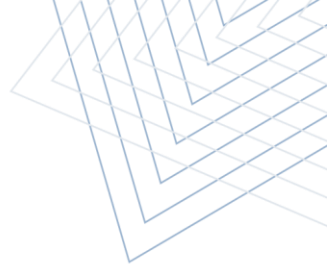
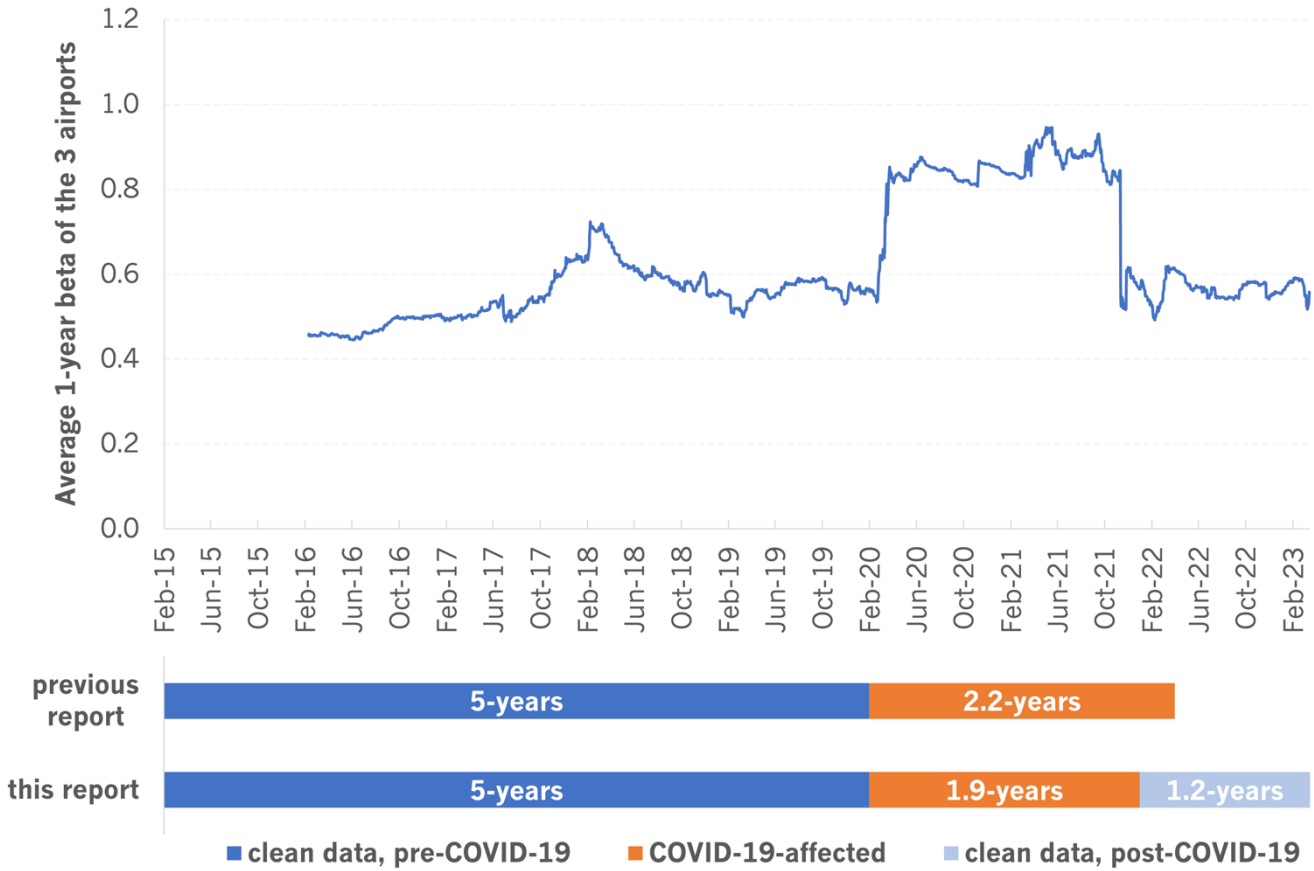


FIGURE 1: SUMMARY OF COMPARATOR BETAS AND UPDATED CLASSIFICATION OF DATA



Note: 3 airports include AENA, ADP and Fraport. Betas are estimated against the STOXX 600 and assume a debt beta of 0.05. Gearing is interpolated from Thomson Reuters reported net debt.
 Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

We retain our main comparators. Updated evidence for some comparators used previously, on which we placed limited weight, is no longer reliable and are removed from our wider comparator set. We have also reconsidered the relative weight to place on ENAV, the only listed Air Navigation Service Provider (ANSP).

Other elements of our approach remain aligned with our previous report.

Our updated recommendation

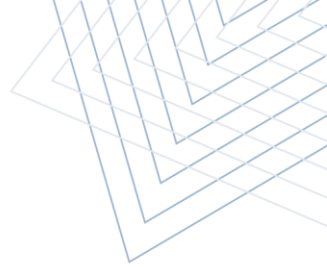
Our resulting recommendations are slightly changed from our previous report.

The combination of old and new data points to baseline beta estimates slightly below the midpoint of our previous range. We therefore reduce the lower bound of baseline beta from 0.52 to 0.50, while retaining our upper bound of 0.62.

For our COVID adjustment, we estimate a range (based on airports) of 0.02 to 0.08, slightly lower than the range in our earlier report.

Table 1 below summarises our updated asset beta recommendation for NERL at NR23.



**TABLE 1: FLINT UPDATED RESULTS**

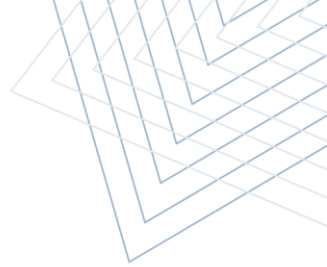
	Lower bound	Upper bound
Baseline beta	0.50	0.62
COVID adjustment derived from airport evidence	0.02	0.08
Combined beta for NR23	0.52	0.70
<i>Previous recommendation for NR23</i>	<i>0.54</i>	<i>0.73</i>

Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

Our recommendations mainly rely on evidence from the airport comparators. We (and the CAA) have not identified any explanation for the apparent instability of ENAV's beta over time, nor its divergence compared to the airport comparators (which remain more aligned).

ENAV's beta diverged greatly from the airports in our previous analysis. The ENAV pre-COVID-19 beta was lower, while our previous estimate of the COVID adjustment for ENAV was higher. ENAV evidence now points to a combined beta slightly above the mid-point of our range, made up of a baseline of 0.62 and a COVID adjustment of 0.02 to 0.04, for an overall beta of 0.64 to 0.66.

Nonetheless, there remains significant uncertainty about ENAV's beta, and unlike our airport comparators, the results for ENAV are sensitive to alternative classifications of our dataset. For this and other reasons, we remain of the view that the airport evidence is more robust and appropriate for estimating NERL's asset beta at NR23.



1. Introduction

The CAA is setting a price control for NATS En Route plc (NERL) for the NR23 period (2023-2027).

In October 2022, the CAA published its Initial Proposals. Alongside this, the CAA published a report, produced by Flint in May 2022, on estimating NERL's beta following the COVID-19 pandemic.¹ Ahead of Final Proposals, the CAA has asked us to update our analysis considering more recent evidence and stakeholder comments.²

Structure

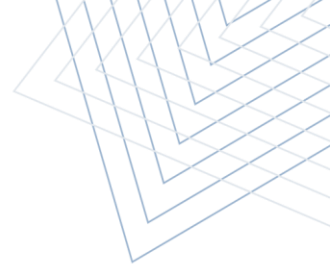
This report is structured as follows:

- Section 2 explains our updated approach,
- Section 3 presents our revised baseline beta estimate,
- Section 4 explains and presents our revised COVID adjustment, and
- Section 5 summarises our recommendations.³

¹ Flint (May 2022), Support to the Civil Aviation Authority: Estimating NERL's beta at NR23, hereafter "**Flint 2022 NR23 report**".

² This report should be read alongside our Flint 2022 NR23 report which explains our methodology in full.

³ The appendices set out further details and rationale about our approach.



2. Updated approach

This section explains our updated approach to estimating NERL's beta. We consider that the overall approach from our May 2022 report remains appropriate (see Section 2.1). However, we have updated the dataset we use to account for the extra year or so of data available since our last report, and we have considered how best to treat that data (see Section 2.2). We have also made minor changes to our comparator set and updated our view on the weight to place on airport comparators alongside ENAV, the only listed ANSP available to us (see Section 2.3).

2.1 Our overall approach

Summary of our approach (May 2022 report)

When estimating the asset beta for regulated businesses that – like NERL – are not listed, it is accepted practice to rely on historical data for relevant comparators.

We have previously prepared several reports for the CAA that were used to support CAA decisions related to the H7 price controls for Heathrow Airport.⁴ In these reports, we explained and demonstrated the distortive effect of the COVID-19 pandemic on observed betas in the aviation sector. We set out an approach that reflected this in an assessment of the forward-looking balance of risks faced by investors. Stakeholders agreed that recent asset beta evidence is characterised by periods of extreme and abnormal risk.

In our May 2022 report for NR23, we set out our recommendation for a beta for NERL comprised of a 'baseline beta' and a 'COVID adjustment'. This is aligned with the approach we adopted in estimating a beta for Heathrow Airport, reflected in the CAA's H7 proposals.⁵

- Our baseline beta is intended to reflect the systematic risk faced if an event like COVID-19 were never to happen again.
- Our COVID adjustment is intended to capture the systematic risk associated with potential future events similar in nature to COVID-19.

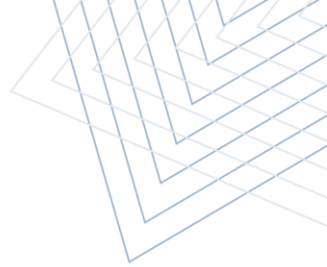
In essence, our approach posited that the COVID-19 pandemic may have changed investors' perceptions of the systematic risks that aviation stocks face, while recognising that the 'raw' betas observed during the COVID-19 pandemic are likely to overrepresent this effect.

To capture a more balanced view of the future risks faced, we developed beta estimates that captured a range of likelihood and impact of possible future COVID-19-like events, alongside the lower systematic risks observed during more benign periods.

To do this, we deconstructed recent historical share price data for comparator airports and reweighted it to estimate forward-looking betas.

⁴ See for example, Flint (May 2022), Support to the Civil Aviation Authority: H7 Updated Beta Assessment, hereafter "**Flint 2022 H7 report**", p. 9.

⁵ See for example Flint 2022 H7 report, p. 9.



Our updated approach

As summarised in Appendix 4, stakeholders have put forward alternative views on the appropriateness of our overall approach:

- NERL argues that our approach makes wrong assumptions about the end date of the COVID-19 pandemic, and understates tail risk by excluding important information about outliers.⁶ Similarly, Oxera, NERL’s advisor, argues that “*the CAA’s choice to reduce the weight on pandemic data in its analysis risks understating the ‘true’ beta for NR23.*”⁷
- Responding on behalf of British Airways, CEPA argues that our approach “*yields results that over-estimate the pandemic impact on NERL’s enduring asset beta.*”⁸ CEPA also notes that our approach allows outliers to have disproportionate influence and “*does not achieve the stated aim in terms of the relative balance of pre-pandemic and pandemic data.*”⁹

NERL and British Airways present opposing views on the effect of our approach on resulting beta estimates. While NERL/Oxera argue that our approach understates the ‘true’ beta for NR23, British Airways/CEPA argue that it over-estimates the pandemic impact.

Our approach reflects a balanced view of risk

While there is increasing evidence that aviation stocks and the wider market have moved beyond the COVID-19 pandemic (as we discuss in the section below), we consider that our approach remains appropriate for estimating the balance of risks faced, today, by an investor in NERL.

As stated in our H7 report,¹⁰ we consider that our approach faithfully captures the balance of risks faced by investors. Our approach reflects that COVID-19-like events may happen in the future, but that recent backward-looking aviation betas over-weight the prominence of this risk. The CMA stated the same view in the PR19 redetermination in March 2021:¹¹

“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.”

Oxera characterises our approach as ‘excluding outliers’ from the beta analysis, where instead we effectively *reweight* outliers in line with a more plausible forward-looking likelihood and impact. This provides a better basis from which to reflect the balance of systematic risk that NERL faces at NR23 than relying on recent ‘raw’ estimates of betas.

⁶ NERL (December 2022), NERL response to the CAA NR23 Initial Proposals, CAP2394, hereafter “**NERL response**”, p. 123.

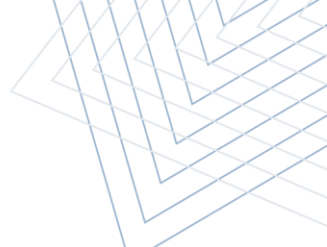
⁷ Oxera (December 2022), NR23 cost of capital: November 2022 update, hereafter “**Oxera report**”, p. 20.

⁸ CEPA (December 2022), NERL Cost of Capital – Response to the CAA’s Initial Proposals, hereafter “**CEPA report**”, pp. 12.

⁹ CEPA report, p. 12.

¹⁰ Flint (August 2021), Support to the Civil Aviation Authority: Estimating Heathrow’s beta post-COVID-19, hereafter “**Flint 2021 H7 report**”, Section 3.

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.



We also disagree with CEPA that our approach gives (the same) outliers associated with COVID-19 disproportionate influence. The extreme observations experienced during the COVID-19 pandemic inform our assessment of the market's potential reaction to prospective future COVID-19-like events, and should be duly reflected in a forward-looking beta estimate.

NERL and Oxera suggest that it is implicit in our approach that a COVID adjustment should be applied permanently (i.e. in future price control decisions).¹² We do not speculate about what market evidence will be available to the CAA in future. However, we agree that an 'ongoing' COVID adjustment may be justified, so long as backward-looking evidence relied upon to estimate the future 'baseline beta' is judged to be clean of COVID-19-like events, but the risks of such events are believed to remain.

We disagree with NERL's suggestion that an assessment of this kind in the future would not be in the interests of NERL and customers.

2.2 Changes to how we classify recent data

Summary of our previous approach (May 2022)

In our last report, we considered that all data since the start of the pandemic up until the end of our dataset (March 2022) should be treated as "COVID-19-affected". This was consistent with our approach for H7. It reflected that data since February 2020 was *potentially* affected by COVID-19, and should not, therefore, be included when estimating the beta that would prevail should a COVID-19-like event not occur.

We considered at the time that this was a cautious approach.¹³ We also tested alternative formulations of our model which demonstrated that the approach did not materially influence our resulting recommendations.¹⁴

Accordingly, for estimating baseline betas for each comparator, we relied only on pre-COVID-19 data.

For estimating our re-weighted betas, we treated all data since the start of the COVID-19 pandemic as COVID-19 affected. We then weighted the data in line with the assumptions of our model regarding the future likelihood and impact of COVID-19-like events.

From these, we calculated our (estimated) COVID adjustment. These simply reflected the difference between the clean, 'reference' beta estimates (based on pre-COVID-19 data) and our re-weighted beta estimates capturing less frequent COVID-19-like events.

Our updated approach

Some recent data is likely to be clean of COVID-19

At the time of our last report, recent short-window betas already suggested that COVID-19 may no longer be prominently affecting comparator betas in early 2022. However, we continued to adopt

¹² NERL response, p. 126 and Oxera report, p. 20.

¹³ Flint 2022 NR23 report, pp. 35-37.

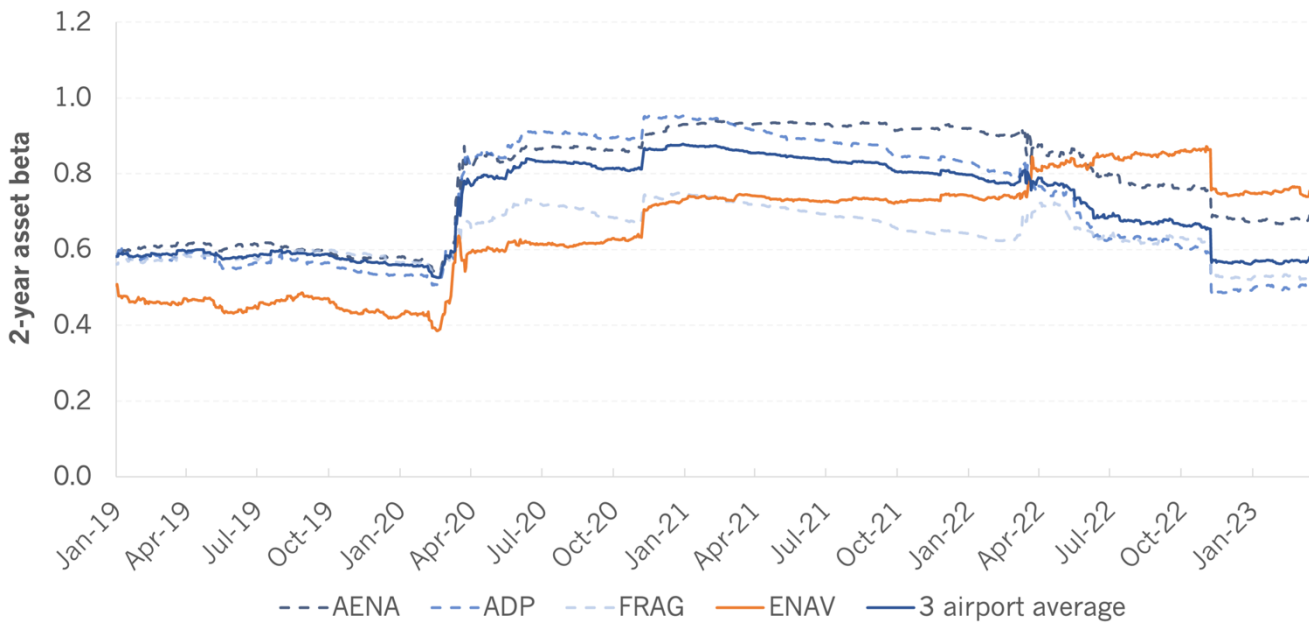
¹⁴ Flint 2022 NR23 report, p. 10.



a cautious assumption about the risk that recent data continued to be influenced by COVID-19. We did so because we considered the short-window estimates to be potentially unreliable, and in recognition of prevailing uncertainty at the time. Around 12 months of further new evidence is now available, and we are now able to estimate betas over longer windows more commonly used for regulatory purposes.

Figure 2 below shows two-year daily rolling asset betas for our main comparators. These now support a stronger conclusion that the significant and sudden elevation of betas since the COVID-19 pandemic emerged has now subsided. We observe two-year daily beta observations partly in recognition of their common use in regulatory settings. That said, evidence from shorter-window betas indicates that reversion may have occurred even earlier (see Figure 4 below), in line with our earlier tentative conclusion.

FIGURE 2: TWO-YEAR ROLLING COMPARATOR BETAS USING DAILY DATA



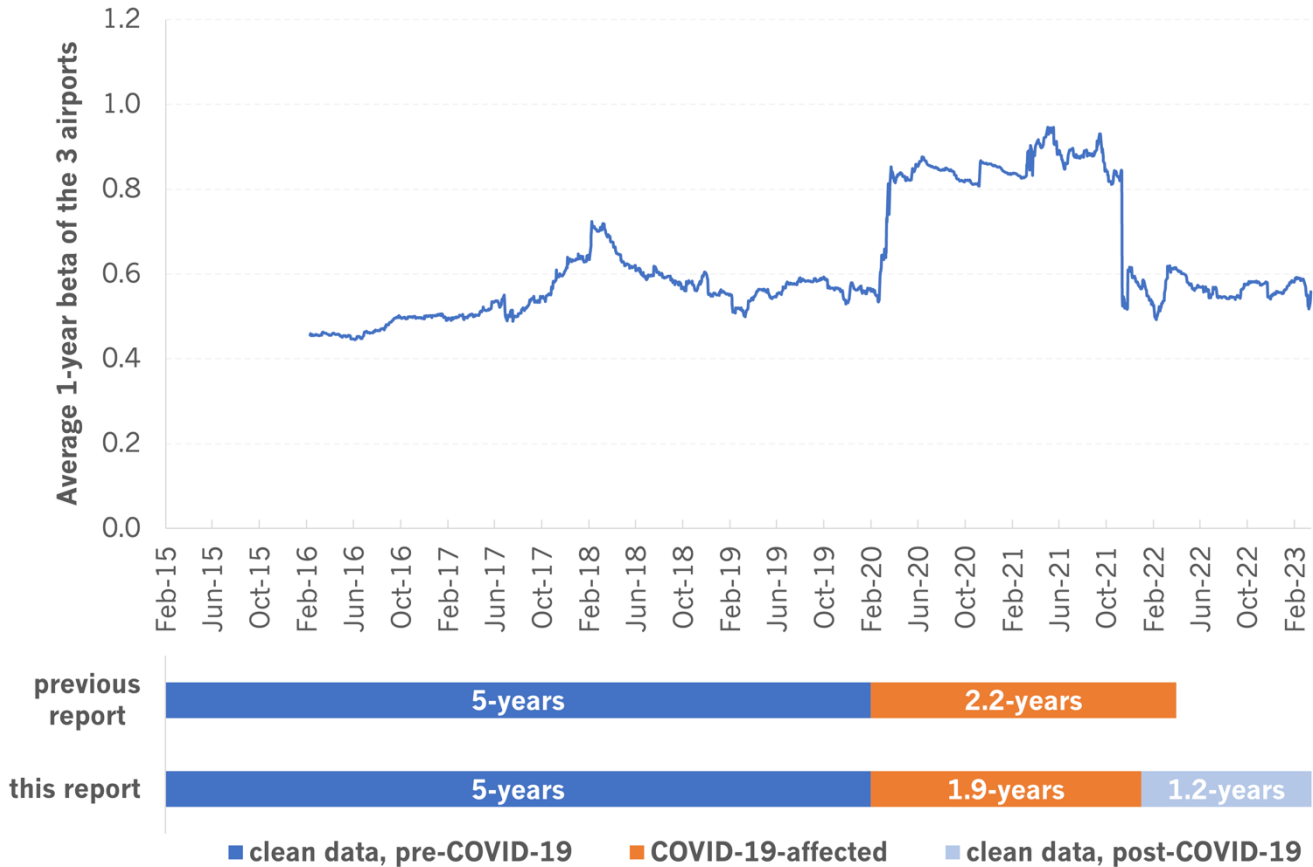
Note: 3 airports include AENA, ADP and Fraport. Betas are estimated against the STOXX 600, and assume a debt beta of 0.05. Gearing is interpolated from Thomson Reuters reported net debt.
 Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

Over the course of 2022, a series of other events will have affected aviation stocks (and market indices), for instance, events associated with the invasion of Ukraine and its effect on energy costs and the wider economy. While such events have not affected betas to the same extent as the COVID-19 pandemic, inclusion of such data in our COVID-19-dataset may lead us to misstate the nature of future COVID-19-like events. Similarly, the failure to consider recent evidence that may be clean of COVID-19 may lead us to wrongly estimate the beta that would have prevailed had the COVID-19 pandemic not occurred.

Since recent evidence supports the view that the ‘COVID-19 effect’ has receded from recently observed comparator evidence, we now define a conservative but clear cut-off date for the data we consider is ‘COVID-19 affected’ at the end of December 2021.

For simplicity (of illustration only), we consider the pattern shown by the one-year asset beta figures in particular, in Figure 3 below. The pattern of beta reversion around November 2021 is remarkably consistent across the principal airport comparator group. It is unusual – though reassuring – to observe such a clear and consistent pattern (see Figure 5 below).

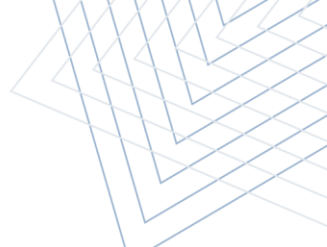
FIGURE 3: UPDATED CLASSIFICATION OF DATA



Note: 3 airports include AENA, ADP and Fraport. Betas are estimated against the STOXX 600 and assume a debt beta of 0.05. Gearing is interpolated from Thomson Reuters reported net debt.
 Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

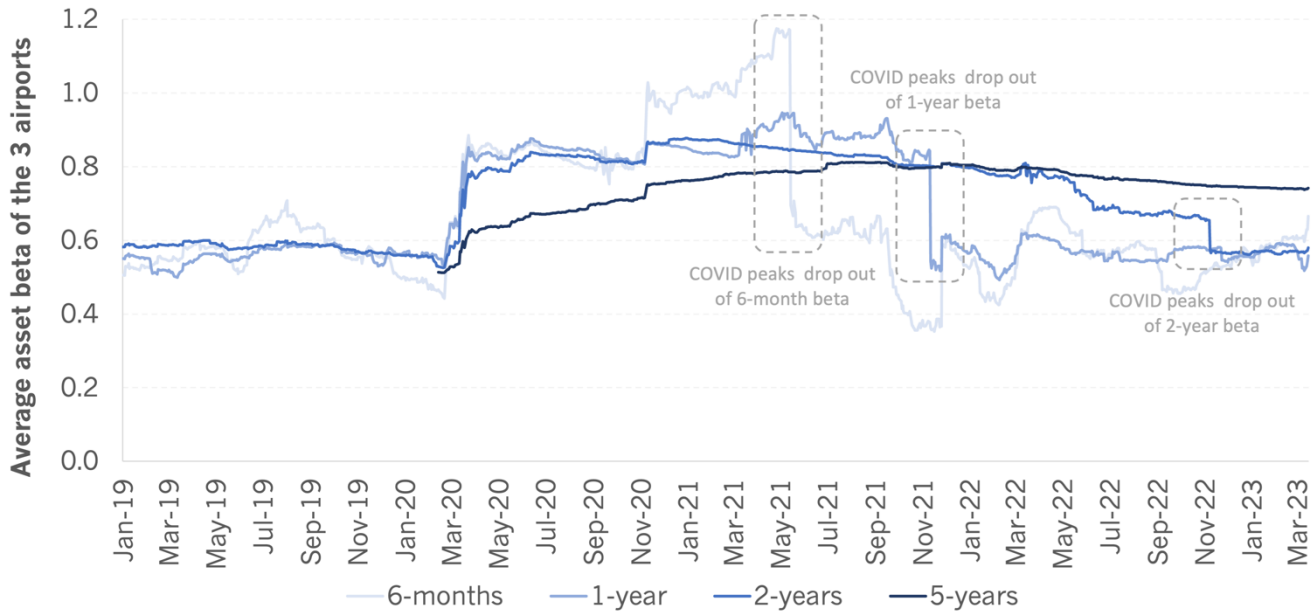
It is also apparent, from inspection of the underlying data, that this reversion of betas is not a function of new data being *included* within the beta calculations as time progresses, but, overwhelmingly, the *exclusion* of earlier COVID-19-affected data (from November 2020).

For example, the low one-year daily beta measured in January 2022 reflects price movements dating only back to January 2021. On the other hand, the high value of the obviously COVID-19-affected beta measured in October 2021 reflects price movements dating back to October 2020. The latter includes the data from November 2020 (a period dominated by news related to COVID-19 vaccines), while the former does not. Essentially the downward movement in observed betas is a direct reflection of effects of the November 2020 vaccine news falling out of the dataset. This turns out to have been the last major COVID-19 linked events that drove a distortive impact on betas.



Further illustration of this is seen in the behaviour of betas representing different data-windows over time, which we present in Figure 4 below. As the figure shows, betas estimated over shorter windows revert towards their pre-COVID-19 level sooner than betas estimated over longer estimation windows.

FIGURE 4: DAILY ASSET BETAS FOR THREE-AIRPORT COMPARATOR SET OVER DIFFERENT ESTIMATION WINDOWS

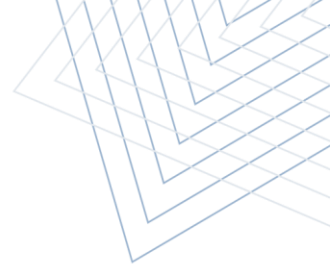


Note: 3 airports include AENA, ADP and Fraport. Betas are estimated against the STOXX 600 and assume a debt beta of 0.05. Gearing is interpolated from Thomson Reuters reported net debt.
Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

It is important to ensure that we capture any COVID-19 affected data within our COVID-19 dataset. Therefore, we reflect a period of ‘clear water’ of a year’s data between the apparent end of the distortive effects of COVID-19, and our defined cut-off date. This approach recognises that there is no clearly defined date at which COVID-19 ceased to have a dominant effect but a progression through which other events returned to prominence in defining market and share price behaviour. We therefore classify data since January 2022 as non-COVID-19 affected.

As a result, we now reflect the evidence beyond January 2022 in our updated recommendation for the NERL baseline beta. It offers the most recent view of observed systematic risk faced by the comparators. However, this dataset alone is insufficient to provide a reliable basis for beta estimates, covering too short a period. We therefore also reflect the older pre-COVID-19 evidence, which remains relevant, in arriving at our recommendation.

We calibrate our COVID adjustment in the same way. We treat recent data as part of our ‘clean-of-COVID-19’ dataset, for the purpose of estimating reweighted betas for each comparator and their counterfactual baseline beta. As we show later in our report, our estimate of the COVID adjustment is not sensitive to the precise cut-off date chosen for the COVID-19-affected dataset.



2.3 Changes to our comparator set

Summary of our approach (May 2022 report)

In our last report we evaluated evidence from six airport groups and ENAV, the only listed ANSP.

To reduce the impact of company-specific factors, we averaged the observed COVID adjustment across groups of airport comparators:

- A broad set of suitable airport comparators: AENA, ADP, Fraport, Zurich, Vienna and Sydney
- A subset of four airports considered more relevant: AENA, ADP, Fraport and Zurich
- The CMA's preferred airport comparator group used for RP3: AENA, ADP and Fraport

We also noted several factors that may have supported more weight being placed on airport evidence than ENAV.

Our updated approach

Sydney and Vienna are now rejected, and the inclusion Zurich does not affect our results

Sydney was delisted from the Australian stock exchange in February 2022. We are no longer able to use this comparator, as we are unable to estimate a baseline beta for it using a comparable dataset.

Since our last report, the one-year beta for Vienna has fallen below zero (see Figure 11 in Appendix 3). This is extremely unusual and raises questions about the reliability of data for Vienna. We therefore also disregard this comparator, to avoid it distorting our analysis.

Zurich airport remains relevant. However, as stated in our earlier report, Zurich may be less appropriate as a comparator for NERL than our (and the CMA's) group of three airport comparators. The other three remaining airport groups have much larger enterprise values, and should be given greater weight in our assessment.¹⁵ Based on enterprise values, Zurich is around one third of the size of ADP, and half as big as the next smallest comparator, Fraport. Zurich's observed beta during the pre-COVID-19 period was unstable, by comparison with other airports.

Zurich's implicit baseline beta within our model is only slightly above the other three comparators. We do not consider it appropriate to allow Zurich to exert undue influence (based on a simple average) given the higher level of consistency in baseline beta and COVID adjustment observed for the other three airports.

Also, in updating our analysis below, we find that the inclusion of Zurich in our comparator set does not materially change our implied COVID adjustment compared to the average of only three airport comparators. Therefore, for simplification, we now report our main results only for the

¹⁵ See, for example, the CMA's considerations on the relative size of Zurich and its other comparators, CMA (July 2020), NATS (En Route) Pls / CAA Regulatory Appeal, Final report, p. 186.



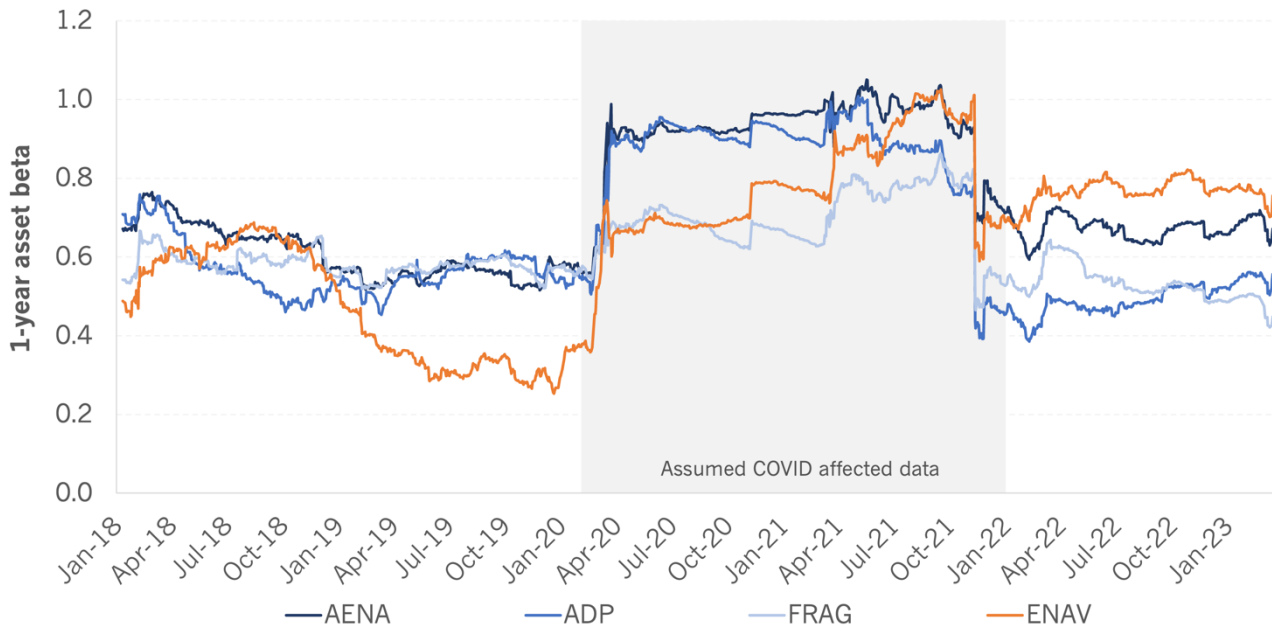
three-company comparator set and ENAV alone. We continue to report results for Zurich in Appendix 2.

ENAV’s beta estimates have remained less stable

In our May 2022 report for NR23, we set out our concerns with ENAV that undermined the reliability of its observed betas and led us to largely disregard ENAV data.¹⁶ We have reviewed recent evidence for this report.

First, we find ENAV’s beta estimates continues to be less stable than that of airports. Figure 5 below shows the one-year rolling asset beta for each comparator. ENAV’s asset beta has oscillated within a wider range than all comparator airports over the period. There is no obvious underlying reason for the more volatile behaviour of ENAV’s beta.

FIGURE 5: ONE-YEAR ROLLING BETA ESTIMATES



Note: Betas are estimated against the STOXX 600 and assume a debt beta of 0.05. Gearing is interpolated from Thomson Reuters reported net debt.
 Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

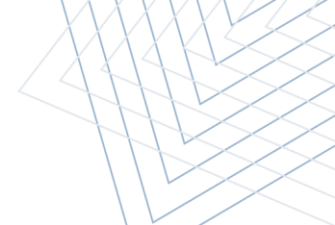
ENAV’s beta estimates are less statistically reliable

Statistical analysis suggests ENAV’s beta estimates are less reliable than each of the individual airport comparators over time.

Figure 6 below shows the estimated 95% confidence interval of airports and ENAV’s one-year daily beta estimate for each calendar year, based on the spot value at year end. ENAV confidence intervals are consistently wider than those of the airports.

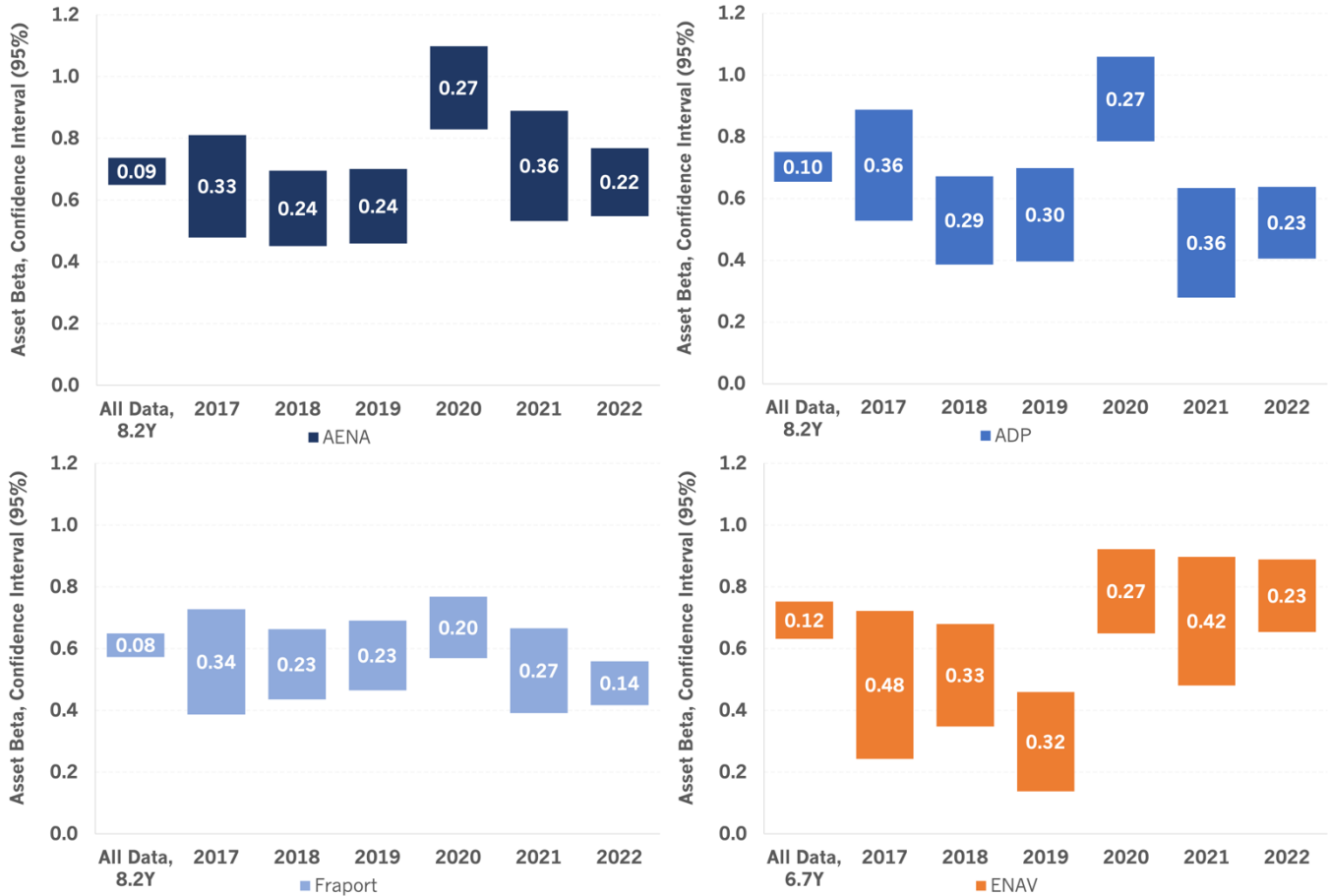
In addition, we are able to group the airports and observe an average, across the group. The betas of airports within our group generally exhibit a similar trend at each point in time. This offers

¹⁶ Flint 2022 NR23 report, pp. 17-19.



reassurance which helps improve confidence in the airport betas. We cannot do this for ENAV as it is the only listed ANSP.

FIGURE 6: CONFIDENCE INTERVALS OF AIRPORTS AND ENAV'S BETA



Note: The confidence intervals shown represent the confidence intervals of the underlying equity betas scaled to reflect average gearing over the year.

Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

Our updated conclusion on ENAV

Based on the analysis set out above and our previous reasoning, we continue to consider that ENAV is less reliable than our preferred airport comparators.

Furthermore, the apparent shift in value of ENAV’s beta between the pre- and post-COVID-19 level (and related to its volatility over time compared to other comparators) makes it particularly challenging to estimate the counterfactual beta that would have prevailed absent the COVID-19 pandemic – an important element when estimating NERL’s forward-looking beta.

The behaviour of ENAV’s beta is puzzling. We understand the CAA is unaware of evidence that would support disregarding the recent ENAV share price evidence. However, the CAA is also unaware of evidence that would point to a clear structural shift in ENAV’s systematic risk and lead us to disregard older evidence and place weight *solely* on the recent evidence. This leaves us with ENAV evidence which is highly variable and difficult to interpret. We also note that the Performance Review Body of the Single European Sky (PRB) did not put weight on ENAV’s beta information



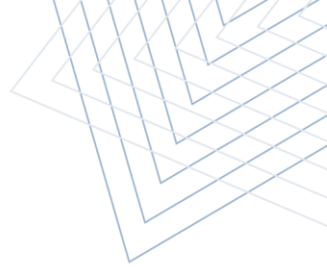
when estimating a cost of capital for ENAV that informs the preparation of performance plans by Member States.¹⁷

As the only listed ANSP comparator available to us, ENAV remains a relevant data point when estimating NERL's beta and is retained throughout our analysis. As a minimum, ENAV is useful as a cross-check of other evidence.

As we discuss in more detail below, we do not recommend placing great weight on ENAV's implied COVID adjustment, since it is relatively more sensitive to the parameters of our model. However, our estimate of ENAV's clean baseline beta is within the range of our baseline beta estimate for NERL, and that results for ENAV's COVID adjustment are similar to those we estimate from our preferred airport comparators.

If ENAV's beta stabilises in future, and greater evidence can be gathered on its direct comparability with NERL, this position might be reviewed.

¹⁷ Performance Review Body of the Single European Sky (September 2021), Study on cost of capital, Methodology review and update, pp. 19-22.



3. Baseline beta

This section sets out our updated approach to estimating a baseline beta for NERL. As we describe in Section 2 above, our baseline beta is intended to capture the balance of risks unrelated to COVID-19 that are likely to prevail in the future.

3.1 Our assessment

Summary of our previous approach

In our earlier report, we anchored our baseline beta recommendation to the CMA's RP3 asset beta, primarily for regulatory consistency.¹⁸ We noted at the time that had we carried out our own bottom-up analysis (on pre-COVID-19 data alone), we may have made some different methodological choices that might have supported a slightly lower baseline beta.¹⁹

The CMA:

- Used data from three comparator airport groups (AENA, ADP and Fraport), along with ENAV.
- Adopted a data cut-off date of 28 February 2020 – i.e. immediately before the COVID-19 outbreak. As such, the CMA RP3 asset beta range was unaffected by COVID-19.
- Estimated two-year daily, two-year weekly, five-year daily and five-year weekly betas. For each, the CMA then evaluated the spot estimate and one-year, two-year and five-year average of spot estimates.
- Developed an estimated range for each comparator which placed limited weight on the weekly data, in particular the two-year weekly beta estimates, with other outlier values also largely ignored.
- We infer that the CMA chose a 'central point' beta estimate for each comparator, rounded to the nearest 0.05. The CMA adopted a range around each 'central point' of 0.10 (i.e. plus or minus 0.05) "*reflecting the degree of uncertainty and judgement required*".

In light of recent market evidence (for the same comparators) that we consider unaffected by COVID-19, we evaluate how the CMA might have reflected this alongside (or instead of) the pre-COVID-19 data it relied on in its 2020 decision.

Recent clean data should be considered alongside older pre-COVID-19 data

In our last report, we estimated pre-COVID-19 betas for each comparator which we used as the clean, non-COVID-19 baseline against which we estimated our COVID adjustment. They previously

¹⁸ Flint 2022 NR23 report, p. 22.

¹⁹ "*These different methodological choices might have led us to estimate a lower baseline beta for NERL had we carried out our analysis bottom-up (rather than using the CMA's precedent for our NR23 baseline beta)*". Flint 2022 NR23 report, p. 22.



only reflected pre-COVID-19 data. Our recommendation for the baseline beta for NERL was, however, more directly linked to the (then very recent) CMA decision on NERL.

We considered the CMA's decision an important and relevant precedent. It also mainly reflected data that mapped onto our 'pre-COVID-19' dataset at that time. Because our pre-COVID-19 beta estimates did not point to obvious disagreement with the CMA's range, we did not diverge from its recommendation.

We now have a further 12 months of more recent 'non-COVID-19' data to inform an updated assessment of the baseline beta.

We compare beta estimates that we can observe from our combined 'non-COVID-19 dataset' with the pre-COVID-19 estimates set out previously by the CMA. We compare the CMA estimates with three new pieces of evidence which are relevant to balance the weight between recent and past evidence:

- The clean, 'reference' beta, against which we derive the COVID adjustment. This is effectively a spot c. six-year daily beta, made up of c.80% pre-COVID-19 data and 20% post-COVID-19 data. It gives equal weight to each 'clean' daily observation – i.e. data unaffected by COVID-19.
- A c.14-month trailing average of five-year daily betas estimated from a blended pre- and post-COVID-19 'clean' dataset. This puts greater weight on pre-COVID-19 evidence.²⁰
- A c. two-month trailing average of one-year daily betas estimated from 'clean' post-COVID-19 data only.

We recognise the shortcomings of one-year betas. A one-year window is shorter than the estimation window typically used by regulators and these observations carry correspondingly lower statistical confidence. We are therefore cautious about over-relying on these estimates. However, the one-year betas allow us to cross-check the pre-COVID-19 and post-COVID-19 'clean' data more directly.

Given we no longer rely solely on the evidence used previously by the CMA, the 'implicit baseline beta' also becomes a more important reference to ensure consistency with our COVID adjustment.

Table 2 below compares our new 'clean' beta estimates with the range the CMA relied-upon for each of its comparators. When the CMA reported its comparator-specific ranges in its final report, it did so based on a debt beta of zero. For consistency with the figures we report elsewhere in this report, we have adjusted the CMA estimates for each airport comparator to reflect an assumed debt beta of 0.05. This adjustment is in line with the CMA's own assessment for NERL, which lifted its final beta range by 2 basis points above its asset beta of 0.50 to 0.60 (with a zero debt beta).²¹

We make the following observations on the longer-term evidence:

- AENA's beta is at or below the bottom end of the CMA's proposed range at RP3.
- ADP's beta is close to or slightly below the midpoint of the range proposed by the CMA.

²⁰ Exact weighting varies, within each spot five-year estimate that contributes to the 14 month average.

²¹ CMA (July 2020), NATS (En Route) PIs / CAA Regulatory Appeal, Final report, p. 195 and 244. We do not adjust ENAV's estimates as they are not sensitive to a 0.05 debt beta.

- Fraport's beta sits in the upper half of the CMA's range.
- An average beta for the three airports sits below the midpoint of the CMA's range.

More recent (though less stable) shorter-term evidence, shown in the final row of the table, points to the following:

- Fraport and ADP's betas are close to the bottom end of the CMA's range.
- AENA's beta is slightly above the top-end of the CMA's range.
- An average beta for the three airports is exactly in the middle of the CMA's range.

The evidence for ENAV now consistently points to values above the top of CMA's estimated range for ENAV at RP3. Our c. five-year estimate of ENAV's beta (using all available 'clean' data) is materially higher than the CMA's earlier assessment of ENAV's beta. However, it is also comfortably within the range of the CMA's earlier resulting recommended beta for NERL (0.52-0.62).

TABLE 2: COMPARISON OF NON-COVID-19 ASSET BETAS WITH EARLIER CMA RANGES

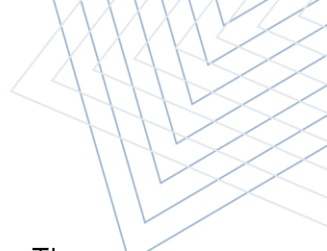
	AENA Madrid	ADP Paris	Fraport Frankfurt	3 airport average	ENAV
CMA decision at RP3					
Lower Bound	0.57	0.52	0.47	0.52	0.45
Upper Bound	0.67	0.62	0.57	0.62	0.55
Flint daily beta estimates using the non-COVID-19 dataset					
Clean 6.2-year beta, spot estimate (blend)	0.56	0.56	0.54	0.55	0.62
Clean 5-year beta, 1.2 years average (blend)	0.57	0.54	0.54	0.55	-
Clean 1-year beta, 0.2 years average (post-COVID-19)	0.69	0.54	0.49	0.57	0.76

Note: CMA estimates are based on spot estimates and one-year, two-year and five-year averages (updated for consistent debt beta treatment). The CMA noted two-year weekly betas were less reliable and put less weight on these estimates. Flint non-COVID-19 estimate includes five-years of pre-COVID-19 data for the period from February 2015 to January 2020 (3.5-years for ENAV, from July 2016 to January 2020) and 1.2 years of post-COVID-19 data for the period January 2022 to March 2023. We have adjusted the CMA estimates for a debt beta as described in the text above the table. Betas are estimated against the STOXX 600 and assume a debt beta of 0.05. Gearing is interpolated from Thomson Reuters reported net debt.

Source: Flint analysis based on Thomson Reuters data as of 15 March 2023. CMA (Jul 2020), NATS (En Route) Plc / CAA Regulatory Appeal, Final Report.

3.2 Our updated baseline beta

The evidence we relied upon for our baseline beta recommendation in our last report remains relevant for our assessment today. Regulators generally tend to 'drop' older historical data when updating beta estimates over time. However, the context here – in which COVID-19 interrupts or curtails any attempts to confidently estimate more recent 'clean' betas – means that older data remains appropriate. Therefore, in developing our recommendation, we focus on how the additional data we have collected may change our earlier conclusions.



First, we conclude that the upper-bound of our range (0.62) remains appropriate. The one-year post-COVID-19 beta we have estimated for AENA might suggest a higher/rising beta for that comparator. However, we are cautious about giving undue weight to recent one-year beta statistics of limited history.

Second, we have considered the implications of our updated findings on the lower-bound of our range (which was 0.52 in our last report):

- For most of our preferred airport comparators ‘clean’ long-window beta estimates support a beta below the midpoint of our previous range (0.56). All sit within a range of 0.54 to 0.57.
- Our long-window clean baseline beta (which is also important for estimating our COVID adjustment) is on average across the three comparators, 0.55 (with a range of 0.54 to 0.56). All values sit below the midpoint of our previous range.
- With the exception of AENA, recent, post-COVID-19 evidence is lower still (0.49-0.54).
- For our preferred baseline ‘clean’ estimate, our average across the three airport comparators is 0.55, which is also below the midpoint of our previous range.

Therefore, we conclude that the updated evidence supports a lower-bound of 0.50. This is consistent with our assessment of the pre-COVID-19 evidence implied by the same comparators in our assessment for Heathrow at H7.

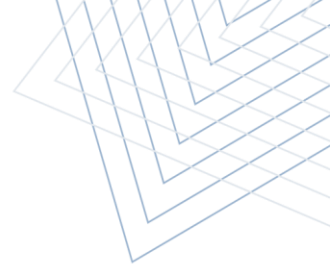
Accordingly, we recommend a revised baseline (non-COVID-19) beta range of 0.50-0.62.

Finally, we calculate ‘raw’ two-year betas – as a cross check. In our model we treat data from February 2020 to December 2021 as COVID-19 affected. However, we relax this assumption in evaluating whether our revised range is consistent with recent spot estimates of the beta estimated over a two-year window (from March 2021 to March 2023).

We do this in light of views from some stakeholders and the prominence placed on (more typically a longer time series of) two-year daily betas in previous regulatory decisions.²² The results provide some assurance, and support our overall conclusions.

For our preferred comparators, we estimate an average two-year daily spot value beta of 0.58, with a range of 0.52 to 0.69. Given the midpoint and average of the two-year beta is within our revised range, we consider our recommendation is not inconsistent with this cross-check.

²² The two-year daily asset beta estimates are: 0.69 for AENA, 0.52 for ADP and 0.53 for Fraport. Two-year daily asset betas estimated based on a beta window from 16 March 2021 to 15 March 2023, using a 0.05 debt beta.



4. COVID adjustment

This section explains our updated estimate of the COVID adjustment to be added to NERL's baseline beta, to capture the effect of future COVID-19-like events. We use the same methodology that we adopted in our last report but update our approach to account for our treatment of recent data. We also consider the effect of our classification of data on our results.

4.1 Our approach

We adopt the same overall method for estimating the COVID adjustment described in our last report.²³ For each comparator, we compare estimates of a clean or 'reference' beta (representing the beta that would have prevailed absent COVID-19) with re-weighted betas which reflect the risks of a COVID-19-like event occurring infrequently in future (e.g. once in a 50-year period). As before, we use 'Least Squares' regressions²⁴ and data from February 2015. We respond to specific stakeholder comments about our approach in Appendix 4 below.

The main change we have made relates to our classification of data into 'COVID-19-affected' and 'clean' subsets in light of the additional data available since our last report. As discussed in Section 2.2 above, we now include data since January 2022 in our 'clean' dataset.

TABLE 3: HISTORICAL DATASET OF DAILY DATA USED TO CONSTRUCT OUR RE-WEIGHTED BETAS

	Previous report (May 22)	This report (Apr 23)
Full dataset		
Start date	12 February 2015 (airports) 27 July 2016 (ENAV)	
End date	31 March 2022	15 March 2023
Assumed COVID-19 affected data		
Start date	1 February 2020	
End date	31 March 2022	31 December 2021

Source: summary of Flint dataset.

We evaluate the impact of this new treatment of recent data, in sensitivity analysis shown in Appendix 1. The assumption does not significantly influence our conclusions. The airport results are robust to alternative formulations of our model. On the other hand, ENAV's beta is sensitive to alternative classifications of COVID-19-affected and clean data. This reinforces the concerns expressed in our previous chapter about the reliability of the evidence for ENAV.

We retain our previous assumptions about the possible frequency of future COVID-19-like events, focusing on results within a range of once every 20, to once every 50 years.

²³ See Flint 2022 NR23 report, pp. 25-26.

²⁴ We adopt the 'Ordinary Least Squares' (OLS) method, applied to a re-weighted underlying dataset. This may sometimes be referred to as 'Weighted Least Squares' or WLS. In this report we generally use the term OLS to describe our approach.



Finally, we assume a range of potential impact of future COVID-19-like events. As before, we consider a central case in which future events exert similar impact to COVID-19, and then assume a lower and upper bound of two thirds and 1.5 times the impact of our central case respectively.

4.2 Our updated COVID adjustment

The table below summarises the results from our updated analysis. These show:

- The betas implied for COVID-19-like events of frequency between one-in-20 and one-in-50 years.
- Our central case, lower, and upper bounds in terms of ‘impact’, as described above.
- The table focuses on the results from our three-airport comparator set, and ENAV. We set out more detailed results in Appendix 2 below.

TABLE 4: SUMMARY OF UPPER AND LOWER BOUND COVID ADJUSTMENT

Frequency of COVID-19-like events one in X years	3 airport average	ENAV
Clean beta		
Non-COVID-19 beta estimate	0.55	0.62
Central Case		
COVID adjustment		
20	0.06	0.03
50	0.02	0.01
<i>Re-weighted COVID-19 beta</i>		
<i>20</i>	<i>0.61</i>	<i>0.65</i>
<i>50</i>	<i>0.57</i>	<i>0.64</i>
Lower Bound		
COVID adjustment		
20	0.04	0.02
50	0.02	0.01
<i>Re-weighted COVID-19-like events beta</i>		
<i>20</i>	<i>0.59</i>	<i>0.65</i>
<i>50</i>	<i>0.57</i>	<i>0.63</i>
Upper Bound		
COVID adjustment		
20	0.08	0.04
50	0.04	0.02
<i>Re-weighted COVID-19-like events beta</i>		
<i>20</i>	<i>0.63</i>	<i>0.67</i>
<i>50</i>	<i>0.59</i>	<i>0.64</i>
Overall range		
Minimum	0.02	0.02
Maximum	0.08	0.04

Note: Betas are estimated against the STOXX 600 and assume a debt beta of 0.05. Gearing is interpolated from Thomson Reuters reported net debt.

Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

The implied range for the COVID adjustment for our three-airport comparator set is between two and eight basis points (0.02 to 0.08). This is added to the baseline beta range of 0.50 to 0.62 described in the previous chapter, to give an overall 'COVID adjusted' beta range of 0.52 to 0.70.

The range for the COVID adjustment is slightly lower than our previous range of 0.02 to 0.11. The fall largely reflects the small increases in the average 'non-COVID-19' betas that result from the treatment of recent data as 'clean'. This, in turn, reduces the implied effects of COVID-19 within our re-weighted betas.²⁵

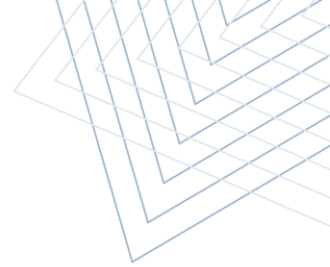
²⁵ For example, for our Central Case, the clean baseline beta has increased by 4 basis points compared to our last report, while our reweighted betas for COVID-like events occurring once every 20 and 50 years have increased by only 2 basis points.



The COVID adjustment implied by ENAV data has become more closely aligned to the airport evidence.

At the Initial Proposals stage, data for ENAV suggested a higher COVID adjustment of 0.04 to 0.17, and a lower baseline beta (0.41). Both have changed materially. The more recent ENAV evidence suggests a COVID adjustment of 0.02 to 0.04 and a revised baseline beta of 0.62.

The decrease in ENAV's COVID adjustment is again driven by our inclusion in the model of more recent, 'clean' data. While this has little impact on the airports, it drives a materially higher non-COVID-19 beta (and lower COVID adjustment) for ENAV than we observed previously.



5. Conclusions and recommendations

As set out above, we continue to consider NERL's beta is best captured by two components, a baseline beta (capturing prevailing risks unrelated to COVID-19) and a COVID adjustment.

In updating our analysis, we have considered stakeholder comments on our May 2022 report and reviewed recent data. Since our last report, we have around one year's additional data.

We consider that our overall approach from our May 2022 report remains appropriate. However, in reflecting the new data available, we conclude that recent data is sufficiently 'clean' of COVID-19 to inform our re-assessment of the baseline beta for NERL at NR23 and the counterfactual beta that would have prevailed in the absence of COVID-19.

We have also refined our comparator set (although retain our main airport comparators) and reconsidered the relative weight to place on airport comparators versus ENAV, the only listed ANSP available to us. As a result, our recommendations rely mainly on evidence from the airport comparators.

For our baseline beta, we now reflect some recent clean data alongside evidence from before the COVID-19 pandemic. The latter includes the information which informed the CMA's assessment of NERL's beta in 2020, and the basis on which the CMA arrived at its conclusions at that time.

In our view the combination of old and new data points to baseline beta estimates slightly below the midpoint of our previous range. We therefore reduce our lower bound baseline beta from 0.52 to 0.50, while retaining our upper bound of 0.62.

For our COVID adjustment, we estimate a range (based on airports) of 0.02 to 0.08. The upper bound is lower than we proposed in our last report of 0.11. The changes arise partly due to our revised estimates of the beta that would have prevailed in the absence of COVID-19, and also in the convergence of comparator results, which narrow the overall proposed range.

Table 5 below summarises our updated recommendation.

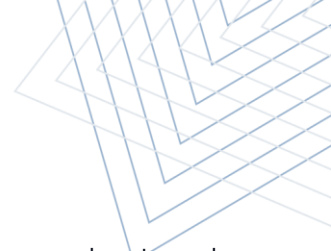
TABLE 5: FLINT UPDATED RECOMMENDATION

	Lower bound	Upper bound
Recommended baseline beta range	0.50	0.62
COVID adjustment	0.02	0.08
Combined beta for NERL at NR23	0.52	0.70
<i>Previous recommendation for NR23</i>	<i>0.54</i>	<i>0.73</i>

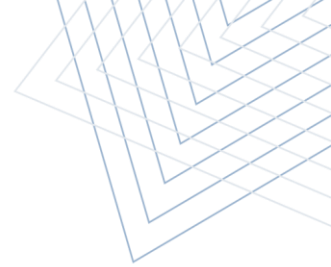
Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

ENAV's beta diverged greatly from the airports in our previous analysis. However, its evidence now points to a beta slightly above the mid-point of our range (a baseline of 0.62 and a COVID adjustment of 0.02 to 0.04, for an overall beta of 0.64 to 0.66).

Nonetheless, there remains significant uncertainty about ENAV's beta, and unlike our airport comparators, the results for ENAV are sensitive to alternative classifications of our dataset. For



this and other reasons, we remain of the view that the airport evidence is more robust and appropriate.



Appendices

Appendix 1. Sensitivity analysis

Given the uncertainty about the exact date at which recent data can be considered ‘clean’ of COVID-19, we consider the sensitivity of our results to the dates used to classify our dataset.

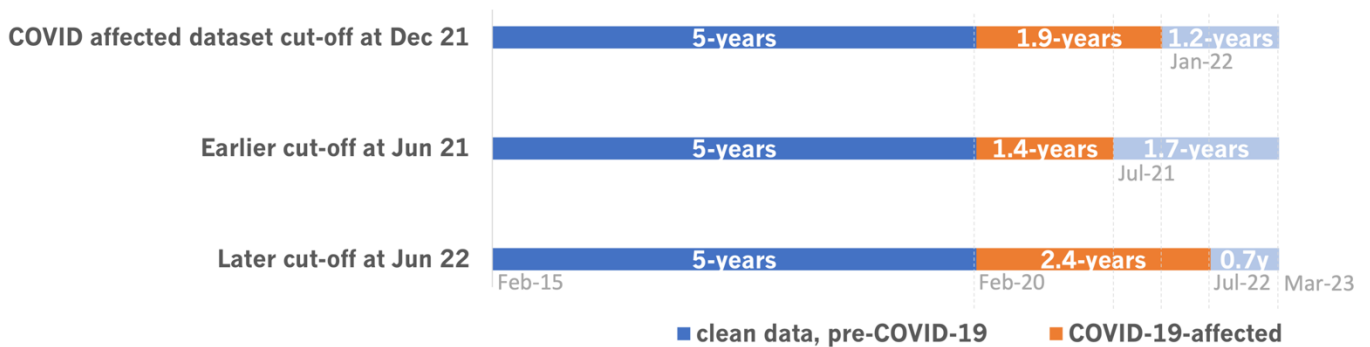
We conducted similar analysis in our May 2022 report and found that results for our airport comparators were robust, but that ENAV’s results were very sensitive, to alternative assumptions.

In this update, we consider two sensitivities that shorten / extend our COVID-19 affected dataset. We move the ‘cut-off’ date by six months from our preferred approach, shown in Figure 7 below:

- First, we consider an earlier cut-off of the COVID-19 affected dataset – of June 2021. This would reflect that all data from June 2021 onwards was ‘clean’. It would assume that the distortive effect of COVID-19 on share prices lasted only 17 months (6 months less than our preferred approach).
- Then, we consider a later cut-off – of June 2022. This would reflect a belief that COVID-19 had a more prolonged impact, of 29 months, and that only share price data beyond June 2022 was ‘clean’ of the effects of COVID-19.

In each case, our model is otherwise unchanged. In evaluating this sensitivity, for simplicity, we do not consider the ‘high/low impact’ variants of our model – focusing only on how it might affect our central case results.

FIGURE 7: SUMMARY OF OUR TREATMENT OF DATA SINCE THE COVID-19 PANDEMIC BEGAN



Our ‘shorter’ sensitivity is effectively in line with a suggestion made by CEPA.²⁶ It can help tell us how our assumption about COVID-19 continuing to affect betas during 2021 may affect our results.

Table 6 below shows the results of these sensitivities.

²⁶ CEPA report, p. 14.

TABLE 6: SUMMARY OF COVID ADJUSTMENT IN OUR SENSITIVITIES

Frequency of COVID-19-like events one in X years	3 company Central case	ENAV
Clean beta		
Non-COVID-19 beta estimate	0.55	0.62
COVID adjustment		
20	0.06	0.03
50	0.02	0.01
<i>Re-weighted COVID-19 beta</i>		
<i>20</i>	<i>0.61</i>	<i>0.65</i>
<i>50</i>	<i>0.57</i>	<i>0.64</i>
Earlier COVID-19 affected data cut-off		
Clean beta		
Non-COVID-19 beta estimate	0.55	0.64
COVID adjustment		
20	0.06	0.02
50	0.02	0.01
<i>Re-weighted COVID-19 beta</i>		
<i>20</i>	<i>0.61</i>	<i>0.66</i>
<i>50</i>	<i>0.57</i>	<i>0.65</i>
Later COVID-19 affected data cut-off		
Clean beta		
Non-COVID-19 beta estimate	0.54	0.53
COVID adjustment		
20	0.07	0.08
50	0.03	0.04
<i>Re-weighted COVID-19 beta</i>		
<i>20</i>	<i>0.60</i>	<i>0.61</i>
<i>50</i>	<i>0.57</i>	<i>0.57</i>

Note: Betas are estimated against the STOXX 600 and assume a debt beta of 0.05. Gearing is interpolated from Thomson Reuters reported net debt.

Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

The earlier COVID-19 cut-off sensitivity suggests:

- Identical results for the airport group. The non-COVID-19 beta, re-weighted beta, and COVID adjustments remain completely unchanged.
- For ENAV, the non-COVID-19 beta is slightly increased, reflecting the treatment of more of the (high beta) recent data as 'clean'. The re-weighted betas are very slightly reduced. The combined effect implies a lower COVID adjustment.

The later COVID-19 cut-off sensitivity suggests:

- Again, very similar results for the airport group. Only one of the non-COVID-19 beta values falls by 0.01, which prompts an almost exactly offsetting increase of 0.01 in the associated COVID adjustment.

- For ENAV, the non-COVID-19 beta is materially lower than in our preferred approach. This is for the opposite reason to that described for the earlier COVID-19 cut-off sensitivity. The re-weighted betas are also materially lower, though not to a fully offsetting degree. The resulting COVID adjustment is markedly higher.

Overall, the airports' beta analysis is highly robust to alternative assumptions as to when COVID-19 was driving the observed beta behaviours.

In contrast, and as expected, the results for ENAV are more sensitive. This is primarily driven by changes to the 'non-COVID-19' baseline beta, discussed above.

Appendix 2. COVID-19 adjustment detailed results

Updated central case results

Table 7 and Table 8 below set out the detailed results of our analysis across a range of frequencies of future COVID-19-like events of 23-month duration.

TABLE 7: REWEIGHTED ASSET BETA ESTIMATES FOR OUR ASSUMED FREQUENCY OF COVID-19-LIKE EVENTS SIMILAR TO COVID-19

	AENA Madrid	ADP Paris	Fraport Frankfurt	Zurich	ENAV	3 company	4 company
1.9-year raw beta	0.92	0.83	0.64	0.79	0.74	0.80	0.79
8.2-year raw beta, airports	0.70	0.72	0.63	0.70	0.69	0.69	0.63
6.7-year raw beta, ENAV							
Frequency of COVID-19-like event (1 in X years)							
20	0.62	0.63	0.57	0.63	0.65	0.61	0.61
50	0.59	0.59	0.55	0.61	0.64	0.57	0.58
'Clean' beta estimate	0.56	0.56	0.54	0.59	0.62	0.55	0.56

Note: Assumes debt beta of 0.05. '3 company' column takes a simple average of AENA, ADP and Fraport. '4 company' column takes an average of AENA, ADP, Fraport and Zurich.

Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

TABLE 8: ESTIMATED COVID ADJUSTMENT FOR OUR ASSUMED FREQUENCY OF COVID-19-LIKE EVENTS SIMILAR TO COVID-19

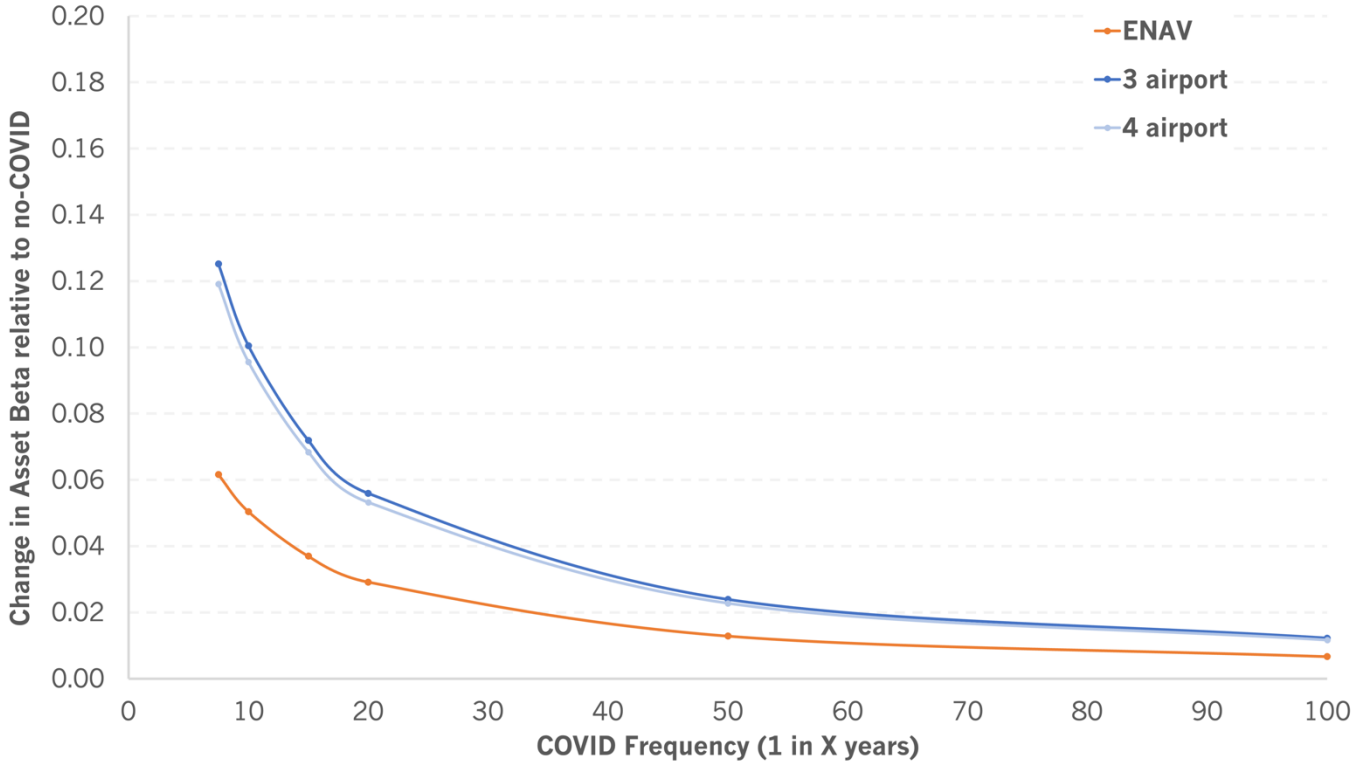
	AENA Madrid	ADP Paris	Fraport Frankfurt	Zurich	ENAV	3 company	4 company
Frequency of COVID-19-like event (1 in X years)							
20	0.06	0.07	0.04	0.04	0.03	0.06	0.05
50	0.03	0.03	0.02	0.02	0.01	0.02	0.02

Note: Assumes debt beta of 0.05. '3 company' column takes a simple average of AENA, ADP and Fraport. '4 company' column takes an average of AENA, ADP, Fraport and Zurich.

Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

Figure 8 below illustrates these same results as a graph for our three comparator sets.

FIGURE 8: CHANGE IN ASSET BETA RELATIVE TO NO-COVID-19 AT DIFFERENT FREQUENCIES OF COVID-19-LIKE EVENTS FOR OUR COMPARATOR SET



Note: Assumes debt beta of 0.05. '3 company' column takes a simple average of AENA, ADP and Fraport. '4 company' column takes an average of AENA, ADP, Fraport and Zurich.

Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

Lower bound results

Table 9 and Table 10 below set out the detailed results of our analysis across a range of frequencies of future COVID-19-like events two thirds as impactful as COVID-19.

TABLE 9: REWEIGHTED ASSET BETA ESTIMATES FOR OUR ASSUMED FREQUENCY OF COVID-19-LIKE EVENTS TWO THIRDS AS IMPACTFUL AS COVID-19

	AENA Madrid	ADP Paris	Fraport Frankfurt	Zurich	ENAV	3 company	4 company
Frequency of COVID-19-like event (1 in X years)							
20	0.60	0.60	0.56	0.62	0.65	0.59	0.60
50	0.58	0.58	0.55	0.60	0.63	0.57	0.58

Note: Assumes debt beta of 0.05. '3 company' column takes a simple average of AENA, ADP and Fraport. '4 company' column takes an average of AENA, ADP, Fraport and Zurich.

Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

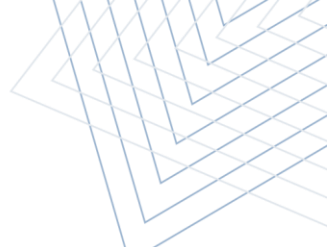


TABLE 10: ESTIMATED COVID ADJUSTMENT FOR OUR ASSUMED FREQUENCY OF COVID-19-LIKE EVENTS TWO THIRDS AS IMPACTFUL AS COVID-19

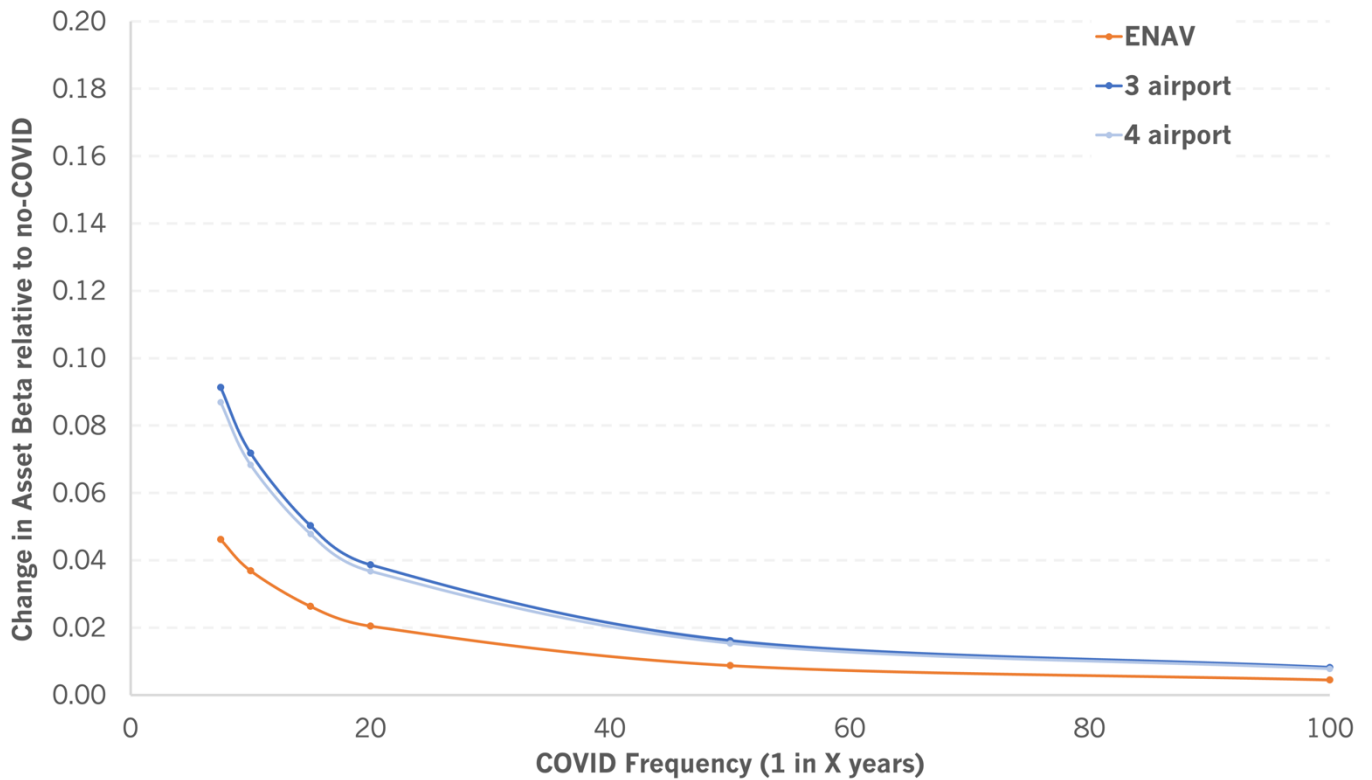
	AENA Madrid	ADP Paris	Fraport Frankfurt	Zurich	ENAV	3 company	4 company
Frequency of COVID-19-like event (1 in X years)							
20	0.04	0.05	0.03	0.03	0.02	0.04	0.04
50	0.02	0.02	0.01	0.01	0.01	0.02	0.02

Note: Assumes debt beta of 0.05. '3 company' column takes a simple average of AENA, ADP and Fraport. '4 company' column takes an average of AENA, ADP, Fraport and Zurich.

Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

Figure 9 below illustrates these same results as a graph for our three comparator sets.

FIGURE 9: CHANGE IN ASSET BETA RELATIVE TO NO-COVID-19 AT DIFFERENT FREQUENCIES OF COVID-19-LIKE EVENTS FOR OUR COMPARATOR SET



Note: Assumes debt beta of 0.05. '3 company' column takes a simple average of AENA, ADP and Fraport. '4 company' column takes an average of AENA, ADP, Fraport and Zurich.

Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

Updated upper bound results

Table 11 and Table 12 below set out the results for our upper bound, COVID-19-like events 1.5 times more impactful than COVID-19.

TABLE 11: REWEIGHTED ASSET BETA ESTIMATES FOR OUR ASSUMED FREQUENCY OF COVID-19-LIKE EVENTS 1.5 TIMES MORE IMPACTFUL THAN COVID-19

	AENA Madrid	ADP Paris	Fraport Frankfurt	Zurich	ENAV	3 company	4 company
Frequency of COVID-19-like event (1 in X years)							
20	0.65	0.66	0.59	0.65	0.67	0.63	0.64
50	0.60	0.60	0.56	0.62	0.64	0.59	0.59

Note: Assumes debt beta of 0.05. '3 company' column takes a simple average of AENA, ADP and Fraport. '4 company' column takes an average of AENA, ADP, Fraport and Zurich.

Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

TABLE 12: ESTIMATED COVID ADJUSTMENT FOR OUR ASSUMED FREQUENCY OF COVID-19-LIKE EVENTS 1.5 TIMES MORE IMPACTFUL THAN COVID-19

	AENA Madrid	ADP Paris	Fraport Frankfurt	Zurich	ENAV	3 company	4 company
Frequency of COVID-19-like event (1 in X years)							
20	0.09	0.10	0.05	0.06	0.04	0.08	0.08
50	0.04	0.04	0.02	0.03	0.02	0.04	0.03

Note: Assumes debt beta of 0.05. '3 company' column takes a simple average of AENA, ADP and Fraport. '4 company' column takes an average of AENA, ADP, Fraport and Zurich.

Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

Figure 10 below illustrates these same results as a graph for our three comparator sets.

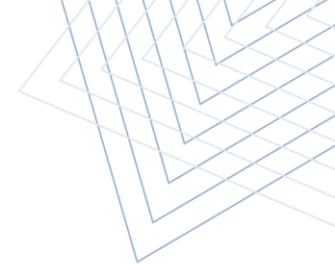
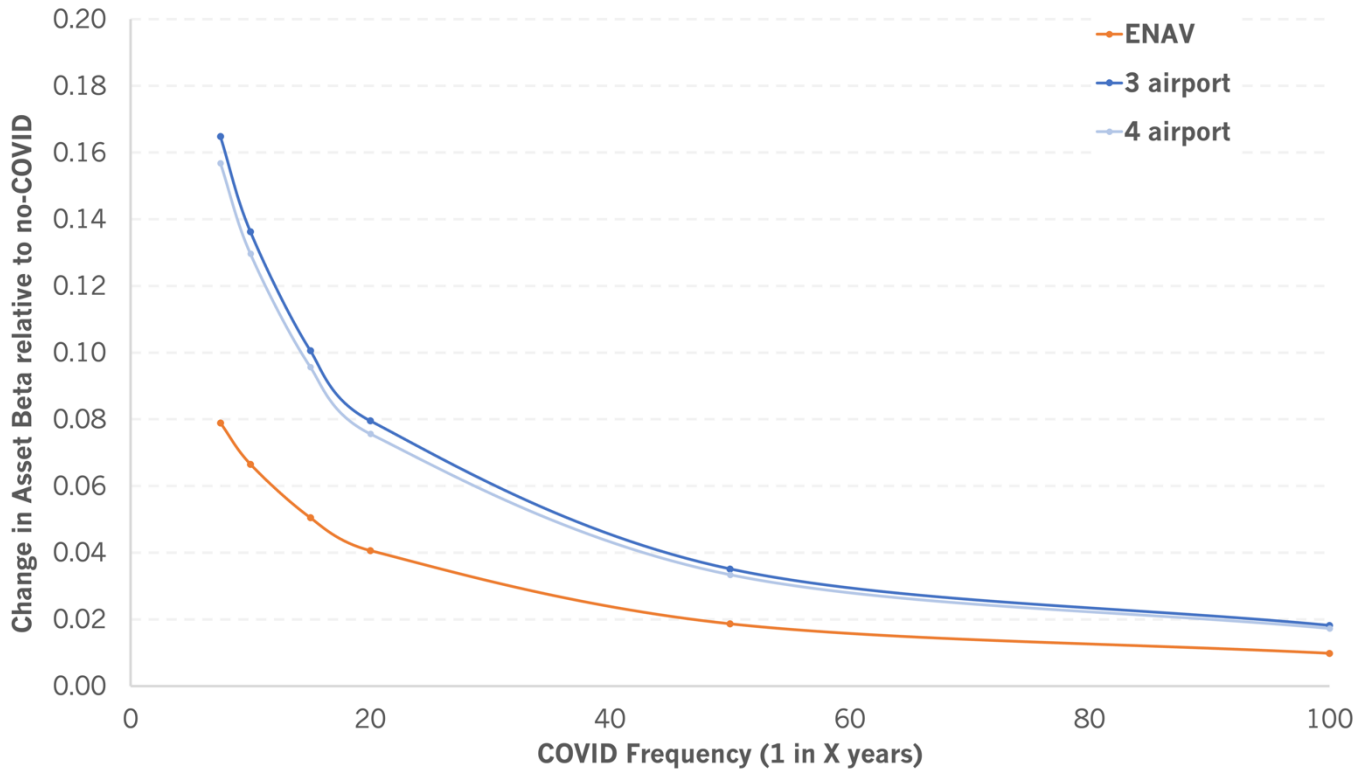


FIGURE 10: CHANGE IN ASSET BETA RELATIVE TO NO-COVID-19 AT DIFFERENT FREQUENCIES OF COVID-19-LIKE EVENTS FOR OUR COMPARATOR SET



Note: Assumes debt beta of 0.05. '3 company' column takes a simple average of AENA, ADP and Fraport. '4 company' column takes an average of AENA, ADP, Fraport and Zurich.
 Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.

Appendix 3. Exclusion of Sydney and Vienna

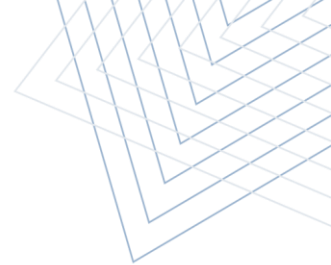
As for H7, our choice of comparators for calculating the COVID adjustment was initially informed by a list of eight listed airport stocks which the CAA suggested might be appropriate for Heathrow along with the only listed ANSP.

From the CAA's shortlist of eight, we rejected Auckland and Copenhagen, because of the low reliability of traded price information (Copenhagen), or the inability to identify an appropriate diversified index (Auckland).²⁷

Concerns over Sydney and Vienna now lead us to also exclude these airports. We noted concerns over these comparators in our May 2022 report, where we said "[betas for the group of 3 and group of 4] airports appear to be more robust/reliable than betas estimated for Sydney and Vienna."²⁸

²⁷ See Flint 2021 H7 report, p. 19.

²⁸ Flint 2022 NR23 report, p. 49.



Sydney is no longer quoted

Sydney was delisted from the Australian stock exchange in February 2022. In our May 2022 reports, Sydney had only recently been delisted and therefore still offered some possibly useful information – thought was ultimately considered less relevant.

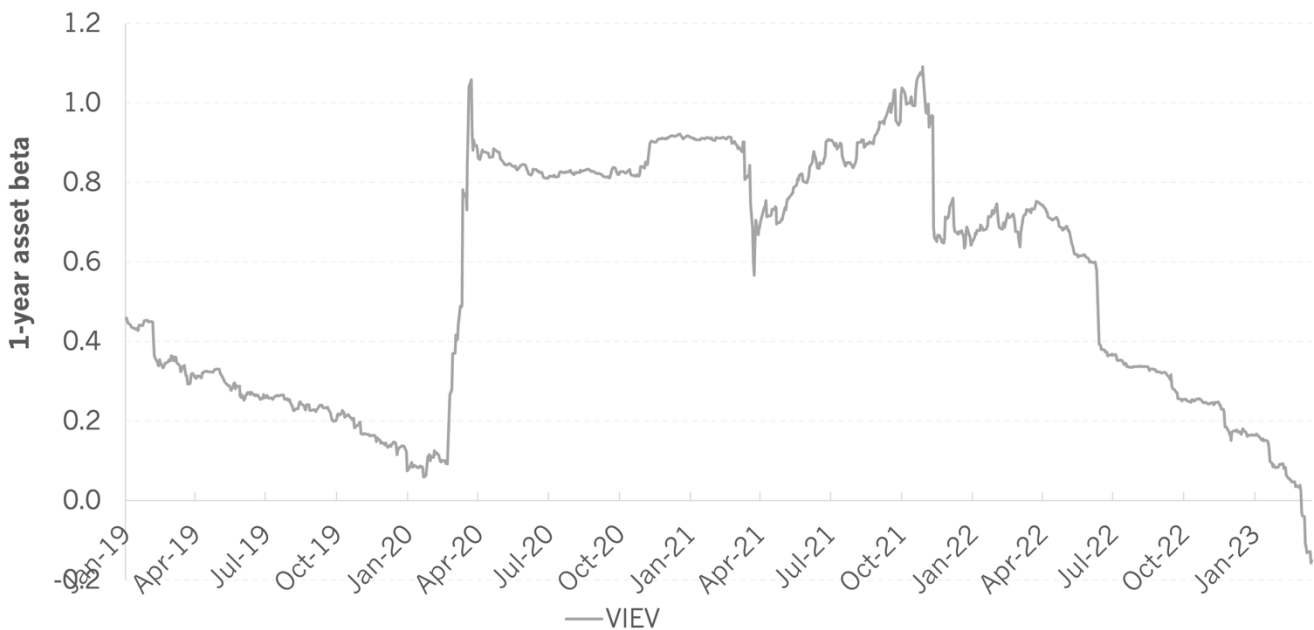
Over one year has now elapsed since Sydney was delisted. This prevents us from any ongoing evaluation of Sydney’s – we therefore remove Sydney from our comparator set.

Vienna’s recent beta behaviour is clearly unreliable

Vienna’s observed one-year beta has been extremely volatile, more so than any of the other comparators. Figure 11 below shows Vienna’s observed beta has risen from around 0.1 to over 1 at the onset of the pandemic, and then started falling in late 2021, recently becoming negative.

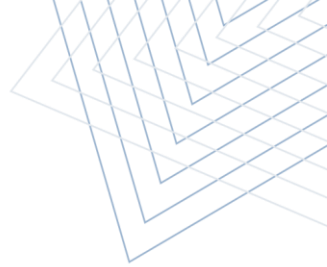
We consider this implausible for any credible comparator, and therefore disregard such obviously questionable data which may distort our conclusions.

FIGURE 11: ONE-YEAR ROLLING ASSET BETA FOR VIENNA AIRPORT



Note: Beta is estimated against the STOXX 600 and assume a debt beta of 0.05. Gearing is interpolated from Thomson Reuters reported net debt.

Source: Flint analysis based on Thomson Reuters data as of 15 March 2023.



Appendix 4. Responses to stakeholder comments

Comments on our overall approach

NERL argues that our approach makes wrong assumptions about the end date of the COVID-19 pandemic, and understates tail risk by excluding important information about outliers.²⁹ Similarly, Oxera, NERL's advisor, argues that *"the CAA's choice to reduce the weight on pandemic data in its analysis risks understating the 'true' beta for NR23."*³⁰

Responding on behalf of British Airways, CEPA argues that our approach *"yields results that over-estimate the pandemic impact on NERL's enduring asset beta."*³¹ CEPA also notes that our approach allows outliers to have disproportionate influence and *"does not achieve the stated aim in terms of the relative balance pre-pandemic and pandemic data."*³²

NERL and British Airways present opposing views on the effect of our approach on resulting beta estimates. While NERL/Oxera argue that our approach understates the 'true' beta for NR23, British Airways/CEPA argue that it over-estimates the pandemic impact.

Oxera's characterisation of our approach as 'excluding outliers' from the beta analysis is not correct. Our approach to calculating the COVID adjustment includes all available market data, weighted in line with more plausible likelihood and impact of COVID-19-like events in the future. This provides a better basis from which to reflect the balance of systematic risk that NERL faces in future.

We also disagree with CEPA that our approach gives outliers disproportionate influence. We noted this in our H7 report. In calculating an OLS beta estimate it is true that observations that are 'further from the mean' have a bigger impact. In usual circumstances, we might agree that a forward-looking beta estimate could, in principle, adjust for such historical 'outliers' – if they are known to be errors or noise.

However, the extreme observations experienced during the COVID-19 pandemic are not 'outliers' of this type. They inform our assessment of the market's potential reaction to a prospective future COVID-19-like events. They should therefore be duly reflected in a forward-looking beta estimate.

As an alternative to our reweighting approach, CEPA proposes something similar to the linear cross-check method we presented in our report for the CAA at H7, i.e. based on a simple weighted average of the pre-pandemic beta and the beta observed around the pandemic.

While CEPA's approach for averaging betas – i.e. the linear method – only captures the scale of the beta³³, our preferred approach captures both the scale and strength of the beta relationship

²⁹ NERL response, p. 123.

³⁰ Oxera report, p. 20.

³¹ CEPA report, pp. 12.

³² CEPA report, p. 12.

³³ 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 one-year beta of 0.75. However, taking an OLS regression of the full one-year dataset would likely obtain a beta different from this. The one-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.

experienced during different periods.³⁴ Given this is an inherent feature of the regression that is generally adopted by regulators, we consider our approach to be more reasonable.

Comments on comparator selection

Stakeholders have provided views on the comparators upon which we rely. We respond to these comments above in the course of updating our analysis in light of more recent data:

- Oxera agreed that we should rely on Fraport, ADP, AENA and Zurich, but argued we should have placed more weight on ENAV as “*the best comparator for NERL*”.³⁵ In Oxera’s view, ENAV also supported a point estimate towards the top end of the asset beta range. We discuss in Section 2.3 why we consider ENAV, while a relevant comparator, insufficiently reliable to be relied upon to the extent of our airport comparator set.
- Oxera further argued that the CAA’s (and Flint’s) reasons for excluding ENAV are not valid:
 - The instability of ENAV’s beta prior to the pandemic relative to airport comparators was not supported by the CMA RP3 decision: the CMA “*made no mention of ENAV exhibiting higher volatility than the other comparators, and such a conclusion does not appear to be borne out by the charts presented by the CMA.*”³⁶ We discussed our views on why ENAV’s beta appears more volatile in our last report – and note it is also demonstrated in Figure 5. We disagree with Oxera’s effective suggestion that this evidence is not relevant simply because it was not discussed in the CMA’s decision at RP6 – particularly since the CMA chose not to rely on ENAV for the other reasons set out in its report.
 - The sensitivity of the COVID adjustment implied by ENAV to the inclusion or exclusion of recent data “*highlights the issues with Flint’s approach to estimating the NR23 beta, rather than an ENAV issue*” and “*calls into question the assumption that betas will return to pre-pandemic levels outside of the defined pandemic window*”.³⁷ We disagree with Oxera’s conclusion. The instability of ENAV’s beta over time presents a challenge for relying on it a comparator for NERL irrespective of our assumptions (and beliefs) about the COVID-19 pandemic and are not in any way unique to the methodology Flint has adopted. We explain in Section 2.3 above why we consider ENAV’s beta to be less reliable than the airport comparators.
- Meanwhile, CEPA has re-stated previous arguments that it continues to consider relevant:³⁸
 - Comparator selection: CEPA supports the consideration of a broader set of comparator airports. CEPA also notes the empirical asset betas in the CAA’s comparator set sit towards the top end of the range for a broader comparator set. We describe in our previous report

³⁴ Flint

2022 H7 report, p. 15.

³⁵ Oxera report, pp. 20-22.

³⁶ Oxera report, p. 21.

³⁷ Oxera report, p. 21.

³⁸ CEPA report, p. 15.

why we considered other betas from other comparators insufficiently reliable, and have updated this analysis to now exclude Sydney and Vienna, as we discuss in Appendix 3.

- Relative risk effects: CEPA considers NERL’s beta is lower than indicated in the Initial Proposals. As discussed in our May 2022 NR23 report, we do not have evidence to suggest that NERL’s systematic risk has changed.³⁹
- Relative index choice: CEPA considers results from both domestic indices and continental indices are relevant. We continue to disagree for the reasons set out in our previous report at NR23, and in detail in our earlier report for H7.⁴⁰ We also note our choice of index is consistent regulatory precedent, including the CMA’s most recent decision for NERL.⁴¹

Comments on our approach to estimating the COVID adjustment

NERL/Oxera and CEPA challenged some of the assumptions used to estimate our COVID adjustment:

- NERL (and Oxera) argue that Flint *“implies that the COVID pandemic ended on 31 March 2022, whereas it is evident that the effects of the pandemic were still being felt by the aviation sector beyond this time and into NR23”*.⁴² NERL/Oxera also state we make a subjective assessment of the duration and frequency of future pandemic-like events *“not substantiated with evidence”*.⁴³
- CEPA argues that the CMA’s RP3 decision is not a suitable estimate of the pre-pandemic asset beta because the evidence supports a lower baseline asset beta. CEPA considered that our use of a ‘pre-pandemic’ estimate that includes pandemic-affected data to end-February and a COVID adjustment based on beta estimates up to end-January is inconsistent.
- CEPA also argued that the CAA (and Flint)’s use of the CMA’s pre-COVID-19 asset beta was at odds with regulatory consistency. It noted in particular the *“CAA’s own view of the asset beta at RP3 was lower than that of the CMA”*, and that we might have estimated a lower baseline beta for NERL if we *“carried out the analysis bottom-up”*⁴⁴.
- CEPA also argues that the duration assumption adopted in our last report, and disagrees with the use of our upper bound pandemic impact assumption and our use of one-in-50 year events for estimating the upper bound of our COVID adjustment, and argues they *“do not pass the ‘sniff’ test”*.⁴⁵

Recently observed betas suggest that airports don’t exhibit sustained higher systematic risks

NERL’s assertion that our approach implies the COVID-19 pandemic ended on 31 March 2022 is not correct. In implementing our approach, we made no judgement on when and whether the pandemic ends, but instead assesses whether data at a particular date in time can be considered

³⁹ See also Flint 2022 NR23 report, p. 21.

⁴⁰ Flint 2021 H7 report, p. 40.

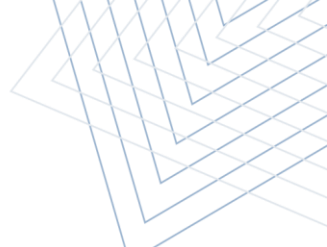
⁴¹ CMA (July 2020), NATS (En Route) Pls / CAA Regulatory Appeal, Final report, pp. 202-203, para 13.125.

⁴² NERL response, p. 126.

⁴³ NERL response, p. 123. Oxera report, p. 20.

⁴⁴ CEPA report, p. 12.

⁴⁵ CEPA report, pp. 13-15.



‘clean’ of COVID-19. As discussed in Section 2.2 above, there is strong evidence that COVID-19 was no longer dominating airport betas after the summer of 2021.

These beta estimates now more strongly support the view that airport betas have reverted to pre-pandemic levels. As the 2020 data (March and November) that was most significantly affected by COVID-19 ‘drops out’ of the window used for each calculation, the betas show a marked decline, and establish at a generally lower level than during COVID-19. The more recent level is similar to that observed before February 2020.

We also do not agree with CEPA’s suggestion that our classification of data (as COVID-19 affected) leads us to overstate the impact of COVID-19.

First, CEPA’s analysis to support this argument is based on 90-day betas. These exhibit major statistical unreliability.

Second, as we show in our sensitivity analysis in relation to our COVID adjustment (in Section 4 and Appendix 1), our recommended COVID adjustment is not sensitive to alternative assumptions about the cut-off for our COVID-19-affected dataset.

The parameters of our COVID adjustment reflect uncertainty about frequency and nature of future events

CEPA’s statement that our assumptions of duration and frequency did not pass the ‘sniff test’ is misleading.

First, and as we describe in our last report, our range of assumptions about duration are intended as a proxy for the potential range of impacts of future COVID-19-like events, and are calculated symmetrically around our central case. They are not intended to act as a mechanical assumption about the duration of future events.

Second, CEPA’s assertion that treating 17.5% of all observations as COVID-19 affected (i.e. a 3.5 year impact every 20 years, or approximately one year impact every five years) turns COVID-19-like events into a regular occurrence is an oversimplification of our approach. Critically, CEPA’s illustration relies only on the upper bound of our estimates.

Taking the lower bound of our estimate would be akin to implying a 1.5-year disruption that begins once every 50 years – equivalent to only 3% of all observations being COVID-19 impacted. This scenario is materially different from treating 17.5% of all observations as COVID-19 affected, as suggested by CEPA. Importantly, under our lower bound, it would be wrong to characterise COVID-19-like events as a ‘regular occurrence’.

CEPA’s illustration mischaracterised our approach. We therefore continue to believe it is correct to estimate the impact of COVID-19-like events based on the probability of their occurrence – which is likely more infrequently than at every price control, as in the example put forward by CEPA.