Response to Airline Submissions

NZCC Targeted Amendments Draft Decision

16 July 2026

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Table of contents

List of figures

List of tables

1 Executive summary

1. This report responds to submissions made by certain airlines, principally Qantas, Air New Zealand, and the Board of Airline Representatives New Zealand (BARNZ), on the Commerce Commission's targeted amendments to the Airport Cost of Capital Input Methodologies. The airline submissions make two central claims:

   a) first, that three-year asset beta estimates to January 2026 show investor-perceived airport risk is now lower than it was both during and before COVID; and

   b) second, that Airports of Thailand is an outlier that should be excluded from the comparator sample.

2. We disagree with both claims.

3. Three-year asset betas are too noisy to support the weight the airlines place on them; small changes to the estimation window produce materially different results, including different rankings of individual airports and, in particular, of Airports of Thailand.

4. The NZCC's methodology assumes a zero debt beta, an assumption which is known to be wrong and to underestimate the asset beta the higher the leverage of the comparator. This assumption is, nonetheless, generally fit for purpose if the methodology involves taking the sample average estimated asset beta and re-levering that sample average asset beta to the sample average leverage to arrive at the benchmark equity beta. This is because the negative bias in asset beta created by assuming a zero debt beta during the de-levering of equity beta to asset beta is, to a first approximation, cancelled out in the process of re-levering to the sample average leverage. (That is, despite the leverage formula being wrong (assuming a zero debt beta) there is approximately the same amount of both de-levering and re-levering such that the bias in the formula cancels out.)

5. However, assuming a zero debt beta is not fit for purpose if the methodology involves making within sample comparisons of relative asset betas. This is because different levels of bias for firms with different levels of leverage mean that the individual asset betas have different levels of bias and, therefore, are not comparable.

6. Nonetheless, the airlines rely on those same zero debt-beta asset beta estimates to single out Airports of Thailand as an outlier. The airline submissions compare Airports of Thailand (with the lowest leverage in the sample) with Fraport (with the highest leverage in the sample). Fraport's estimated asset beta is materially underestimated by assuming a zero debt beta but Airports of Thailand's estimated asset beta is not. The result is that the difference between these estimated asset betas is, in large part, illusory and is simply a result of the incorrect use of a zero debt beta in the leverage formula.

7. We also show that the chart Qantas relies on most heavily to make its case is itself misleading: its trend line is an artefact of the arbitrary order in which airports are listed along the chart's horizontal axis, not evidence of any real relationship in the data. Reordering the same data produces a markedly different picture.

8. Correcting for these issues by using more robust estimation windows, a positive debt beta consistent with theory and regulatory precedent (including UK and Australian precedent from the AER and QCA), and a wider comparator sample, substantially changes the picture the airlines present, including its effect on the vanilla WACC.

9. We also note that, while the assumption of a zero debt beta in the 2023 IMs is generally fit for purpose when it is applied in the way described in paragraph 4, it can become problematic if there is a large

within sample variation of leverage. If this is the case, nonlinearities in the averaging process can mean that the bias created in the de-levering process is not fully offset in the re-levering process. As it happens, the within sample variation in the leverage for the NZCC sample and post COVID period is very high. This is largely driven by Fraport's extremely high leverage for an airport (66%). As a result, we estimate that there remains a 0.12% negative bias in the vanilla WACC when using this sample and period – even if the benchmark leverage is set equal to sample average leverage. This bias is materially smaller if longer estimation periods are used (e.g., the last 10 years with or without a Flint adjustment). This is illustrated in Table 7-4 in Section 7.

2 Introduction

10. The Commerce Commission's draft decision on targeted amendments to the Airport Cost of Capital Input Methodologies is the subject of several airline submissions, which are in favour of the New Zealand Commerce Commission's new approach.

11. This report examines those submissions.

a) Section 3 sets out some observations on the methodological changes between the NZCC 2023 IM decision and the 2026 draft decision. We clarify our position on those changes and explain that, our analysis in this cross-submission is, responsive to the airline submissions, focussed on the NZCC sample and the post COVID period, that does not mean that we consider that this sample and period is appropriate.

b) Section 4 summarises the airports' submissions with which we disagree.

c) Section 5 identifies the conceptual errors in that analysis, including the unreliability of three-year asset betas, the problems with comparing asset betas estimated using a zero debt beta, and Qantas' misleading presentation of the data.

d) Section 6 sets out the role of debt betas in the asset beta formula as well as our estimates of debt beta and its variation with leverage.

e) Section 7 quantifies the effect of a positive debt beta on equity beta and the vanilla WACC.

3 Observations on methodology

12. The NZCC targeted amendment draft decision has a number of methodological departures from the 2023 IM final decision.

    a) Sample selection.

        i. The draft decision adopts the same sample as the 2023 final decision but restricts analysis to the post COVID period (despite that sample having been formed by applying a sample selection methodology to pre COVID data).

        ii. Consistency with the 2023 IM method would require that the the post COVID sample was chosen by applying the 2023 IM sample selection methodology to the post COVID data.

    b) Benchmark leverage.

        i. The draft decision sets the benchmark leverage consistent with the asset beta sample average leverage. In doing so, the draft decision reverts to clearly established precedent in the 2016 and 2010 IMs.

        ii. The 2023 IM departed from that precedent and set the benchmark leverage different to the sample average leverage.

    c) Weighting COVID and non-COVID data in an attempt to arrive at a weighted dataset that is representative of investors' perceived risk exposure.

        i. The draft decision determined that zero weight should be given to the pandemic period.

        ii. The 2023 IM determined that some weight needs to be given to pandemic affected data in order for the estimation data to be representative of investors' perceived risk exposure.

    d) Setting the date that COVID ceased to affect the relevant data.

        i. The draft decision determines that COVID affected data ended on 31 January 2023.

        ii. The 2023 final decision determined that the pandemic affected data ended in 30 September 2021.[1]

13. There is another methodological question where the draft decision is unclear. Specifically, whether the decision output is:

    a) a value for the asset beta/leverage under the IMs determined based on the data for the 3 years from 1 February 2023 to 31 January 2026; or

    b) a methodology which should be updated as new data becomes available. If so, there is further ambiguity around whether the NZCC now believes:

        i. The most recent 3 years is the best estimate at the beginning of each PSE (most representative of investors' risk perceptions); or

        ii. Whether new data should be added to the draft decision's 3 years of data as it becomes available (e.g., a 6 year asset beta would be more applicable to WIAL at its next PSE rather than a 3 year asset beta).

14. The number of methodological changes and ambiguities creates challenges for submissions. One cannot perform analysis on all of the possible combinations of different methodologies. The focus of

[1] See 4.84, 4.86, 4.263, 4.268.

the analysis in this cross-submission is on the draft decision sample (although we include analysis of other samples in Appendix B) and on post COVID data with zero weight to pandemic data. This is driven by the nature of the cross-submission process and does not reflect our views on the appropriate methodology to adopt. For the absence of doubt, we summarise our views on the above methodological issues in Table 3-1 below.

Table 3-1: Summary of CEG position on methodological changes between the 2023 IM and the 2026 draft decision

Methodological question	**CEG position**
12.a)	CEG's position is that a wider sample than in either the 2023 or 2026 decisions should be adopted. However, to the extent that a narrower sample is adopted this should be based on a specified methodology. Only the 2023 decision set out such a methodology and, therefore, this "targeted amendment" should simply apply that methodology. That could result in the removal of Airports of Thailand (on the basis of "asset beta variability" because its weekly and 4-weekly asset beta estimates are materially different) and would result in the inclusion of four other airports (3 Mexican airports and Malaysia Airports). In our view, the strict order of preference for the samples is: 1. The wider sample (that only applies a liquidity filter) on the basis that it has the largest sample size; then 2. The NZCC 2023 sample selection methodology on the basis that it has the second largest sample size and is derived from a pre-existing sample selection methodology; then 3. The NZCC draft decision sample on the basis that it has the third largest sample size; then 4. The airlines' proposed sample (which excludes Airports of Thailand but does not include any other airports) on the basis that it has the smallest sample size and is justified on flawed conceptual grounds. Namely: a) Comparing asset betas estimated with zero debt betas for firms with different leverage (see sections 5.2 and 6) b) Drawing conclusions on "outliers" that are contingent on a single 3 year estimation window despite 3 year asset beta estimates being highly volatile (see section 5.1) and where the opposite conclusion results if either: i. a statistically robust definition of the post COVID period (which has over 4 years of data) is adopted based on the Flint post COVID period (which is supported by the analysis in Section 5 of our June 2026 submission); or ii. a different 3 year window is adopted (e.g. ending just one year earlier). We also note that the comparison of "asset beta variability" suffers from the same problem as does the comparison of asset betas within the sample. As explained in sections 5.2 and 6 of this report, assuming a zero debt beta tends to underestimate the asset beta for highly levered firms. Consequently, it also tends to underestimate the absolute variability of

	asset betas for those firms (the difference between two downward biased estimates is itself downward biased). An estimate of variability in equity beta would be free from such bias. In the 2026 draft decision 3 year period, the difference between weekly and 4-weekly equity betas for Airports of Thailand and Fraport was 0.38 and 0.23 respectively. Expressed as a percentage of their average equity beta in the NZCC period (1.29 and 0.62) this was 29% and 37% respectively. That is, Airports of Thailand has lower "equity beta measurement variability" than Fraport when expressed in this mor meaningful way.[2]
12.b)	We consider that the 2026 draft decision (returning to sound 2016 and 2010 IM precedent) is a better methodology than the 2023 IM method.
12.c)	We consider that the 2023 IM correctly identified the need to give weight to pandemic affected data in order to arrive at an asset beta that reflects investors' risk perceptions. We consider that the draft decision departure from that method is a serious error.
12.d)	We consider that the 2023 IM method of treating data from October 2021 onwards as no longer COVID affected was sound and consistent with analysis performed in our June 2026 report (see section 5 and, in particular, section 5.3 of that report). The 2023 IM decision was also consistent with Flint's assessment (see section 5.2 of our June 2026 report). The 2026 draft decision was inconsistent with the evidence (see section 5.2 to 5.6 of our June 2026 report) and arrived at in an illogical manner (see section 5.1 of our June 2026 report).
13	We do not consider that only post COVID data should be used. However, if required to only use post COVID data we do consider that a longer period than the draft decision 3 years of data should be used to determine a value for the IM asset beta and leverage.

15. In relation to the last item in the above table, if the draft decision methodology is to:

a) "Lock in" a value for asset beta based on the 3 years to January 2026 then that is an extra-ordinarily low asset beta (in the bottom 2%[3] of observed 3 year asset betas through time).

b) Establish a methodology to be applied at the next PSE, then that methodology has the potential to give rise to extra-ordinarily volatile asset betas at the next PSE.

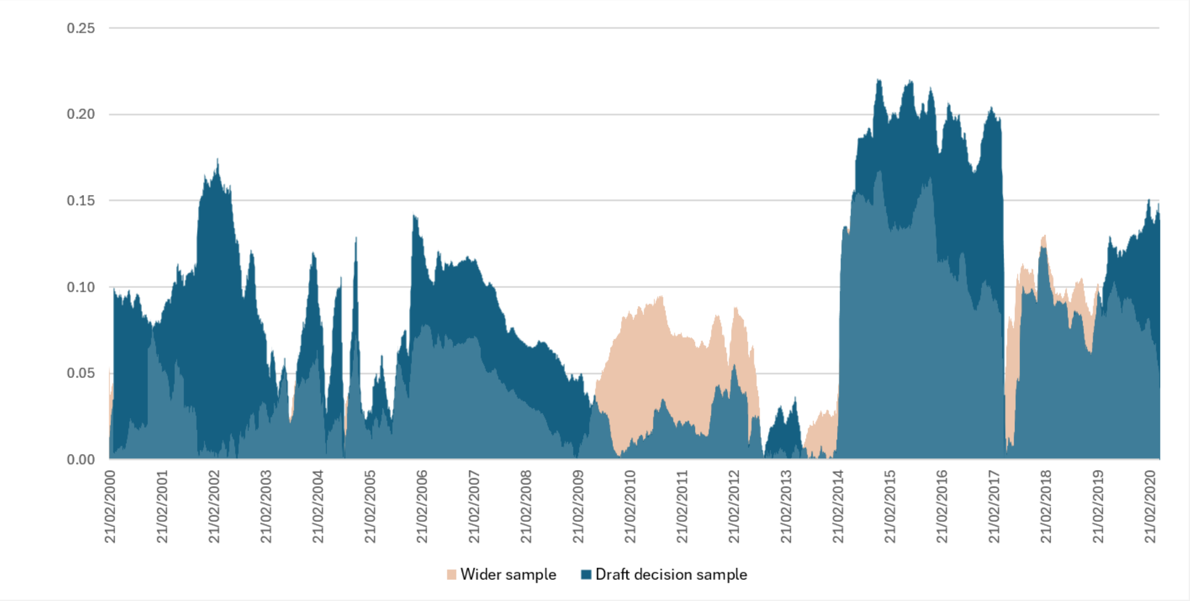
16. To see that this is the case simply examine Figure 5-1 in section 5 below (Figure 4-4 from our June 2026 report). This shows 3-year asset betas varying between 0.60 and 1.00 historically. Alternatively, if the implied methodology is to add data to the draft decision's 3 year data window then this still gives rise to very volatile potential asset betas. For example, WIAL's next PSE begins 3 years and 2 months after the end of the draft decision data window. As shown in Figure 3-1, adding 3 years and 2 months of data to a 3 year asset beta for the NZCC draft decision sample results in an

[2] We note that if one is to use variability in measured betas as a criteria one must express that variability as a percentage of the average beta rather than as an absolute value. Otherwise one is introducing a bias to exclude firms with high return volatility/betas (as these firms will naturally have the highest absolute difference between measured betas).

[3] See CEG, Critique of NZCC Targeted Amendments Draft Decision Airport asset betas inclusive of pandemic risk, June 2026, paragraph 133.

asset beta that can be very different to the 3 year asset beta (noting that the volatility is larger with the smaller sample).

Figure 3-1: Absolute change in asset beta when the estimation window increases from 3 years to 6.2 years with a common start date (x-axis is the start date for the estimation period).



Each data point represents the difference between the two measures calculated from the same start date. For each comparison between the 3 and 6.2 year windows the same comparators are in each sample. This means that an airport that lists after February 2020 only enters the 3 and 6.2 year samples after it has 6.2 years of data.

4 Airline submissions

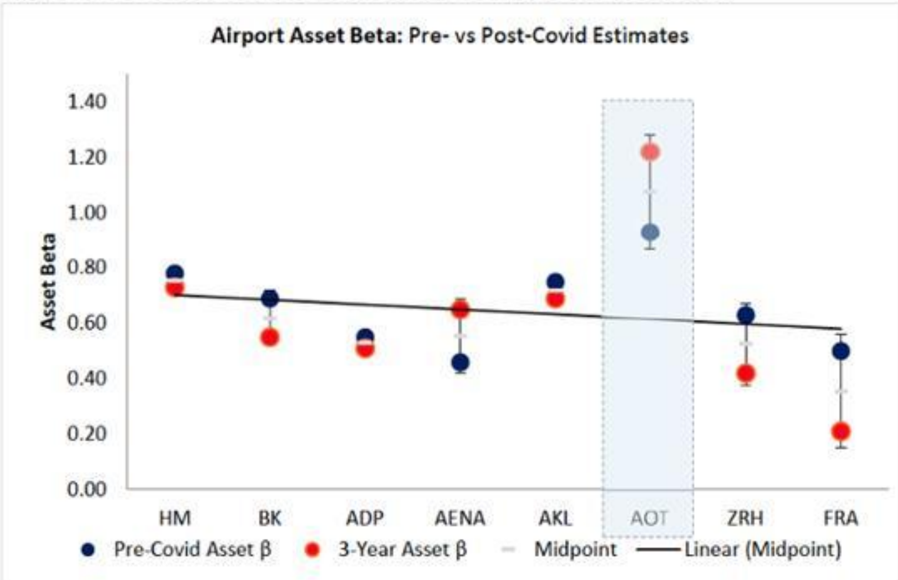
17. There are two main points made in airline submissions. Namely, the submissions contend that 3 year asset beta estimates ending January 2026 reliably demonstrate that:

a) Investors' perceived risk of investting in airports is now lower than both during COVID and prior to the COVID period; and

b) Airports of Thailand is an outlier and should be removed from the NZCC sample.

18. Qantas' submission makes both points explicitly (emphasis added):

> *QAG supports:*
>
> *The adoption of a three-year post-COVID estimation window for asset beta, **excluding the COVID-disrupted period. This better reflects current airport risk,** removes statistical complexity, and aligns with long-run pre-COVID averages resolves two related issues**: it removes the need for the pandemic premium methodology**, and naturally excludes Sydney Airport from the comparator set.*
>
> *QAG considers further refinement is needed on:*
>
> *Airports of Thailand (AOT) should be removed from the comparator set. **Its post-COVID asset beta of 1.22 is a clear outlier** that materially overstates the sample average. **Its ultra-low leverage of 5% also suppresses the average leverage, compounding the distortion across both parameters***
>
> (Page 1)
>
> *...*
>
> *Figure 1 below illustrates the divergence in asset beta across the comparator set. While asset betas have generally stabilised or declined post-COVID, AOT has moved materially in the opposite direction, amplifying its influence on the sample average.*
>
> **Figure 1: Pre-COVID vs Post-COVID Asset Beta by Comparator Firm[8]**



> (Page 3)

19. Air New Zealand made similar submissions:

The inclusion of pre-Covid or Covid-affected data would produce estimations that are either not commercially realistic or do not reflect current market conditions.

Finally, use of post-Covid data removes the uncertainty and complexity associated with development of the Flint method … (Page 3)

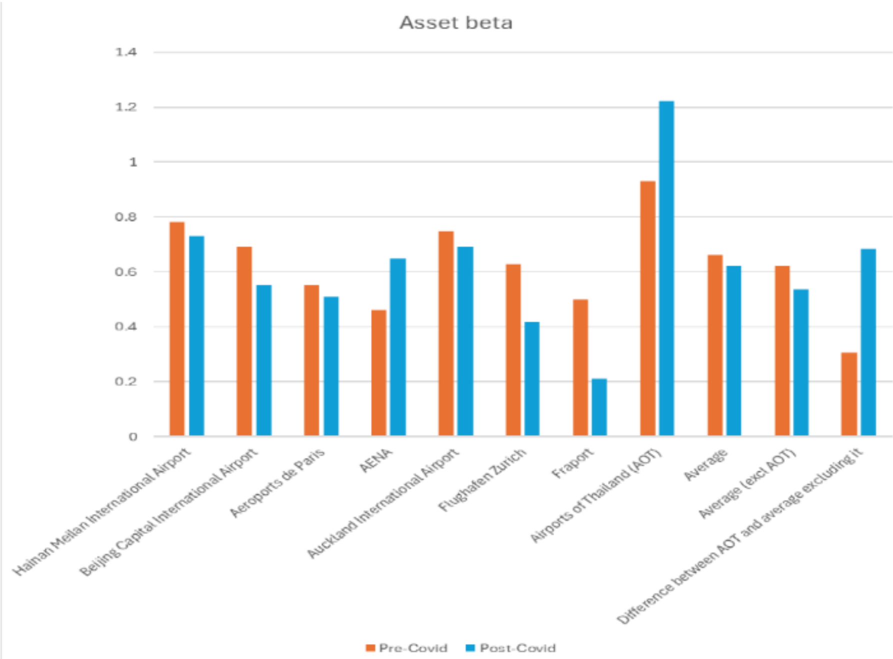
However, in its final Decision, and despite its recognition that Thailand was a developing country, the Commission retained Airports of Thailand in the comparator set because it did not have "strong grounds" to exclude it: The new post-Covid data now provides those strong grounds

a) On its face, Airports of Thailand is now a clear outlier to the other firms in the proposed comparator set. Its post-Covid estimate of asset beta (1.22) reflects that it has materially greater systematic risk than the broader equity market. That runs contrary to the observation that regulated airport monopolies are typically exposed to less systematic risk than the average firm in the market. Indeed, the asset betas of all other airports in the comparator set demonstrate on average materially lower systematic risk than the market in both the pre-Covid and post-Covid period (on average, post-Covid, 0.54).

b) Airports of Thailand's asset beta sits significantly outside the Commission's proposed standard error of the asset beta in the draft IM (0.25).[9]

c) In addition, the leverage of Airports of Thailand (of 0.05) is the lowest by a considerable margin and significantly below the average leverage of all other comparator firms in the proposed set (0.33).

This data is shown in the graphs below (expanding on Table 3.7 in the Commission's draft decision paper):



(Pages 5-6)

20. TDB Advisory in their report for BARNZ states (emphasis added):

*This approach provides the most practical way of ensuring that the new estimates **reflect current circumstances and expectations**, including the apparent fall in asset betas and increase in* *leverage since the pandemic. It also avoids the complications and uncertainties that would be associated with attempts to correct and update the methodology used earlier in the 2023 IMs.* (Paragraph 1)

It represents a pragmatic, sensible, and relatively straight forward way of responding to the issues at hand – notably the turbulence evident in equity beta estimates during the pandemic; uncertainties in the immediate post-pandemic period as to how betas would be affected for the rest of the regulatory period covered by the IMs; and errors that arose in trying to adjust non-covid beta estimates for potential residual systematic impacts of the pandemic. (Paragraph 4)

Further evidence of such differences is indicated in Table 3.7 in the Commission's report, showing beta and leverage estimates across the airports in its proposed comparator set. These data suggest that Airports of Thailand is significantly out of line with the other airports, with an abnormally high asset beta and abnormally low leverage (especially post-covid). (Paragraph 9)

21. Setting aside the fact that Qantas' plot is misleading, which we expand on in Section 5.3 (notice that the Linear (Midpoint) line is meaningless as it changes when adjusting the arrangement of the airports in the plot), we disagree with these conclusions for two reasons:

   i. 3-year asset betas are too noisy to draw meaningful conclusions from; and
   ii. Using a zero debt beta means you cannot meaningfully compare asset betas between firms with different leverage.

5 Conceptual errors in airline submissions

5.1 Treating a single 3 year asset beta estimate as probative/determinative of investors' perceived risk

22. As explained in section 3.1 of our June 2026 report, empirical equity betas are the result of a straight-line regression of stock returns against equity market returns over a specific period of time. The slope of that regression line is the measured equity beta. The measured equity beta captures the extent to which returns on the stock in question are correlated with the returns on the equity market and the relative volatility (standard deviation) of the stock versus the equity market in that period. These empirical betas are levered, and removing the effect of that leverage results in an asset beta.

23. We explained in sections 3.2 and 3.3 of our June 2026 report that simple mathematics, confirmed by the academic literature, makes it clear that equity betas purely reflect the shocks affecting equity markets in the measurement period. Adopting equity betas measured over a short 3 year window as a reliable measure of forward- looking perceptions is akin to assuming that investors believe that that 3 year period is perfectly representative of all risks to which they are exposed in the future.

24. This is false in general of any historical period but, with a long estimation window, that covers a large number of shocks to equity markets, one can take more comfort in the implicit assumption of representativeness. However, even so, if the period does not incorporate data from historical high volatility market events (such as COVID) it will not capture any of the corresponding risk. That is the purpose of including such events with a corresponding Flint adjustment in order to give those events an appropriate (representative) weight.

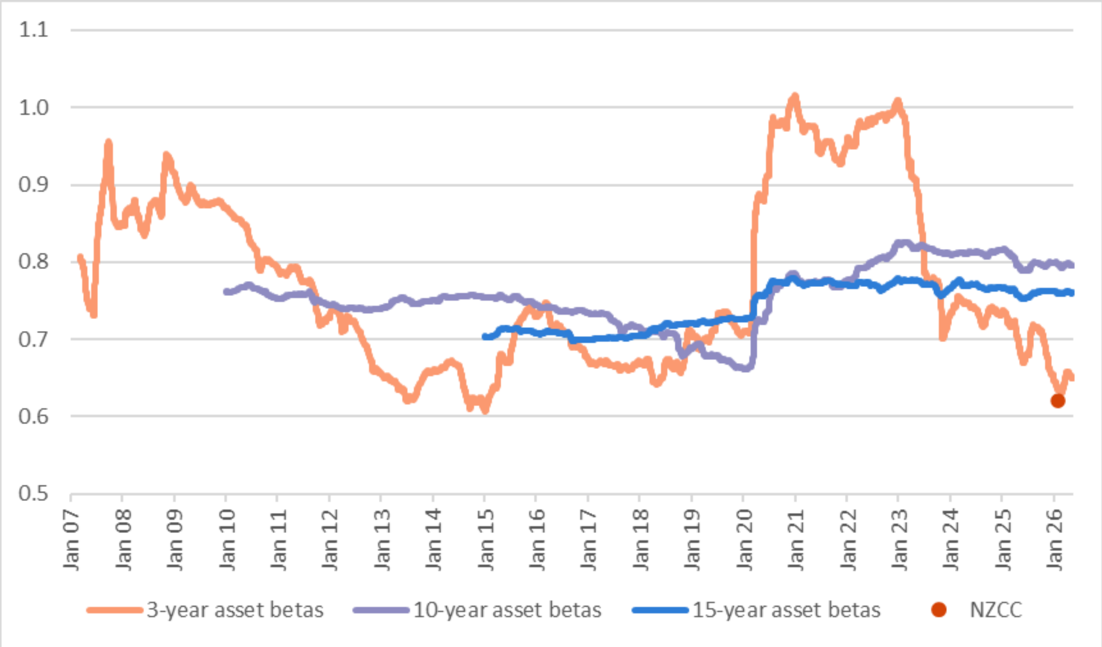
25. Adopting a beta estimated over only three years is like estimating the long-run flood risk of a property using only the last three years of weather. If those years happened to be unusually mild, the resulting estimate will understate the risks the property may face in future. A longer record is more likely to capture the range of conditions that can occur. But excluding the one major flood from the data guarantees that the estimate makes no allowance for that risk at all. The appropriate response is not to ignore the flood, but to include it while adjusting its weight so that an exceptional event is not treated as though it occurs every few years.

5.1.1 A 3 year asset beta that is in the bottom 2 percent of historical estimates is not determinative of investors' perceived risk

26. Relying solely on short window low volatility "normal-time" beta estimates will provide inadequate compensation for the actual risk (both borne and perceived) by investors. 3-year asset betas are noisy and sensitive to choice of window. Figure 5-1, (a reproduction of Figure 4-1 from our original submission)[4], highlights the volatility of short-term asset betas compared to longer-term asset betas and illustrates that the NZCC post COVID 3 year asset beta is a low outlier.

[4] See also the shorter time period for Figure 4-4 from our original submission which starts after AENA is listed.

Figure 5-1: 3-year, 10-year and 15-year asset betas using data from March 2004 to May 2026 for the six comparators with data across this entire period (excluding AENA and ADP)



27. In order to see the unreasonableness of the airline submissions, the following statements should be read in the knowledge that they all implicitly rely on the red dot in Figure 5-1 being determinative of investors' perceptions of post-COVID asset beta risk.

<u>Qantas</u>

Qantas supports: The adoption of a three-year post-COVID estimation window for asset beta, excluding the COVID-disrupted period. This better reflects current airport risk, removes statistical complexity, and aligns with long-run pre-COVID averages. (Page 1)

<u>Air New Zealand</u>

The inclusion of pre-Covid or Covid-affected data would produce estimations that are either not commercially realistic or do not reflect current market conditions. (Page 3)

<u>TDB</u>

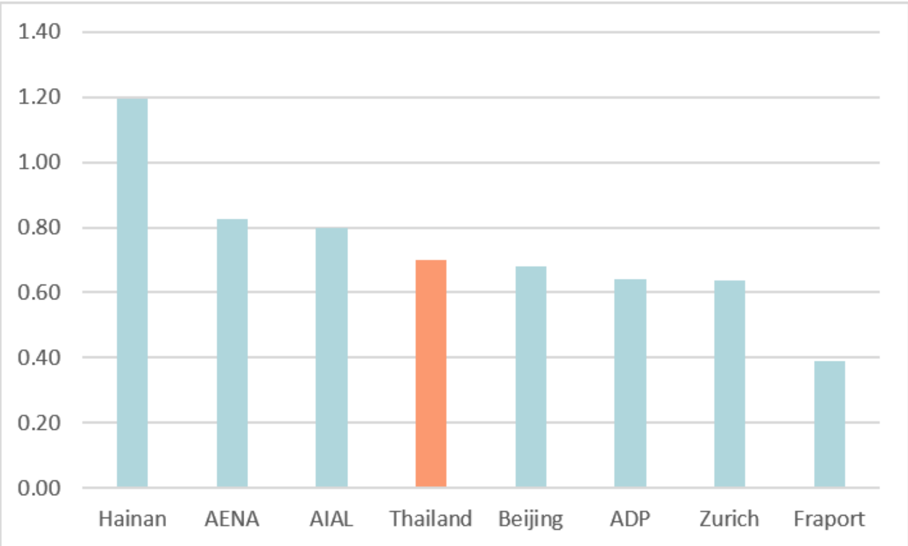
This approach provides the most practical way of ensuring that the new estimates reflect current circumstances and expectations, including the apparent fall in asset betas and increase in leverage since the pandemic. It also avoids the complications and uncertainties that would be associated with attempts to correct and update the methodology used earlier in the 2023 IMs. (Paragraph 1)

It represents a pragmatic, sensible, and relatively straight forward way of responding to the issues at hand – notably the turbulence evident in equity beta estimates during the pandemic; uncertainties in the immediate post-pandemic period as to how betas would be affected for the rest of the regulatory period covered by the IMs; and errors that arose in trying to adjust non-covid beta estimates for potential residual systematic impacts of the pandemic. (Paragraph 4)

28. In our view, these statements are patently unreasonable. They amount to claiming that the single 3-year asset beta, that is in the bottom 2% of all estimates for the same sample,[5] best reflects investors' risk perceptions and: "removes statistical complexity, and aligns with long-run pre-COVID averages" and "provides the most practical way of ensuring that the new estimates reflect current circumstances and expectations". Never mind that, for example, simply shifting the 3-year period one year backward or forwards materially increases the estimated asset beta (the 3 years to 31 January 2025 asset beta is 0.73 vs 0.62 and is entirely within the Flint post COVID period).

29. Similarly, the claim that Airports of Thailand can reliably be identified as a high outlier does not survive a more robust examination of the wider data. If all we do is shift the NZCC's 3-year period backwards by just 1 year, we obtain Figure 5-2 below. Airports of Thailand is in the middle of the sample – even assuming a zero debt beta (discussed more below). In this three year window Fraport and Hainan are the only airports that have asset beta estimates materially different to the average.

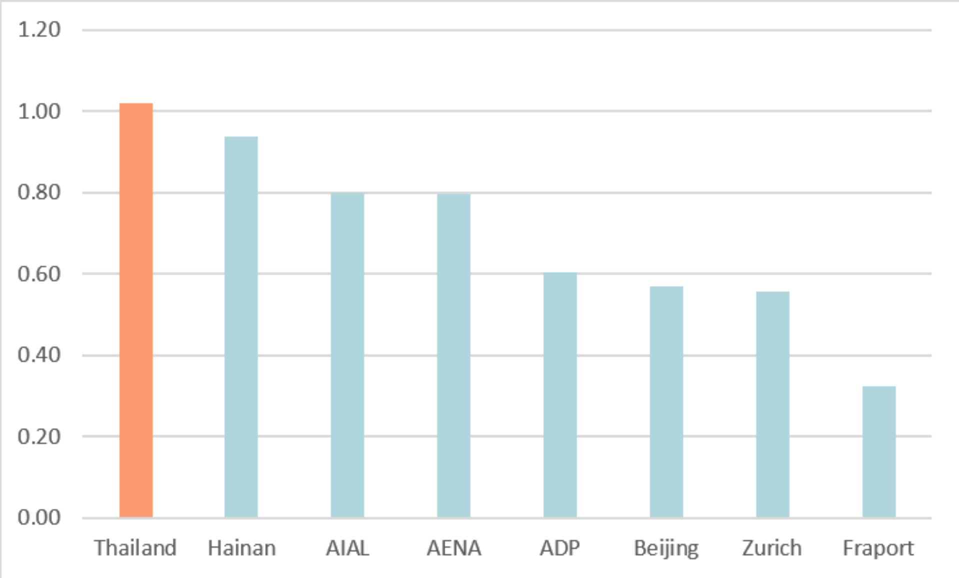
Figure 5-2: Asset betas (with zero debt beta) of airports in the comparator sample, using data from 1 February 2022 to 31 January 2025



30. If we instead used the Flint post COVID period from 1 January 2022 to 31 May 2026 we estimate Figure 5-3 below.

[5] See CEG, Critique of NZCC Targeted Amendments Draft Decision Airport asset betas inclusive of pandemic risk, June 2026, paragraph 133.

Figure 5-3: Asset betas (estimated with zero debt betas) of airports in the comparator sample, using data from 1 January 2022 to 31 May 2026



31. Airports of Thailand has the highest asset beta (estimated with a zero debt beta) but there is nothing unusual about its value relative to the rest of the sample (every sample must have a highest observation). By contrast there is a large "step jump" from Zurich's asset beta (the second lowest asset beta) to Fraport's asset beta (the lowest asset beta). Fraport is also clearly a high outlier for leverage (see Figure 5-4 below). Applying the airlines' logic Fraport would be excluded. We explain why the airlines' logic is flawed in section 5.2 and why there is no basis to exclude either Fraport or Airports of Thailand.

5.1.2 An asset beta that gives zero weight to COVID is not determinative of investors' perceived risk

32. Airline submissions line up in support of the NZCC draft decision error of assuming that equity/asset betas measure investors' perceptions of all risks that they are exposed to rather than simply the risks/shocks that affected equity prices within the estimation period. In response, we simply repeat the analysis in section 3 of our June 2026 report.

33. In addition, we note that Qantas' submission also claims that the Flint methodology was not designed to accommodate a decline in asset beta[6]; that claim is without basis. Indeed, the Flint method is precisely designed in order to add a pandemic premium to non-pandemic data, whatever asset beta that non-pandemic data gives rise to (be it characterised as "low" or "high"). The use of the Flint method is most critical when the non-pandemic observations are taken from unusually low volatility/measured asset beta periods.

5.2 Comparing asset betas wrongly estimated with a zero debt beta

34. The airline submissions argue that Airports of Thailand is an outlier with a high asset beta and that it should be removed from the sample. This is the main new argument introduced in the airline

[6] *It also removes the need for complex and inherently uncertain statistical adjustments for the pandemic period, including the pandemic premium methodology which was not designed to accommodate a decline in asset beta.* (Page 2)

submissions and, consequently, the rest of this report is devoted to explaining why it is wrong and is based on a failure to understand the data the airlines are relying on.

35. We have already established that this claim is dependent on the 3 year window ending January 2026 and that if that window is shifted back by just one year Airports of Thailand is in the middle of the sample. If any comparator is an outlier in both estimation periods it is Fraport as a low outlier. However, as we shall demonstrate, the difference between Fraport and Airports of Thailand (and the sample more generally) is an illusory artefact of assuming a zero debt beta.

36. Notably, the airline submissions also note that Airports of Thailand has the lowest leverage in the sample but they fail to understand that these two facts are, in fact, largely the same thing. Qantas states:

> *Airports of Thailand (AOT) should be removed from the comparator set. Its post-COVID asset beta of 1.22 is a clear outlier that materially overstates the sample average. Its ultra-low leverage of 5% also suppresses the average leverage, compounding the distortion across both parameters.* (Page 1)

37. It is well understood that debt beta is not zero (see section 6). The NZCC accepts that this is true (see section 6.1) as do all other regulators and finance experts. Similarly, it is well understood that debt betas increase with leverage (see sections 6.3 and 6.4).

38. The NZCC, unlike most other regulators that rely on the CAPM, does set the debt beta to zero. However, it acknowledges that this causes it to underestimate asset betas, especially for highly leveraged firms (see section 6.1). Precisely because of this known error in its leverage formula (i.e., using a zero debt beta) the NZCC determines the benchmark leverage to be equal to the sample average leverage. The NZCC does so on the basis that:

    a) the error in the de-leveraging process to arrive at (an underestimated) sample average asset beta;

    b) is offset by an approximately equal error of the opposite sign in the re-leveraging process (to move from the erroneously low asset beta back to the benchmark equity beta for the benchmark leverage).

39. However, the cancellation of errors only occurs once the sample average asset beta is re-levered to an equity beta. Assuming a zero debt beta leaves a leverage-dependent bias in the estimated individual asset betas. Firms with higher leverage have their asset betas understated by more than firms with lower leverage. Consequently, when individual firms have materially different leverage, the resulting asset betas are no longer directly comparable.

40. Qantas' statement:

> *Airports of Thailand (AOT) should be removed from the comparator set. Its post-COVID **asset beta of 1.22 is a clear outlier** that materially overstates the sample average. Its **ultra- low leverage of 5% also suppresses the average leverage**, compounding the distortion across both parameters.*

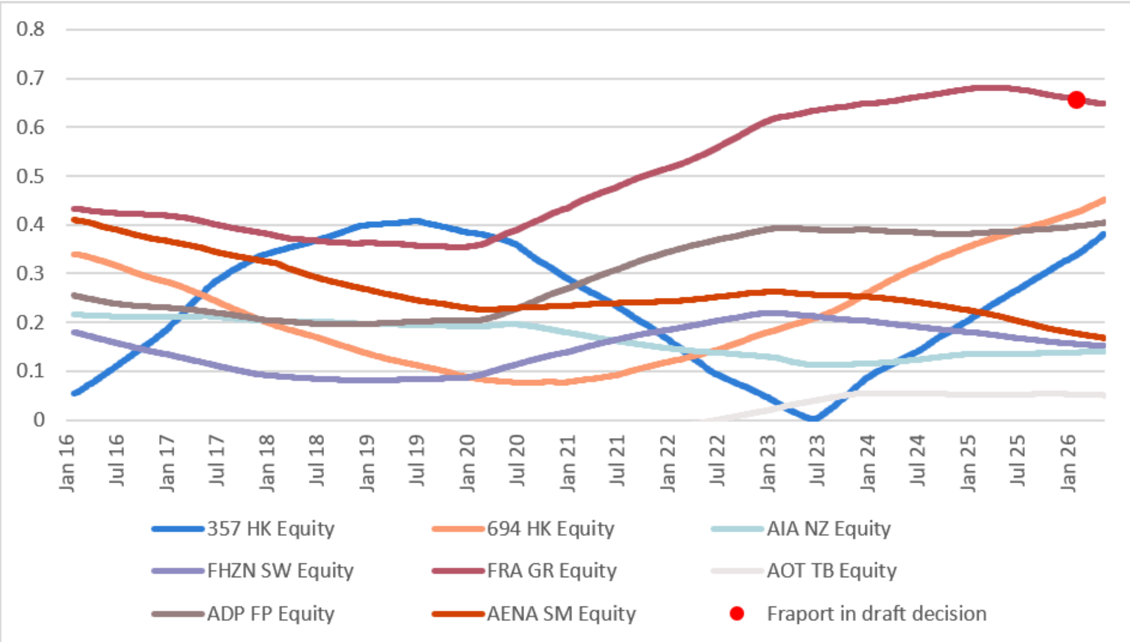
41. This is a clear illustration of Qantas' failure to understand that Airports of Thailand's high relative asset beta (estimated with zero debt beta) is, in part, because of its low leverage, which means that its asset beta is less distorted by the assumption of a zero debt beta than the other airports (in particular, Fraport with 66% leverage).

42. In fact, it is Fraport's leverage that is the outlier that gives rise to Fraport's asset beta being seriously underestimated when a zero debt beta is assumed. The reason that Fraport appears to have such a low asset beta relative to Airports of Thailand (and the rest of the sample) is, at least in part, due to the fact that the assumption of a zero debt beta is wrong and all asset betas are underestimated. However, this bias has only a small effect on Airports of Thailand (5% leverage) but has the largest

effect on Fraport (66% leverage – the highest leverage in the sample). In short, the magnitude of the difference between Airports of Thailand and Fraport is illusory.

43. We note that Fraport's unusual leverage of 66% is an outlier not only within the sample but also historically, as shown in Figure 5-4, where the x-axis represents the end date of each 3-year period.

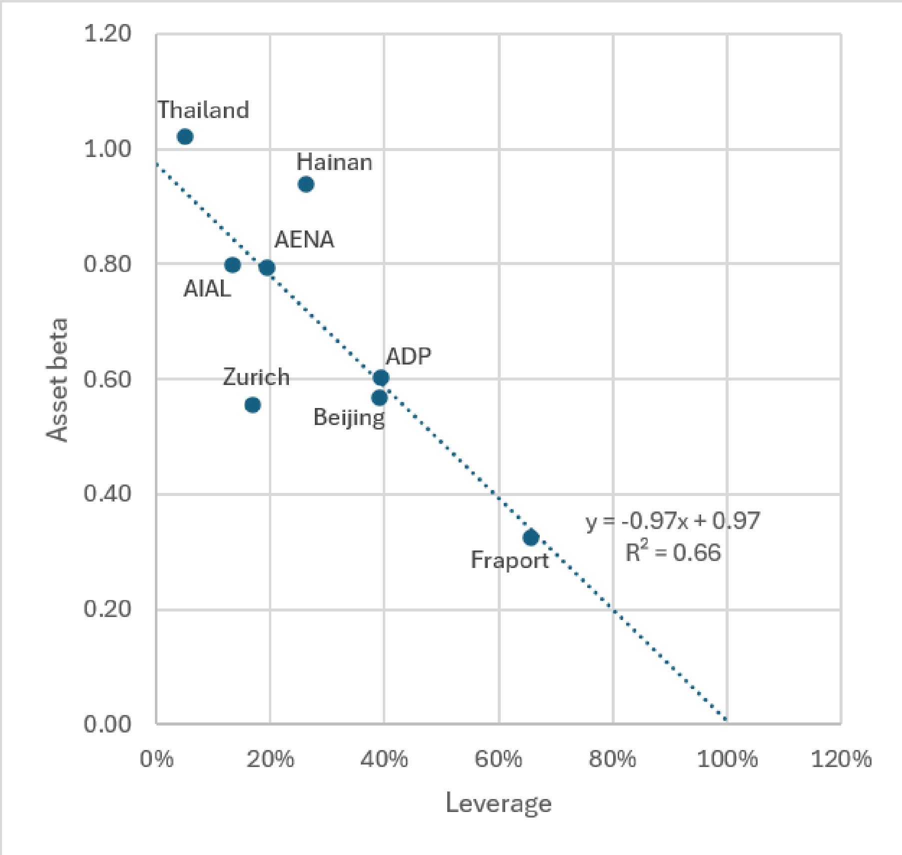
Figure 5-4: 3-year leverages using data from January 2013 to May 2026 for the eight comparators



44. It is peculiar that Qantas singles Airports of Thailand out as having an "*ultra-low leverage of 5%*" when, compared with Fraport's 66% leverage, Airports of Thailand is much closer to the sample average leverage both in the 3 years ending January 2026 and in all other three year periods.

45. The problem with assuming a zero debt beta is demonstrated below with the NZCC's comparator sample, using asset beta estimates for the Flint post-COVID period. Regressing asset beta (estimated with a zero debt beta) against leverage results in a strongly statistically significant negative relationship. At zero leverage the asset beta is 0.97 and asset beta falls by 0.01 for every 1% increase in leverage.

Figure 5-5: Asset beta vs leverage for the 8 comparator firms using data from 1 January 2022 (Flint's post-COVID date) to 31 May 2026, with a zero debt beta



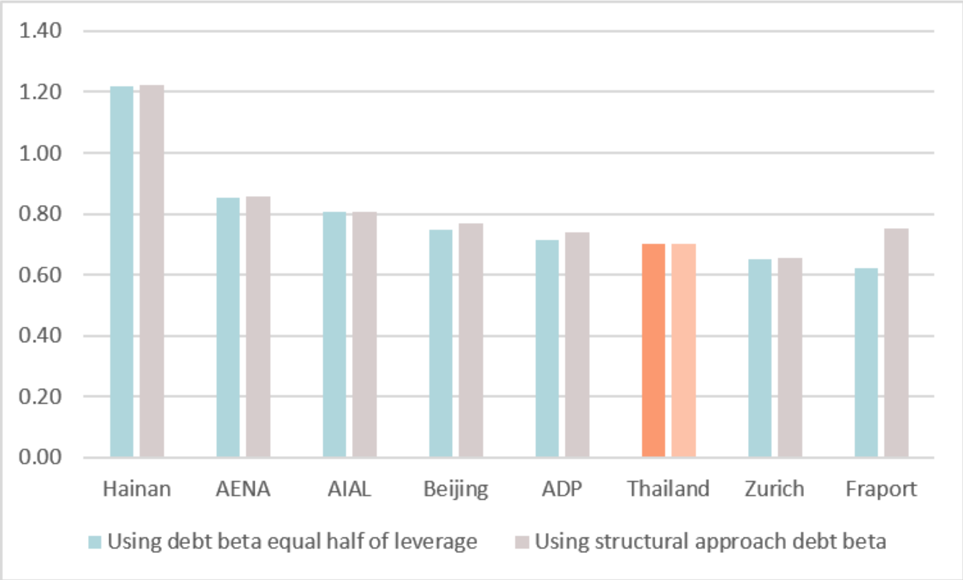
46. Here there is daylight between Fraport's estimated asset beta and the rest of the sample. However, this largely explained by the fact that high leverage leads to a large error in Fraport's estimated asset beta.

47. The observed negative relationship between asset beta and leverage is problematic because the point of the de-levering process is to remove the effect of leverage on equity beta. A strongly statistically significant relationship between asset beta and leverage is consistent with the known fact that the de-levering process, with a zero debt beta, will give rise to precisely this artificial estimated relationship – even if all of the firms have the same true underlying risk.

48. If one is to attempt to draw meaningful conclusions from within sample comparisons of asset beta then one needs to accurately estimate the debt beta for each firm in the sample. In section 6.5 we demonstrate that once positive debt betas are accounted for neither Fraport, which otherwise is a low outlier; nor Airports of Thailand can reasonably be regarded as outliers.

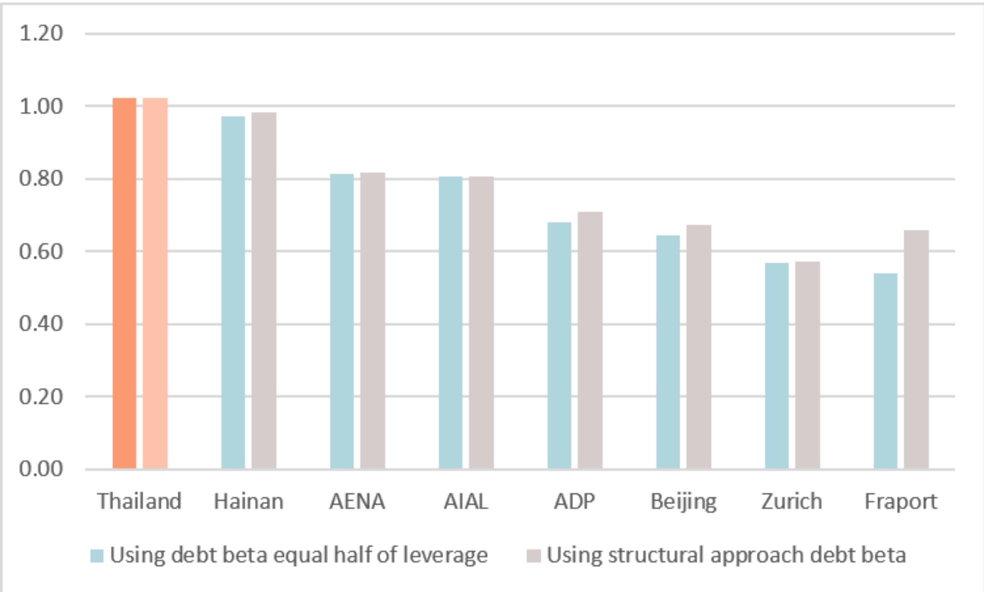
49. A key chart from that analysis repeated below. It shows that with a slightly different 3-year estimation window and with positive debt betas Airports of Thailand has an asset beta that is in the bottom half of the sample.

Figure 5-6: Asset betas (with positive debt beta) of airports in the comparator sample, using data from 1 February 2022 to 31 January 2025



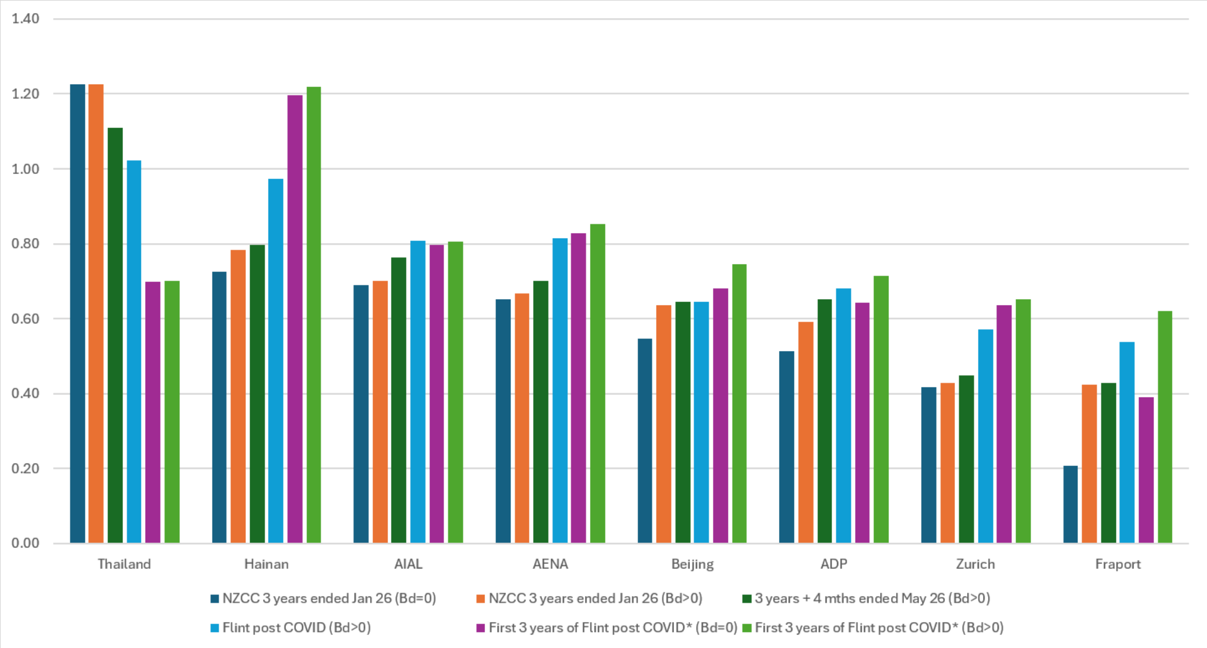
50. If we instead use the full Flint post COVID period, Airports of Thailand has the highest asset beta and Fraport the lowest. However, the difference between them is much reduced and neither can be claimed to be an outlier relative to the variation in the sample.

Figure 5-7: Asset betas (estimated with positive debt betas) of airports in the comparator sample, using data from 1 January 2022 to 31 May 2026



51. Figure 5-8 illustrates the sensitivity of within sample asset beta estimation comparisons to using different post COVID periods and positive debt betas.

Figure 5-8: NZCC sample with different post COVID periods and debt betas



* This is the 3 years ended 31 January 2025 being 3 years ended exactly one year earlier than the NZCC draft decision 3 year period. Technically this is 3 years of data starting one month after the beginning of the Flint post COVID period.

52. The dark blue bars that appear first on the left for each airport are the asset betas that the airline submissions are based on (and as reported in the NZCC draft decision). The orange bars retain the same estimation window but apply a positive debt beta. The dark green bars add 4 months of new data to the NZCC draft decision and apply a positive debt beta. The light blue bars apply the Flint definition of the post COVID period using data up until May 2026 and apply a positive debt beta. The next two bars show asset betas for the first 3 years of the Flint post COVID period (with zero/positive debt betas).

53. Based on the dark blue bars (as reported in the NZCC draft decision), Airports of Thailand's asset beta is 1.7 times the asset beta of Hainan. However, for every iteration after that the gap lowers. Retaining the NZCC definition of the end of COVID but adding the most recent 4 months of data and applying a positive debt beta the ratio falls to 1.4. Using the full Flint post COVID period and positive debt betas the ratio falls to 1.1. Using the first 3 year window within the Flint post COVID period (rather than the last years of that period) the ratio is 0.6 and Airports of Thailand is in the bottom half of the sample.

54. This illustrates that the airlines' conclusion that Airports of Thailand's asset beta is an outlier is contingent on the choice of:

    a) an arbitrarily narrow estimation window (excluding relevant data before and after the 3 years ending January 2025); and

    b) a flawed estimation method (incorrectly assuming a zero debt beta).

55. Relaxing any of those assumptions causes the asset betas for:

    a) all of the other airports to rise materially; and

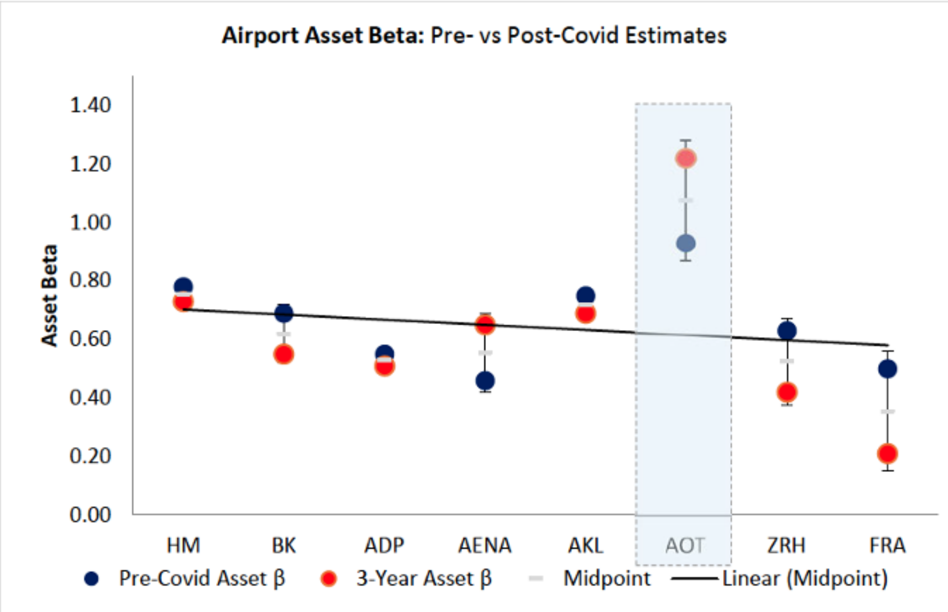
    b) Airports of Thailand's to fall.

56. The fact that every other airport's asset beta rises and Airport of Thailand's asset beta falls when a different estimation window is used suggests, if anything, that the 3 years ending January 2026 is a problematic estimation window rather than that Airports of Thailand is a problematic comparator.

5.3 Qantas' misleading presentation and ill-conceived regression analysis

57. Qantas' Figure 1 (reproduced as Figure 5-9 below) presents the data in a misleading manner.

Figure 5-9: Pre- and post-COVID asset betas of airports in the comparator sample (Figure 1 from Qantas' submission)

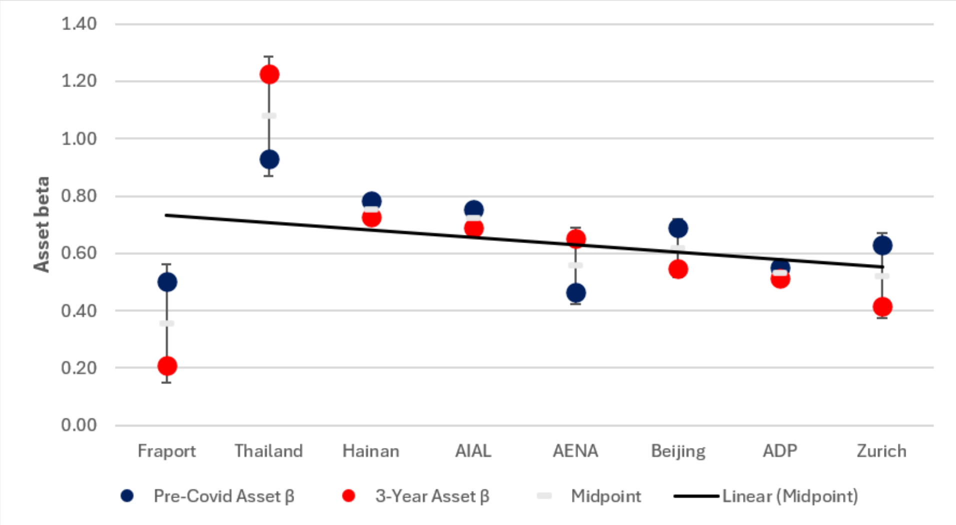


Source: Qantas Group – Submission on Targeted Amendments to Airport Cost of Capital IMs draft decision – 16 June 2026

58. Qantas has fitted a straight "Linear (Midpoint)" trend line through the midpoint of each airport's pre- and post-COVID asset betas, and placed Airports of Thailand at the right-hand end of the chart, next to Zurich and Fraport, both of which have comparatively low estimated asset betas (with zero debt betas). Placing a high beta directly next to a run of low betas is what creates the visual impression of a single downward-sloping trend running through the whole sample, with Airports of Thailand as the awkward exception sitting apart from it.

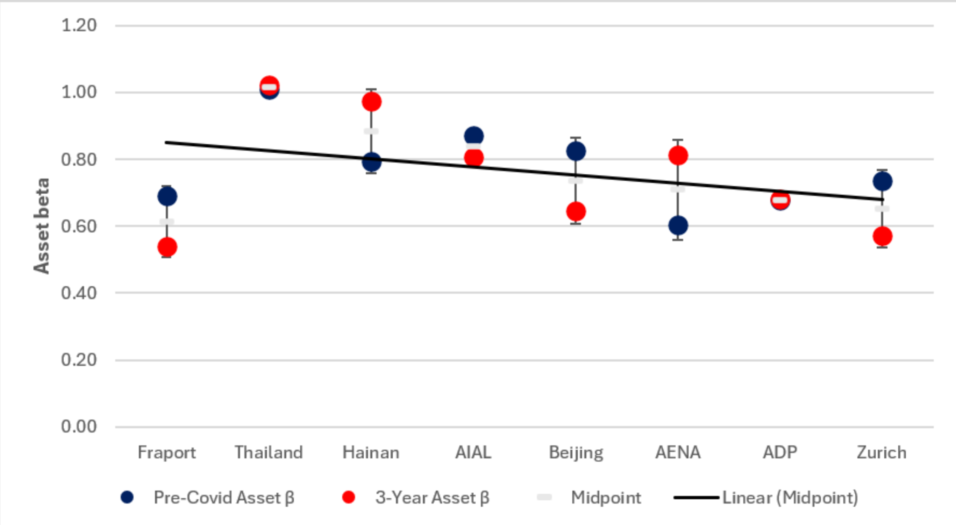
59. But the order the airports appearing along the horizontal axis has no economic meaning and simply reflects the order Qantas chose to list them in. There is no reason Airports of Thailand needs to sit where it does, and no reason the trend line needs to slope the way it does. Place Fraport first and Airports of Thailand second and the presentation changes materially, as shown in Figure 5-10 below..

Figure 5-10: Pre- and post-COVID asset betas of airports in the comparator sample, arranged in descending order except with Fraport on the left, using data from 1 February 2023 to 31 January 2026



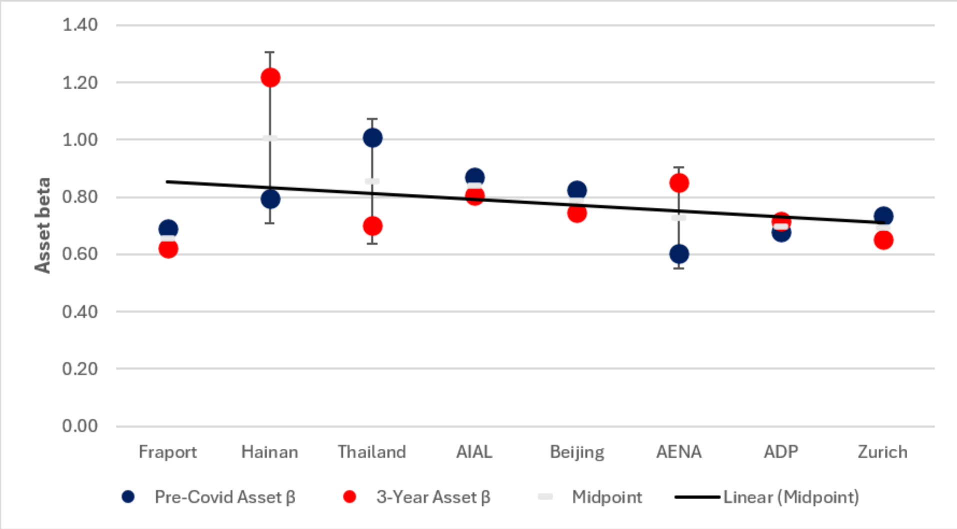
60. Now Fraport appears as much of an outlier as Airports of Thailand. If we amend this chart to use the Flint post COVID period (1 January 2022 to 31 May 2026) and a positive debt beta then we arrive at Figure 5-11.

Figure 5-11: Pre- and post-COVID asset betas of airports in the comparator sample, arranged in descending order except with Fraport on the left, using data from 1 January 2022 to 31 May 2026



61. In this figure neither Fraport nor Airports of Thailand appear as outliers. We can draw similar conclusions when reproducing the above figure but using a three year period one year earlier than the NZCC period.

Figure 5-12: Pre- and post-COVID asset betas of airports in the comparator sample, arranged in descending order except with Fraport on the left, using data from 1 February 2022 to 31 Jan 2025



6 Role and estimation of debt betas

62. Within the capital asset pricing model, asset betas are the weighted sum of the systematic risk borne by equity funders (equity beta) and to debt funders (debt beta):

Equation 1: Brealey Myers leverage formula

$$\beta_E = \frac{1}{1-gearing} \times (\beta_A - gearing \times \beta_D);$$

rearranged implies

$$\beta_A = (1 - \text{gearing}) \times \beta_E + \text{gearing} \times \beta_D;$$

- β_A = asset beta.
- β_E = equity beta.
- β_D = debt beta.
- $gearing = \frac{debt}{debt+equity}$

63. It is clear that if the true debt beta is positive then assuming a zero debt beta ($\beta_D = 0$) will result in an underestimate of the true asset beta and the level of this estimate will increase with leverage (especially given debt beta also increases with leverage).

64. Conceptually, assuming a zero debt beta assumes that debt holders do not bear any risk and that, as leverage rises, 100% of asset risk is concentrated with equity holders without any transfer of risk to debt holders. This amounts to assuming that corporate debt is risk-free. A positive debt beta correctly assumes that risk does get passed to debt holders (corporate debt is not a riskless asset) and, therefore, an increase in debt passes some risk to debt holders and concentrates the remaining risk amongst equity holders. The theoretically accurate asset beta formula with a positive debt beta captures the former effect, with the passing of some risk to debt holders causing a less steep relationship between equity beta and gearing.

65. The ultimate explanation for the negative relationship between asset beta and gearing in Figure 5-5 is the absence of a debt beta in the current asset beta formula. The absence of a debt beta means that the model assumes debt holders take on zero (none) of the asset risk as leverage rises. It is well understood that this assumption is inaccurate. When a firm issues debt the lenders take on some of the underlying asset risks.

66. If the true debt beta is positive, then using a zero debt beta will create inaccuracies in the re-levered equity beta so long as the re-levered gearing is different to the original gearing (i.e., the gearing associated with the observed equity beta). Specifically, the re-levered equity beta has an observed relationship to gearing such that:

a) when the assumed gearing is <u>lower</u> than the observed gearing, using a zero debt beta will <u>underestimate</u> equity beta; and

b) when the assumed gearing is <u>higher</u> than the observed gearing, using a zero debt beta will <u>overestimate</u> equity beta.

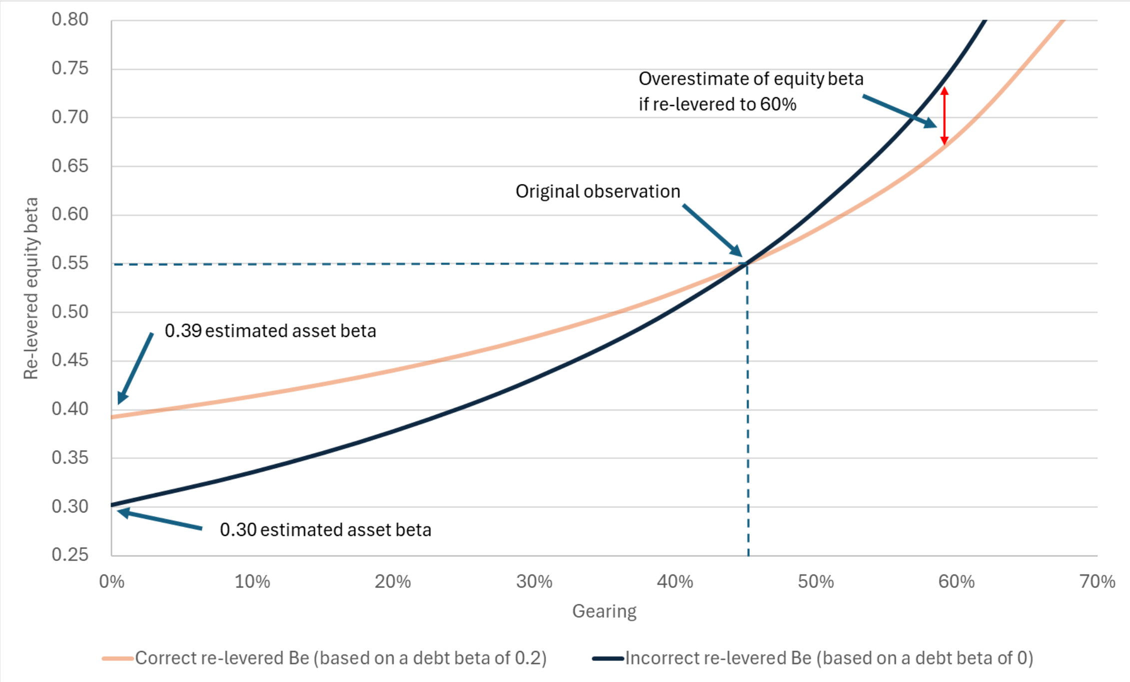
67. Put simply, assuming a zero debt beta causes a "too steep" leverage effect.

68. Consider an observed equity beta of 0.55 that is associated with an observed gearing of 45% and an actual (but unobservable) debt beta of 0.20. The estimated asset beta using the Brealey Myers leverage formula with a zero debt beta will be 0.30 (=0.55*(1-45%)) while the correct asset beta will be 0.39 (=0.55×(1-45%)+0.20×45%).

69. This underestimated asset beta (equity beta at zero debt) reflects the more general fact that all equity betas will be underestimated when assumed gearing is less than the original 45%. The flipside of this is that all equity betas will be overestimated if the assumed gearing is greater than the original 45% used. This is also driven by the fact that the asset beta formula is "too steep".

70. The following chart illustrates the difference between the correct and the modelled equity beta in this scenario.

Figure 6-1: Illustration of why re-levering away from the original gearing causes errors if the debt beta is incorrect



71. The simplified formula with a zero debt beta assumes that beta falls "too fast" with gearing. That is why it underestimates the asset beta (equity beta with zero debt). For precisely the same reason, re-levering to above the original gearing will overestimate equity beta. The overestimate of the equity beta assuming a 60% gearing is illustrated by the red vertical line in Figure 6-1.

72. In simple terms, adopting the sample average leverage as the benchmark leverage ensures that:

a) the error in the de-leveraging process to arrive at sample average asset beta;

b) is offset by an approximately equal error of the opposite sign in the re-leveraging process (to move from the erroneously low asset beta back to the benchmark equity beta for the benchmark leverage).

73. As we shall see below in section 7, this is not strictly true if debt betas vary with leverage because this creates non-linear effects that are not cancelled out on average. However, the NZCC is correct that if a zero debt beta is to be used for all comparators, then it is critically important that the sample average leverage be used as the benchmark leverage.

6.1 Why the NZCC zero debt beta is fit for purpose when de-levering and re-levering to the sample average leverage

74. The NZCC refers to the overly steep relationship between equity beta and leverage when using a zero debt beta as "the leverage anomaly". This is referred to as an anomaly because it causes WACC to rise with leverage when, consistent with the Modigliani Miller Theorem, the WACC should be independent of the leverage (i.e., the fundamental risk of a firm is unchanged by its financing structure). This "leverage anomaly" would imply that the WACC is always minimised by issuing zero debt (emphasis added).[7]

> *This positive relationship between leverage and WACC is inconsistent with the behaviour of firms in workably competitive markets. Firms in those markets issue debt, providing debt levels are prudent, and are considered to be acting rationally when doing so.*
>
> ***In 2010 we identified two main options to overcome this anomaly: use the average leverage of the sample of comparator companies used to estimate asset beta, or use non-zero debt betas. We noted that the use of non-zero debt betas is theoretically better than using notional leverage, but there are practical difficulties in accurately estimating debt betas**. We also noted that most regulators do not use non-zero debt betas and that we had not used them in the past.*
>
> *Debt beta measures a firm's systematic risk associated with borrowing, and is measured by the sensitivity of the returns on corporate debt to movements in returns on the market portfolio of all assets. In 2010 PwC submitted that: **If debt betas are to be excluded from the WACC analysis (which we concur with), then to be consistent the notional leverage used in the WACC estimation should be close to the average leverage of the comparator companies used to derive the (average) beta estimate**. This is a fundamental requirement in order to be able to justify application of a "short cut" approach and thus ignore debt betas.*
>
> ***We recognise that the greater the riskiness of debt, the more it resembles equity. Therefore, the greater the systematic risk of debt due to market conditions, the greater the debt beta.***
>
> *Consequently, in principle, debt betas should be included in the cost of capital calculation. The use of non-zero debt betas is theoretically sounder than using notional leverage as the use of non-zero debt betas would reduce the extent to which the post-tax WACC estimate for each service varies with leverage.*
>
> *However, we noted in 2010 that most submissions preferred the use of zero debt betas, that most regulators do not use debt betas (though a minority do), and that we had not used non-zero debt betas in the past. Further, there are practical difficulties in accurately estimating debt betas. Those challenges to the use of non-zero debt betas remain.* (Emphasis added)

75. The NZCC discusses in more detail all of the technical issues that would need to be dealt with if relying on an estimate of the debt beta in its 2010 decision. The NZCC's key conclusion was that, rather than estimating a debt beta the NZCC would align benchmark gearing with the average gearing of the comparators used to estimate equity and asset betas.[8]

> *With regard to estimating equity betas, the Commission noted that these would be inherently imprecise and involve a significant degree of judgement. Given the difficulty associated with obtaining reliable data for a portfolio of traded corporate bonds, the Commission considers that the*

[7] NZCC, Input methodologies review decisions, Topic paper 4: Cost of capital issues, 2016, pp. 142-143.

[8] Input Methodologies (electricity distribution and gas pipeline services) Reasons Paper, December 2010, pp. 428 to 431 and appendix H9 pp. 552 to 556.

> *estimation of debt betas would be even more imprecise and require an even greater degree of judgement.*

76. Consistent with this, we explained in our response to the 2023 IM draft decision[9]:

> *Such a relationship between debt beta and equity beta is well understood and accepted by the NZCC. Indeed, the NZCC carefully explains why the existence of positive debt betas means* ***internal consistency requires it to use the same benchmark gearing as the sample average gearing from the asset beta sample of firms.*** *Otherwise, using a debt beta of zero and a value for benchmark gearing above the sample average would tend to overestimate the equity beta and create "the leverage anomaly" whereby WACC increases with gearing when the Modigliani Miller Theorem argues that WACC should be independent of gearing (within reasonable ranges).* (Paragraph 21)

6.2 Assuming a zero debt beta is not fit for purpose if comparing individual asset betas for firms with materially different leverage

77. However, the cancellation of errors is a property of the sample average, not of individual observations. Assuming a zero debt beta introduces a leverage-dependent bias into estimated individual asset betas. Firms with higher leverage have their asset betas understated by more than firms with lower leverage. Consequently, when individual firms have materially different leverage, the resulting asset betas are no longer directly comparable. Any apparent differences in estimated asset betas may simply reflect differences in leverage, rather than differences in the underlying systematic risk of the firms' assets. Accordingly, comparisons of individual asset betas estimated using a zero debt beta are unreliable whenever there are material differences in leverage across the firms being compared.

6.3 Debt betas are positive and increase with leverage

78. It is well accepted that corporate debt betas are non-zero. Indepen[10], in a 2018 consultation for Ofgem, explained that:

> *A case for non-zero debt beta also rests on theoretical grounds and debt market pricing practices which suggest that promised returns to debt securities increase with increasing risk of those securities. It also rests on the view that debt securities cannot be immune to economy wide forces and their returns are likely to co-vary with such forces.*

79. A number of past regulatory decisions and current regulatory methods assume positive debt betas in their rate of return and WACC calculations.

   a) The AER draft 2026 Rate of Return Instrument adopts a fixed 0.1 debt beta.[11]

   b) The QCA currently adopts a fixed debt beta of 0.12 in their approach to determining rates of return.[12]

80. Most regulated companies in the UK have adopted a fixed positive debt beta:

[9] CEG (2023), Response to 2023 IM draft decision on cost of capital.

[10] Indepen (2018), Ofgem Beta Study – RIIO-2 Main Report, p. 4.

[11] Australian Energy Regulator (2026), Draft 2026 Rate of Return Instrument, Explanatory Statement, p. 2.

[12] Queensland Competition Authority (2024), Rate of return review, p. 3.

Figure 6-2: UK regulatory decisions on the debt beta from 2015 to 2019

Regulatory review	Review stage	Year	Debt beta used
CMA (Bristol Water)	Decision	2015	0
Ofcom (MCT)	Decision	2015	0.10
Ofcom (BCMR)	Decision	2016	0.10
NI Utility Regulator (GD17)[23]	Decision	2016	0.10
NI Utility Regulator (RP6)	Decision	2017	0.10
Ofwat (PR19)	Methodology decision	2017	0.10
Ofcom (WLA)	Decision	2018	0.10
Ofgem (RIIO-2)	Methodology decision	2019	0.10-0.15
CAA (NERL)	Decision	2019	0.10
Ofwat (PR19)	Draft Decision	2019	0.125
Ofcom (LLCC)	Decision	2019	0.10

Source: CEPA review of regulatory determinations, supplemented by UKRN (2019) and NERA (2018)

81. However, it is important to note that adopting a single positive debt beta for every firm in the sample:

a) is a reasonable approximation if the analysis is to be performed on the sample average (for the reasons explained in section 5.2); but

b) is not a reasonable approximation if within sample comparisons of asset beta are to be performed for firms with very different leverage (for the reasons explained in section 6.2).

82. If within sample comparisons of asset beta are to be performed one needs to apply debt betas that are specific to the airport in question and take account of that airport's leverage.

6.4 Empirical estimates of debt beta and its variation with leverage

6.4.1 Regression estimates of debt beta

83. In 2019, CEPA was retained by the UK Regulators Network (UKRN) to provide advice on the debt beta.[13] In their report, CEPA note that Schwert and Strebulaev (2014) estimated the equation:

$$\beta_D = -0.09 + 0.63L$$

by regressing the debt betas of seven credit rating categories against their average gearing levels. Both coefficients are statistically significant at a 95% level, and the model has an R-squared of 0.91, which means that 91% of the variation in debt beta is explained by leverage.

84. Table 6-1 provides the data that Schwert and Strebulaev (2014) used in their regression analysis.

[13] CEPA (2019), Considerations for UK regulators setting the value of debt beta.

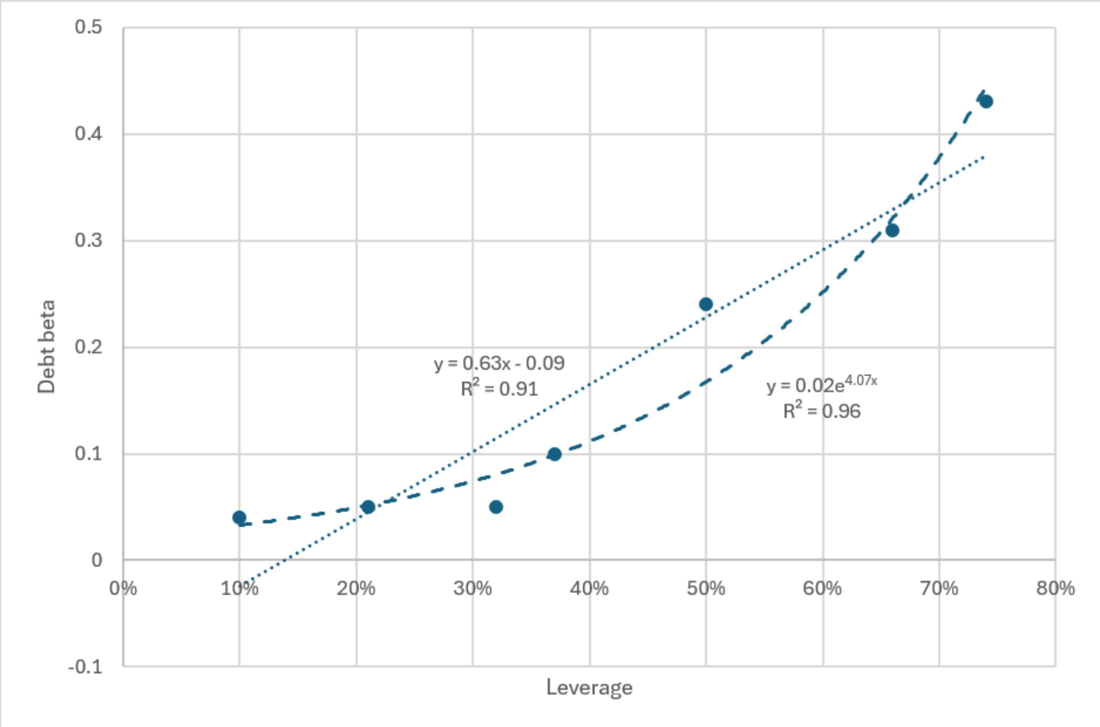
Table 6-1: Debt beta and gearing for different credit ratings

Rating	AAA	AA	A	BBB	BB	B	CCC
Gearing	0.10	0.21	0.32	0.37	0.50	0.66	0.74
Debt beta	0.04	0.05	0.05	0.10	0.24	0.31	0.43

Source: Schwert and Strebulaev (2014)

85. Only four of the airports in the NZCC sample (Zurich, AENA, AIAL and ADP) have credit ratings and credit ratings for AENA, Zurich and ADP are in the context of material government ownership of those airports. This leaves leverage as the only viable guide to deriving debt betas from Schwert and Strebulaev (2014).

Figure 6-3: Debt beta vs. leverage using data from Schwert and Strebulaev (2014)

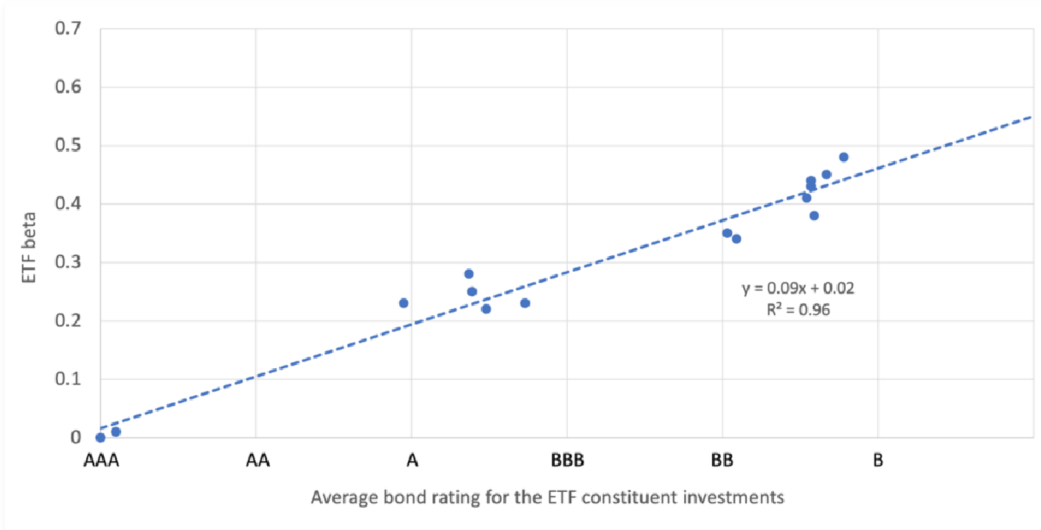


86. Cooper and Jullens (2024)[14] perform similar analysis and estimate a flatter, but still significantly upward sloping, relationship between debt beta and credit rating. Cooper and Jullens (2024) do not report leverage levels associated with each credit rating.

> *It is possible to calculate a debt beta from price data in the same manner as for an equity beta. It is also possible to observe average debt betas using the price changes for bond funds. The beta of a bond fund is itself the weighted average of the betas for the underlying bond constituents. The chart below shows the results for 15 US bond ETFs.*

[14] https://www.footnotesanalyst.com/equity-beta-asset-beta-and-financial-leverage/ accessed on 10 July 2026.

Bond ETF beta compared with average rating of constituent investments



Data derived for a selection of US bond ETFs using the Footnotes Analyst Beta Calculator Model.

The two ETFs with betas close to or equal to zero are a US government bond ETF and a fund investing in high quality (94% AAA) CDOs. The middle group, with a beta of 0.2 to 0.3, are portfolios of investment grade corporate bonds where the credit ratings of constituent bonds are mostly in the range of BBB to AA. The average bond rating for the portfolio is derived from the disclosed asset allocation for each ETF. The final group represents portfolios of high yield / sub-investment grade bonds.

The chart shows there is a clear relationship between bond beta and bond rating and that the betas for even investment grade bonds are not insignificant. There is an approximate 0.09 increase in bond beta for each major step in bond rating.

Arguably the use of a linear regression underestimates the relationship between debt beta and leverage at high levels of leverage. If we plot the data for the Schwert and Strebulaev (2014) we see that the relationship between debt beta more closely follows an exponential relationship than a linear relationship. The exponential relationship has an R-squared of 96% while the linear relationship has an R-squared of 91%.

87. Partington and Satchell (2021) were asked by the Australian Energy Regulator to opine on the relationship between the WACC and leverage. Naturally, this required Professor Partington to opine on debt beta.[15] They advised that the debt beta was positive and would increase with leverage.

Second, is the assumption that the beta of debt is zero, this leads to an upward bias in the cost of equity when relevering the equity beta.9 Bringing the value of the beta of debt into the adjustment formula will control this problem, but we then face the problem of determining the beta of debt.

…

Non-linear adjustment

Third, a bias arises because as the debt becomes riskier at higher levels of leverage an increasing quantity of business risk is being transferred from the shareholders to the debt holders. Although the equilibrium expected return on equity rises with leverage (due to increased financial risk) it does so

[15] Graham Partington and Stephen Satchell, Report to the AER: WACC and Leverage, May 2021.

> *at a decreasing rate.* ***The equilibrium expected return on debt also rises with leverage because of increased systematic risk, and the promised return rises due to increasing default risk****.*
>
> *With risk free debt, or a cost of risky debt that is independent of leverage, there is a linear relation between the cost of equity and the level of leverage.* ***However, the reality is that the cost of risky debt rises with leverage and consequently there is a non-linear relation between the cost of equity and leverage. This is why the cost of equity rises with leverage, but at a decreasing rate****. If the method of adjusting for leverage does not allow for this then cost of equity will go up too quickly. The result is an upward bias in the estimated WACC, which increases with leverage.*
>
> *We have rewritten equation 1 below, with the debt related betas and the value of the debt tax shield subscripted with l to emphasise that they may change with leverage. One solution to the problem above is to use the rewritten equation 1a.* ***Under this approach, the debt beta will rise with leverage…***

88. In a 2025 report Professor Partington advised the AER.[16]

> *My solution to the debt beta relevering bias would be to include a debt beta in the unlevering and relevering. This then raises the question of what the debt beta should be. Unfortunately, debt betas can vary widely depending on how they are estimated and the data used. For example, UK regulators have used debt betas of 0.1 and when I recently looked up the betas for Australian corporate debt ETFs the betas were of the order of 0.4 and 0.5.*

89. However, Professor Partington goes on to express the view that debt betas of 0.4 to 0.5 are inconsistent with his prior view and that corporate debt betas in the range 0.1 to 0.2 are more plausible for investment grade corporate bonds. Professor Partington does not describe how he believes that debt betas would vary with leverage or credit rating but he does cite the analysis of Cooper and Jullens (2024) referred to above.

6.4.2 Modelled estimates of debt beta and its variation with leverage

90. CEPA also had regard to a modelled estimate of how debt beta should, in theory, vary with leverage. This involved deriving a debt beta based on theoretical finance models developed by Nobel Laureate Robert Merton (1974)[17] which was itself an application of the famous Black Scholes model to corporate debt. CEPA follows Cooper and Davydenko (2007)[18] in applying the Merton model to derive a relationship between debt beta and leverage.

91. CEPA conclude[19] as follows:

> *…debt betas should rise as gearing increases, as debt bears more non-diversifiable risk. The question is the extent of this effect. The structural approach described previously has the advantage that the dependence of the debt beta on gearing can be calculated explicitly. Figure 2.1 shows the outcome, using the same illustrative parameter values as in section 2.1.3.*

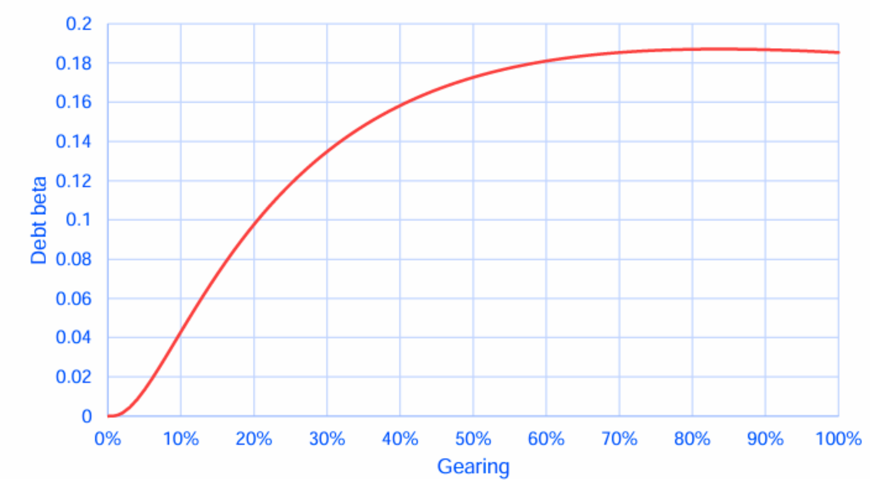
[16] 2026 Rate of Return Instrument review Eligible Experts' joint report, 23 November 2025. Page 38.

[17] Merton, R C (1974), On the Pricing of Corporate Debt: The Risk Structure of Interest Rates", Journal of Finance 29, 449-470.

[18] Cooper, I. A. and Davydenko, S. A., "Estimating the Cost of Risky Debt." Journal of Applied Corporate Finance, 19, 2007, 90-95.

[19] CEPA (2019) Considerations for UK regulators setting the value of debt beta, p. 15.

Figure 2.1: Illustration of the debt beta against gearing using the Cooper and Davydenko (2007) method



92. CEPA derived Figure 2.1 by calibrating the debt beta to an assumed 1.0% debt risk premium at 40% leverage and an equity beta of 0.7. Implicit in this calibration is an asset beta of 0.48. As such, the estimated 0.16 debt beta at 40% leverage is reasonable for a firm with a 0.48 asset beta and debt risk premium of 1.0% at 40% leverage (and other characteristics assumed by CEPA, namely, equity return standard deviation of 30%).

93. It is notable that CEPA's Figure 2.1 has a strongly concave relationship between debt beta and leverage at relatively low levels of leverage when the data from Schwert and Strebulaev (2014) is linear or convex (see Figure 6-3).

94. The reason CEPA's Figure 2.1 is so strongly concave is because CEPA's modelling, which we have reproduced, assumes that the debt risk premium is always 1.0% - irrespective of the leverage and debt beta. While reasonable in the vicinity of its calibration (40% leverage), this is, obviously, problematic the further leverage moves away from 40%. For example, at 100% leverage the debt beta should be equal to the asset beta of 0.48. This is because, at 100% leverage, debt investors take on 100% of the risk. However, in CEPA's Figure 2.1 the debt beta is only 0.18 at 100% leverage (hardly higher than it is at 40% leverage). CEPA's implicit assumption that the debt risk premium is always 1.0% forces the debt beta to be underestimated at higher than 40% leverage. Similarly, CEPA's assumption that the debt risk premium does not fall below 1.0% when leverage falls below 40% causes the modelled debt beta to be overestimated for leverage below 40%.

95. To correct this, we have applied a simple adjustment to the CEPA model such that the debt beta is forced to be equal to the asset beta at 100% leverage. This is achieved by requiring the debt risk premium to increase with leverage according to the exponential rule where:

$$Debt\ risk\ premium = DRP = \alpha \times e^{\gamma * Leverage}$$

96. This formula is then fitted through the following two points:

a) CEPA's 1.0% DRP at 40% leverage; and

b) The value of DRP that equates the debt beta at 100% leverage within CEPA's model with CEPA's asset beta (0.48).

97. This fitted curve results in parameter values as follows:

$$DRP = 0.19\% \times e^{4.16 * Leverage}.$$

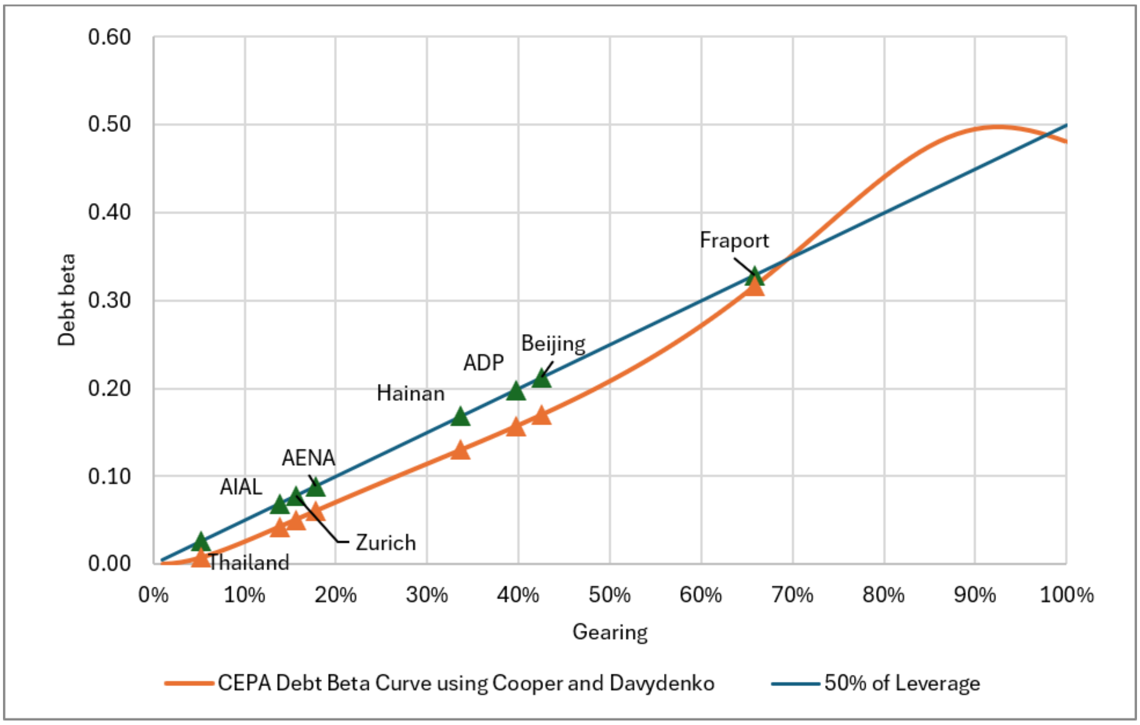
98. This formula results in a:

a) 1.0% DRP at 40% leverage,

b) 2.3% DRP at 60% leverage (which, as we will see below, is consistent with Fraport's DRP when its leverage is in the vicinity of 60%).

99. Implementing the assumption that $DRP = 0.19\% \times e^{4.16*Leverage}$ within the CEPA model results in the amended version of CEPA's Figure 2.1 shown in Figure 6-4. Also included in Figure 6-4 for comparison is the simple assumption that debt beta equals 50% of leverage.

Figure 6-4: Amended version of CEPA Figure 2.1 such that $DRP = 0.19\% \times e^{4.16*Leverage}$ retaining CEPA asset beta of 0.48



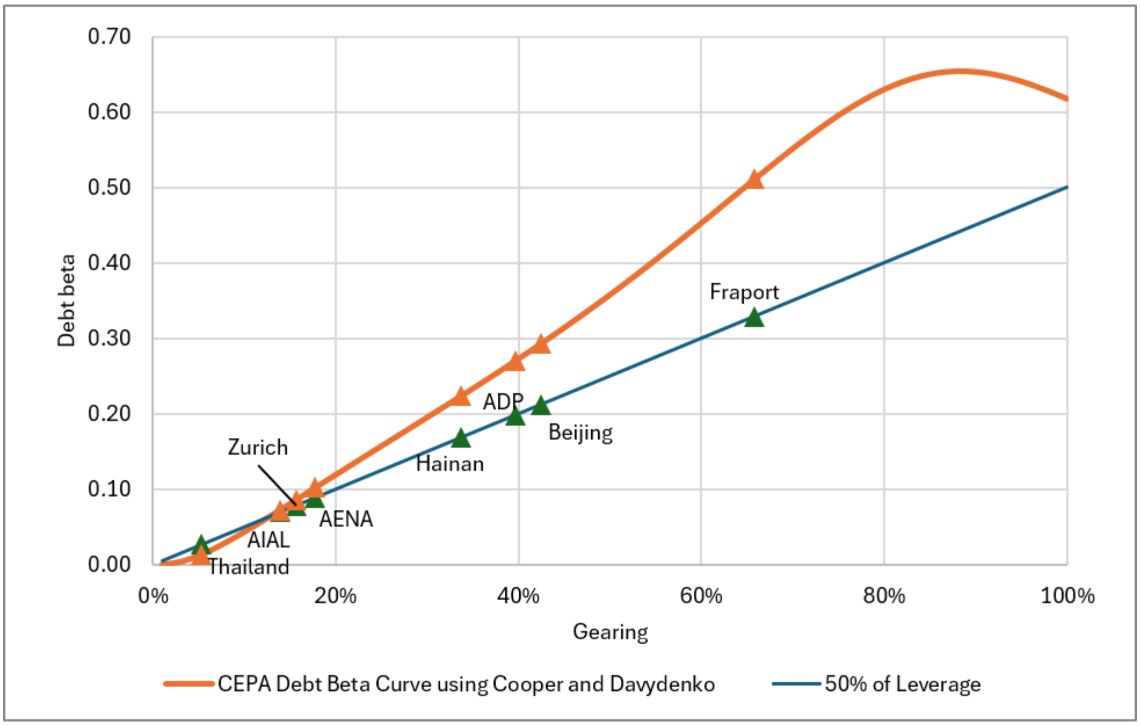
100. However, it should be noted that CEPA's calibration is for an asset beta of 0.48 which is consistent with the fact that the UKRN, for which CEPA was writing, is dominated by energy and water regulators. The lowest estimate for the airport asset beta that the NZCC has speculated on is 0.62.[20] If we amend the CEPA analysis to calibrate to a 0.62 asset beta we derive the following relationship between DRP and leverage:

$$DRP = 0.47\% \times e^{3.24*Leverage}.$$

101. Inserting this into the CEPA model results in the relationship shown in Figure 6-5 below.

[20] NZCC (2026), Targeted amendments to the Cost of Capital Input Methodologies for Airports – equity beta and related parameters Draft decisions reasons paper, p. 5.

Figure 6-5: Amended version of CEPA Figure 2.1 such that $DRP = 0.47\% \times e^{3.24*Leverage}$ and asset beta is 0.62

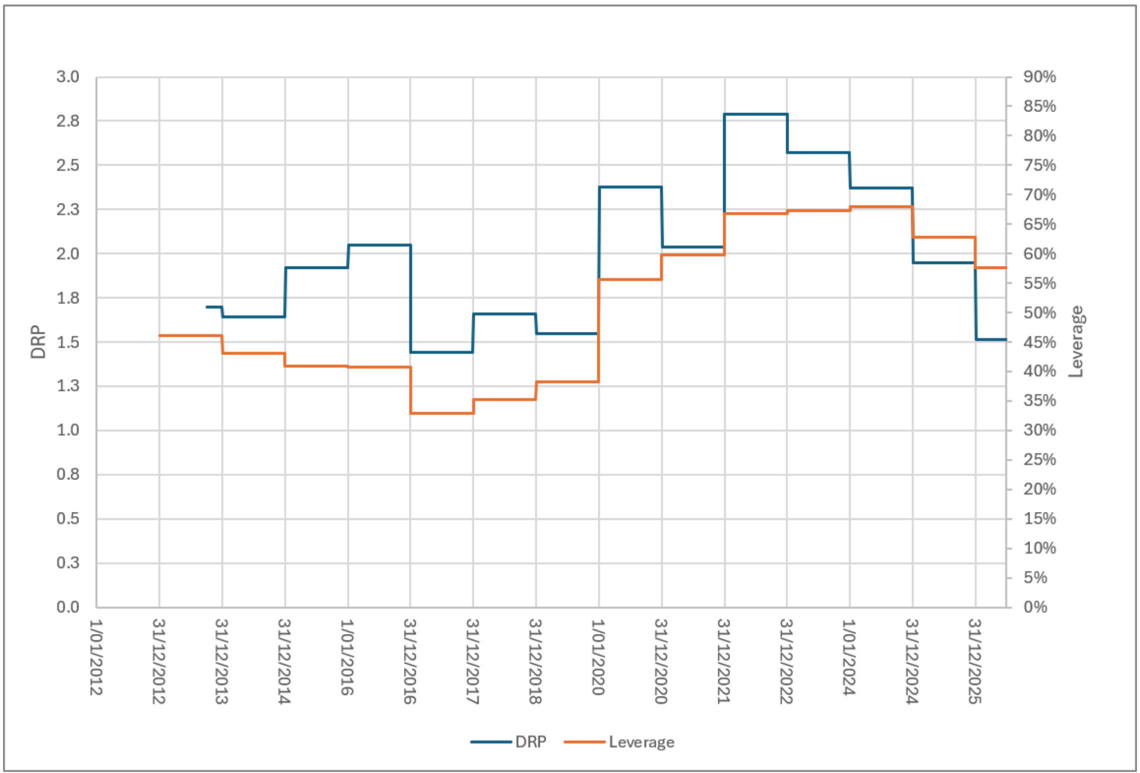


102. An alternative approach is to estimate the relationship between DRP and leverage using the data for an actual airport. The most relevant airport for the purpose of this analysis is Fraport because it has the highest variation in leverage (and the highest leverage). Fraport is the high leverage outlier in the sample (over 66% in the last 3 years). Because Fraport no longer has a credit rating there is relatively little yield data available on its bonds. Moreover, Fraport has relied increasingly on bilateral loans and promissory notes rather than corporate bonds. Prior to 2023, Fraport included in its annual report information that allowed one to estimate the yield on new promissory notes (and, to a lesser extent) bilateral loans. Based on this information we can see that a new 12 year promissory note was issued during 2021 at a DRP of 2.2% to 2.7%.[21]

103. The one non-callable Fraport corporate bond that Bloomberg has current yield data for is a bond maturing in September 2029 and issued in October 2013 (Bloomberg code EI077817 Corp). We can plot the DRP for this bond relative to German Government bonds and this is shown in Figure 6-6 below. We have also plotted Fraport's leverage in the same chart.

[21] Fraport only reported the year the promissory note was issued and the year of maturity but not the date at which it was issued. Given that the 10 year German Government bond yield in 2021 was between -0.12% and -0.61% we can estimate the range for the DRP as 2.2% to 2.7%.

Figure 6-6: Fraport corporate bond (EI077817 Corp) annual average DRP and Fraport annual average leverage

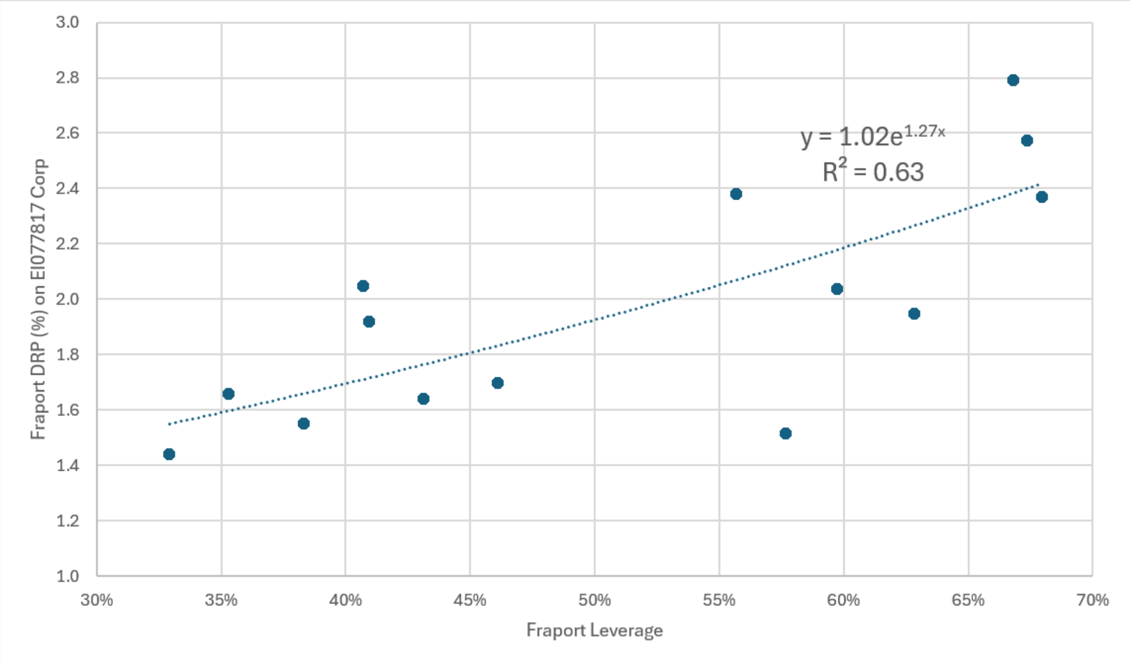


104. While there are, of course, factors other than leverage that determine corporate bond yields, it can be seen that the annual average DRP reached a maximum of over 2.8% during 2022 and remained above 1.9% until the end 2025. Over the same period Fraport's leverage was over 65%. Notably, the DRP has declined to average 1.5% over 2026 so far and the leverage has also declined from 67% to 57%.

105. We can also attempt to calibrate our DRP formula to the Fraport data contained in Figure 6-6. If we express that same data as a scatter plot, the exponential equation with the best fit is:

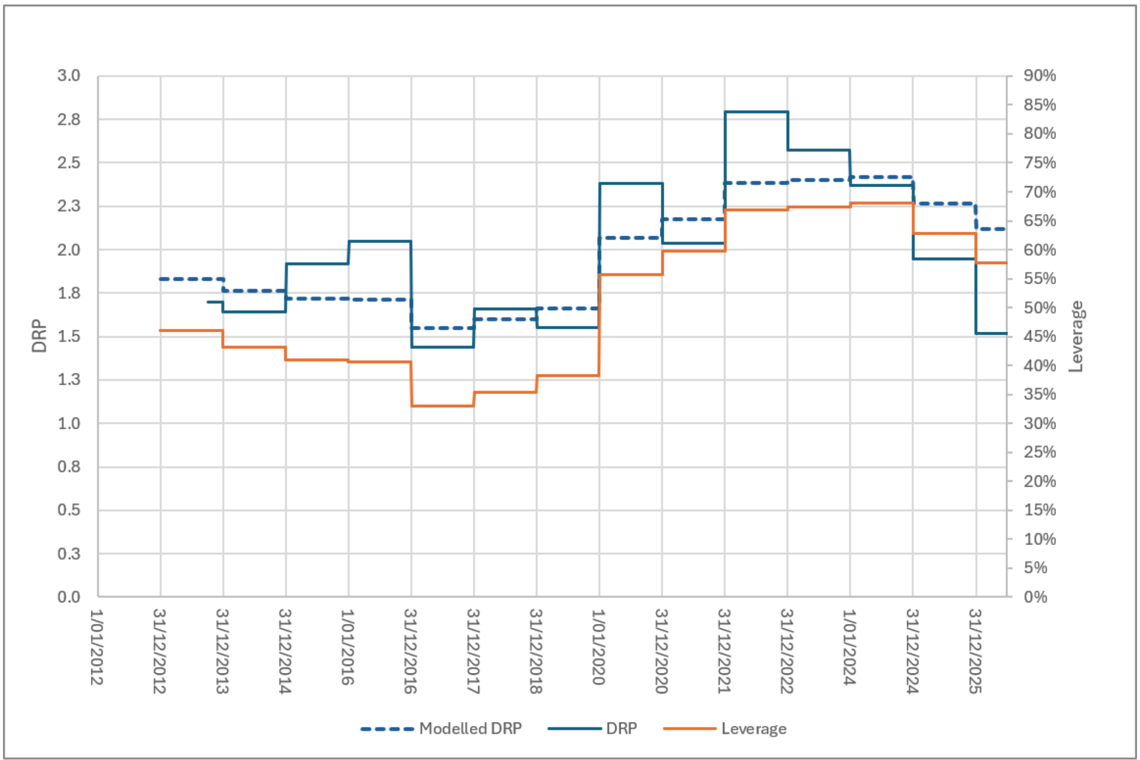
$$DRP = 1.02\% \times e^{1.27*Leverage}.$$

Figure 6-7: Annual average DRP vs leverage for Fraport



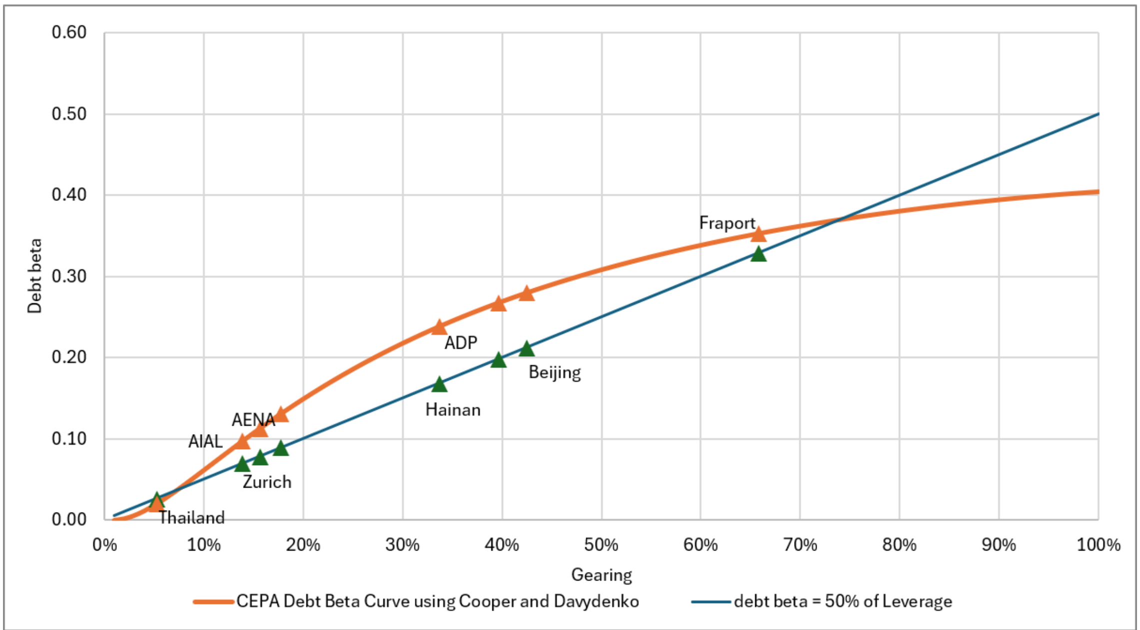
106. Using this formula to compare the modelled DRP with the actual DRP from Figure 6-6 results in Figure 6-8 below.

Figure 6-8: Fraport corporate bond (EI077817 Corp) annual average DRP and Fraport annual average leverage



107. Inserting $DRP = 1.02\% \times e^{1.27*Leverage}$ into the CEPA model results in the relationship shown in Figure 6-9 below:

Figure 6-9: Amended version of CEPA Figure 2.1 such that $DRP = 1.02\% \times e^{1.27*Leverage}$ and asset beta is 0.62



108. Each of the estimated relationships between debt beta and leverage in Figure 6-4, Figure 6-5 and Figure 6-9 are plausible reflections of reality. Figure 6-5 and Figure 6-9 imply debt betas are above

half of leverage in the relevant range and Figure 6-4 implies debt betas are modestly below half of leverage in the relevant range.

6.4.3 Best estimate of debt beta for airports

109. For the purpose of this report, we adopt as our central estimate the assumption that debt beta is half of leverage. We do not claim that this is a precise estimate of debt beta but it does provide a reasonable basis for the purpose of the illustrations we are providing. Most critically, we are focussed on using positive debt betas to provide a more realistic comparison of the asset beta for the highly levered Fraport (66%) and the relatively lowly levered Airports of Thailand (5%) as well as AIAL (14%), Zurich (16%) and AENA (18%).

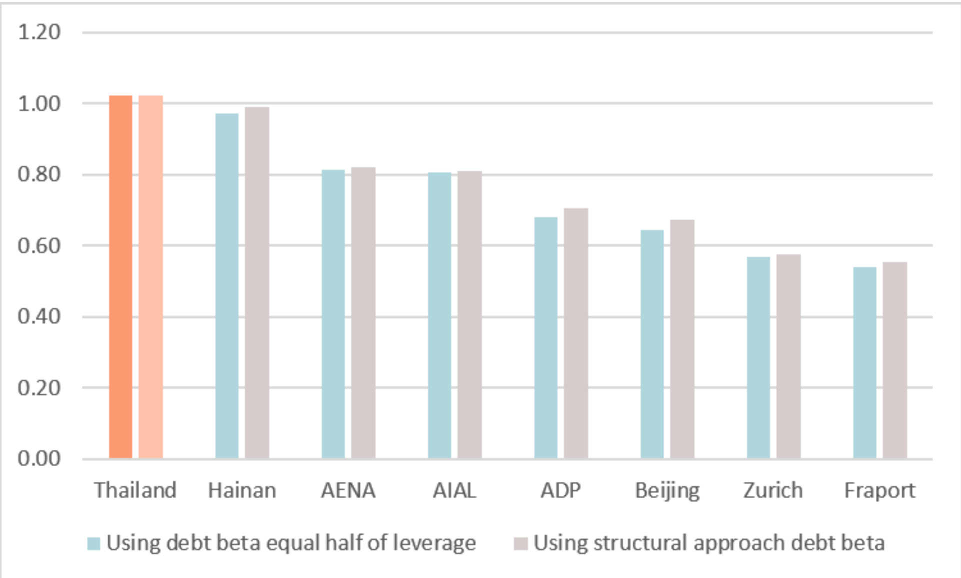
110. As it happens, the debt beta for Fraport is the same whether it is derived by assuming debt beta simply equals half of leverage ($\beta_D = 0.0 + 0.5 \times Leverage = 0.5 \times 0.66 = 0.33$) or if we use Schwert and Strebulaev's equation to obtain Fraport's theoretical debt beta ($\beta_D = -0.09 + 0.63 \times 0.66 = 0.33$). This is also consistent with the debt betas estimate for Fraport in Figure 6-4 and Figure 6-9 and materially below that estimated in Figure 6-5.

111. Similarly, Airports of Thailand's debt beta is approximately zero no matter the method used to arrive at a debt beta (due to its close to zero leverage).

6.5 Within sample asset beta variation when positive debt betas are used

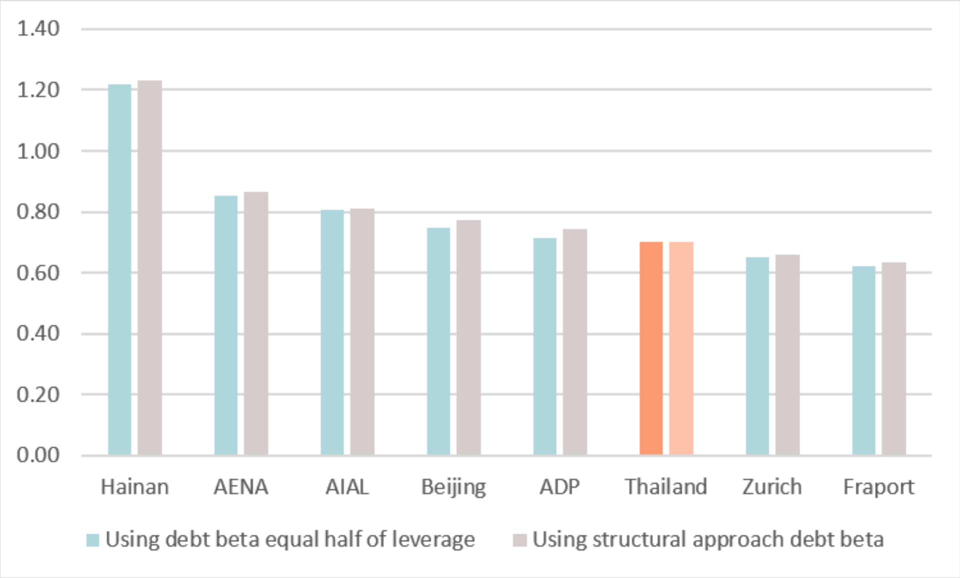
112. Adopting the Flint definition of the post COVID period (the shortest defensible period as per section 5 of our June 2026 submission) and a positive debt beta, the within sample asset beta variation is as per Figure 6-10 below. Airports of Thailand still has the highest asset beta in the sample but there is a much smaller range in estimated asset betas within the sample and there is no "step jump" between Zurich and Fraport. Note that the "structural approach" refers to the model we use to produce Figure 6-9 above, that is, using CEPA's structural approach but assuming $DRP = 1.02\% \times e^{1.27*Leverage}$.

Figure 6-10: Asset betas (estimated with positive debt betas) of airports in the comparator sample, using data from 1 January 2022 to 31 May 2026



113. Figure 6-11 below illustrates sample average asset beta variation when positive debt betas are used to estimate asset beta for the three years to January 2025 (i.e., a 3 year period within the Flint post COVID period but one that ends one year earlier than the NZCC draft decision 3 year period).

Figure 6-11: Asset betas (with positive debt beta) of airports in the comparator sample, using data from 1 February 2022 to 31 January 2025



114. It can be seen that Airports of Thailand is now in the bottom half of the sample and is, in fact, very similar to Fraport.

115. The above analysis was repeated with a wider sample of comparators, each of which is detailed in Table 6-2 of our June 2026 report[22] and in Appendix C. The results of this analysis are in Appendix B.

[22] CEG (2026), Critique of NZCC Targeted Amendments Draft Decision, p. 51.

7 Effect of debt beta on equity beta and WACC

7.1 Assuming a zero debt beta biases WACC down when within sample leverage is diverse

116. Before providing numerical illustrations, it is useful to explain the relevant concepts in plain terms. A company is financed partly by shareholders ("equity") and partly by lenders ("debt"). Its asset beta measures the risk of the underlying business and is a weighted average of its equity beta and debt beta, with the weights determined by the proportions of equity and debt in its financing.

117. Assuming a zero debt beta means assuming that lenders bear none of the company's systematic risk. That assumption enters the calculation twice: first, when each comparator company's equity beta is converted into an asset beta ("de-levering"); and second, when the average asset beta is converted back into an equity beta at the benchmark leverage adopted for airports ("re-levering").

118. The NZCC's reasoning is that, although the zero-debt-beta assumption is incorrect, using the same assumption at both stages means that the resulting errors largely cancel. As discussed in section 5.2, that may be a reasonable first-order approximation where the comparator firms have similar leverage and similar debt risk.

119. However, the cancellation is not generally exact. The amount of risk attributed to debt for any particular firm depends on two things at once: the firm's leverage and its debt beta. In mathematical terms, the relevant contribution is the product of those two variables: leverage multiplied by debt beta.

120. Where more highly leveraged firms also have higher debt betas, the average of these firm-specific products will exceed the product obtained by separately averaging leverage and debt beta. This is the familiar statistical result that the average of two variables multiplied together is not generally equal to the product of their separate averages. The difference reflects the covariance between leverage and debt beta.

121. Consequently, assuming a zero debt beta when de-levering does not merely create an error that can be reversed by making the same assumption when re-levering. It causes the estimated asset betas of the more highly leveraged firms to be understated by disproportionately large amounts. Once those understated asset betas have been averaged with the rest of the sample, re-levering the average at a single benchmark leverage cannot restore the omitted risk.

122. The approximation that the errors cancel is therefore most reliable where leverage levels are similar across the comparator firms, or where debt beta does not rise with leverage. It becomes progressively less reliable where leverage varies widely and the firms with the most debt also have the riskiest debt.

123. That is important here because the NZCC's post-COVID comparator sample has substantial variation in leverage. In those circumstances, assuming a zero debt beta can have a material effect on the resulting benchmark equity beta.

124. Table 7-1 illustrates this with a simple example using equity and asset beta. It considers five hypothetical firms that all have exactly the same equity beta of 0.6. Four of the five firms have no debt at all, while the fifth is far more heavily geared, with debt equal to 80% of its total value. We assume, consistent with the evidence discussed above, that the risk carried by lenders rises in proportion to how indebted a firm is, so the heavily-geared firm has a debt beta of 0.4.

Table 7-1: Example of the effect of non-linear averaging effects on equity beta

Firm	Regression equity beta	Leverage	Debt beta (=0.5*Leverage)	Asset beta with zero debt beta	Asset beta with non-zero debt beta
A	0.60	0%	0	0.60	0.60
B	0.60	0%	0	0.60	0.60
C	0.60	0%	0	0.60	0.60
D	0.60	0%	0	0.60	0.60
E	0.60	80%	0.4	0.12	0.44
Average	**0.60**	**16%**	**0.08**	**0.50**	**0.57**
Re-levered equity beta				**0.60**	**0.66**

125. Reading across the table, the left-hand columns assume debt carries no risk at all (a zero debt beta). This produces an average, de-levered average asset beta of 0.50 across the sample, with the firm with the highest leverage having a materially lower estimated asset beta than all of the other firms (just as Fraport does in the NZCC post-COVID sample). Re-levering this average, again assuming a zero debt beta, returns exactly 0.6 equity beta – which was the sample average equity beta.

126. The right-hand column redoes the same exercise, this time correctly assuming that debt does carry some risk. Now the average de-levered asset beta is higher, at 0.57, and re-levering this produces an equity beta of 0.66 (where 0.66 is estimated via Equation 1 assuming an asset beta of 0.57, leverage of 16% and a debt beta of 0.08).

127. This is the correct sample average equity beta at the sample average leverage and it is a meaningfully higher value than 0.60.

128. This error will exist so long as debt betas are positive but is most material when debt betas increase in line with how much debt a company has. We set out the underlying algebra for readers in Appendix A, however, the key takeaway is the one just described.

7.2 Impact on the vanilla WACC

129. The Table 7-2 compares the asset beta and re-levered equity beta for the NZCC sample assuming a zero and positive debt beta.

Table 7-2: NZCC sample asset and equity beta with and without a positive debt beta

Airport	Regression equity beta	Leverage	Debt beta	Asset beta with zero debt beta	Asset beta with debt beta=0.5*Leverage
Hainan	1.14	34%	0.17	0.73	0.78
Beijing	0.96	42%	0.21	0.55	0.64
ADP	0.85	40%	0.20	0.51	0.59
AENA	0.79	18%	0.09	0.65	0.67
AIAL	0.80	14%	0.07	0.69	0.70
Thailand	1.29	5%	0.03	1.22	1.23
Zurich	0.49	16%	0.08	0.42	0.43
Fraport	0.62	66%	0.33	0.21	0.43
Average	**0.87**	**29%**	**0.15**	**0.62**	**0.68**
Re-levered equity beta at sample average leverage				**0.88**	**0.90**

130. The regulatory WACC calculation holds everything else constant (the risk-free rate, the investor tax rate, the market risk premium, average leverage and the cost of debt). Therefore, a 0.02 higher equity beta feeds through directly into a higher WACC. In other words, whether the debt beta is set correctly or not has a real, measurable effect on the rate of return that the NZCC's decision would allow airports to earn.

131. The impact on the vanilla WACC, assuming the same risk free rate/TAMRP and debt parameters as used in the NZCC's March 2025 Review of Auckland Airport's 2022-2027 Price Setting Event Final report is shown in Table 7-3 below.

Table 7-3: Vanilla WACC for NZCC post COVID period/sample - with and without a positive debt beta

	NZCC 3 year period
Zero debt beta	7.64%
Debt beta equals half of leverage	7.76%
Difference	**0.12%**

132. We illustrate this impact for other samples (CEG wider sample) and estimation windows/methods below. We show the impact of using five different ways of choosing the underlying regression period and method:

i. The NZCC draft decision's 3-year period from 1 February 2023 to 31 January 2026;
ii. The Flint post COVID period, from 1 January 2022 to 31 May 2026;
iii. The 2016 IM method, which takes the average of two regressions from 1 June 2016 to 31 May 2021 and from 1 June 2021 to 31 May 2026;
iv. Using the last 10 years from 1 June 2016 to 31 May 2026, with a Flint adjustment assuming COVID either ended 31 January 2023 as per the NZCC's draft decision, or 31 December 2021 as per Flint's report;
v. Using data from 1 October 2007 (as per the 2023 IM's pre-COVID period) to 31 May 2026, with a Flint adjustment assuming COVID either ended 31 January 2023 as per the NZCC's draft decision, or 31 December 2021 as per Flint's report.

133. Table 7-4 sets out the results, comparing the WACC calculated with a zero debt beta against the WACC calculated with a positive debt beta equal to half of leverage, for each sample and time period.

Table 7-4: Vanilla WACCs with and without a positive debt beta[23]

	NZCC 3 year period	Flint post COVID period	2016 IM	Last 10 years (NZCC COVID/Flint COVID)	From Oct 2007 (NZCC COVID/Flint COVID
Narrow sample					
Zero debt beta	7.64%	7.72%	8.67%	8.17%/8.31%	8.11%/8.15%
+ve debt beta	7.76%	7.84%	8.74%	8.24%/8.39%	8.15%/8.19%
Difference	**0.12%**	**0.12%**	**0.07%**	**0.07%/0.07%**	**0.04%/0.04%**
Wider sample					
Zero debt beta	8.03%	8.00%	8.78%	8.45%/8.44%	8.24%/8.26%
+ve debt beta	8.13%	8.11%	8.86%	8.53%/8.52%	8.31%/8.33%
Difference	**0.11%**	**0.11%**	**0.07%**	**0.07%/0.07%**	**0.07%/0.07%**

134. It can be seen that the impact of incorrectly assuming a zero debt beta is largest for the NZCC sample and the NZCC post COVID period. The next largest error is for the Flint post COVID period. The error is smaller when using pre COVID data largely because the unusually high level of leverage for Fraport (and, to a lesser extent, other airports) post COVID is diluted by relying on more normal periods of leverage during and prior to COVID – see Figure 5-4.

135. For example, in the narrow sample, the shorter and more volatile post-COVID periods show a WACC increase of 0.12 percentage points, compared to only around 0.04 percentage points using the longer and less volatile period from October 2007 to May 2026.

[23] Each column contains vanilla WACCs calculated with a regression period/method listed in Paragraph 132, in the same order.

Appendix A Proof that positive debt betas result in higher re-levered equity betas

136. Consider the asset beta formula for a single firm i

$$\beta_{A,i} = (1 - L_i) \times \beta_{E,i} + L_i \times \beta_{D,i}$$

where $\beta_{A,i}, \beta_{E,i}, \beta_{D,i}$ and L_i represent asset beta, equity beta, debt beta and leverage of firm i respectively.

137. Let the average asset beta used in the re-levering calculation be denoted as

$$\overline{\beta_A} = \frac{1}{n}\sum_{i=1}^{n}(1 - L_i)\beta_{E,i} + L_i\beta_{D,i}$$

and let the average leverage and average debt beta be denoted as $\bar{L} = \frac{1}{n}\sum_{i=1}^{n} L_i$ and $\overline{\beta_D} = \frac{1}{n}\sum_{i=1}^{n}\beta_{D,i}$ respectively, where n is the number of comparator firms.

138. The re-levered equity beta is

$$\begin{aligned}
\beta_E &= \frac{\overline{\beta_A} - L\overline{\beta_D}}{1 - \bar{L}} \\
&= \frac{\frac{1}{n}\sum_{i=1}^{n}\left[(1 - L_i)\beta_{E,i} + L_i\beta_{D,i}\right] - \frac{1}{n}\sum_{i=1}^{n} L_i \frac{1}{n}\sum_{i=1}^{n}\beta_{D,i}}{1 - \frac{1}{n}\sum_{i=1}^{n} L_i} \\
&= \frac{\sum_{i=1}^{n}\beta_{E,i} + \sum_{i=1}^{n} L_i\left(\beta_{D,i} - \overline{\beta_D} - \beta_{E,i}\right)}{n - n\bar{L}}.
\end{aligned}$$

139. The difference between a re-levered equity beta with and without a debt beta is then $\frac{\sum_{i=1}^{n} L_i(\beta_{D,i} - \overline{\beta_D})}{n - n\bar{L}}$; it suffices to prove that $\sum_{i=1}^{n} L_i\left(\beta_{D,i} - \overline{\beta_D}\right) \geq 0$. With the reasonable simplifying assumption that debt betas are proportional to leverage, we have

$$\begin{aligned}
\sum_{i=1}^{n} L_i\left(\beta_{D,i} - \overline{\beta_D}\right) &= \sum_{i=1}^{n} L_i\left(kL_i - \frac{1}{n}\sum_{j=1}^{n} kL_{i,j}\right) \\
&= k\sum_{i=1}^{n} L_i^2 - \frac{k}{n}\left(\sum_{i=1}^{n} L_i\right)^2 \\
&= k(n-1)\left[\frac{1}{n-1}\sum_{i=1}^{n} L_i^2 - \frac{1}{n(n-1)}\left(\sum_{i=1}^{n} L_i\right)^2\right] \\
&= k(n-1) \times \text{sample variance of leverage} \\
&\geq 0
\end{aligned}$$

where $k > 0$ is a constant.

140. We can see from the numerator of $\frac{\sum_{i=1}^{n} L_i(\beta_{D,i} - \overline{\beta_D})}{n - n\bar{L}}$ that generally, the greater the differences between each debt beta and the average debt beta, the greater the difference between re-levered equity betas with a zero or non-zero debt beta. Furthermore, assuming that debt beta is proportional to leverage makes the difference in re-levered equity betas proportional to the sample variance of the leverage, and proportional to $k = \frac{\text{debt beta}}{\text{leverage}}$, if the sample average leverage is held equal.

Appendix B Analysis in section 6.5 repeated for other samples (with positive debt beta)

Appendix B.1 CEG preferred wider sample[24]

Figure 7-1: Asset betas (with positive debt beta) of airports in the wider sample, using data from 1 February 2022 to 31 January 2025

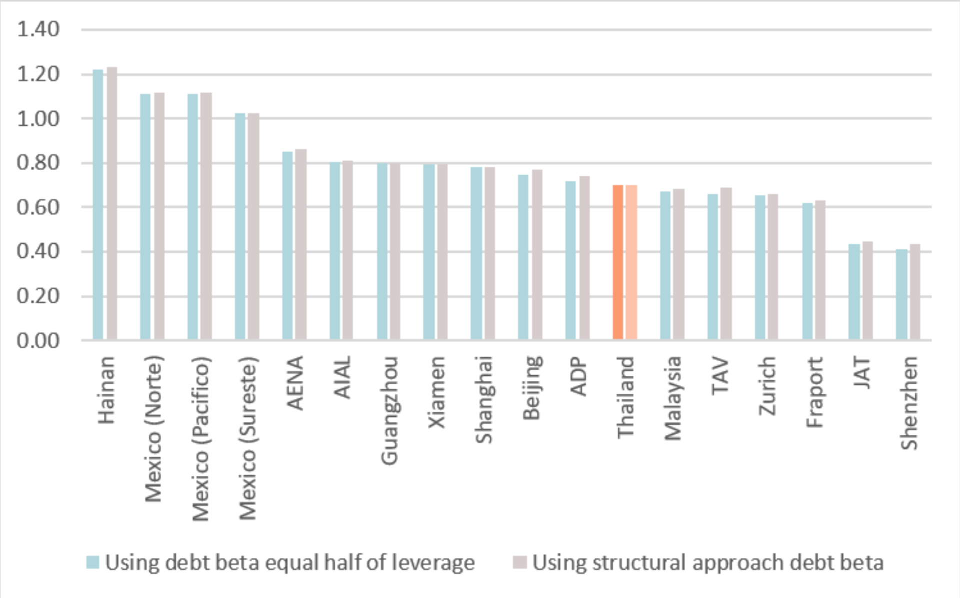
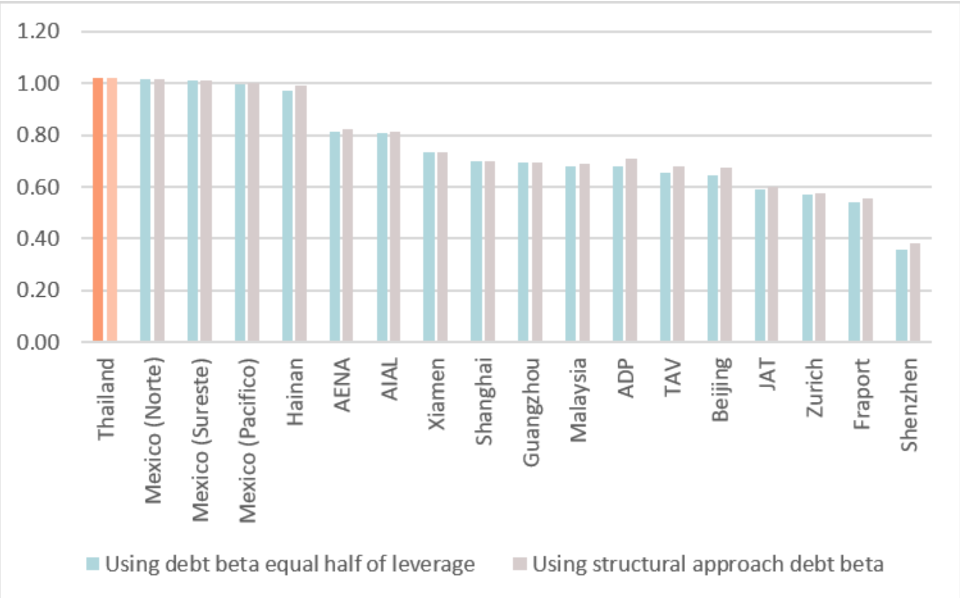


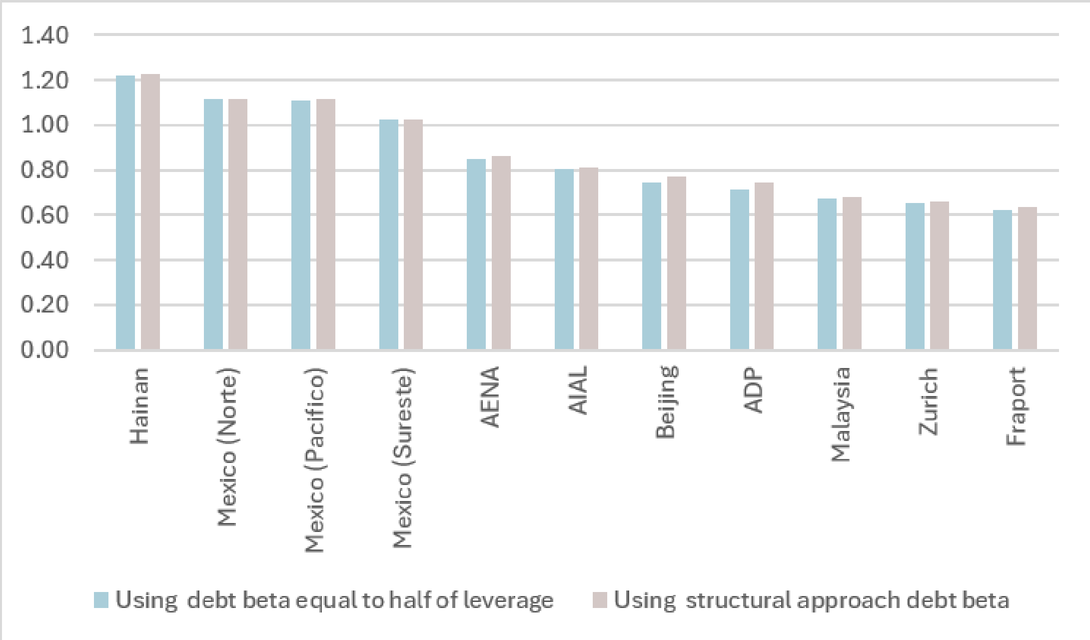
Figure 7-2: Asset betas (estimated with positive debt betas) of airports in the wider sample, using data from 1 January 2022 to 31 May 2026



[24] CEG (2026), Critique of NZCC Targeted Amendments Draft Decision, Table 6-2

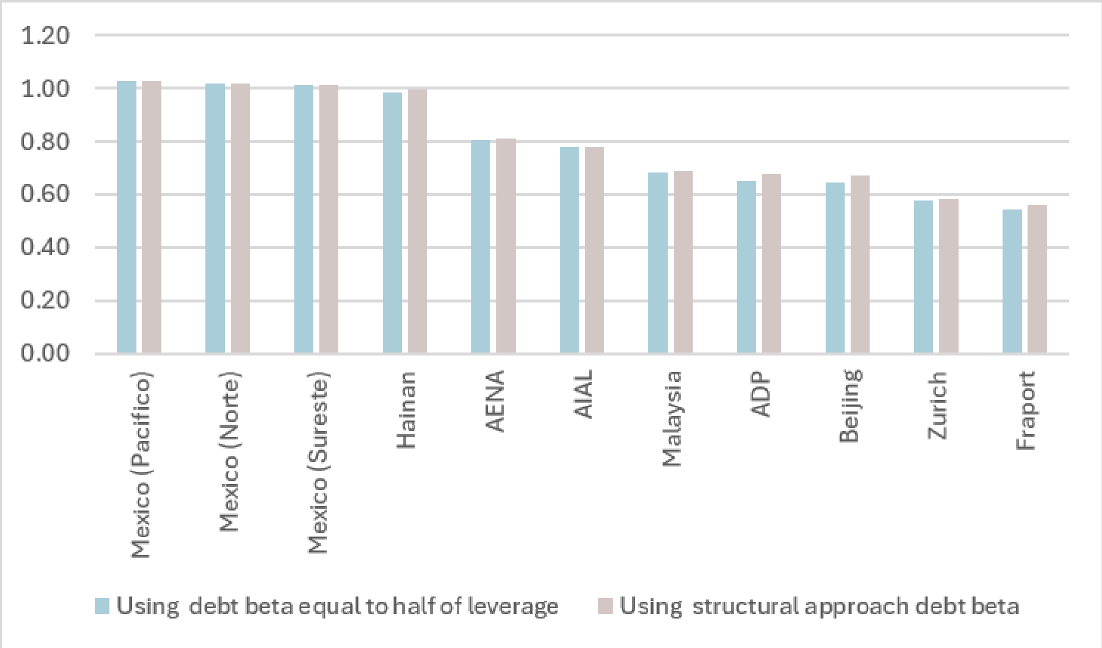
Appendix B.2 Sample formed by applying 2023 IM sample selection methodology[25]

Figure 7-3: Asset betas (with positive debt beta) of airports in the wider sample, using data from 1 February 2022 to 31 January 2025



[25] CEG (2026), Critique of NZCC Targeted Amendments Draft Decision, Table 6-1.

Figure 7-4: Asset betas (estimated with positive debt betas) of airports in the wider sample, using data from 1 January 2022 to 31 May 2026



Appendix C CEG wider sample

Table 7-5: CEG 2023 wider sample (excluding illiquid stock)

Ticker	Name	Bid-ask spread	Free float %	Illiquidity exclusion (Free float % <20%, bid-ask spread>0.75%)
000089 CH Equity	Shenzhen	0.15%	41%	
357 HK Equity	HNA	0.57%	90%	
600004 CH Equity	Guangzhou	0.10%	42%	
600009 CH Equity	Shanghai	0.04%	34%	
600897 CH Equity	Xiamen	0.09%	27%	
694 HK Equity	Beijing	0.43%	97%	
9706 JP Equity	JAT	0.10%	67%	
ACV VN Equity	Vietnam	0.31%	5%	Exclude
ADB IM Equity	Bologna	0.92%	31%	Exclude
ADP FP Equity	ADP	0.13%	37%	
AENA SM Equity	AENA	0.08%	46%	
AERO SG Equity	Serbia	2.61%	17%	Exclude
AIA NZ Equity	AIAL	0.18%	92%	
AOT TB Equity	Thailand	0.47%	28%	
ASURB MM Equity	Grupo (Sureste)	0.17%	50%	
FHZN SW Equity	Zurich	0.15%	62%	
FLU AV Equity	Vienna	0.95%	8%	Exclude
FRA GR Equity	Frankfurt	0.16%	36%	
GAPB MM Equity	Grupo (Pacific)	0.15%	87%	
KBHL DC Equity	Copenhagen	1.17%	1%	Exclude
MAHB MK Equity	Malaysia	0.18%	43%	

MIA MV Equity	Malta	#N/A	66%	Exclude (bid-ask spread not available)
OMAB MM Equity	Grupo (Cent)	0.16%	81%	
TAVHL TI Equity	TAV	0.08%	51%	
TYA IM Equity	Toscana	2.62%	27%	Exclude