Review of submissions on asset beta estimates for airports

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COMPETITION ECONOMISTS GROUP

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1 Introduction

1. I, Tom Hird of [redacted], have been engaged by New Zealand Airports Association ("NZ Airports") to provide advice on asset beta estimation for airports in the context of the 2023 IM update by the New Zealand Commerce Commission ("NZCC").

2. I hold the following qualifications:

   - Bachelor of Economics (Honours First Class), Monash University (1989); and
   - PhD in Economics, Monash University.

3. From 1990 to 2000 (both prior to, during and after the completion of my PhD in economics) I was employed by the Commonwealth Treasury. Since 2001 I have worked as a consulting adviser specialising in economics: first with Arthur Andersen, then NERA Australia and, since 2007, for my own firm, Competition Economists Group ("CEG"). I have advised private clients, regulators, and other Government agencies on a large number of cases specialising in finance theory.

4. I have more than 30 years of experience in the economic analysis of markets and in the provision of expert advice in regulatory, litigation and policy contexts. I have provided expert testimony before courts and tribunals and in numerous regulatory forums in Australia but also in the United Kingdom and New Zealand.

5. In completing this report, I have received assistance from my colleagues at CEG, Ker Zhang and Samuel Lam. Notwithstanding this assistance, all of the opinions expressed in this report are my own.

6. In preparing this report I have had regard to the materials specifically identified throughout the report, in the form of footnotes or in the text.

7. I confirm that I have been referred to the Code of Conduct for Expert Witnesses (Code), as contained in Schedule 4 of the High Court Rules 2016 for New Zealand, and that this report has been prepared in accordance with that Code.

1.1 Report structure

8. This report has the following structure:

   - Section 2 provides an executive summary;
   - Section 3 addresses submissions on any estimate of differences between asset beta for aeronautical and non-aeronautical asset beta.

- Section 4 addresses submissions on the correct calculation of a "COVID-19 free" asset beta and an associated "COVID-19 uplift" should such a calculation be attempted (noting that I do not consider it should be attempted);
- Section 5 addresses submissions from Castalia and TDB that appear to be suggesting that the best way to estimate the impact of exposure to pandemic risk for airports is to choose an estimation window for asset beta that does not include a pandemic;
- Section 6 addresses submissions from Castalia and TDB that the draft decision's application of "country filters" for forming an asset beta sample of comparators is good practice.
- Section 7 addresses Qantas submission that AIAL's asset beta estimate is an unreliable estimate of the asset beta for New Zealand airports and that the NZCC should, instead, only have regard to the other comparators in the draft decision sample (namely: a) the mega conglomerate airport companies of AdP, Fraport and AENA; and b) Beijing, Sydney, Zurich and Vienna;
- Section 8 addresses submissions to the effect that "RAB multiples" reported by the NZCC provide support for a conclusion that the draft decision WACC is not set too low.

2 Executive summary

2.1 Aeronautical vs non-aeronautical asset beta

9. Qantas and TDB present analysis from which they attempt to infer that the percentage of aeronautical revenues in an airport company is, within the NZCC sample, correlated with a low asset beta.

10. This analysis involves selective presentation of the data by Qantas (only showing results with weekly and not four weekly asset betas) and errors in the calculation of aeronautical revenue shares. A more reasonable and wholistic analysis, even if restricted to the NZCC comparator sample, shows, if anything, the opposite conclusion.

11. Moreover, the NZCC dataset has, at most, 7 observations in any 5 year period. This is not typically enough observations to form reliable estimates of relationships. My analysis, in my February 2023 report:

    - Used the whole sample and multiple years and in all regressions there was a positive relationship between measured asset betas and the percentage of aeronautical revenues and this was statistically significant at the 10% level.
    - Provided an event study analysis showed that, in the wake of COVID19, aeronautical revenues fell materially more than non-aeronautical revenues across the full sample of airports.

12. Neither TDB's nor Qantas' submissions addressed that evidence.

2.2 COVID-19 adjustments using pandemic data

13. I do not consider that any COVID-19 adjustments should be attempted. However, if they are to be attempted then the methodology must be as sound as possible.

14. Dr Lally provided a submission that correctly explained why the NZCC method for estimating a COVID19 adjustment can be expected to be materially downward biased. In my July 2023 report I also reached this conclusion. Dr Lally (and I) submit that the correct method would be similar to that applied by the UKCAA "Flint method" and this can be expected (does) result in materially higher asset beta estimates.

15. TDB has submitted that the NZCC method is "largely consistent" with the Flint method. This is factually incorrect.

2.3 Proposals to ignore all pandemic data in the future

16. Castalia and TDB that appear to make submission suggesting that the best way to estimate the long run impact of exposure to pandemic risk for airport investors is to choose an estimation window for asset beta that does not include a pandemic.

17. This is illogical and suggests a fundamental lack of understanding of what estimated asset betas actually measure.

2.4 Proposals in support of the draft decision application of country filters

18. Castalia and TDB submit that the draft decision application of a "developed market filter" for forming an asset beta sample of comparators is good practice. In doing so, they give zero weight to airport specific metrics of comparability discussed by me in section 5.3 of my July 2023 report - such as:

    a. the size/number of routes served/passenger volatility etc for each airport; or

    b. capacity utilisation of the airport (including whether the airport is primary hub airport with stable traffic volumes due to market wide fluctuations being absorbed at secondary airports)

19. In this report, I endorse Incenta's critique of the developed country/market filter and also show, statistically, that the number of routes an airport serves is a much better explanatory variable for the variation in asset betas within the sample – as is illustrated in Figure 2-1 below. Figure 2-1 shows the results with various settings for sample selection where":

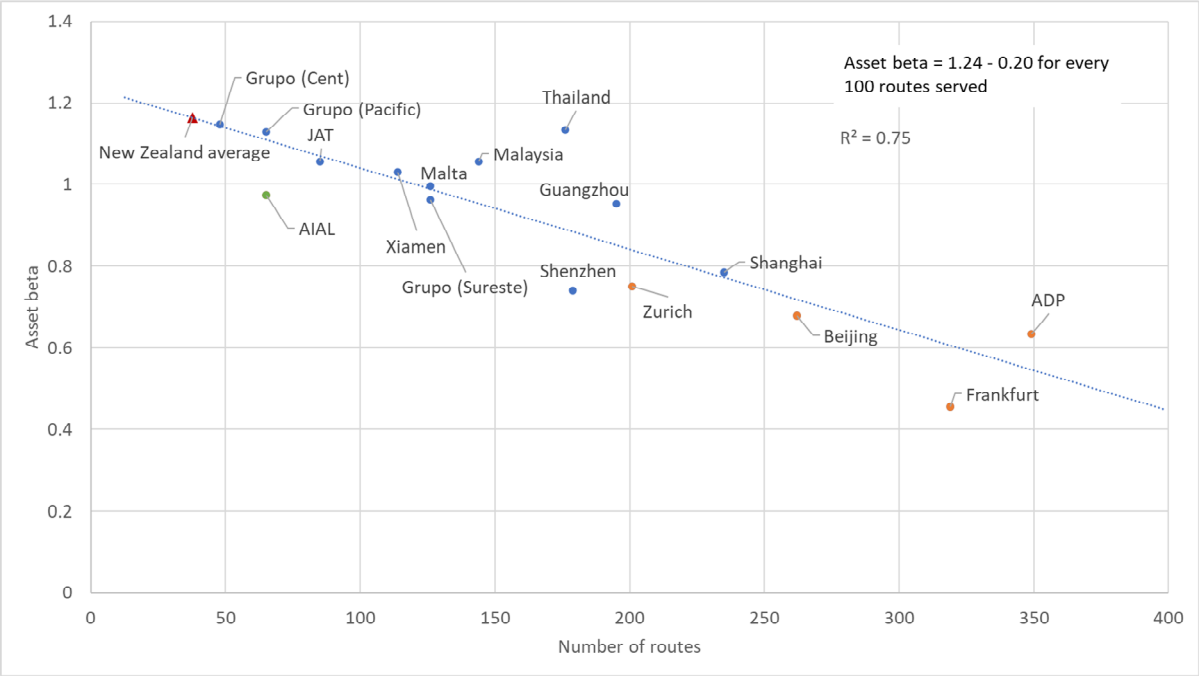
    a. **Setting a.** Includes only liquid airport companies that have 10 years of data from both periods.

    b. **Setting b**. The same as "setting a." above but excluding airport conglomerate companies (AoT, Malaysia, Vietnam, Fraport and AdP) on the basis that I do not have an accurate estimate of the number of routes all of their airports (just the largest airports in the company).

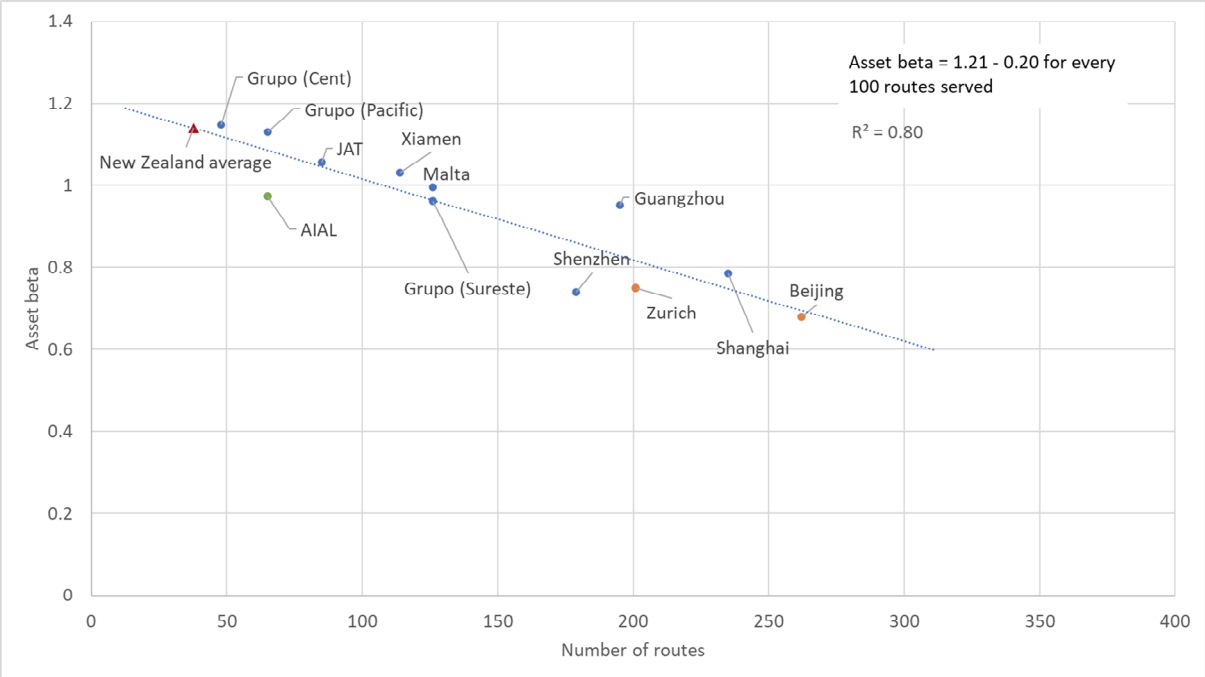
    c. **Setting c**. The same as "setting a." but including the airports that only have sufficient data in one of the two periods (Sydney, AENA, Vietnam), with the other period using whatever data is available.

Figure 2-1: Asset beta vs number of routes

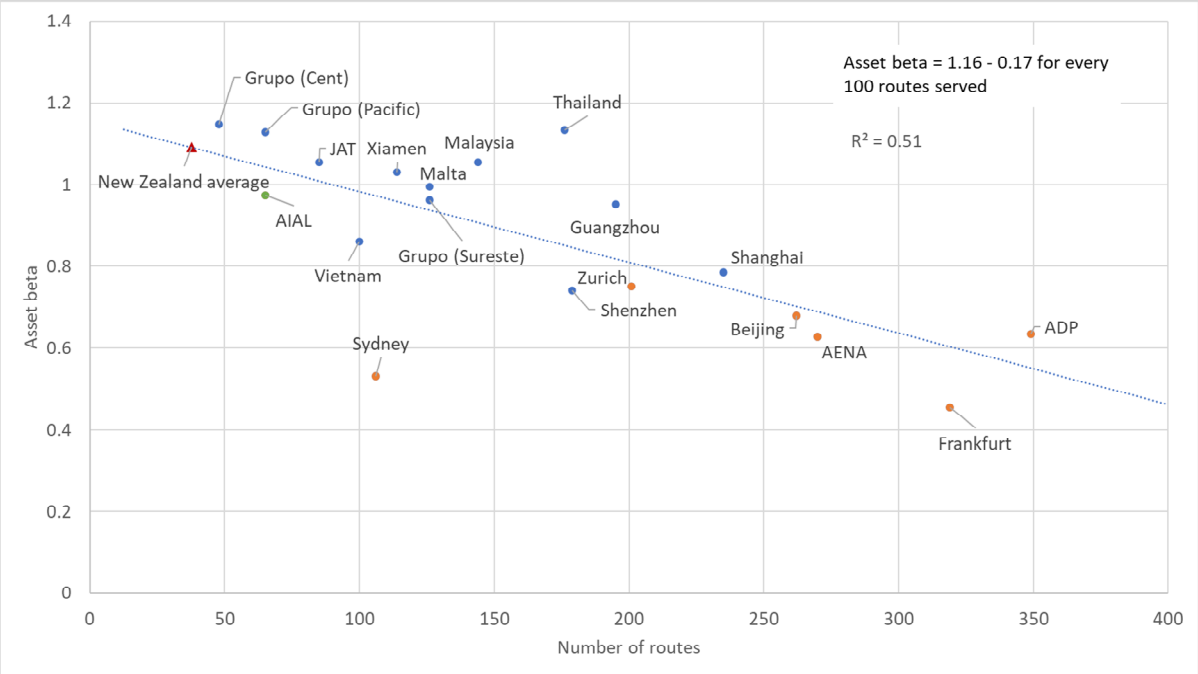
Setting a



Setting b



Setting c



20. It is relevant to note that New Zealand airports are at the extreme left hand end of this metric. That is, they are in the top left of the top left quadrant. The average number of routes for New Zealand airports is only 36.3 routes, which is below the bottom end of the observations in the sample (i.e., the red triangle is the left most observation in the charts).

21. The draft decision, by contrast, forms its sample from the bottom right quadrant (with the exclusion of AIAL and Sydney[1]).

22. In all these regressions there is a strong fit to the data (highly statistically significant coefficient and high r-squared) suggesting that number of routes is a good predictor of asset beta over the last 10 years.

23. This evidence strongly suggests that, to the extent that differences between airports is to be accounted for, the number of routes variable should play a dominant role beta for New Zealand airports. It also strongly supports the view expressed by TDB in May 2022 that:

> *On balance, we would prefer that a smaller sample of more comparable firms be used. We suggest that, in the Commission's current sample, the* ***smaller operators that have primary responsibility for just one***

[1] Noting that Sydney is also an unusually capacity constrained airport (with a new airport under construction in Sydney) for its relatively small number of routes which may explain its presentation as an outlier in setting c.

airport are likely to be more similar to their NZ counterparts *than the very large, and often regional or even national, operators that are also included in the sample.*

24. TDBs' most recent submission does not attempt to reconcile its previous position to its current position that the most comparable sample is comprised of mostly large capacity constrained airports and mega airport conglomerates.

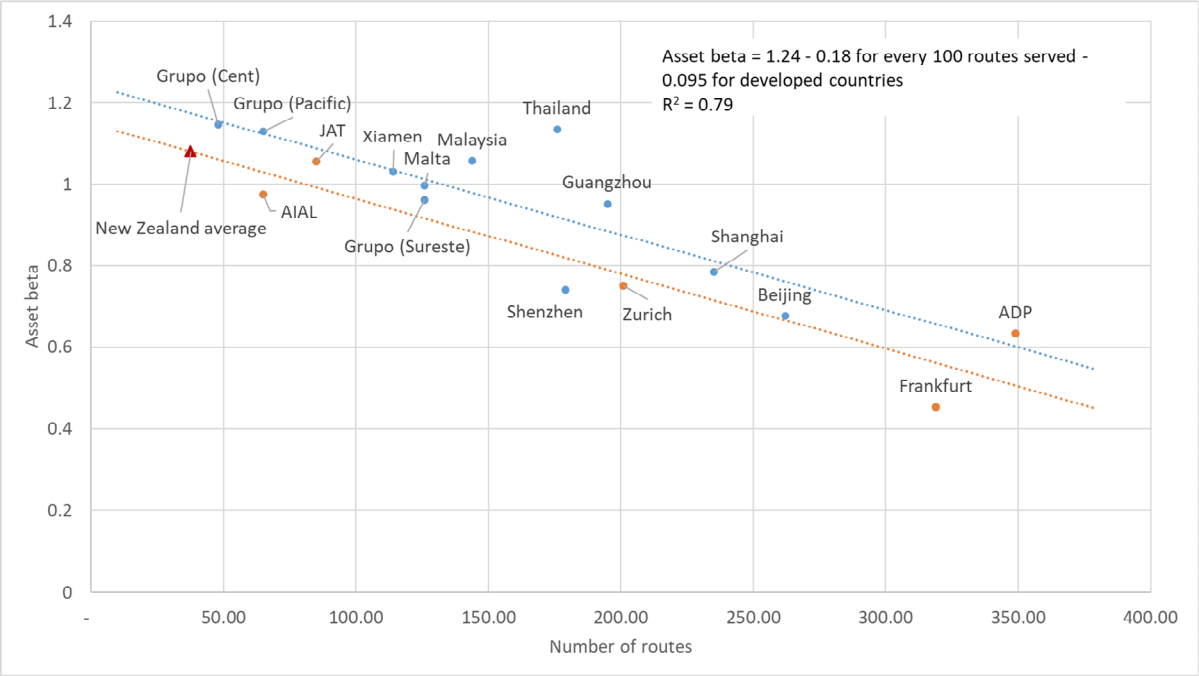
2.4.1 Testing a developed country dummy

25. It is also possible to test whether adding a developed country dummy, the draft decision's primary sample filter criteria, to the number of routes regression improves the statistical properties of the regression.

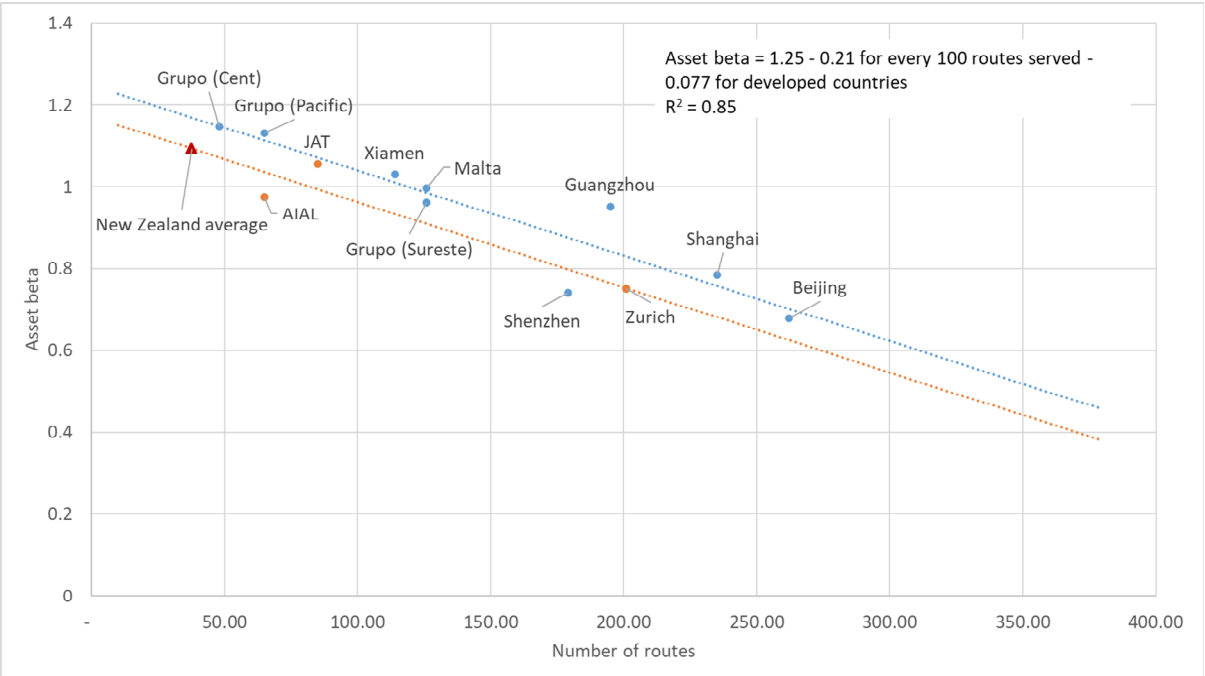
26. Figure 2-2 shows the results of including a developed country dummy and Table 2-1 provides the regression statistics. Now two regression lines are shown both with the same slope (relationship to routes) but with different intercepts (higher for less developed countries and lower for developed countries).

Figure 2-2: Number of routes with developed country dummy

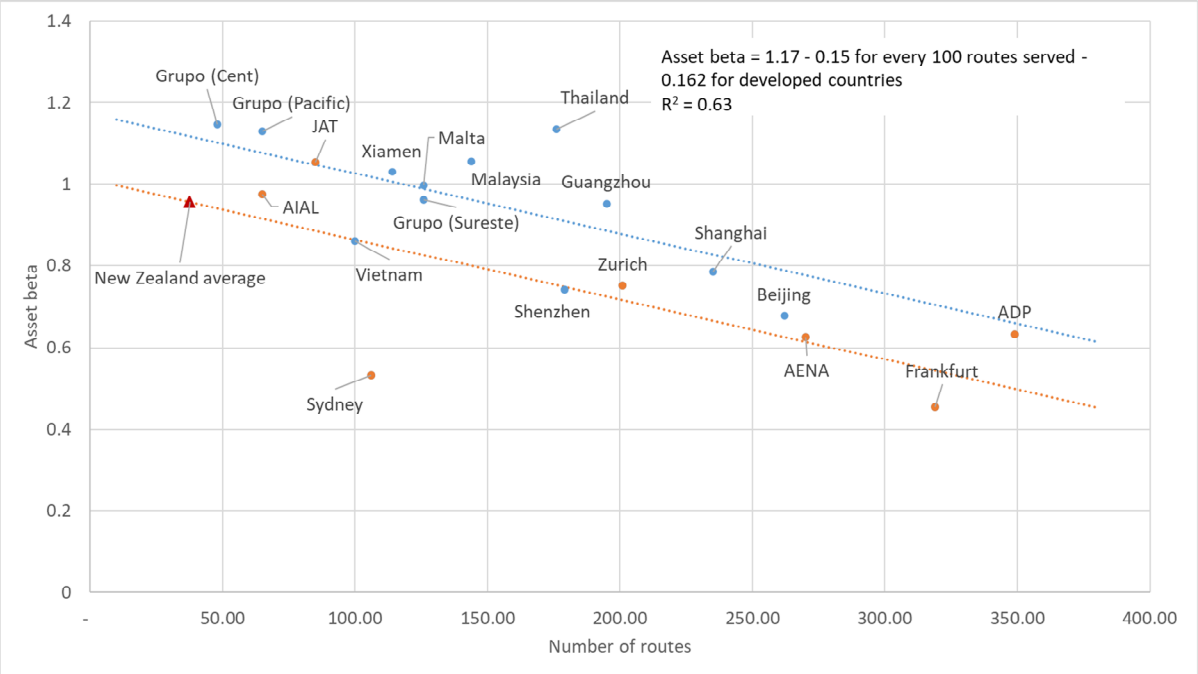
Setting a



Setting b



Setting c



27. In the first two of these regressions the developed country dummy is not statistically significant at the 10% level. In the third of these regressions, the inclusion of Sydney airport creates a low outlier in the developed country set. This causes the dummy variable to be significant at the 5% level.

Table 2-1: Summary statistics for # routes with developed country dummy regression

Sample	Intercept	Coef [per 100 routes] (p-value)	Coef [developed dummy] (p-value)	R^2	F-stat (df)	Predicted value (NZ average)
a)	1.24	-0.18 (0.0%)	-0.095 (11.8%)	0.79	24.54 (13)	1.08
b)	1.25	-0.21 (0.01%)	-0.077 (12.6%)	0.85	25.84 (9)	1.09
c)	1.17	-0.15 (0.2%)	-0.162 (3.1%)	0.63	13.9 (16)	0.96

28. Moreover, even with the developed country dummy included, the predicted asset beta for a New Zealand airport is 0.96 or above.

29. In summary:

- There is, at best, weak statistical support for a conclusion that developed country status lowers asset beta once the effect of the number of routes on asset beta is accounted for;

- Even if I were to include a dummy variable and adopt the setting that results in the lowest predicted asset beta for New Zealand airports, I would derive a predicted asset beta of 0.96 for an airport with the average number of routes as New Zealand airports.

30. This evidence strongly supports the TDB May 2022 view that comparison to small airports similar to New Zealand airports is critically important. It provides only weak support for the NZCC draft decision and TDB July 2023 view that developed country status might be relevant. However, it provides no support for the NZCC draft decision and TDB July 2023 view which is, in effect, that developed country status is the only material determinant of airport asset betas.

2.5 Qantas' submission on reliability of AIAL's measured asset beta

31. Qantas' submits that AIAL's asset beta estimate is an unreliable estimate of the asset beta for New Zealand airports and that the NZCC should, instead, only have regard to the other comparators in the draft decision sample (namely: a) the mega conglomerate airport companies of AdP, Fraport and AENA; and b) Beijing, Sydney, Zurich and Vienna.

32. I explain why Qantas' submission is without merit.

2.6 Submissions on "RAB multiples"

33. There are a number of submissions to the effect that "RAB multiples" reported in the draft decision provide support for a conclusion that the draft decision WACC is not set too low.

34. I have investigated the RAB multiples reported in the draft decision and my conclusion is that:

- The "RAB multiple" estimates for AIAL relied on by the NZCC are, in fact, not derived from the market value of AIAL. Rather, they are UBS and Forsyth Barr estimates of the value of AIAL's aeronautical operations and, to the extent that their basis is exposed, they involve highly questionable assumptions;
- A RAB multiple analysis for AIAL or any other airport will never be informative of the reasonableness of the regulatory WACC because:
  - Unregulated operations at airports are too important to overall profits to allow for an accurate/uncontested observation of the market value of the regulate activity; and
  - The value of regulated operations at any time depend heavily on non-WACC related factors (e.g., volume forecasts) such that, even if a RAB multiple for

the regulated assets could be reliably estimated, disentangling WACC and non-WACC related factors would be extremely difficult.

3 Aeronautical versus non-aeronautical risk

35. In this section I address Qantas' and TDB Advisory's (TDB's) submission that evidence supports a conclusion that aeronautical operations are lower risk than non-aeronautical operation.

36. I demonstrate that Qantas' and TDB's calculations of aeronautical and non-aeronautical business shares are inaccurate and that Qantas analysis relies only on weekly asset betas (not weekly and monthly as used by the NZCC). When corrected, it is apparent that there is no relationship between an airport's proportion of aeronautical revenue and asset beta. I also show that it is inconsistent:

    - for Qantas to place heavy reliance on AIAL data when arguing that aeronautical operations are lower risk and separately claim observations of AIAL's asset beta are unreliable; and
    - for TDB Advisory to include in its calculations of allegedly "low risk" aeronautical revenues for AdP and Fraport, a large amount of revenue from operations in developing countries while simultaneously submitting that airports in less developed countries should be excluded from the comparator sample.

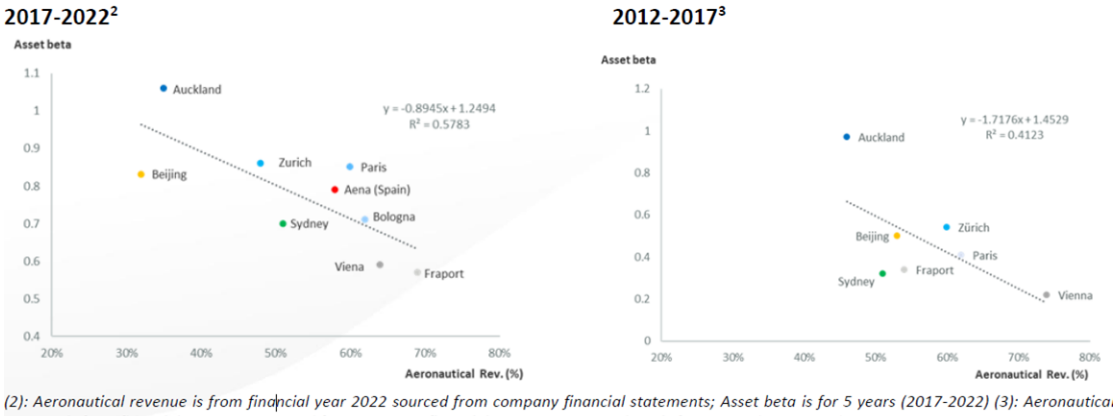
37. I remain of the view that there is no evidence to support a downward adjustment to Auckland Airport's or the comparator sample's asset beta.

3.1 Qantas submission

38. Qantas presents the following empirical analysis and claims.

> *A comparison of asset beta to aeronautical services revenue shows that a trend exists for the NZCC's draft comparator set (see Figure 2 below).* ***With the exception of Auckland Airport****, most airports within the comparator set show a strong correlation between the percentage of contributions of aeronautical revenue and asset beta. With Auckland a significant outlier (32% aeronautical revenue contribution and asset beta >1.0), a downward adjustment for Auckland Airport is appropriate.*

Figure 2: 5-year asset beta against aeronautical revenue[2] for NZCC basket (including Bologna Airport)



(2): Aeronautical revenue is from financial year 2022 sourced from company financial statements; Asset beta is for 5 years (2017-2022) (3): Aeronautical revenue is from financial year 2017 sourced from company financial statements; Asset beta is for 5 years (2012-2017)
Source:2022 Annual Reports; Commerce Commission Cost of Capital Topic paper, Table A3

39. A number of observations can be made about this analysis.

- First, based on Qantas' own data, the Auckland Airport data point is not an "exception" to the estimated relationship it is, rather, the dominant driver of the estimated relationship. The Auckland data point has high leverage[2] and, absent that data point there would be an almost perfectly flat slope in the 2012 to 2017 chart and a much flatter slope in the 2017-22 chart.
- Second, the data Qantas has used for the aeronautical percentage of revenue is unreliable. Correcting the Qantas data reverses the slope estimated in the 2022 regression and reduces the R^2 in the 2017 regression from 0.41 to 0.05.[3]
- Third, I presented detailed analysis in my February 2023 report,[4] both regression analysis (of the kind Qantas presents) and event study analysis showing that, in the wake of COVID19, aeronautical revenues fell materially more than non-aeronautical revenues across the full sample of airports. Qantas' submission simply ignores that evidence and, instead, presents the above deeply flawed analysis.

40. I explain these observations further below.

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2 In linear regression, the concept of "leverage" relates to how different an observation is in the independent variable (in this case the aeronautical revenue percentage) to the average for the sample. An observation with high leverage has a stronger potential to influence the regression than observations with low leverage.

3 In the 2012-2017 regression I have used 2018 share of aeronautical revenue because this is data I had already collected for the purpose of prior analysis provided to the NZCC (which I discuss below). I note that my result might reflect either: the same errors in the Qantas data collection used for 2022 or Qantas 2017 data may be correct but simply changing the revenue share to the next year may dramatically alter the Qantas conclusion. Either way, Qantas conclusion is not reliable.

4 CEG, NZCC comments on asset beta estimates for airports, February 2023. See section 2 and appendices A and B.

3.1.1 In Qantas' data Auckland is the driver not the exception

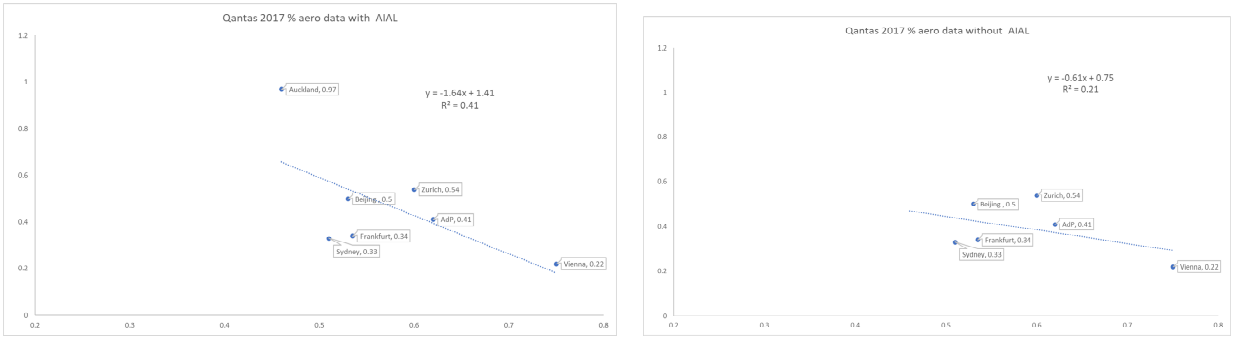
41. In Qantas' data the Auckland data point is driving the negative regression slope – it is not an exception to it. Given that Qantas' submission separately states that the Auckland asset beta is unreliable and should be removed from the sample (which I disagree with), it is inconsistent that Qantas simultaneously wishes to rely on a regression analysis in which the Auckland data point is pivotal.

42. In order to illustrate this, I have obtained the 2012-2017 asset beta data from the NZCC draft decision (which is the source quoted by Qantas). While Qantas does not disclose this in its submission drafting, in my attempt to replicate its charts it became apparent that Qantas only used weekly asset beta data (not the average of weekly and 4 weekly asset betas as is the NZCC practice). I have also attempted to use the Qantas estimates of the percentage of aeronautical revenues in 2017.

43. I explain in the next subsection that the Qantas percentage aeronautical revenue values are incorrect and that Qantas's estimated relationship reverses when they are corrected. However, in this section I demonstrate that, even if those percentage aeronautical revenue figures were correct, removing Auckland from the sample materially alters the estimated relationship between aeronautical revenue share and asset beta.

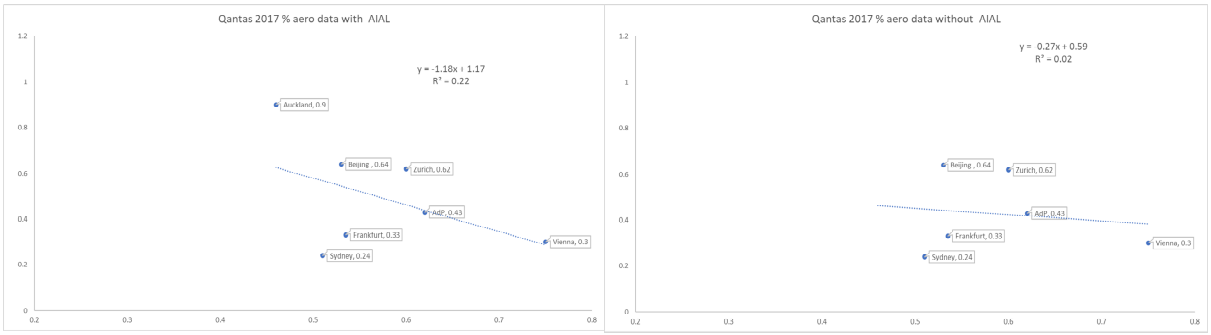
44. Figure 3-1 and Figure 3-2 are the same except Figure 3-2 uses 4-weekly data which Qantas omitted from its analysis. The left panel in each figure shows estimated relationship including the Auckland data point and the right hand panel shows the relationship excluding the Auckland data point.

Figure 3-1: Qantas 2012-2017 figure with and without Auckland (based on Qantas' use of weekly asset betas only)



Source: NZCC draft decision for asset beta (weekly) and Qantas submission for the percentage of aero revenues.

Figure 3-2: The results of the same analysis using 4-weekly asset betas (not reported by Qantas).



Source: NZCC draft decision for asset beta (four-weekly) and Qantas submission for the percentage of aero revenues.

45. It can be seen that Qantas' unexplained decision to use only weekly asset beta data is very important to its presentation of the relationship between asset beta and (Qantas' estimated) percentage of aeronautical revenues. Had Qantas used four weekly asset betas then the estimated relationship would have been much weaker and the R^2 much lower.

46. Moreover, if the Auckland data point was removed the estimated relationship largely disappears (especially when using 4-weekly asset betas). Given that Qantas' submission is that the Auckland asset beta is unreliable and should be removed (or adjusted down in some way)[5] it is problematic that Qantas' submission on the relationship between aeronautical revenue and asset beta relies so heavily on the Auckland asset beta.

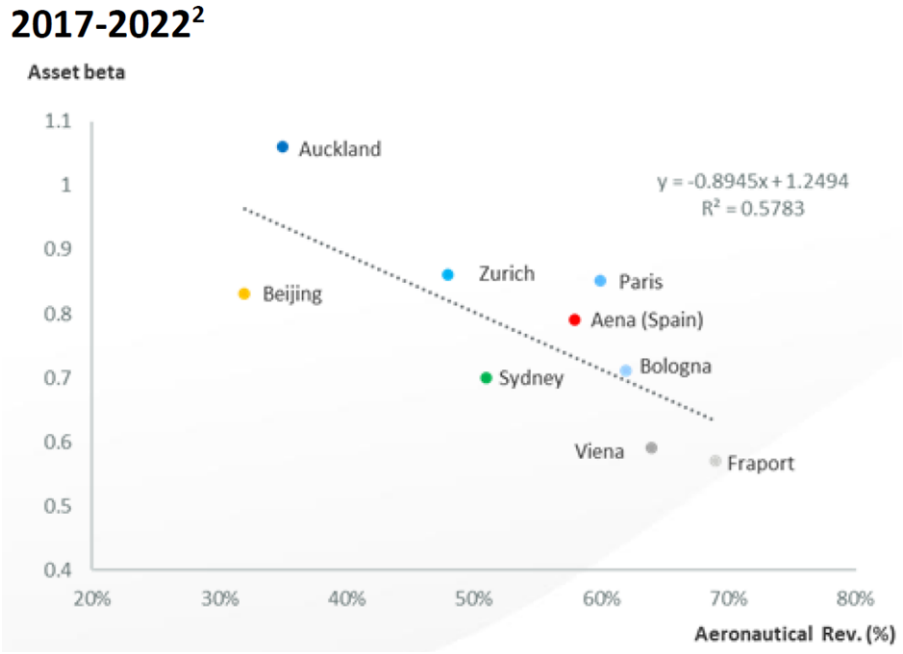
47. The same conclusion, although to a lesser degree, would apply to Qantas' 2017-22 analysis. However, that analysis is so contaminated with other problems (discussed in the next section) that I do not repeat my analysis above.

3.1.2 Incorrect Qantas data for aeronautical revenue share

48. Qantas' visual representation of the 2017-22 data is reproduced below.

5 Qantas submission, section entitled "Auckland Airports overrepresentation in NZX50 index" on page 1.

Figure 3-3: Reproduction of Qantas 2017-22 regression



49. In this chart there are four observations that are most important to estimating the slope of the regression – these are the two left most and right most observations:

    - Beijing and Auckland which are reported to have higher than average asset betas and the lowest percentage aeronautical revenue; and
    - Vienna and Fraport which are reported to have the lowest asset betas and the highest percentage aeronautical revenue.

50. These data points have what is known as "high leverage" in the regression. Simple visual inspection is enough to ascertain that removing all the other data points but retaining these four data points would result in a very similar regression line.

51. It is, therefore, important that the data for these observations is reliable. Unfortunately, Qantas estimates for aeronautical revenue share are unreliable for all but Beijing airport amongst these four high leverage estimates. For the rest of the sample, I estimate a similar percentage revenue share except for AdP. The four firms where my estimates are materially different to Qantas are outlined below.

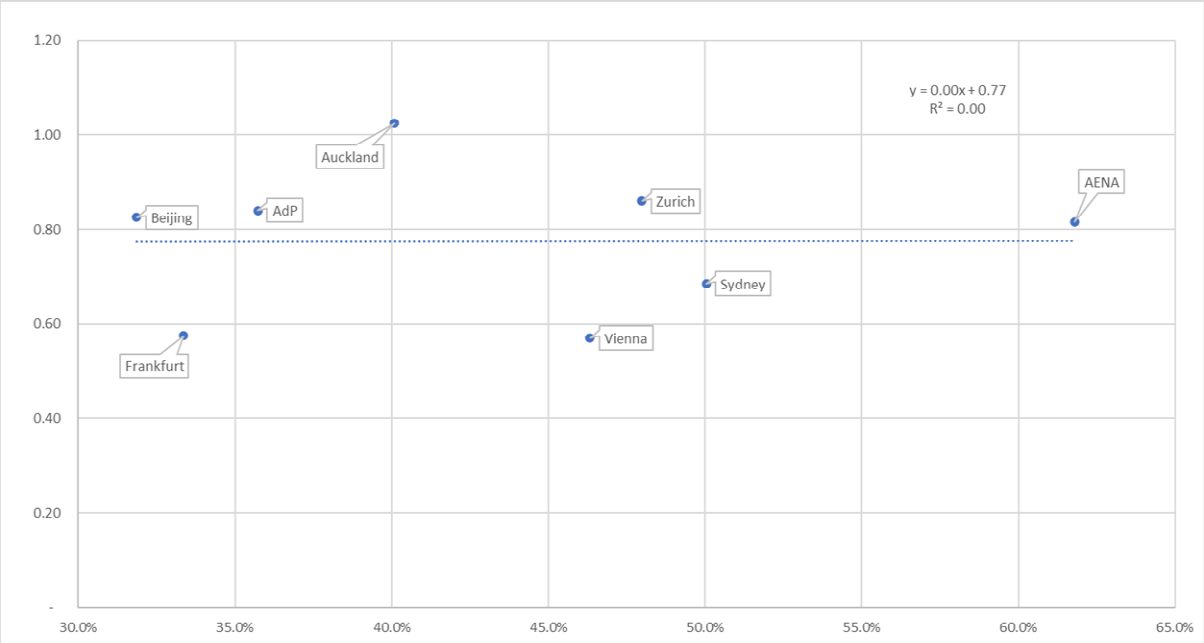
Table 3-1: Qantas vs my estimates of the percentage of aeronautical revenues

	Qantas % aero 22	CEG % aero 22	Notes
Auckland	35	40	Note 4 on page 39 of AIAL's FY22 Financial report is unambiguous. Aero revenue is 118.8 and total revenue is 296.3 such that the %Aero = 40%
Vienna	65	45	Note 1b. on pages 90 to 98 of Vienna's 2022 Annual Report have various breakdowns. My estimate of 45% is based on Airport Aviation revenue of €309m (table on the top of page 96) divided by €693m total revenue. This is consistent with p.90 of the same document which only characterises the "Airport" segment revenues as ("for the most part") subject to fee regulation and pages 99 and 164 which specify that ground handling services are not subject to approval (not regulated by the Civil Aviation Authority). There may also be regulated revenue generated by Vienna's investment in Malta airport. Even if I remove all Malta revenue (which as stated on p.8 includes revenue "*generated from aviation services, parking and the rental of retail and office space"*) from my denominator, my estimate would only increase to 51%.
Frankfurt	70	33	Note 5 on p. 170 of the Fraport FY22 Annual Report. My estimate is based on 100% of the reported Aviation revenue (an overestimate of regulated aeronautical revenue) plus revenue from Ground Handling Infrastructure charges (which is regulated at Frankfurt Airport (p.44)). Even if I were to add aviation revenue from Fraport's international operations my estimate would only be 52%.
AdP	61	36	Note 4.1 of Groupe ADP Consolidated Financial Statements as of 31 December 2022 p. 19. My estimate is based on Aviation Revenue (€1,675m) divided by total revenue (€4,688). I note that the only way to get an estimate close to Qantas' 61% estimate would be to include 87% of revenue from AdP's "International and airport developments" segment which includes revenues from all AdP's international operations not just aeronautical revenue (indeed that segment includes airport design and construction business (p.18)) .

52. When I update Qantas' analysis[6] using my estimates of the percentage of aeronautical revenues I estimate the following relationship.

[6] I do not include Bologna in my analysis because it is not included in the NZCC sample due to liquidity concerns.

Figure 3-4: Qantas 2017-22 regression with corrected % aero revenue



Source: NZCC draft decision asset beta estimates (average of weekly and four-weekly) and CEG estimates of aeronautical revenue shares.

53. It can be seen that using corrected data the relationship is essentially flat (very modest positive slope), and the explanatory power of the percentage of aeronautical revenue is essentially zero.

3.1.3 My previous analysis

54. I presented detailed analysis in my February 2023 report,[7] in which I explained:

- There is no sound conceptual basis to presume aeronautical operations are of different risk to non-aeronautical operations
- Regression analysis (of the kind Qantas presents) but using the whole sample and not just using a single year revenue share but separately analysing revenue shares from 2018 to 2021. In all of the regressions there was a positive relationship between measured asset betas and the percentage of aeronautical revenues and this was statistically significant at the 10% level.
- An event study analysis showed that, in the wake of COVID19, aeronautical revenues fell materially more than non-aeronautical revenues across the full sample of airports. Moreover, of those five firms (AIAL, JAT, AENA, AdP and Frankfurt) that provided EBITDA on a segment basis, Figure 3-5 (reproduced

7 CEG, NZCC comments on asset beta estimates for airports, February 2023. See section 2 and appendices A and B.

from my earlier report) shows the time series for aeronautical and non-aeronautical profits at these airports.

Figure 3-5: EBIT and EBITDA time series for aero and non-aero (2018=1)

EBITDA

Source: annual reports and CEG analysis.

55. It can be seen that in all cases, aeronautical profits fell more than non-aeronautical profits following the unexpected passenger shock due to COVID-19.

56. Qantas' submission does not address that evidence.

3.2 TDB analysis

57. TDB submits that "while the previous 0.05 downward adjustment in the asset beta may have been partially internalised in the beta average of the new sample (to the extent that this sample prioritises core infrastructure services), we think that further adjustment is appropriate to acknowledge the significance of retail and other such non-aeronautical services for certain operators in the sample".

58. In Table 2 of its report, TDB reports its own estimates for 2022 revenue shares for the draft decision sample (for some reason, which is not explained in its report, excluding AENA). I have set these beside Qantas' estimates (read off its chart) and my own. I have highlighted rows where there are material differences between one or more of the three estimates.

Table 3-2: Qantas vs TDB vs CEG estimates of % aero revenue

	Qantas	TDB	CEG
Auckland	35%	32%	40%
Sydney	52%	50%	50%
Vienna	65%	64%	46%
Beijing	33%	32%	32%
AdP	61%	36%	36%
Frankfurt	70%	76%	33%
AENA	60%	NA	62%
Zurich	50%	48%	48%

Source: Qantas, TDB, 2022 annual reports

59. In summary:

- TDB and I have the same estimates for AdP but very different to Qantas;
- TDB has materially higher estimates for Frankfurt than Qantas and much higher than me;
- TDB and Qantas have similar estimates for Vienna which are higher than my estimate; and
- TDB has a lower estimate for Auckland than both Qantas and myself.

60. I have explained the basis of my estimates in the previous section. I have also tried to work out how Qantas and TDB have arrived at different estimates. For the most part I cannot replicate the Qantas estimates, which I also explained in the previous section. However, for TDB it appears that we have the following differences:

Table 3-3: TDB vs my estimates of the percentage of aeronautical revenues

	TDB assumptions	My assumptions
Auckland	TDB appears to have removed from Auckland's stated aeronautical revenues rental income ($16m) rates recoveries ($0.8m) and other income ($7.3m). This results in a 32% estimate.	TDB does not explain that it has used less than 100% of what AIAL reports as "aeronautical revenues" and has not explained how this adjustment to AIAL's reported revenues is consistent with what it has done at other airports.
Vienna	TDB appears to have estimated aeronautical revenues as the sum of airport aviation (€309m), airport non-aviation revenues (€12m), handling and security aviation (€116m) handling and security non-aviation (€9m). Doing so results in a 64% ratio to total revenue.	TDB differs from me by adding non-aviation revenue (€12m) and "handling and security" revenues for both aviation and non-aviation (€125m). It is the latter that drives the difference between us. However, I note that ground handling services are contestable (e.g., AIAL does not provide them) and are unregulated at Vienna Airport (pp. 99 and 164 of Vienna's annual report specify that ground handling services are not subject to approval (not regulated by the Civil Aviation Authority)). It is unclear why TDB would wish to include these services as part of a proxy for regulated aeronautical services.
Frankfurt	TDB appears to have estimated aeronautical revenues as the sum of 100% of the aviation (€828m) plus ground handling (€550m) operations plus 100% of aviation and non-aviation revenues from the "International activities and services" (€595m+€444m). This gives rise to 76%	My estimate is based on 100% of the reported Frankfurt Aviation segment revenue (which is an overestimate of regulated aeronautical revenue) plus revenue from Frankfurt ground handling "Infrastructure charges" (which are regulated at Frankfurt Airport (p.44)).

61. In summary, TDB seems to have:

- Removed from AIAL's aeronautical segment revenue items that it (presumably) believes might not be regulated, although TDB does not explain why it thinks those items might not be regulated;
- Added to Vienna and Frankfurt's aviation segment revenue items that it does not explain why they have been added and, clearly based on the annual reports and financial statements, are not regulated.

62. When it comes to Frankfurt, the below extract is the relevant source data from the FY22 annual report.

Table 3-4: Extract from Fraport FY22 annual report

5 Revenue

Revenue

€ million	2022	2021
Aviation		
Airport charges	618.4	361.7
Security services	173.7	194.1
Other revenue	36.0	31.7
	828.1	**587.5**
Retail & Real Estate		
Real Estate	185.9	168.8
Retail	153.6	72.1
Parking	78.9	51.4
Other revenue	28.0	26.8
	446.4	**319.1**
Ground Handling		
Ground services	291.2	221.2
Infrastructure charges	237.5	141.5
Other revenue	21.4	23.7
	550.1	**386.4**
International Activities & Services		
Aviation	594.6	316.6
Non-Aviation	444.1	292.0
Contract revenue from construction and expansion services (IFRIC 12)	331.1	241.7
	1,369.8	**850.3**
Total	**3,194.4**	**2,143.3**

63. My estimates of regulated aeronautical revenues are circled in green. These give rise to a 33% revenue share (were I to include international aviation revenue my estimate would be 52%). By contrast, TDB's estimate of 76% appears to be based on all the green values that I used plus the red circled items.

64. I have included regulated ground handling revenues which account for 43% of the segment. I have not included other revenues on the basis that the objective is to determine whether having a higher/lower share of regulated revenues affects a firms' asset beta. TDB has included not just unregulated ground handling revenues at Frankfurt but also all revenues from foreign airports (including retail, car parking, land rental etc) which are almost exclusively located in less developed countries.[8]

65. What reasonable basis TDB has for doing so is unclear to me. I note that doing so does support both TDB and Qantas' assertion that higher aeronautical revenue share lowers risk – but only because doing so incorrectly assigns the highest estimated revenue share to a comparator (Fraport) that has an unusually low asset beta.

66. Not only is doing so wrong, but it is entirely inconsistent with TDB and Qantas submission that airport comparators that operate in less developed countries should be excluded because they "operate in quite different markets"[9] and are not

8 As outlined in Figure 6-4 of my July report, Fraport's international operations are dominated by China, Turkey, Greece, Russia and Brazil

9 TDB, NZ Commerce Commission: Part 4 Input Methodologies Review 2023 – Draft Decision, July 23, p.5.

comparable to "operating in a New Zealand environment".[10] There is, in my view, a fundamental inconsistency to simultaneously:

- Include revenues from Fraport's operations in less developed countries (including unregulated revenues) in support of an argument that these revenues are low risk and explain why Fraport has low estimated asset beta; while
- Arguing that other airport companies, operating in the same or similar countries,[11] should be excluded from the sample because operating in those countries is higher asset beta risk than operating in New Zealand.

10 Qantas, p.1.

11 As outlined in Figure 6-4 of my July report, Fraport's international operations are dominated by China, Turkey, Greece, Russia and Brazil

4 COVID-19 adjustment

67. In this section I explain that:

- Dr Lally's identification of flaws in the COVID-19 adjustment method used in the Draft Decision is consistent with my previous advice;
- TDB Advisory's submission that the Draft Decision correctly applies the UK CAA / Flint method is mistaken. If it is applied correctly there would be a materially higher permanent uplift for pandemic risk. I have also identified unexplained differences between the uplift calculated by TDB and me when using the UK CAA / Flint method, which suggests that there is an error in TDB's calculation of a low uplift for AIAL (noting that TDB did not provide uplift estimates for other airports).
- Castalia provides unconvincing arguments to the effect that future policy responses to a pandemic will be different. The most appropriate presumption is that, faced with a similar pandemic, future New Zealand policy makers will respond in a similar fashion.

4.1 Dr Lally submission

4.1.1 Draft decision estimate is biased because it fails to account for higher market volatility due to COVID-19

68. Dr Lally identifies the same flaw in the draft decision weighting scheme as I did. In section 8.2.2 of my July report, I stated:

> *The reason the NZCC method so significantly misestimates the impact of the pandemic on long run beta estimates is that it (implicitly)* ***assumes that market volatility is the same in the pandemic as outside the pandemic.*** *If this were correct then the NZCC time weighting method would correctly estimate the long run equity beta including pandemic impacts.*
>
> ***However, during COVID-19 the market volatility was much higher than "normal".*** *Investors care much more about the protection from volatility a stock supplies during high market volatility than they do during "normal" volatility because in a "normal" period there is less volatility to be protected from.*

69. Dr Lally shows this mathematically and reaches the same conclusion that I did.[12]

> *This is the formula seemingly used by the Commerce Commission. Using the conditional betas of βC = 0.53 and βD = 0.93 invoked by the Commerce Commission, the unconditional beta would then be β = 0.56 as noted by the Commerce Commission (ibid, para 4.64). However, this equation (4) rests on two* ***assumptions: that expected returns are equal in the covid and no-covid scenarios****, and that the variance of the market returns is the same in both scenarios.* ***By their very nature, covid type scenarios could be presumed to involve a higher variance of market returns****. Consistent with this presumption, the variance of market returns was significantly elevated in the three-month period commencing on 1 March 2020.1 So, the second assumption appears to be false. In addition, the covid scenario may involve a lower expected return, and therefore the first assumption may also be false.* (Emphasis added.)

4.1.2 The UKCAA/Flint method is conceptually correct

70. I also identified the method applied by the UKCAA consultant, Flint, as the best way to adjust asset betas for an assumption about the "true" future frequency of COVID-19 like events (although, for other reasons, I do not consider that such adjustments should be attempted). This involves including COVID-19 and non-COVID-19 affected data in the same regression and simply reducing the weight given to COVID-19 affected data to reflect the assumed frequency and duration of a COVID-19 like event.

71. Dr Lally reaches the same conclusion as me.[13]

> *An alternative approach to the Commission's approach of weighting the conditional betas* ***would be to apply weights to the covid and non-covid returns data, and then generate a single estimate of beta.*** *This is the empirical counterpart to equation (2), with average returns for asset* x *and the market portfolio being used rather than their expectations. Such an approach does not require the assumptions that underlie the Commission's approach. Interestingly,* ***the Commerce Commission (ibid, para 4.58 – 4.62) refers to work by Flint (2021) and TDB (2023)****, and seems to characterize their work as being of the type in equation (4), i.e., weighting over beta estimates. However, TDB's work instead seems to involve weighting returns data from both covid and non-covid scenarios within the beta estimate rather than*

[12] Dr Lally, The Impact of Future Covid Scenarios on Beta Dr Martin Lally Capital Financial Consultants 22 June 2023, p.4.

[13] Dr Lally, The Impact of Future Covid Scenarios on Beta Dr Martin Lally Capital Financial Consultants 22 June 2023, p.5

> *weighting betas, as in equation (2), and therefore avoids the problem identified here with the use of equation (4). Furthermore, whilst Flint (2021, Table 6) does present results from the same approach as equation (4),* ***their preferred method shown in their Table 6 is to weight returns data from both covid and non-covid scenarios within the beta estimate, as in equation (2),*** *which again avoids the problem identified here with the use of equation (4). Furthermore,* ***Flint's (2021, Table 6) results from their preferred approach are significantly higher than from equation (4)****, and therefore the analysis in the current paper could then be viewed as explaining why this difference arises.* (Emphasis added.)

4.1.3 Even with the correct method, the merits of attempting to apply an adjustment are contentious

72. In my July 2023 report I stated:

> *I have previously provided evidence to the NZCC detailing the complications and difficulties that would be involved in adjusting estimated asset betas for unusual events (such as COVID-19).*[14] *I explained that this would be close to impossible to do in a rigorous manner that was consistently applied overtime. I explained that doing so would have far reaching complications not just in this IM review but in all future IM reviews.*
>
> *The draft decision did not address/evaluate that evidence.*

73. I explained that this would create problems more generally for the regulatory regime. It would require selected events to be identified as "sufficiently" unusual and "removed/de-weighted" from asset beta estimates when they occur but added back in periods where they did not occur (emphasis in the original).

> *The rest of this section explains why I previously advised that attempting to adjust data for unknown and unknowable "true" probabilities of abnormal shocks:*
>
> - *Will be impossible to do accurately; and*
> - *Will result in a regulatory quagmire* ***now*** *with:*
>   - *ad hoc measures that disturb regulatory precedent in a manner that makes regulatory precedent have little value;*
>   - *claims and counter claims about the unknowable "true probabilities" required to implement the ad hoc adjustments;*

[14] Section 3.3 and Appendix B of Hird, NZCC comments on asset beta estimates for airports, February 2023.

- *Will result in a regulatory quagmire **in the future** because the:*
  - *uplifts for the "true" risk of a pandemic need to be consistent/amended for future events (e.g., what happens if the next pandemic occurs in 2038?);*
  - *there will be other abnormal shocks that some stakeholders will want the same treatment as COVID-19 applied to.*

74. Dr Lally expresses similar concerns before going onto focus on the NZCC's mathematical errors in estimating an adjustment.[15]

> *The merits of applying such treatment to selected events are contentious, especially when the probability of a recurrence of the event is so hard to estimate and any such recurrences may be materially more or less severe. However, this paper focuses purely upon the mechanics of the adjustment used by the Commerce Commission.*

4.2 TDB submission

4.2.1 TDB submission prior to the NZCC draft decision

75. BARNZ submitted a TDB Advisory report dated 26 January and entitled: "Auckland Airport's Asset Beta: Covid-19 Adjustment Using Flint Study".

76. In that report TDB correctly describes the Flint method. However, I am unsure as to whether TDB correctly applied that method. TDB's estimates for AIAL's uplift appear very low compared to mine as can be seen in Table 4-1 below.

[15] Dr Lally, The Impact of Future Covid Scenarios on Beta Dr Martin Lally Capital Financial Consultants 22 June 2023, p.2

Table 4-1: Flint method uplift (average across weekly and 4-weekly)

	Data	Covid period	Duration	Frequency of 1-20 years	Frequency of 1-50 years
CEG#	5 years ending 31 March 2023	18 months starting 21 Feb 2020	18 mth	0.115	0.052
TDB	5 years ending "August" 2022	17 months starting X(?) Feb 2020 and ending Y(?) June 2021	17 mth	0.035	0.005
TDB	5 years ending "August" 2022	17 months starting X(?) Feb 2020 and ending Y(?) June 2021	30 mth	0.095	0.015

* TDB values are calculated as the average uplift across weekly and monthly estimates for the 1 in 20 duration column of Table 2 in the TDB 26 January report. # See Appendix B for a full list of all the airports and asset beta estimates including uplifts/

77. There are relatively small differences in our stated method.[16]

78. I would expect that we would have similar estimates of the uplift when we adopt the same assumptions about the frequency of future pandemics. However, my estimate for a:

- 1 in 20 year frequency is 3.3 times TDB's estimate; and
- 1 in 50 year frequency is 10.4 times TDB's estimate.

79. In my view, it is likely that there is an error in the TDB application of the Flint method.

4.2.2 TDB submission to the NZCC draft decision

80. In response to the draft decision TDB states:

> *We strongly support this approach. Its rationale,* ***methodology and findings are largely consistent with the approach and findings we reported in our replication of the Flint method used in the U.K.****, as cited by the Commission.*
>
> *We think that the resulting asset beta of 0.55, based on a 0.02 premium on the pre-Covid average of 0.53, provides an analytically sound and economically reasonable input for estimating the cost of capital in the regulatory period ahead.*

[16] My estimates for AIAL using the 5-year to 31 March 2023 and an 18 month duration (but the same frequencies). My dataset starts and ends 7 months after TDBs. However, we both appear to adopt very similar definitions for the COVID-19 period (17 versus 18 months from February 2020). Consistent with this, we adopt similar assumptions for the duration of a future pandemic (17 versus 18 months months). I also note that I have used the average uplift across 5 weekly and 20 four weekly estimates as per the NZCC standard methodology. TDB states that it is "using the Commerce Commission methodology to determine daily, weekly and monthly asset betas".

81. This is factually incorrect:

- the **methodology** applied in the draft decision is very different to the Flint method;
  - as explained in my July 2023 report and in Dr Lally's submission and, indeed, as is clear from TDB's description of the Flint method in its previous report.
- the **findings** of this methodology (correctly applied) will result in a substantially higher uplift than the NZCC estimated due to the fact that market volatility was higher during the COVID-19 period.
  - In my draft report I estimated an uplift of 0.08 for the NZCC sample including Sydney based on an 18 month duration and a one in 20 year frequency (see Table 2-4 and footnote 26 to that table)
  - Dr Lally (p.5) illustrates that the NZCC method gives roughly half the appropriate weight to the COVID-19 period if the market volatility is twice as high during COVID-19 affected periods as unaffected periods. Dr Lally also notes that the NZX50 volatility was four times as high in the 3 months post March 2020 as in the 3 year prior.

82. It does appear to be the case that the NZCC uplift of 0.03 for AIAL (as estimated in draft decision paragraph 4.62.3) is similar to TDB's closest corresponding uplift estimate of 0.02[17] estimate of the uplift based on 17 months. Indeed, it is peculiar that the NZCC estimate is almost double the TDB estimate given that the NZCC "time weighted" methodology is biased down (as has been noted by me (section 6.2.2 of my July report), Flint (see section 8.2.3.2 of my July report) and Dr Lally (see above)).

83. I consider that the most likely explanation for the similarity in the findings by TDB and the NZCC is because there is an error in the TDB calculation (or an undisclosed material methodological departure from a plain reading of TDB's stated methodology).

84. For the above reasons, I do not consider that any weight should be given to TDBs support for the draft decision's application of a clearly incorrect and (as a matter of statistics/mathematics) biased methodology.

[17] This is calculated from TDB's Table 2 (17-month pandemic duration vs NZCC 18-month duration) by taking the difference between 0.83 (weekly no-Covid beta) and 0.85 (weekly 1 in 20 years frequency- which is also the frequency used in the NZCC calculation).

4.3 Evidence on relative severity of COVID-19 government interventions

85. Our World in Data[18] provides data on international travel restrictions broken down into the following categories:

    i. No measures;

    ii. Screening;

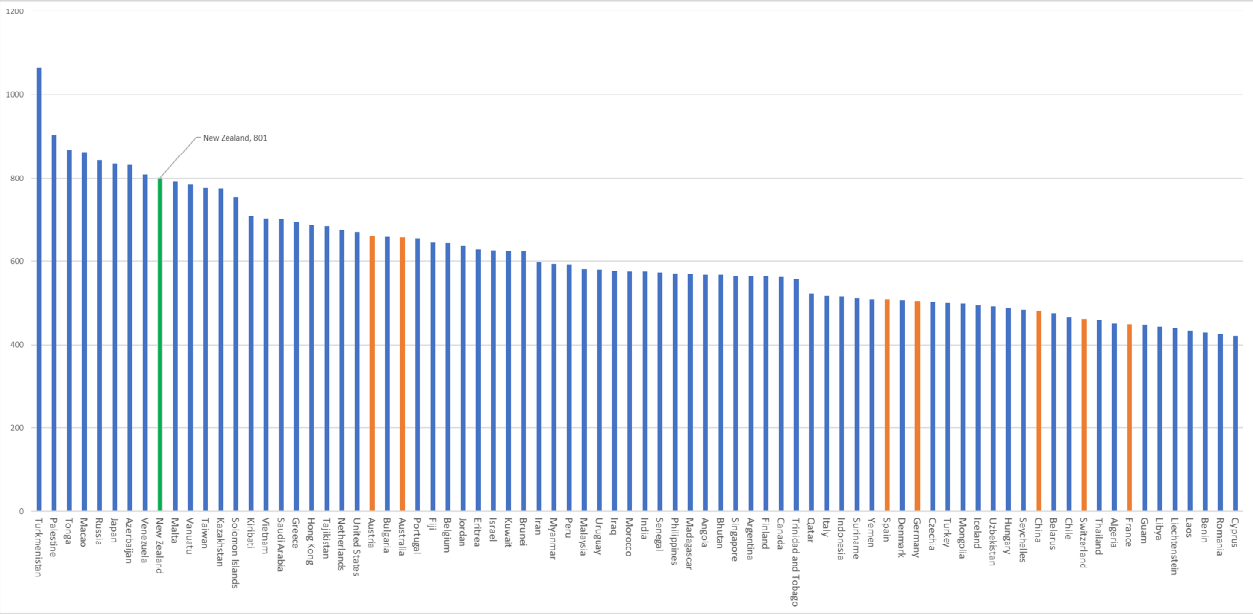
    iii. Quarantine arrivals from high-risk regions;

    iv. Ban on high-risk regions; and

    v. Total border closure

86. The following chart shows the total days of level iv and level v restrictions for New Zealand versus all other countries that had more than 420 days of level iv and/or v restrictions. It can be seen that New Zealand (green) has one of the highest observations in the world and materially higher than the average for the rest of the NZCC sample countries (orange).

Figure 4-1: Days with level iv and/or v restrictions



87. In my view, any view on the likely policy response to a future pandemic is best informed by the response to COVID-19. New Zealand, as an island nation with no

18 https://ourworldindata.org/grapher/international-travel-covid

road or rail transport connections to other countries is unusually well suited to putting in place travel restrictions (e.g., unlike European countries who rely extensively on people and goods to travel by road and rail between countries).

88. To the extent that the New Zealand policy response to COVID-19 reflects that underlying economic reality, then, absent strong evidence to the contrary, it is prudent to assume a similar policy response to a future pandemic.

89. In this regard I note that restrictions were in placed prior to the New Zealand election on 17 October 2020. At that election the Labour Government won re-election with a majority of seats. It is the first time that this had occurred since the mixed-member proportional representation (MMP) system was introduced in 1996. Absent any strong evidence to the contrary, this would suggest that a future Government could expect popular support for similar restrictions in the event of a future pandemic.

90. I do not believe that the two articles listed in the Castalia's footnote 1 on page 4 of its July 2023 submission,[19] neither of which appear to mention New Zealand at all, constitute strong evidence of the kind required to overturn the presumption of the previous paragraph.

[19] Castalia reference "for example" Yanovskiy, M., & Socol, Y. (2022). Are Lockdowns Effective in Managing Pandemics?. International journal of environmental research and public health, 19(15), 9295. https://doi.org/10.3390/ijerph19159295, and Camera, G., & Gioffré, A. (2021). The economic impact of lockdowns: A theoretical assessment. Journal of mathematical economics, 97, 102552. https://doi.org/10.1016/j.jmateco.2021.102552

5 Fundamental misinterpretation of beta estimates

91. In this section I address Castalia and TDB's views that the draft decision's small adjustment for pandemic risk is appropriate because post-COVID-19 observations of asset beta "price in" pandemic risk and/or COVID-19 has had limited impact on systematic risk.

92. I explain that Castalia's and TDB's views are based on a misunderstanding of what asset beta observations measure. In short, they measure how the stock market reacted to the actual shocks that hit the economy in the relevant estimation window – and do not measure the exposure to risks that did not actually eventuate.

93. Measured asset betas are the best source for an estimate of forward-looking asset betas. As I explained in section 9 of my July 2023 report, relying on periodically updated asset betas estimated from the most recent 10 year estimation window will ensure that all systemic risks are correctly and appropriately weighted and the resulting asset beta will provide compensation that best matches the average forward-looking systemic risk for the airport sector. Indeed, this is the only methodology that can reliably achieve this outcome.

94. Castalia and TDB seem to be implying that pandemic risk will be picked up in asset beta estimates derived using data that does not include pandemic events. This is patently not correct.

95. My interpretation of the draft decision is that asset beta observations during the COVID-19 period must be given weight, which is correct. My view remains that adhering to the asset beta IM (i.e., the most recent 10 year period) gives COVID-19 data the correct weight over time. However , if the Draft Decision approach is retained, then any calculated uplift must be permanent (i.e., applied in this and all future IMs).

5.1 Castalia and TDB appear to not understand asset betas are estimated

96. Castalia has a section entitled:

> *"New perceptions of pandemic risks are priced into actual betas, but post-pandemic data sample is too small to rely on for an accurate estimate"*

97. I reproduce that section in full below.

> *The Commission notes:*

> *Our view is that it is likely that COVID-19 provided new information that had not been included in the market's assessment of the airport asset beta, that the spike in the asset beta during the early stages of COVID-19 would be repeated in future pandemics, and that investors have repriced and reweighted airports in their efficient portfolio of investments.*

We agree that COVID-19, as the first global pandemic event of this scale in the time of mass air travel, likely fundamentally shifted market perceptions of pandemic risks. We also agree that ***by now markets will have priced in pandemic risk, and this is reflected in the actual betas of listed companies,*** *including airports. Unfortunately, actual betas cannot be observed, only estimated.*

A first-best approach would be to use reliable estimates for actual ***betas that reflect the re-pricing of airport assets*** *with the new market knowledge created by COVID-19 and responses to it.* ***This would require using a data set that can only start from the point in time investors formed a view that air travel restrictions would largely be lifted****. That point in time is highly subjective—the Commission uses 1 October 2021, while New Zealand did not announce a concrete plan to reopen borders until February 2022.*

Regardless of the chosen cut-off date, the time horizon of any such data sample would be well below the Commission's usual ten-year period. Therefore, at this point in time the Commission is not able to adopt a first-best approach, but may be able to do so at the next IMs review.

98. TDB states:

> *As we and others have argued previously, the COVID-19 pandemic was an extraordinary event, including in its economic, social and public policy impact. While future shocks of this nature shouldn't be ruled out, we maintain the hope and expectation that these are relatively rare events and* ***ones that would be met by policy measures that are informed by the experiences of recent years****.*
>
> *Consistent with this view, the Commission identifies the sharp jump in the airport asset beta average during the more intense phase of the pandemic,* ***along with the subsequent decline in the average back towards its pre-pandemic level. We agree with the Commission's assessment that this pattern suggests there has been at most a limited systematic impact of the pandemic****.*

99. For a lay person there is a certain attractiveness to Castalia and TDB's submissions. The above submissions proceed along the following logical progression (sometimes implicitly and sometimes explicitly):

a. Measured asset betas over any period capture and correctly weight all potential economic shocks that investors have "priced in" to their stock valuations even if none of those shocks actually occurred in the estimation window.

b. Early in the pandemic investors overstated the risks of the pandemics but the reason measured asset betas are lower using data exclusively after the pandemic is not because investors long run perceptions of pandemic risk fell and this lower risk perception was "reflected in the actual betas of listed companies";

   i. Castalia. Only after it became clear that border restrictions would be lifted did their perceptions reflect a rationale "pricing in" of pandemic risk. Therefore, correct estimates of pandemic risk *"require using a data set that can only start from the point in time investors formed a view that air travel restrictions would largely be lifted";*

   ii. TDB. After the "*sharp jump in the airport asset beta average during the more intense phase of the pandemic*" the "subsequent decline in the average back towards its pre-pandemic level" is evidence that investors perceive that there is a "*limited systematic impact of the pandemic*".

c. The best estimate asset beta that is inclusive of investors' true perceptions of pandemic risk would be derived by excluding the COVID-19 affected data prior to the point in time that investors arrived at a rational "pricing in" of pandemic risk (for Castalia this appears to be some date post 1 October 2021 or perhaps February 2022).

d. If the Commission had enough data post these dates it could simply rely on that data to provide a reasonable estimate of asset beta risk inclusive of pandemic risk.

100. These submissions start from the factually incorrect assumption that estimated asset betas measure the perceptions of risk that investors have within their minds over the estimation window. TDB and Castalia's submissions proceed as if the following were true:

- If an investor is worried about a future pandemic then, the mere fact of "pricing this risk into" valuations means that this risk will show up in the measured asset beta even if there is no pandemic during the measurement window;
- If an investor is worried about a future financial crisis then this will show up in the measured asset beta even if there is no financial crisis during the measurement window;
- If an investor is worried about a future war between China and Taiwan then this will show up in the measured asset beta even if there is no war between China and Taiwan during the measurement window;
- If an investor is investor is worried about "Shock X" then this will show up in the measured asset beta even if there is no "Shock X" during the measurement window;

- Etc.

101. Nothing of the sort is true. Estimated asset betas measure what actually happened during the relevant estimation period – not what investors were worried about happening but did not. Estimated asset betas, unlike dividend growth models and the like,[20] do not attempt to measure investor discount rates applied to airports. Estimated asset betas only measure correlation of stock returns and standard deviation of stock returns.

$$Measured\ asset\ beta = correl\ (airport\ return, marekt\ return) \times \frac{SD(airport\ return)}{SD\ (market\ return)}$$

102. In order for a shock to affect the measured asset beta it has to actually happen and have an effect on the three variables that form part of the measured asset beta: 1) correlation of airport returns with the market; 2) standard deviation of airport returns; and 3) standard deviation of the market return.

103. Estimated asset betas **do not** measure the impact of shocks that investors were worried might occur but did not occur. The reason that measured asset betas are lower when the measurement period starts after the COVID-19 shock period is:

- not because the lower asset beta reflects a "repricing" of pandemic risk by investors; rather
- it is because the data does not include a pandemic shock and, therefore, includes zero reflection of pandemic risk.

104. It follows that for pandemic risk to be included in the forward-looking asset beta estimate in the draft decision, the historical data used to compile that estimate must give weight to a period actually impacted by a pandemic.

105. I do not consider that the draft decision actually made this mistake. The draft decision quote reproduced by Castalia is somewhat ambiguous but appears to me to be suggesting the opposite. Namely, that the impact of the data from during the actual pandemic shock needs to be given weight.

5.2 Policy implications for the current and future IM

106. It is my view that the best way to deal with the impact of the pandemic on measured asset betas is to continue to apply the 2016 IM asset beta methodology. My view is

[20] A dividend growth model compares the prevailing share price with an estimate of future profits/dividends and asks what discount rate will equate these two. This method for estimating investor discount rates is affected by the prevailing level of stock values (including what risks investors are "pricing into" their discount rates). Estimated asset betas are not driven by the prevailing level of stock prices they are driven by historical correlations between movements in stock prices.

that this will ensure that the correct weight is applied to pandemic events (and all other events) in the long run. See section 9 of my July 2023 report.

107. However, if the Commission proceeds with its draft decision uplift approach (attempting to remove the pandemic impact from the estimated asset beta and then apply an uplift to reflect a view about the underlying true actuarially fair future risk of pandemics) then that uplift must be applied permanently into the future. I explain this in section 9.4 of my July 2023 report.

> *The logic for an uplift to a pandemic-free estimate of asset beta is that there is always some latent risk of a pandemic that investors require compensation for even if the estimation window for asset beta is unaffected by a pandemic. It follows that any uplift must be permanent (or, at least, applied when there is no pandemic event in the asset beta estimation window).*

108. Castalia and TDB's submissions are somewhat ambiguous, but might be read as suggesting that:

- the fact that asset betas are lower using "post -COVID" data indicate that investors do not require a material pandemic uplift now (e.g., in the 2023 IM); and
- by the time of the 2030 IM, pure reliance on post COVID-19 data will adequately reflect investors' perceptions of exposure to pandemic risk. That is, there will be no need for any uplift.

109. Any such suggestions would represent a manifest failure to understand what estimated asset betas are measuring and would not reflect well on the authority of any party making them.

6 Sample selection (airport not country filters)

110. In this section I address submissions that support the draft decision's approach to selecting the comparator sample.

111. The draft decision removes comparators based on:

- Developed country market/MRP criteria (**excludes 11** comparators if applied first: Shenzen, Guangzhou, Shanghai, Xiamen, AoT, Grupo Sureste, Grupo Pacifico, Grupo Centro, GMR, Malaysia and Malta[21]);
- Liquidity criteria (**excludes 4** comparators: Toscana, Copenhagen, HNA, Bolgna)
- Asset beta volatility criteria (**excludes zero** comparators if the above filters are applied first);
- Low debt leverage criteria (**excludes zero** comparators if the above filters are applied first).

112. As explained in section 6.1 of my July report, while liquidity is a reasonable filter the other filters have no sound justification. Moreover, and inexplicably, the dominant filter applied by the NZCC is the developed country/MRP filter, which accounts for three quarters of the exclusions. This filter measures nothing about the airport in question (and, as explained in section 5.4 of my July report, if it was applied consistently it would also exclude Fraport and AdP).

113. None of the criteria attempt to measure anything about the specific operations relevant to systematic risk of the airports in question. In particular, there was no analysis of:

- Airport size and diversity of traffic (e.g., number of routes, international destinations etc);
- Capacity utilisation at the airport (including whether the airport is the primary airport for a city served by secondary "spill over" airports);
- The regulatory environment for the airport.

[21] Attachment A of the NZCC draft decision lists the sole reason for exclusion for Malta and Malaysia as "Beta estimate unreliable". This is peculiar because Malaysia has an "Advanced Emerging" country classification and other airports with the same classification have "market comparability" listed as a reason for exclusion. Similarly, Malta has country classification of "Frontier" which is the least developed of all the classifications in the sample but "market comparability" is not listed. This illustrates a degree of randomness in relation to what reason for exclusion is ascribed to what airport – see also section 6.1.2 of my July report.

114. This is despite sound economic reasons (both conceptual and empirical) for expecting these factors to play an important role in determining exposure to traffic volatility risk and, therefore, asset beta risk.

6.1 Submissions on the draft decision

6.1.1 TDB

115. In May 2022 TDB, on behalf of BARNZ, advised the NZCC that they should focus on small standalone airports similar to the New Zealand airports.

> *On balance, we would prefer that a smaller sample of more comparable firms be used. We suggest that, in the Commission's current sample, the* ***smaller operators that have primary responsibility for just one airport are likely to be more similar to their NZ counterparts*** *than the very large, and often regional or even national, operators that are also included in the sample.*

116. The NZCC did not follow this advice in the draft decision and, in fact, pursued a diametrically opposed method. The draft decision narrowed the NZCC sample to be dominated by:

- mega airport companies like Fraport, AdP, AENA and Beijing (see section 5.5 of my July 2023 report); and
- gave one quarter weight to Fraport AG and AdP whose operations are dominated by airports in countries other than Germany and France (and almost exclusively in less developed countries – see section 6.2.2 of my July 2023 report).

117. In its submission on the draft decision TDB states:[22]

> *We strongly support the Commission's draft decision to use a smaller set of more comparable airport companies in its comparator sample. We agree that the comparators now proposed are squarely focused on providing core aeronautical services; that is their key role and identity.*

118. TDB does not explain the factual basis for its assertion that the new narrow set of comparators are "are squarely focused on providing core aeronautical services".

119. TDB does not explain why it no longer considers that airport size and being responsible for a single airport (rather than an airport conglomerate) are important determinants of comparability.

[22] TDB Advisory Ltd Commerce Commission Draft Decision on 2023 IM Review. July 2023, p.5.

120. In this section I explore which of TDB's two positions is best supported by the data. Specifically:

- That small single airport comparators are likely to have similar risk to small single airport companies in New Zealand (the **TDB May 2022 view**); or
- That the NZCC sample (largely based on mega airport companies with some of the largest airports in the world and where the companies own many airports spread around the world) is to be strongly supported as comparable to small single airport companies in New Zealand (the **TDB July 2023 view**).

6.1.2 Castalia

121. In section 3.2 Castalia agrees with the Commission's exclusion of airport companies operating in less developed countries. Castalia expresses support for the use of a third party classification of developed countries (MSCI Market Classification Framework).

122. Castalia accepts that the average equity beta in a country must be 1.0 by definition and, therefore, it is impossible for less developed countries to have higher betas on average than another countries.

123. However, Castalia provides some speculation that airport companies might be an exception. Castalia provides no empirical evidence to support that view (i.e., being from a developed country affects airport asset beta).

124. In this section I address this view and find that:

- Once the size and traffic diversity of an airport is accounted for (as proxied by number of routes) there is, little statistical evidence to support a view that airports in developed countries have lower asset betas; and
- Even if a "developed country dummy" is included in the analysis, the estimated asset beta for the average developed country airport with the same number of routes as the New Zealand airports is materially higher than the average asset beta in the NZCC sample.

6.1.3 Incenta

125. I also note that Incenta has submitted on the NZCC's reliance on the FTSE Equity Country Classification.[23] Incenta explains that this classification system has nothing to do with estimating reliable stock prices and returns in a country. As Incenta notes, the markets classified as not "developed" include very large firms with high liquidity which are covered by dozens of research analysts in the market.

[23] Incenta, Airport comparator sample selection, July 2023, section 2.5

126. Incenta explains that it would be incorrect to argue that the equity markets in these countries are somehow unreliable such that equity betas cannot be accurately estimated. Incenta further explain that:

> *If we look into the criteria that FTSE applies in allocating countries into the "developed" "advanced emerging" and other buckets, we find in the cases of China, Thailand and Mexico that all of them possess "formal stock market regulatory authorities" who actively monitor the market. Key requirements for market making in equity securities, like "transparency – market depth information / visibility and timely trade reporting process", "sufficient competition to ensure high quality broker services" and "implicit and explicit [transactions costs that are] reasonable and competitive" are observed by FTSE in each of those markets.* ***The market characteristics that are absent and cause them not to be classified as "developed" are attributes like stock lending, short sales and a developed derivatives market.***

127. In short, the FTSE Equity Country Classification of developed versus not-developed equity markets relate to characteristics that might be valued by a fraction of investors trading at high frequency (e.g., hedge funds and algorithmic traders) but which are simply unimportant to the estimation of equity returns over weekly and four-weekly intervals (as required for the NZCC estimation method).

128. I agree with Incenta concerning the NZCC's use of the FTSE Equity Country Classification and note that the same considerations apply to Castalia's proposed use of the MSCI Market Classification Framework.

129. In any event, as noted above, in this section I find the empirical evidence does not support the conclusion that airports in less developed countries have statistically significantly different asset betas to those in developed countries:

- Once the size and traffic diversity of an airport is accounted for (as proxied by number of routes) there is, little statistical evidence to support a view that airports in developed countries have lower asset betas; and
- Even if a "developed country dummy" is included in the analysis, the estimated asset beta for the average developed country airport with the same number of routes as the New Zealand airports is materially higher than the average asset beta in the NZCC sample.

6.2 Empirical analysis

130. In my opinion the NZCC should maintain its 2016 IM methodology and continue to adopt a wide sample. However, if a narrow sample was to be adopted, as submitted by TDB and Castalia, then:

- I accept the NZCC's apparent liquidity restriction of a bid ask spread of less than 0.5% is reasonable and note that, consistently applied, means Vienna would be excluded. I also note that, even absent this liquidity concern, Vienna should be excluded based on its regulatory regime removing demand risk (as explained in section 5.2.2 of my July 2023 report);
- However, I consider that any further narrowing of the sample should be based on airport specific metrics that have a sound conceptual and empirical basis as being relevant to airport asset beta risk.

6.2.1 Forming samples based on risk metrics identified in my July 2023 report

131. If I form samples based on each of the metrics presented in section 5 of my July 2023 report I would form the samples set out in Table 6-1 below. In each case I only include airports that have a value for the relevant variable that is between 0.75 and 1.75 times the sum of the 3 regulated New Zealand airports (treating them as a single airport) for that variable less the sample minimum of the metric.[24]

132. Table 6-1 reports summary statistics for the samples so formed. It can be seen that:

- The average asset beta in the samples so formed falls between 0.82 and 1.08;
- The samples formed have similar average values for each metric to the sum of the three New Zealand airports for that metric.

[24] By way of example, the sum of the number of routes at all three airports is 110. The smallest airport in the sample has 24 routes (both WIAL and CIAL). Therefore, I only include airports that have between 110 - 0.75*(110-24) = 45.5 and 110 + 1.75*(110-24) = 174.5 routes. I note that there are no airports in the comparator sample with less than 46 routes so the bottom end of this exclusion is not binding.

Table 6-1: Sample averages where the samples are formed based on airport specific characteristics

Criteria	Sample average Two 5-year beta (ending March 2023)	Comparators*	New Zealand aggregate of metric	Sample average of metric
Number of routes	0.97	10	110.0[25]	97.9
Routes HHI	0.91	12	465	365
Country HHI	0.86	8	3,113	2,662
International country HHI	0.95	4	2,875	2,056
Peak to shoulder CUI#	1.02	4	12%	9%
Peak to average CUI	0.92	6	65%	69%
PAX (million)	0.90	9	34.40	37.63
Pax volatility	0.84	10	3.4%	3.2%

*Data from Bloomberg and Sabre. *The comparators in each sample are set out in Appendix C. However, I note that AIAL is included in all the samples. Of the draft decision comparators AENA and ADP are not in any of the samples, while Fraport is only included in pax volatility. Sydney is in five of the samples, Zurich is 3 of the samples, Beijing is in three of the samples. Of the airports excluded by the NZCC these are in the following samples Malta (7), Grupo Sureste (7), Vietnam (5), Grupo Pacific (4), Grupo Centro (4), Malaysia (3), Xiamen (3), JAT (2), Shenzen (3), Guangzhou (2), Shanghai (2), AoT (1). #Discussed more in Appendix A.*

133. Each of these samples is based on a specific metric that can be expected to affect an airport's asset beta risk.

    - The first four criteria go to the size and geographic diversity of demand for an airport. Lower diversification can be expected to be associated with higher demand risk;
    - The next two criteria relate to capacity utilisation/constraints at an airport. Lower capacity utilisation can be expected to be associated with higher demand risk; and
    - The last three criteria attempt to measure demand risk directly.

134. These narrower samples of airports are all more like New Zealand airports and all have higher sample average assets betas.

[25] Individual routes are treated separately. For example, Christchurch to Sydney and Auckland to Sydney are treated as two different routes rather than the same route, as if the three airports are treated as one.

135. If one took the TDB May 2022 view that it was important to form a sample of comparators that were similar to New Zealand airports in size and in not being airport conglomerates then all of the samples in Table 6-1 would be superior to the NZCC draft decision sample – especially the samples formed on the basis of number of routes and number of passengers. Indeed, only AIAL, Beijing, Sydney and Zurich from the NZCC sample are included in more than one of the samples in Table 5-1. AENA and AdP are in none of the samples and Fraport is in one of the samples.

6.2.2 Regression analysis using the same metrics

136. However, there is, inevitably, an arbitrary element to forming narrow samples in this way. For example, where a hard cut-off for inclusion or exclusion is set is ultimately arbitrary and can have a very significant impact on the final result. Moreover, one might want to:

- use the data from all comparators to form estimates about the relative importance of different metrics; and
- use those estimates to predict the asset beta for New Zealand's specific circumstances.

137. Regression analysis is the standard way in which these issues are dealt with. That is, if one believes that there are significant differences between airports and that these differences can be predicted by observable metrics then regression analysis is the standard way in which one goes about doing so rigorously.

138. That is, an alternative to forming a sample based on specific metrics is to run a regression based on these metrics and derive the predicted value for the New Zealand airports (based on the average value of the independent variable for AIAL, CIAL and WIAL). I report the results of doing so below for the same metrics listed in Table 6-1.

Table 6-2: Regression of asset beta vs airport specific risk criteria

	Intercept	Coefficient	P-value on coef	R^2	F-stat (df)	Predicted value (NZ average)
Number of routes (per 100 routes)	1.24	-0.20	0.0%	0.75	41.02 (14)	1.16
Routes HHI (0-100)	0.78	0.035	2.2%	0.32	6.67 (14)	1.24
Country HHI (0-100)	0.81	0.003	19.8%	0.12	1.82 (14)	0.95
International country HHI (0-100)	0.83	0.004	4.5%	0.26	4.82 (14)	1.05
Peak to shoulder CUI*	1.05	-0.313	4.6%	0.34	5.21 (10)	1.02
Peak to average CUI*	1.29	-0.447	18.4%	0.17	2.04 (10)	1.01
PAX (million)	1.00	-0.001	17.5%	0.13	2.04 (14)	0.99
PAX volatility	0.58	7.920	0.2%	0.52	15.17 (14)	0.88

Notes: ADP, Fraport, Thailand and Malaysia are not included in both CUI analysis as there are insufficient data to calculate a reliable CUI estimates for these conglomerates; AENA, Vietnam and Sydney are also excluded in all the metrics since they only have one of the two five-year periods reliably available.

139. Of all these regressions, the number of routes variable is notable for having a high R^2 of 0.75 - meaning that the number of routes variable can explain 75% of the variation in asset betas in the sample. Consistent with this, the number of routes variable has a highly significant coefficient (significant at the 1%) level.

140. The next best performing variable is passenger (pax) volatility. Interestingly, passenger numbers alone are less good at explaining asset beta variation in the sample than either number of routes and passenger volatility. This suggests that number of routes as a metric for airport size is picking up both airport size and geographic diversification.

6.2.3 Focus on the number (#) of routes regression

141. Given that the number of routes has such high explanatory power, I explore this regression in more detail below – including testing whether adding other criteria (including whether an airport company operates in a developed country)

142. First I set out a visual representation of the data in three scatter plots illustrating the relationships between the number of routes and airport asset betas (average of 2 five-year periods ending March 2023).

143. Each chart also shows the best fit regression line with the predicted asset beta for an airport with the number of routes equal to the simple average of the 3 New Zealand airports. This is shown on the fitted regression line as a red triangle. The three charts represent:

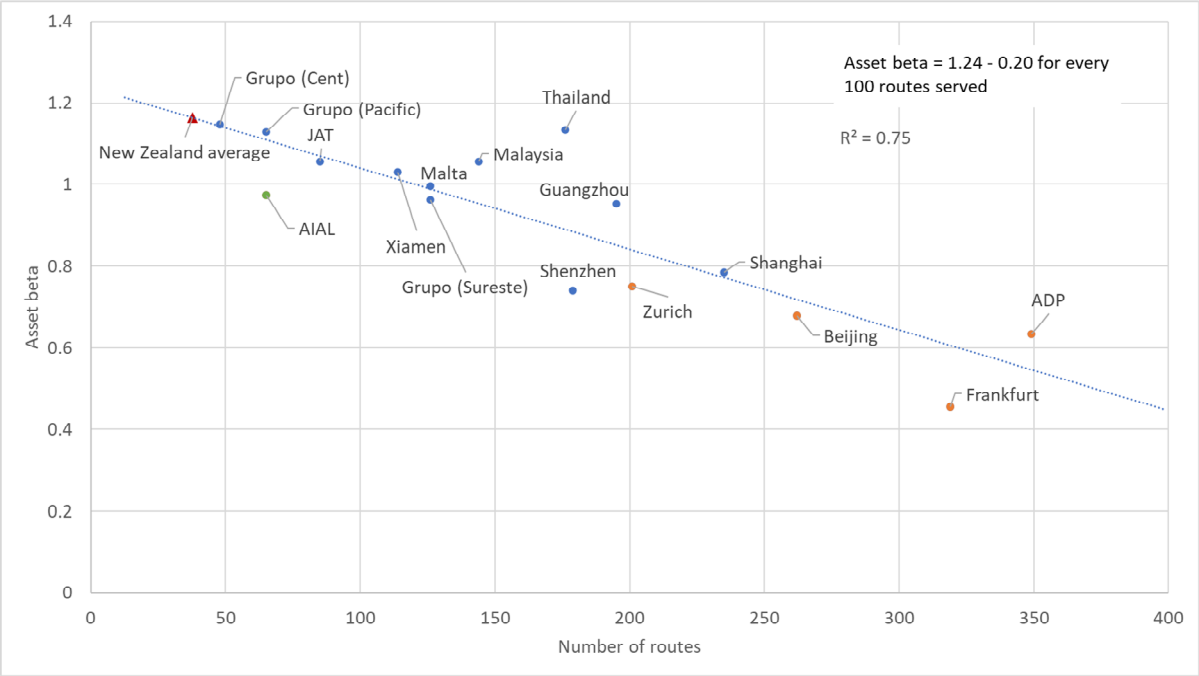
    a. **Setting a.** Just the liquid airport companies that have data from both periods. Including the airport companies with a large number of domestic and/or international airports (AoT, Malaysia, Vietnam, Fraport, AdP). For these airports I do not have route data on all their airports but so I only use data from the largest one or two airports.

    b. **Setting b**. The same as "setting a." above but excluding AoT, Malaysia, Vietnam, Fraport, AdP on the basis that I do not have an accurate estimate of the number of routes all of their airports (just the largest airports in the company).

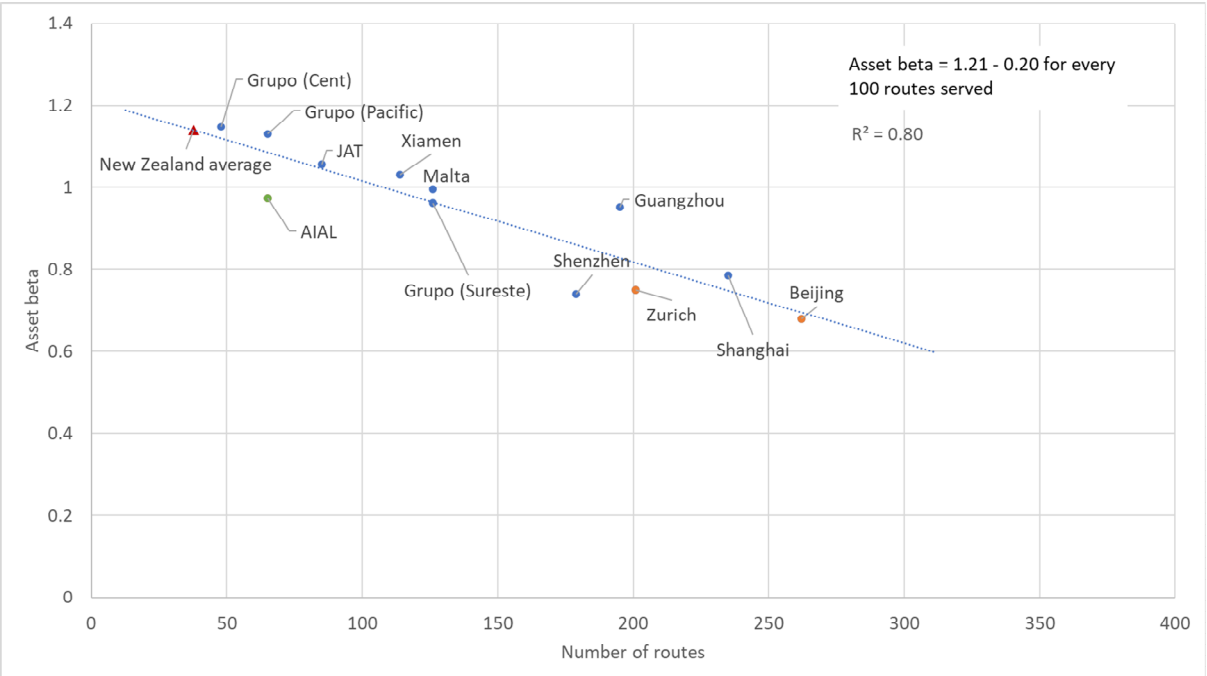
    c. **Setting c**. The same as "setting a." but including the airports that only have sufficient data in one of the two periods (Sydney, AENA, Vietnam), with the other period using whatever data is available.

Figure 6-1: Asset beta vs number of routes

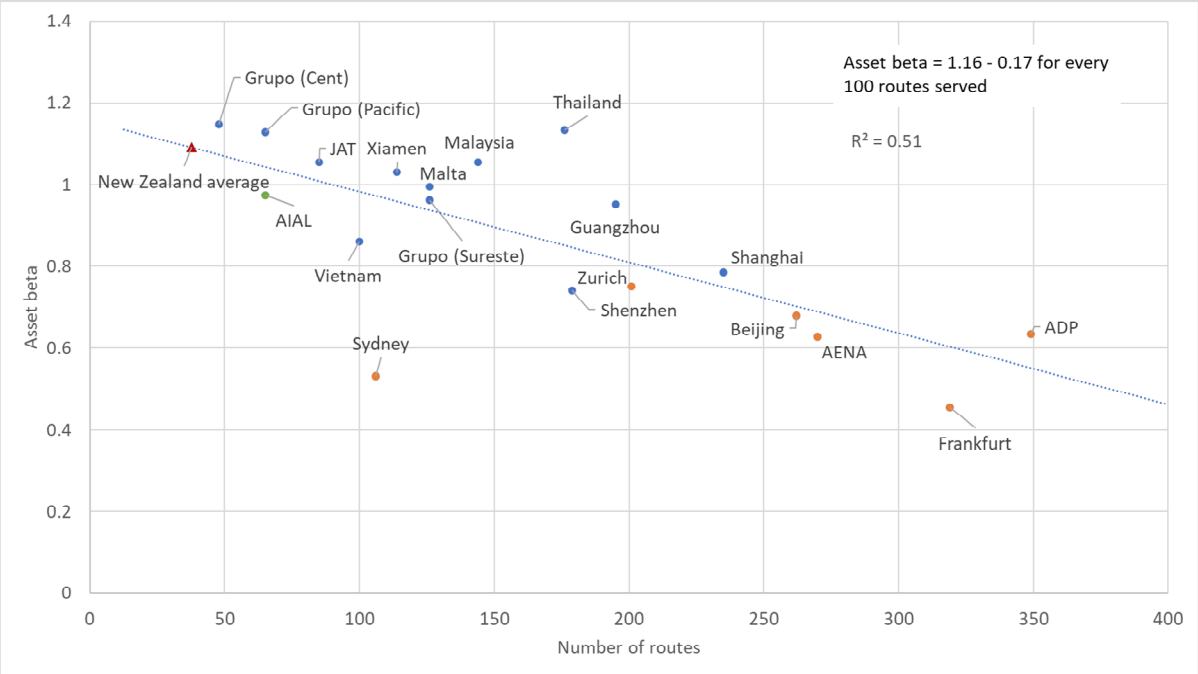
Setting a



Setting b



Setting c



144. It is relevant to note that New Zealand airports are at the extreme end of this metric. The average number of routes for New Zealand airports is only 36.3 routes, which is below the bottom end of the observations in the sample (i.e., the red triangle is the left most observation in the charts).[26]

145. In all these regressions there is a strong fit to the data suggesting that number of routes is a good predictor of asset beta over the last 10 years. Summary statistics for the three regressions are summarised below.

26 This means that, inevitably, any sample formed from the wider sample will have an average number of routes that is higher than the New Zealand average. For example, the average number of routes for the sample defined in the sample defined only by "number of routes" is 65.8. This is almost double the average number of routes for the three regulated New Zealand airports (36.3 routes). This helps explain why the predicted value from the regression is higher than the sample average formed based on that same metric. The regression takes account of the precise New Zealand average for that risk variable while the sample formed from that metric typically has airports with lower average risk based on that metric.

Table 6-3: Summary statistics for # routes regression

Sample	Intercept	Coefficient (per 100 routes)	P-value on coefficient	R^2	F-stat (df)	Predicted value for NZ average
a)	1.24	-0.20	0.0%	0.75	41.02 (14)	1.16
b)	1.21	-0.20	0.01%	0.80	41.23 (10)	1.14
c)	1.16	-0.17	0.1%	0.51	17.5 (17)	1.09

146. This evidence strongly suggests that, to the extent that differences between airports is to be accounted for, the number of routes variable should play a dominant role beta for New Zealand airports. It also strongly supports the TDB May 2022 view on what drives asset beta risk and appears to contradict the TDB July 2023 view.

147. In essence, the regression approach is an alternative to forming a narrow sample while still arriving at a predicted asset beta that takes account of the difference between New Zealand airports and other airports in the sample.

6.2.4 Using the # routes regression as a cross-check

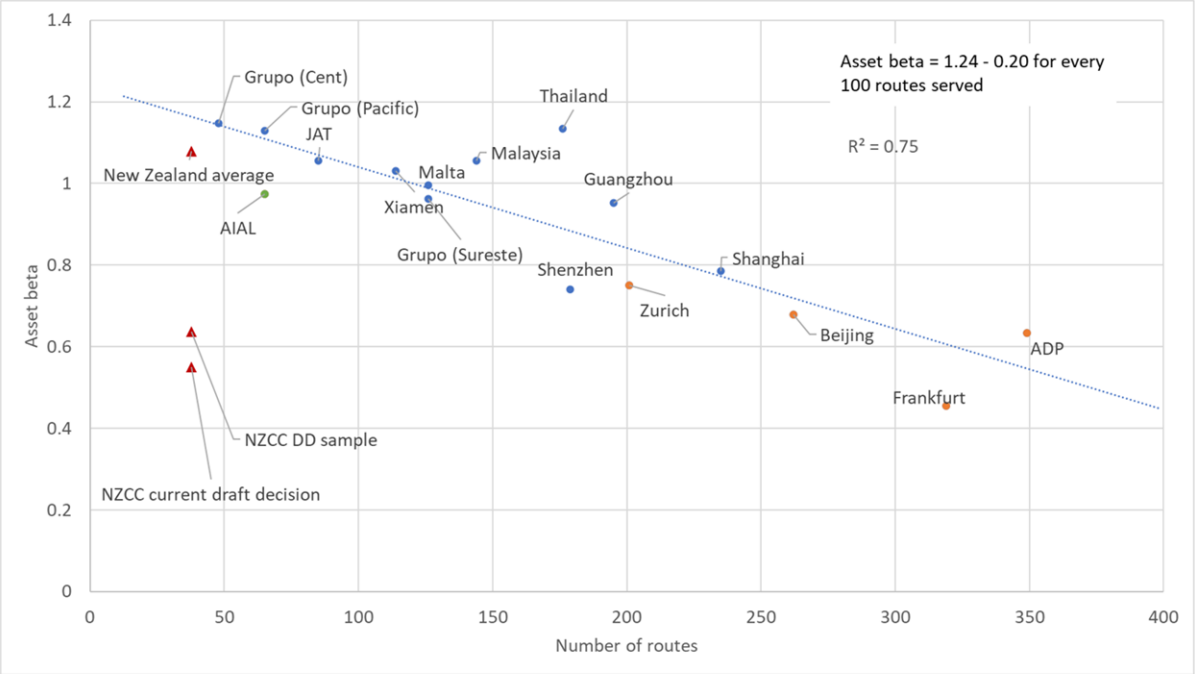
148. To be clear, I am not suggesting that the NZCC departs from its 2016 IM sample and, instead, adopts the predicted values for this regression. However, I strongly urge the NZCC to use this regression result as a cross-check on its draft decision:

- to give zero weight to the airport asset betas observations that are close to AIAL in the top left hand quadrant of the charts in Figure 6-1; and
- to form a sample that is dominated by the firms in the bottom right hand quadrant of the charts in Figure 6-1.
- estimated asset beta for its sample of 0.63 (including COVID-19) and the draft decision asset beta of 0.55.

149. To put this in context, in the below version of "setting a" chart I have red triangles that represent the New Zealand airport average number of routes combined with:

- the NZCC sample average asset beta including COVID-19 (0.63); and
- the NZCC draft decision asset beta (0.55).

Figure 6-2: NZCC estimates compared to sample and predicted values



150. In the context of this data, the NZCC estimates are significant outliers. They would be identified as such by standard outlier tests. My preferred estimate of 0.81, based on the wider sample average, is also materially below the predicted asset beta for New Zealand airports (although much closer than the NZCC estimates).

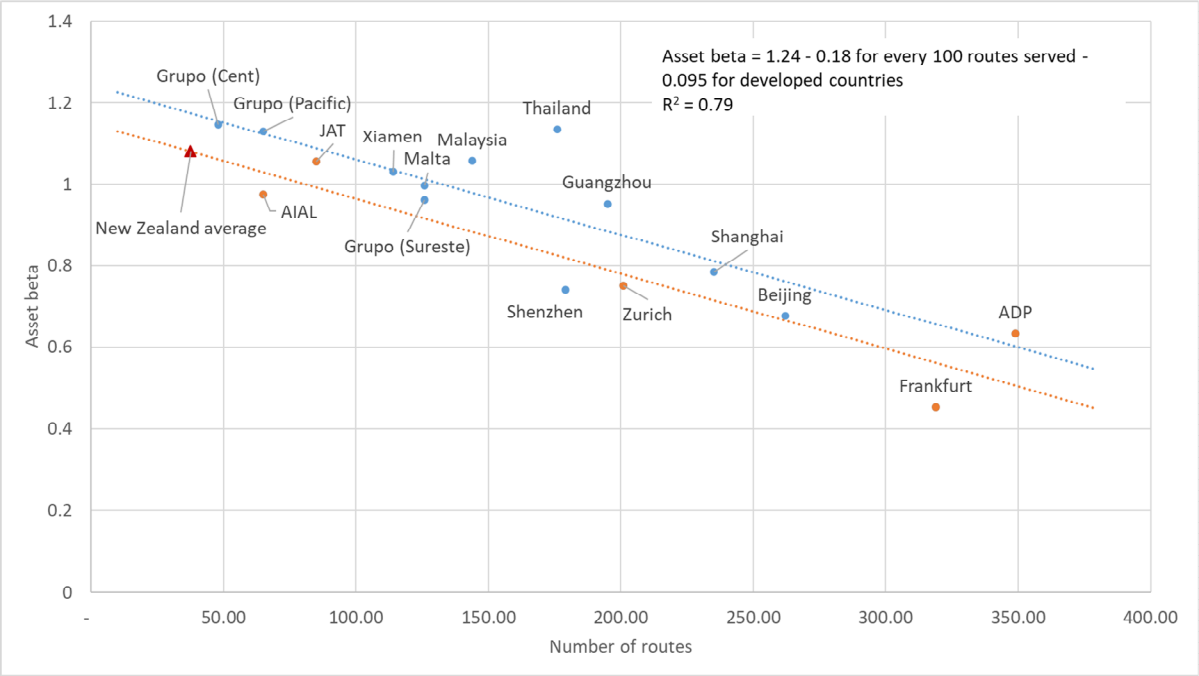
6.2.5 Testing a developed country dummy

151. It is also possible to test whether adding a developed country dummy, the draft decision's primary sample filter criteria, to the number of routes regression improves the statistical properties of the regression.

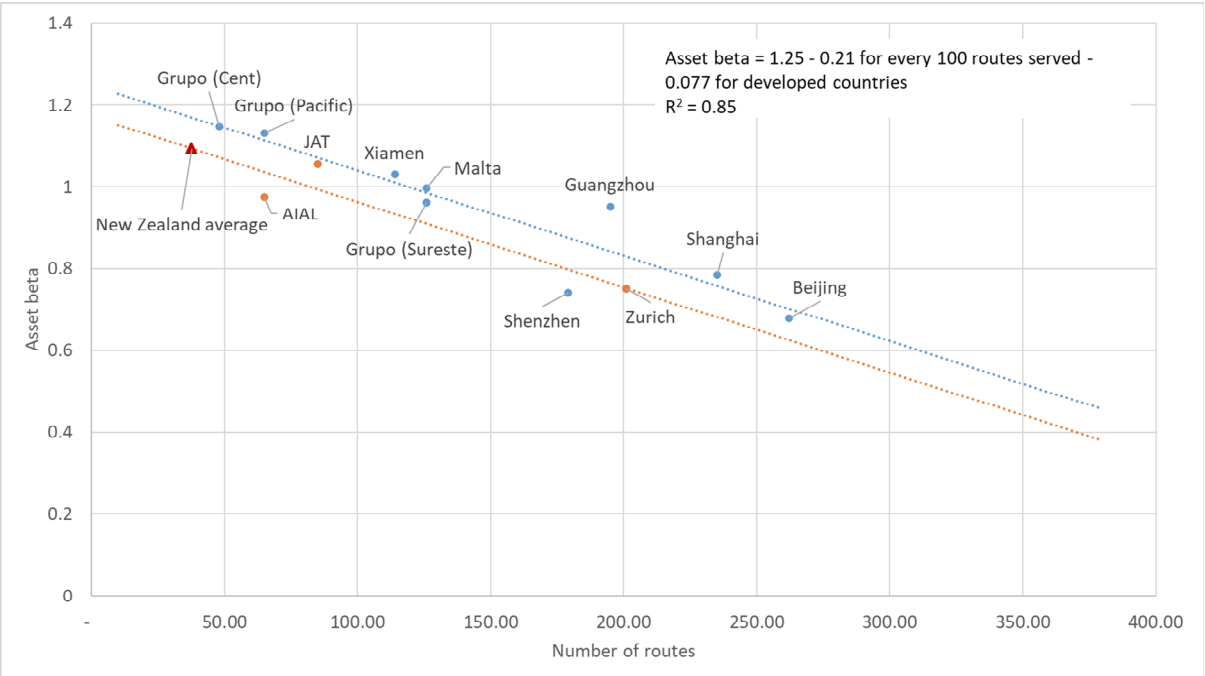
152. Figure 6-3 shows the results of including a developed country dummy and Table 6-4 illustrates the regression results. Now two regression lines are shown both with the same slope (relationship to routes) but with different intercepts (higher for less developed countries and lower for developed countries). The predicted value for New Zealand airports falls respectively by 0.08, 0.05 and 0.13 in each of the regressions shown compared to not having a developed country dummy.

Figure 6-3: Number of routes with developed country dummy

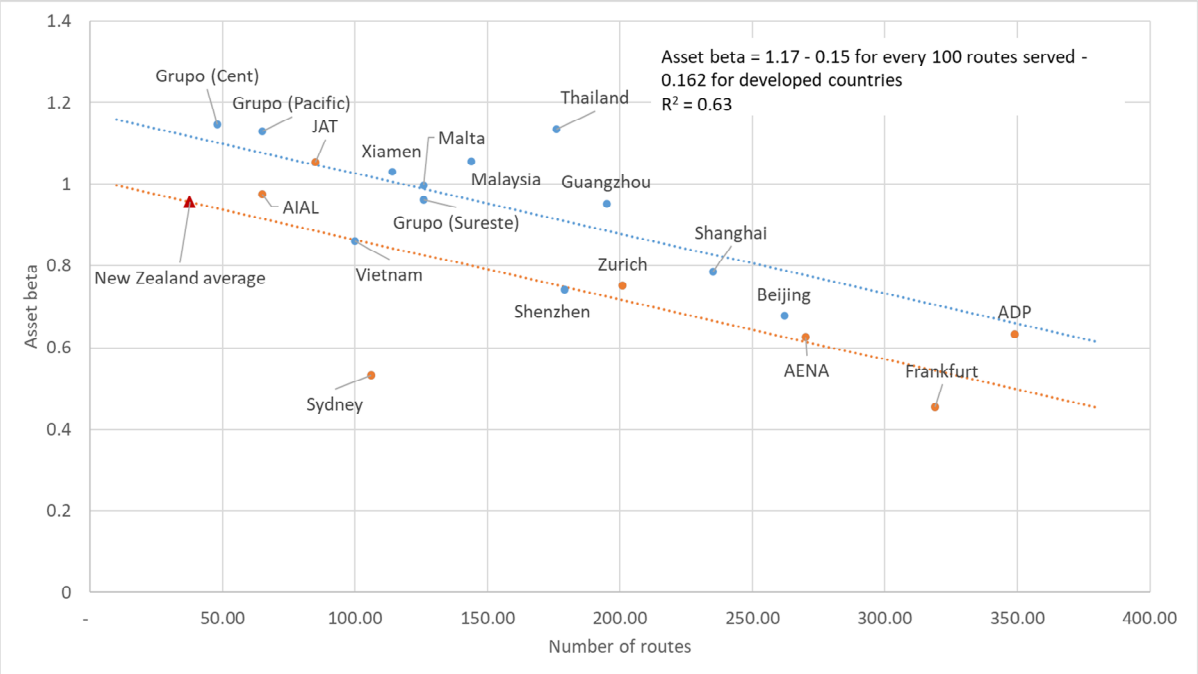
Setting a



Setting b



Setting c



153. In the first two of these regressions the developed country dummy is not statistically significant at the 10% level. In the third of these regressions, the inclusion of Sydney airport creates a low outlier in the developed country set. This causes the dummy variable to be significant.

Table 6-4: Summary statistics for # routes with developed country dummy regression

Sample	Intercept	Coef [per 100 routes] (p-value)	Coef [developed dummy] (p-value)	R^2	F-stat (df)	Predicted value (NZ average)
a)	1.24	-0.18 (0.0%)	-0.095 (11.8%)	0.79	24.54 (13)	1.08
b)	1.25	-0.21 (0.01%)	-0.077 (12.6%)	0.85	25.84 (9)	1.09
c)	1.17	-0.15 (0.2%)	-0.162 (3.1%)	0.63	13.9 (16)	0.96

154. However, the F statistic for this regression (as well as the other two regressions) is lower than for the regression using the same setting in Table 6-3 above. This suggests that, notwithstanding the significance of the developed country dummy under "setting c", the overall fit of the regression to the data is worse with the developed country dummy.

155. In summary:

- There is, at best, weak statistical support for a conclusion that developed country status lowers asset beta once the effect of the number of routes on asset beta is accounted for;
- Even if I were to include a dummy variable and adopt the setting that results in the lowest predicted asset beta for New Zealand airports, I would derive a predicted asset beta of 0.96 for an airport with the average number of routes as New Zealand airports.

156. This evidence strongly supports the TDB May 2022 view that comparison to small airports similar to New Zealand airports is critically important. It provides only weak support for the NZCC draft decision and TDB July 2023 view that developed country status might be relevant. However, it provides no support for the NZCC draft decision and TDB July 2023 view which is, in effect, that developed country status is the dominant determinant of airport asset betas.

6.2.6 Other multivariate regressions

157. I have repeated the same approach for all of the variables listed in Table 6-2. That is, I have run regressions combing all of those variables with the number of routes to test if doing so further improves the regression. In all situations the coefficient on the number of routes remains highly statistically significant at the 1% level but, with the exception of passenger volatility, no other variables are significant at the 5% level.

158. The regression results when I include passenger volatility are shown below.

Table 6-5: Summary statistics for # routes with pax volatility regression

Sample setting	Intercept	Coef [per 100 routes] (p-value)	Coef [pax volatility for every %] (p-value)	R^2	F-stat (df)	Predicted value (NZ average)
a)	1.02	-0.15 (0.1%)	0.035 (5.8%)	0.81	27.51 (13)	1.10
b)	1.09	-0.17 (0.1%)	0.02 (20.6%)	0.84	23.33 (9)	1.10
c)*	0.89	-0.13 (0.5%)	0.051 (2.0%)	0.67	15.52 (15)	1.03

* This regression excludes Vietnam which is a high outlier (more than triple the the passenger volatility of any other airport company).

159. It can be seen that, unlike when I included developed country dummy variable, the inclusion of passenger volatility is statistically significant in all regressions. The predicted values for the average New Zealand airport are somewhat raised by the inclusion of passenger volatility.

160. While not shown, I note that a developed country dummy to this regression would not be significant when added to any of the three regressions in Table 6-5.

161. I note that the failure of other variables to not be statistically significant when included in a regression with the number of routes does not because those metrics are not themselves important. For example, capacity utilisation is likely an important determinant of asset beta as the regression result in Table 6-2 suggests (where both peak to shoulder CUI (discussed more in Appendix A) are statistically significant at the 5% level). However, because airports with a small number of routes are also likely to have low capacity utilisation the route metric is already picking this up.

6.3 Key conclusions

162. If one were to attempt to form a narrow sample "more comparable to New Zealand airports" then one should look at airport specific risk measures;

163. When I form a sample of truly similar comparators to New Zealand airports – i.e., based on factors relevant to systematic risk - I estimate a substantially higher asset beta than the NZCC narrow sample and more consistent with the wider sample average;

164. When I perform statistical analysis of what are the most important drivers of asset beta, the number of routes stands out as a very strong predictor of asset beta. This is consistent with the views expressed by TDB in May 2022 but inconsistent with the TDB and Castalia views expressed in July 2023

    - Neither TDB not Castalia presented any empirical analysis to support their support for the NZCC relying solely on a developed country filter.

165. If the NZCC is to adjust for differences between airports then the number of routes should be given considerable weight (and more weight than the country's status as developed or not).

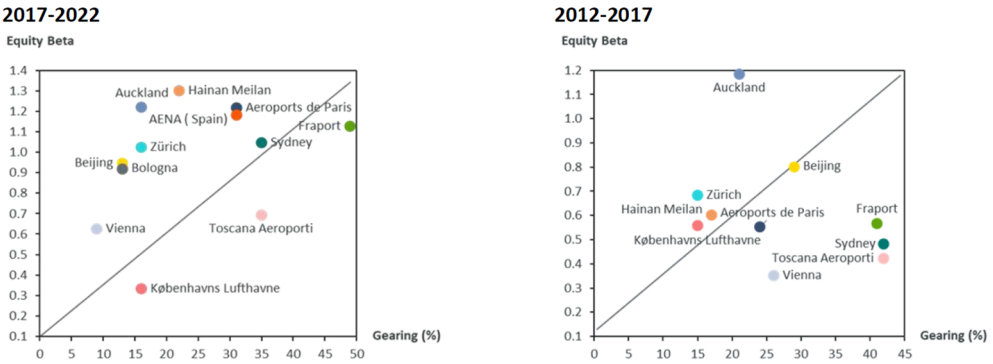
166. It would be a serious error for the NZCC to give sole (or near sole) weight to a developed country criteria to the exclusion of more powerful explanatory variables (such as the number of routes).

7 Reliability of AIAL's asset beta estimate

167. Qantas submits as follows.

> *We note that the NZCC's Draft Decision has not used a market diversification filter, where it would be appropriate to do so. In its filtering approach the NZCC has omitted Bologna Airport and included Auckland Airport in its place. This inclusion is not consistent with an appropriate filter application.*
>
> *Auckland Airport comprises 6% of the NZX50 index and is the second largest stock by market capitalisation as at 18 July 2023. As discussed in Qantas' response to CEPA's report, the lack of market diversification in the NZX50 index driven by Auckland Airport's share of the index distorts its equity beta estimate and introduces an upward bias (as can be seen in Figure 1 below).*

Figure 1: 5-year equity beta against gearing[1] for developed market classification (including Bologna Airport)



(1): Calculated from using gearing and asset beta data from CEPA's Cost of capital report (March 2023) using the Myers & Brealey formula for re-leveraging
Source: Annual Reports; Commerce Commission Cost of Capital Topic paper, Table A3

168. In this submission Qantas appears to be making three distinct claims:

- AIAL is a large (6%) share of the NZX50 index and this results in a higher asset beta estimate than if, other things equal, AIAL had a smaller share in the NZ50 index;
- There is a lack of diversification in the NZ50 index itself which (separate from AIAL's weight in the index) makes all asset betas estimated relative to the NZ50 index unreliable; and
- One or both of these considerations should lead to the exclusion of AIAL as a comparator based on application of a "market diversification filter".

169. In response to this submission, I provide analysis of:

- the impact of AIAL's weight in the New Zealand stock market index on its estimated asset beta; and
- the diversification value of the New Zealand stock market index to New Zealand investors.

170. This analysis shows that AIAL's weight in the index and/or the diversification of the index is immaterial to Auckland Airport's observed asset beta.

7.1 Impact of AIAL's weight in the NZ All index on its estimated asset beta

171. Qantas states that "Auckland Airport comprises 6% of the NZX50 index" (July 2023 submission). In a previous submission Qantas has proposed that any airport company should be excluded if it has greater than 5% weight in the relevant index.[27]

172. There are a number of problems with Qantas submissions on this issue:

- First, it is unclear why Qantas focusses on the NZ50 when the index used by the NZCC to estimate asset betas in New Zealand is the NZX All index which is around 10% higher capitalisation than the NZ50 and, therefore, even if Qantas 6% figure was correct, the AIAL's weight in the relevant index would be less;
- Second, Qantas provides a single date, 18 July 2023, upon which its 6% estimated weight was estimated.
  - I note that 18 July 2023 is more than 3 years after the end date of data used to estimate the NZCC's pre-COVID-19 asset beta (and is also after then end of the estimation window that I use to estimate asset betas (ending 31 March 2023)).

173. I have previously described why I do not consider that a high or low weight for AIAL in the NZ All index is a valid reason for any concern (see section 4.5 of my July report).

174. If airports have a high (or low) weight in the New Zealand stock market index and that raised or lowered their asset beta relative to foreign airports then that is a fact of life for New Zealand investors. If anything, it would mean that asset betas measured in other countries should be given less weight (or that more weight be given to countries where airports are also a similar weight in the market index). A high weight for airports in the New Zealand index is categorically not a reason for AIAL's asset beta should be given less, or as Qantas submits, zero weight.

175. To be clear, New Zealand airports have to raise capital to fund investments in New Zealand. If airports are a large percentage of the New Zealand market index then that is a fact of life for investors in New Zealand airports. Qantas' view that it would be

[27] Qantas submission, Re: CEPA Report on Aspects of the Cost of Capital Input Methodologies for the 2023 Review, 17 February 2023, p.5

preferable for there to be a lower weight for airports in the New Zealand index does not change that fact of life.

176. In any event, a higher weight in the market index for AIAL is more likely to lower AIAL's asset beta than raise it. This is because AIAL's equity beta is above 1.0. This means that AIAL's returns already have high correlation with the market and higher standard deviation than the market. Raising AIAL's weight in the market will tend to cause the market standard deviation to rise and this has the effect of reducing asset beta.

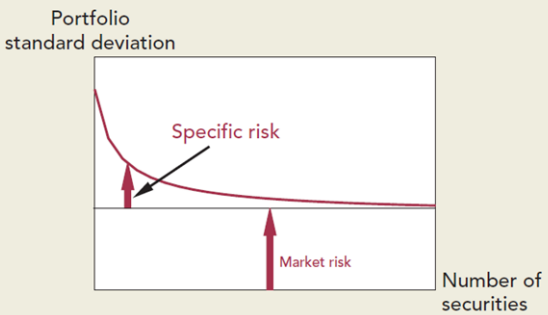
177. Note that, in the extreme, if AIAL's weight was 100% of the market then AIAL's equity beta would be 1.0 by definition (i.e., AIAL would have correlation of 1.0 and the same standard deviation as the market). That is, raising AIAL's weight in the market must, ultimately, move its equity beta towards 1.0. Given AIAL's equity beta is currently above 1.0, this would be a reduction in its equity beta.

7.2 Diversification value for the NZ All index

178. The capital asset pricing model (CAPM) states that asset beta risk must be measured relative to the risk of a diversified portfolio. In order for a stock market index to provide a proxy for a diversified portfolio it must, itself, represent a diversified set of investments across the economy in question. Brealey Myers and Allen (tenth edition)[28] describe this diversification in the market portfolio as follows (bold in original, underline by me).

FIGURE 7.11

Diversification eliminates specific risk. But there is some risk that diversification *cannot* eliminate. This is called *market risk*.



The risk that potentially can be eliminated by diversification is called ***specific risk.*** *Specific risk stems from the fact that many of the perils that surround an individual company are peculiar to that company and perhaps its immediate competitors. But there is also some risk that you can't avoid, regardless of how much you diversify. This risk is generally known as* ***market risk.*** *Market risk stems from the fact that there are other economywide perils that threaten all businesses. That is why stocks have a*

28 Brealey Myers and Allen, Principles of Corporate Finance, tenth edition, 2011.

tendency to move together. And that is why investors are exposed to market uncertainties, no matter how many stocks they hold.

In Figure 7.11 we have divided risk into its two parts— specific risk and market risk. If you have only a single stock, specific risk is very important; but once you have a portfolio of 20 or more stocks, diversification has done the bulk of its work. For a reasonably well-diversified portfolio, only market risk matters. Therefore, the predominant source of uncertainty for a diversified investor is that the market will rise or plummet, carrying the investor's portfolio with it.

179. Brealey Myers and Allen emphasis the fact that 20 stocks are enough to provide a diversified portfolio in Figure 7.9 of their textbook.

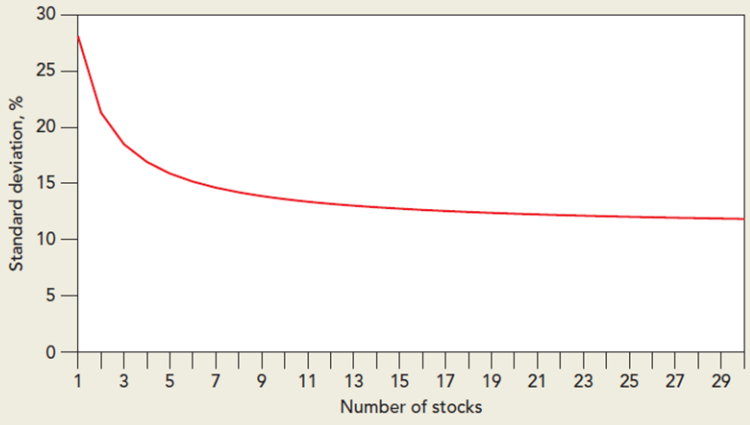


FIGURE 7.9
Average risk (standard deviation) of portfolios containing different numbers of stocks. The stocks were selected randomly from stocks traded on the New York Exchange from 2002 through 2007. Notice that diversification reduces risk rapidly at first, then more slowly.

180. The NZ All index is made up of many more than 20 stocks. On the basis of Brealey Myers and Allen's advice to students, there is no question that it is a sufficiently diversified portfolio to form the basis for the market portfolio in New Zealand.

181. Consistent with this, and as outlined in my July 2023 report, investors generally (and New Zealand investors especially) exhibit very strong "home bias". That is, a preference to achieve diversification in their local index and not in an international index. There are many good reasons why investors prefer investment in their local economy and, if their local index is sufficiently diversified they will act on this preference.

182. Given that New Zealand investors have traditionally had high levels of "home bias" relative to other investors this is strong evidence to support the conclusion that New Zealand investors regard the local index as sufficiently diversified.

183. Moreover, the ultimate test of how well diversified a stock market index comes down to its volatility. If a stock market index was not well-diversified then this show up in high levels of volatility in returns. For example, if the NZZ All index was unusually

"undiversified" relative to other indexes then I would expect the NZ All to have a higher standard deviation of returns than other indexes that are well-diversified.

184. I have investigated precisely this relatively in Figure 7-1 below shows a time series of the NZX All index and the German (DAX) and French (CAC) market indices. Visual inspection of this chart suggests lower volatility for the NZX All index.

Figure 7-1: NZX All vs DAX and CAC index

185. The above data shows the time series of the index absolute value. This can be converted into return data. Figure 7-2 uses the same data to derive month end return data for the DAX and NZX All. The colour code is as follows:

- - Light blue is the DAX return;
- Green is the NZX All return
- Dark blue indicates overlap
- The fact that more light blue than light green can be seen indicates that DAX's return fluctuates more than NZX All return.

Figure 7-2: NZX All vs DAX return volatility

186. The standard deviation of these returns can be used to estimate the overall volatility of any index. I do so below for all relevant indexes (for each country with an airport company in the wider sample). The results are shown in Figure 7-3

Figure 7-3: NZX All standard deviation of returns relative to other indices

187. No matter what the period of analysis undertaken, the NZX All index has lower standard deviation than most other indices including the Euro Stoxx 600 (the European equivalent of the S&P500). With lower standard deviation than the widest European benchmark index it is simply not credible to argue that the NZX All index is not a sufficiently diversified portfolio for New Zealand investors to use as their local market index within the CAPM.

8 RAB multiples

188. In this section I address submissions in support of the draft decision's use of RAB multiples as a reasonableness check for the regulatory WACC.

189. I conclude that the RAB multiples referred to in the draft decision (and more generally) are unreliable indicators of the reasonableness of the draft decision's proposed regulatory WACC. A key reason is that the regulatory WACC does not apply to the entire airport business.

8.1 Submissions on RAB multiples

TDB[29] states:

> *However, we view the RAB multiples reported by the Commission as providing the most robust test of the reasonableness of its WACC estimate.* ***The RAB multiples are the best market-based test of the reasonableness of the WACC estimate as they provide evidence on what return investors are willing to accept in reality when they put their money at stake****. The Commission finds RAB multiples for airports are in the 1.3 to 1.9 range, indicating that investors are prepared to accept a significantly lower return than the Commission allows. Even the lower end of the 1.3 to 1.9 range of the RAB multiples cited by the Commission points to investors being more than adequately compensated for putting their capital at risk.*
>
> *Although occurring in a different sector, the Eastland Network sale provides a recent direct market test of the Commission's overall regulatory framework and its implications. The fact that Eastland sold at a value of nearly 1.4 times the RAB confirms that investors were more than sufficiently compensated for the risks they faced.*
>
> *We also note the long-term growth and strength in Auckland Airport's share price, now largely recovered from its pandemic-related downturn. In a different context and regulatory regime, Sydney Airport was sold in 2022 at a significant premium over its prior market value. These last two observations are, we think, consistent with a broader view that the airport sector has been and probably remains an attractive proposition for the local and global investment community.*

190. It appears that TDB has simply assumed that the "RAB multiples" reported by the NZCC are reliable. However, for the reasons set out in section 8.3.2, TDB is wrong to

[29] TDB Advisory Ltd Commerce Commission Draft Decision on 2023 IM Review, p.7-8

assume that the RAB multiples relied on by the NZCC are a "*market-based test of the reasonableness of the WACC estimate*". The RAB multiple values that the NZCC reports for AIAL from UBS and Forsyth Barr are not derived from market-based estimates of the value of AIAL. They are both entirely based on UBS and Forsyth Barr's views on the value of aeronautical operations and are, in no way, derived from observed market values for AIAL. In the case of UBS these assumptions are not disclosed. In the case of Forsyth Barr these assumptions are disclosed and are demonstrably unreliable in the relevant airport regulatory context.

191. This is no criticism of UBS and Forsyth Barr, who produce their RAB multiple estimates for reasons unrelated to the NZCC's regulatory process.

192. Air New Zealand (and Castalia for Air New Zealand) states:

> *The Commission has taken a variety of approaches to assess the reasonableness of its mid-point WACC estimate for New Zealand airports, including looking at historic and expected New Zealand market returns, the range of New Zealand-sourced post-tax WACC estimates for airports, and international regulatory precedent, with most weight being given to New Zealand-sourced estimates. The conclusion, after assessing these comparators, is that the mid-point estimate of WACC is reasonable. Air NZ considers this conclusion is appropriate,* ***if not generous to airports, as evidenced by the further check undertaken looking at RAB multiples.***
>
> *The Commission notes that RAB multiples provide a useful indicator of whether the allowed rate of return has been set at a level sufficient to adequately compensate investors for putting their capital at risk, with a multiple above 1 suggesting that this would be the case. The Commission's survey of analysts resulted in estimated RAB multiples of 1.3 (UBS) and 1.9 (Forsyth Barr) for Auckland Airport, suggesting that the market perceives regulatory settings and the resulting cost of capital to be generous to airports.*
>
> *As Castalia notes:*
>
> > *"We do note that following the publication of the draft decision* ***the Auckland Airport share price (and presumably the implied RAB multiple) did not materially shift.*** *This suggests at least anecdotally that the decision was not viewed by the market as materially impacting Auckland Airport's expected future profitability."*
>
> *The Commission has noted that there may be a range of factors influencing RAB multiples. In the case of Auckland Airport's observed estimations,* ***it can be surmised that the presence of the non-regulated, non-aeronautical till is likely a key factor in perceived (out)-performance.*** *Having a relatively stable and guaranteed regulated*

income stream underpinning the ability to achieve superior returns in the non-regulated parts of the business would provide significant comfort to investors.

193. It appears that neither Air New Zealand nor Castalia has examined the source for the "RAB multiples" reported by the NZCC. Castalia reasonably, but incorrectly, assumes that the RAB multiples reported by the NZCC are derived from the AIAL share price (as they would be if they were truly market based estimates of RAB multiples). As noted previously, the "RAB multiples" relied on by the NZCC are values assumed by UBS and estimated Forsyth Barr for purposes unrelated to the NZCC's regulatory process. They are not derived from AIAL's share price.

194. Qantas' submission states:

Qantas agrees with the Draft Decision's use of a midpoint WACC, which is aligned to global regulatory precedent. Notwithstanding this, Qantas recommends that the NZCC investigate the RAB multiple further.

The NZCC's RAB multiple range of 1.3-1.9x is high by industry standards and well above a reasonable range of 0.9-1.3x, as detailed in the AER 2018 WACC review. A range consistently in excess of 1.0 signals that the current WACC outcomes may be too high (and well above that required to compensate investors for putting their capital at risk and to attract future investment).

195. I have investigated the RAB multiples further and my conclusion is that:

- The "RAB multiple" estimates for AIAL relied on by the NZCC are, in fact, not derived from the market value of AIAL. Rather, they are UBS and Forsyth Barr estimates of the value of AIAL's aeronautical operations and, to the extent that their basis is exposed, they involve highly questionable assumptions if the RAB multiple is used as a reasonableness check for regulatory WACC;
- A RAB multiple analysis for AIAL or any other airport will never be informative of the reasonableness of the regulatory WACC because:
  - Unregulated operations at airports are too important to overall profits to allow for an accurate/uncontested observation of the market value of the regulate activity; and
  - The value of regulated operations at any time depend heavily on non-WACC related factors (e.g., volume forecasts) such that, even if a RAB multiple for the regulated assets could be reliably estimated, disentangling WACC and non-WACC related factors would be extremely difficult.

8.2 Why RAB multiple cannot be estimated reliably for airport companies

8.2.1 What is a RAB multiple?

196. A RAB multiple is the ratio of the market value of a regulated business to the regulated asset base (RAB) of that business. If the regulated business's sole asset is its RAB and if the regulated business is listed on the stock exchange then this analysis is relatively[30] straightforward to perform. In this case, the analysis proceeds as follows:

    a. Estimate the market value of the business based on:

        i. The equity valuation (EV) of the listed equity in the firm; plus

        ii. The value of liabilities, such as debt instruments and any other liabilities (e.g., employee entitlements) of the firm. Call this the DV, or "debt valuation"

    b. Estimate the RAB for the business over the same period of time.

197. The RAB multiple is estimated as the ratio a/b ($=\frac{EV+DV}{RAB}$).

8.2.2 Why are RAB multiple estimates problematic as a cross-check on asset beta or regulatory WACC ?

198. RAB multiple analysis is problematic to inform the reasonableness of the regulatory WACC because it is not possible to robustly and accurately answer the following two questions:

---

30 This is only "relatively" straightforward because, even though a business has an easily measurable market capitalisation of equity on any given day (equal to the average share price at which a small fraction of all equity trades hands in a given minute/hour/day/week/month multiplied by the shares on issue) this does not necessarily reflect the value of the equity if all the equity were to trade hands. For example, if all existing equity investors sought to sell all of their shares then the resulting sale proceeds would likely be much lower. Similarly, if other investors attempted buy all of the existing shares then the sale proceeds would likely be much higher. It is ambiguous where within these bounds lies the "true" equity value of the firm.

It is also the case that the market value of the business needs to add to the market value of equity the market value of debt and other liabilities. However, the market value of debt liabilities can vary materially from the face value of the debt. For example, imagine a business is a 15-year bond with a face value of $100 and fixed coupon of 2% reflecting generally low risk free rates at that time. However, imagine that the year after the bond has been issued interest rates on that firm's debt have risen to 5%. In that situation, the market value of the bond will have fallen by around 30% relative to the face value of the bond. However, there is no liquid market for debt of an individual firm, so it is difficult to accurately estimate such values.

A. *At the time the analysis is undertaken, can we use observed market valuations to determine whether investors expect the regulated assets to generate returns on the RAB below/above the discount rate that investors are using to discount those returns?*

B. *To what extent can the answer to Question A be attributed to differences between investors' discount rates and the regulated WACC versus other factors determine investors expected returns (such as the forecast of sales volumes etc.)?*

8.2.3 RAB multiples for a close to 100% regulated business

199. Even for a business where 100% of their operations are regulated, investors valuation of the equity in a company depends on many more factors than the regulated WACC.

200. However, one such factor is investors sales volume expectations. By way of simple illustration, the airport companies in the NZCC sample suffered very large stock market valuation falls (circa 50%) during the onset of COVID-19.

201. However, this would have been driven primarily by a reduction in investors' expected sales volumes associated with the realisation that COVID-19 was likely to drive a reduction in expected flights and passengers at the airports. This caused expected sales to fall well below the volume expectations pre-COVID-19 (including the volume forecasts upon which regulated prices were set) causing a significant reduction in the level of expected profits.

202. The fall in valuations had nothing to do with a change in the regulatory WACC.

203. This highlights that, at any given time, the market value of a regulated business is driven by more than just the difference between the regulated WACC and investors' perception of the regulated WACC.

204. As well as sales volumes, investors valuation of the equity in a company depends on many more factors than the regulated WACC. A non-exhaustive list of other factors includes investors':

    a. expected future sales volumes relative to the sales volumes used to set prices (where the regulated company is exposed to sales volume risk) ;

    b. expected path of future inflation relative to:

        i. the inflation rates used to set prices;

        ii. the inflation rates expected at the time the company debts or signed other nominal contracts with suppliers.

    c. expected path for future operating expenditure and efficiencies relative to the forecasts used to set prices;

d. expected path for future capital expenditure and efficiencies relative to the forecasts used to set prices;

e. valuation of the liabilities the company has incurred relative to the assumed value used to set prices;

f. perceptions of asymmetric (non-systematic) risks faced by the company; and

g. perceptions of the overall level of competence and efficiency of management.

8.2.3.1 Key conclusion

205. Even for a business with 100% regulated assets and where there is a reliable estimate of the market value of those assets the resulting RAB multiple must be interpreted with care. It cannot be presumed that the RAB multiple (be it below or above 1.0) is attributable to differences between the regulatory WACC and investors' discount rates.

206. This is especially true for airports relative to regulated energy businesses because assessment of expected sales volumes is more important for airports (given that most energy businesses (in New Zealand at least) do not bear volume risk).

8.2.4 A RAB multiple analysis becomes completely impractical when there are large unregulated operations

207. If a business has a mix of regulated and unregulated assets then it becomes much more difficult to divine anything from a RAB multiple analysis – no matter how carefully constructed it is. This is because, unless the non-regulated assets of the business are highly liquid with easily observed market values (e.g., cash or investments in other listed entities), then there will be no reliable market value of individual segments of a business. It follows that there will be no reliable estimate of the market value of the regulated assets.

208. In this situation one would have to estimate the "market value" of the regulated assets as:

a. The observed market value of the whole business; less

b. An estimate, based on the analyst's assumptions and judgement, of the market value of the non-regulated operations.

209. In order to put this in context, note that, as per Figure 3-4 above, most airport companies have less than 50% of revenues from regulated activities. At this point, any "RAB multiple" estimate:

- ceases to be based on the observed market value of regulated activities; and

- becomes an analyst's estimate of market value of regulated activities (which reflects their estimates of discount rates, sales growth, cost growth etc for the *non-regulated activities*).

210. This is important to emphasise because, in the regulatory process, there is already a central role for expert opinion on the WACC. The value of a RAB multiple analysis, if it has any, is to bypass expert opinion and rely on observed market values (albeit, with the caveats explained in section 8.2.3).

211. If the numerator of a "RAB multiple" analysis is, instead, based on expert opinion about the value of regulated assets (rather than observed market value) then it ceases to have a valuable separate role in the regulatory process. It is the expression of an opinion rather than the observation of a market value.

212. Moreover, it is a very roundabout and oblique way of approaching the question at hand. Instead of being an expert opinion on the WACC for the regulated activity, the opinion being used is:

- an opinion on the value of the non-regulated activities;
- which is then used to derive an estimate of the "market value" of the regulated activities (by subtracting it from the observed market value of the firm);
- which is then used to form a RAB multiple; and
- which then needs to be interpreted subject to the caveats set out in section 8.2.3.

213. In the above process there are many times more assumptions and speculations that must be applied to arrive at an estimate of the RAB multiple and WACC for regulated activities than are involved in simply estimating the WACC directly. In this context, it is difficult to understand how such an oblique application of expert opinion could be useful compared to simply seeking direct expert opinion on the matter at hand.

214. This is especially true if the circuitous route to a "RAB multiple" (arrived at via an opinion on the value of mostly non-regulated assets) is undertaken outside of the regulatory process and without full explanation and testing of the assumptions being used.

215. Certainly, any such opinion on the "RAB multiple" should not be confused for a market observation of a true RAB multiple.

8.2.5 Key conclusion

216. A RAB multiple analysis for AIAL or any other airport will never be very informative of the reasonableness of the regulatory WACC because:

- Unregulated operations at airports are too important to overall profits to allow for an accurate/uncontested observation of the market value of the regulated activity; and

- The value of regulated operations at any time depend heavily on non-WACC related factors (e.g., volume forecasts) such that, even if a RAB multiple for the regulated assets could be reliably estimated, disentangling WACC and non-WACC related factors would be extremely difficult.

8.3 References to RAB multiples in the draft decision and in submissions

8.3.1 The draft decision

217. The draft decision describes RAB multiples as follows and this is consistent with my definition (emphasis added).

> *6.78 RAB multiples are the ratio of **the market value** of a regulated asset to its regulatory book value. RAB multiples are impacted by more than just the WACC. Among other influences, they incorporate future expectations of regulatory settings and the expected ability of the business to earn higher returns through the incentive scheme, and there will always be a concern that the purchaser has overpaid.*

218. I note that the draft decision correctly describes a RAB multiple as the ratio of market value to regulatory book value.

219. The draft decision does provide some detailed analysis of RAB multiples for energy suppliers and, in particular, in relation to the sale of Eastland Network. However, for airports the sum total of the analysis is as set out in the following quote:

Table 7.6 Summary of RAB multiples for regulated energy businesses and airports[343]

	RAB multiple
Energy businesses	
Eastland Group sale of Eastland Network to First Gas - Commerce Commission estimate	1.38x
Vector – Jarden estimates	1.23x for EDBs 1.00x for GDBs
Vector – UBS estimate	1.3x
Airports	
AIAL – Forsyth Barr estimate	1.9x
AIAL – UBS estimate	1.3x

[343] *We have surveyed research analysts at the New Zealand investment banks in early 2023 regarding their RAB multiples for Vector and AIAL*

> *7.50 We note that Forsyth Barr's estimated RAB multiple for Auckland*

> *International Airport is high. However, the UBS estimate is similar to the RAB multiple estimates for energy businesses.*
>
> *7.51 We consider that the available RAB multiples for EDBs and airports (as shown in Table 7.6 above) do not raise concerns about the reasonableness of our WACC estimates for these sectors. The observed multiples, which are generally significantly in excess of one, suggest the current regulatory settings are more than sufficient to compensate investors for putting their capital at risk. This conclusion is likely to hold under our draft amended cost of capital IMs, given that we are not proposing to make material changes to our approach to estimating WACC for these sectors.*

220. The draft decision provides no further description or analysis of the airports "RAB multiples" that it reports above.

8.3.2 UBS and Forsyth Barr

221. I have been provided recent reports post the draft decision by UBS (15 June 23)[31] and Forsyth Barr[32] (27 June 2023). Notably, the range between their "RAB multiple" estimates has increased from 1.3-1.9 to 1.2-2.0 (an increase in range from 0.6 to 0.8).

222. UBS' RAB multiples estimate is simply a reported value in a table and there is no description of the assumptions that underpin this. It is not, in any way, derived from the observed market value of AIAL. Indeed, UBS uses this valuation (and its valuation of the rest of AIAL) to arrive at a "sell" recommendation for AIAL – suggesting that, at the time of its publication, UBS thought the true market value of AIAL was less than the observed market value.

223. The assumptions underpinning Forsyth Barr's estimate of a RAB multiple of 2.0 for aeronautical operations is spelled out in enough detail to understand how Forsyth Barr arrived at this estimate.

224. Based on this detailed explanation it is clear that no weight should be given to Forsyth Barr's RAB multiple when assessing the reasonableness of the draft decision asset beta estimate for airports.

225. To the extent that Forsyth Barr's views are to be given any weight it would need to be in the context of the correct value for the TAMRP. This is because Forsyth Barr's "RAB multiple" estimate AIAL is almost entirely driven by an assumption that Forsyth Barr makes that investors' true TAMRP is 5.5%. Forsyth Barr's positive RAB

[31] UBS, Auckland International Airport, Aeronautical pricing roller coaster, 15 June 2023

[32] Forsyth Barr, Auckland Airport Still Incentivised to Invest, 27 June 2023

multiple follows from this assumption – it is not derived in any way from the observed market value of AIAL.

226. I set out Forsyth Barr's logic below:

a. First, Forsyth Barr estimates a RAB multiple of 1.2 for each of Vector and Chorus (p. 5);

- Forsyth Barr notes that no direct estimate of the RAB multiple for AIAL is performed because, unlike Vector and Chorus, regulated activities are a small fraction of total market value.[33] This is consistent with my conclusion in section 8.2.5 that RAB multiple analysis cannot be reliably performed for airports.

b. Second, Forsyth Barr uses the RAB multiples for Vector and Chorus to inform a 'true' TAMRP range of 5.2% to 6.1% and where Forsyth Barr adopts 5.5% (p. 7) which is 1.5% lower than the TAMRP set in the draft decision.

- It should be noted that this analysis implicitly assumes that all other aspects of the regulatory regime for Chorus and Vector are neutral (e.g., regulatory asset beta is accurate, expenditure forecasts are accurate, compensation of the cost of debt and inflation is accurate etc.).
- This allows Forsyth Barr to attribute all of the estimated 1.2 RAB multiple for Vector and Chorus to an overly generous regulatory estimate of the TAMRP. Forsyth Barr notes that 5.5% is "the TAMRP that we apply in our wider valuation approach across all New Zealand equities".

c. Third, Forsyth Barr takes the 5.5% TAMRP estimate (derived from RAB multiples for Vector and Chorus) and applies it to AIAL's regulated operations. This results in a 1.2% estimated "return spread" for AIAL's regulated operations (p. 10, being primarily the 1.5% TAMRP overestimate multiplied by 74% equity share of total capital). In doing so Forsyth Barr:

i. Explicitly adopts as correct the remainder of the NZCC WACC parameters including the 0.55 asset beta.

ii. Although, Forsyth Barr does state (p.8):

> *"Unfortunately, the quantum of any excess asset beta is even more speculative than that of the market risk premium. We accept that determining asset betas is an inexact science, and therefore we avoid getting deep into theory or observational data, but recognise the importance of the asset beta in the excess return debate."*

[33] On page 7 it is stated "The regulatory parts of their respective businesses form a significantly larger part of their total businesses than AIA's; CNU is ~95% and VCT ~85% split between electricity lines (~76%) and gas pipelines (~9%)."

d. Having arrived at this 1.2% return premium Forsyth Barr then assumes that it will be earned in perpetuity including on a fast growing RAB for aeronautical operations (5.33% annual growth in perpetuity). This is how Forsyth Barr arrives at a 2.0 "RAB multiple" for AIAL's aeronautical operations (Figure 4, p.4).

227. In summary:

- Neither UBS nor Forsyth Barr's estimate of "RAB multiples" start from (or use in any direct way) AIAL's observed market value; and
- Forsyth Barr's RAB multiple for AIAL's aeronautical operations is best interpreted not as a RAB multiple at all but, rather, as the expression of an opinion that the true TAMRP is 5.5% (1.5% below the draft decision's 7.0% estimate).

8.3.2.1 Other observations on Forsyth Barr's analysis

228. The only actual RAB multiple analysis that Forsyth Barr applies is to Chorus and Vector and even this is, in my opinion, not suitable for use as a regulatory WACC reasonableness check.

229. Forsyth Barr reports a RAB multiple for Vector of 1.2 (p.10) but this is rounded to one decimal place. Rounded to two decimal places the value is 1.17 (=5,230/4,456).

230. Forsyth Barr places a value of $860m on unregulated assets but the derivation of this values is not explained.

231. Forsyth Barr assume that 100% of the RAB multiple reflects differences in regulatory and investor WACC estimates. But this is not correct. For example, unexpectedly high inflation delivers windfalls to regulated suppliers with high debt leverage and whose future prices fully compensate for unexpected higher inflation today.

232. The NZCC draft decision explicitly discussed this fact.[34]

> *5.83 As we assume debt costs are fixed in nominal terms (which is also our assumption underlying the hybrid cost of debt – ie, that suppliers can hedge the risk-free component of their cost of debt) there is a risk to suppliers when inflation is lower than predicted at the reset. In that situation the annual revenue wash-up could create a cash flow concern.*
>
> *5.84 There is no cashflow concern (but there is over-compensation) when inflation is higher than predicted, because in that situation the annual revenue wash-up creates excess revenue. This is because debt costs are fixed*

[34] Financing and incentivising efficient expenditure during the energy transition topic paper Part 4 Input Methodologies Review 2023 – Draft decision, 14 June 2023.

> *in nominal terms but the annual revenue wash-up in effect assumes debt costs are variable.*
>
> *5.85 Frontier for Vector calculated that the over-forecasting of inflation in the past has resulted in energy suppliers in total being undercompensated by $250 million between* ***2013-14 and 2019-20, with Vector undercompensated the most by over $80 million****.*
>
> *5.86 However, during the current regulatory period, inflation has been higher than expected and this will result in overcompensation for EDBs and GPBs.*
>
> *5.87 We have calculated the net effect for Vector over the period 2015-16 to 2021-22 is -$3 million.* ***Based on the latest Reserve Bank forecasts, the net benefit to Vector over the period 2015-16 to 2024-25 is $166 million.***

233. I note that one can "back out" of the NZCC calculations the windfall that Vector receives over DPP3 years (2020-21 to 2024-25) to be over $240m (>=$166m+ "over" $80m). These windfalls are "baked in" in the form of lower real future interest and principal payments but not yet realised (i.e., it is not money sitting in a Vector bank account but it is reflected in Vector's share price).

234. Moreover, this windfall applies all of Vector's existing portfolio of nominal debts entered into in earlier periods of lower inflation expectations. Higher than expected inflation is very beneficial to any business that has substantial nominal debt because the nominal repayments on that debt (including of principal) do not rise with inflation (their real value is reduced by inflation).

235. Therefore, the relevant windfall to Vector (and Chorus) is not just in relation to the debt used to fund their regulated activities (which underpins the NZCC estimates of greater than $240m for Vector) but all of their activities. This implies the inflation windfall to Vector will be more than $240m (noting that the $240m value is already an underestimate).

236. However, if I conservatively remove only a $240m inflation windfall from Forsyth Barr's enterprise value for Vector then the estimated RAB multiple falls to 1.12 (=($5,230-$240)/$4,456).

237. This is not to say that I endorse a 1.12 RAB multiple for Vector (after accounting for inflation windfalls). For example, I have not researched and have no opinion on the accuracy of other implicit assumptions Forsyth Barr have used (such as those that sit behind the unexplained $860m valuation of unregulated activities).

238. I merely present the inflation windfall analysis to illustrate the limitations of the Forsyth Barr analysis in attributing an apparent RAB multiple to a divergence between the regulatory and investor WACC.

239. Similarly, by attributing their RAB multiple estimate entirely to divergences between the regulatory and investor TAMRP, Forsyth Barr has assumed:

- that investors place zero value on the ability of Vector to outperform its opex and capex forecasts (and, in doing so, generate higher returns than the regulatory WACC). This appears to be an aggressive assumption given the goal of incentive regulation is precisely to encourage such outperformance; and
- that investors in Vector place zero value on Vector's potential to leverage its expertise to provide new unregulated services associated with the electrification of the New Zealand economy (such as battery storage used to deliver both grid and wholesale benefits).

240. Finally, I note that even if, after all of this analysis was performed, there remained a 1.2 RAB multiple that was unambiguously attributable to the regulatory WACC for Vector being "too high" it would still be a strong assumption to attribute this solely (or even primarily) to the regulatory TAMRP being too high.

241. For example, the NZCC sets an asset beta for Vector of 0.36 while the Australian Energy Regulator (AER) sets a value of 0.24 for equivalent businesses.[35] That is, the NZCC asset beta is 50% higher than the AER asset beta.

242. Forsyth Barr assumes that the NZCC asset beta is correct and, consequently, attributes their 1.2 RAB multiple to the NZCC setting too generous a TAMRP. However, if Forsyth Barr assumed that the AER's asset beta was correct then it would have concluded that the "true" TAMRP was more than 9%.

243. That is, inputting the AER asset beta into the Forsyth Barr analysis would completely reverse their conclusion.[36] Instead of the "true" TAMRP being 1.5% below the NZCC estimate of 7.0% it would be more than 2% above it.

244. This, in turn, following the logic in the Forsyth Barr analysis, would imply that the NZCC WACC for AIAL would be materially below investors' WACC and the RAB multiple for AIAL would be materially below 1.0.

245. In short, whether Forsyth Barr's analysis finds a RAB multiple above or below 1.0 for AIAL depends on what asset beta is assumed to be true for energy distributors.

246. I consider that this analysis demonstrates that the Forsyth Barr "RAB multiple" analysis is of zero value in informing AIAL's cost of capital. The Forsyth Barr "RAB multiple" for AIAL is nothing more than an assumption by Forsyth Barr that the true

35 AER, Rate of return instrument, February 2023. The AER sets an equity beta of 0.6 and gearing of 60% which implies an asset beta of 0.24 (=0.6×(100%-60%)).

36 Specifically, replacing 0.36 with 0.24 in the seventh row from the bottom of Figure 9 on page 8 of Forsyth Barr's document, would result in an implied investor TAMRP of more than 9%.

investor TAMRP is 5.5% - everything in the Forsyth Barr "RAB multiple" analysis flows from this assumption.

247. Moreover, this 5.5% estimate of the "true" TAMRP is based on an unreliable RAB multiple analysis for Vector (and Chorus). Specifically:

- The 1.2 RAB multiple is not well explained (e.g., the valuation of unregulated activities is not explained);
- The assumption that 100% of any RAB multiple is attributable to differences in regulatory vs investor WACC is unreliable. Simply accounting for recent and projected inflation windfalls brings down the Forsyth Barr RAB multiple for Vector down to 1.1;
- The assumption that 100% of any differences in regulatory vs investor WACC is due to differences in TAMRP is unjustified. If there was a WACC related RAB multiple for Vector (which I do not concede) this could be due to the asset beta for Vector being too high. In which case, Forsyth Barr's logic could easily imply a negative RAB multiple for AIAL.

Appendix A CUI measures

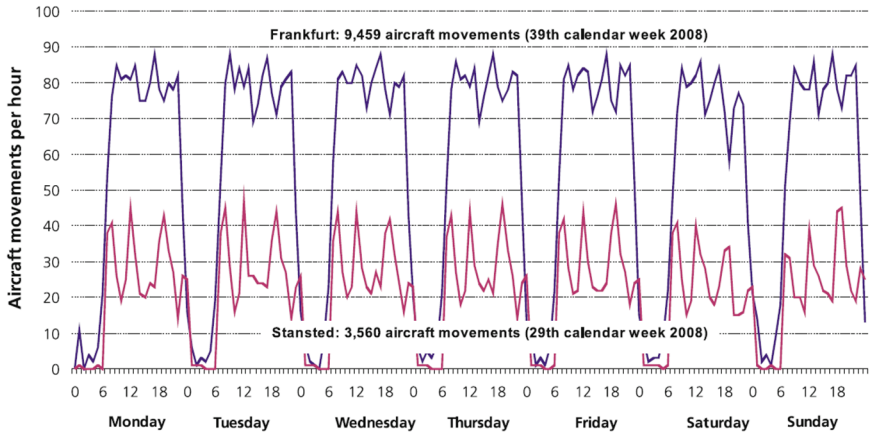
248. In my previous report I included discussion of a peak to average CUI measure. This compared the 95th percentile busiest hour to the average number of flights over the 66.6% of busiest hours in the year. This is a measure of how much capacity exists across the day that could potentially be "filled in" with higher demand.

249. However, this does not a good measure of the spare capacity in the shoulder periods. Spare capacity in shoulder periods is arguably more relevant because it is these hours that will be filled first as demand grows.

250. Reichmuth, et. al.,(2010)[37] illustrate this concept in the following chart.

Figure 8-1: Peak to shoulder variation for Frankfurt vs Stansted

Fig. 7 Hourly variation of flight movements during the peak week in 2008 at Frankfurt and Stansted airports [4, 6]



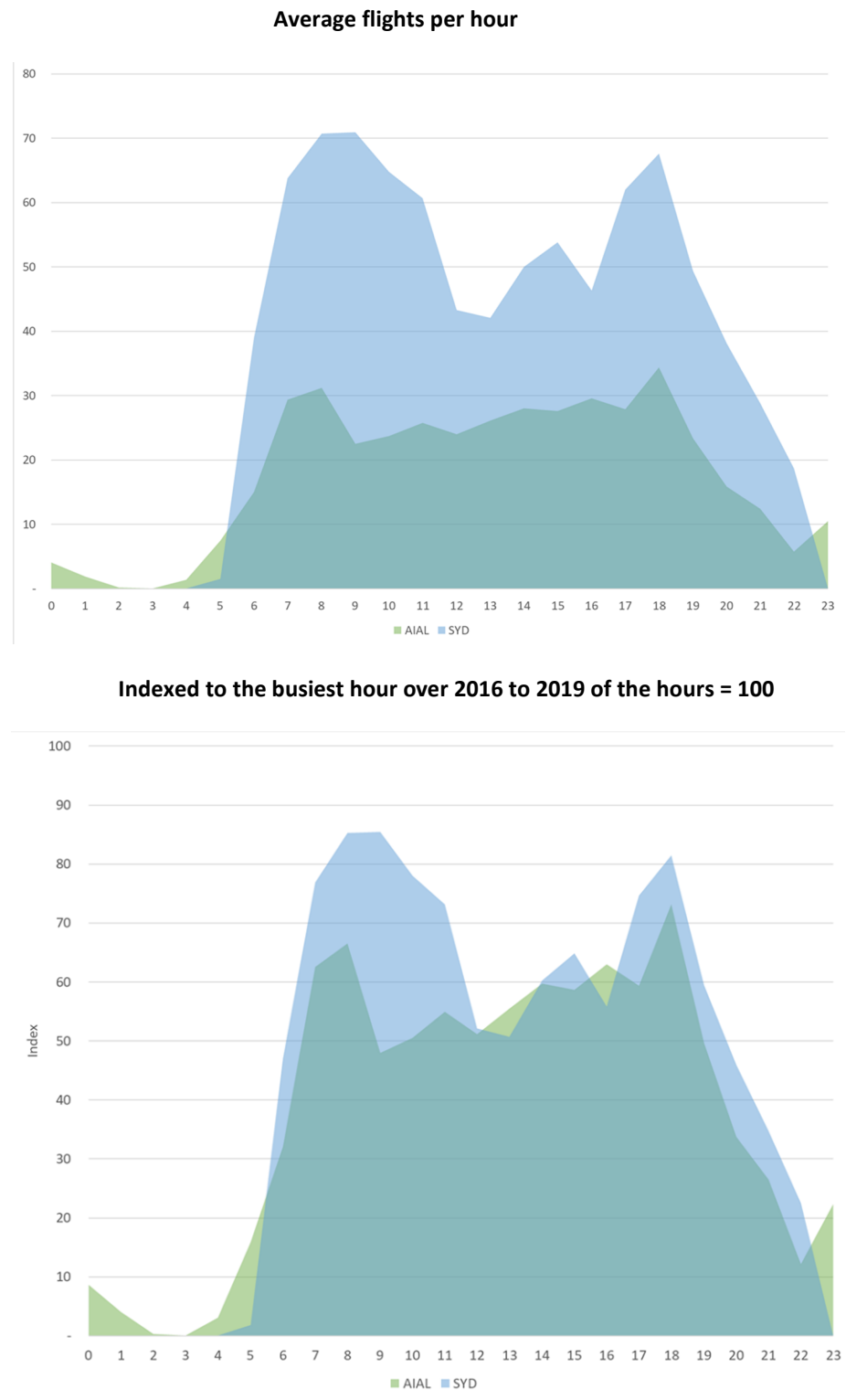
251. It can be seen that at Fraport the percentage difference between peak and shoulder periods is much smaller than for Stansted.

252. The same can be observed for AIAL vs Sydney airport. The top panel of Figure 8-2 shows the average number of flights per hour over the period 2016 to 2019 for AIAL (green) and Sydney airport (blue). The bottom panel has the same data except both data sets are indexed to the busiest hour over the period 2016 to 2019. It can be seen that:

- AIAL's average peak hour is much lower than its busiest peak hour (AIAL is circa 72% and Sydney is circa 85%);
- In the peak periods, especially in the morning peak, AIAL has much faster dop in utilisation in the shoulder period than Sydney.

37 Reichmuth, J., Berster, P. & Gelhausen, M.C. Airport capacity constraints: future avenues for growth of global traffic. CEAS Aeronaut J 2, 21–34 (2011). https://doi.org/10.1007/s13272-011-0034-4

Figure 8-2: Sydney vs AIAL



253. The peak to shoulder CUI is defined as the percentage of all hours that have a number of flights more than 33% of the flights in the busiest hour. In what follows I define the busiest hour as the busiest hour that occurs in that year or in any prior year (i.e., the busiest hour has a "ratchet effect"). I use data from 2016 to 2019.

Figure 8-3: peak to shoulder CUI for draft decision sample (including Beijing)

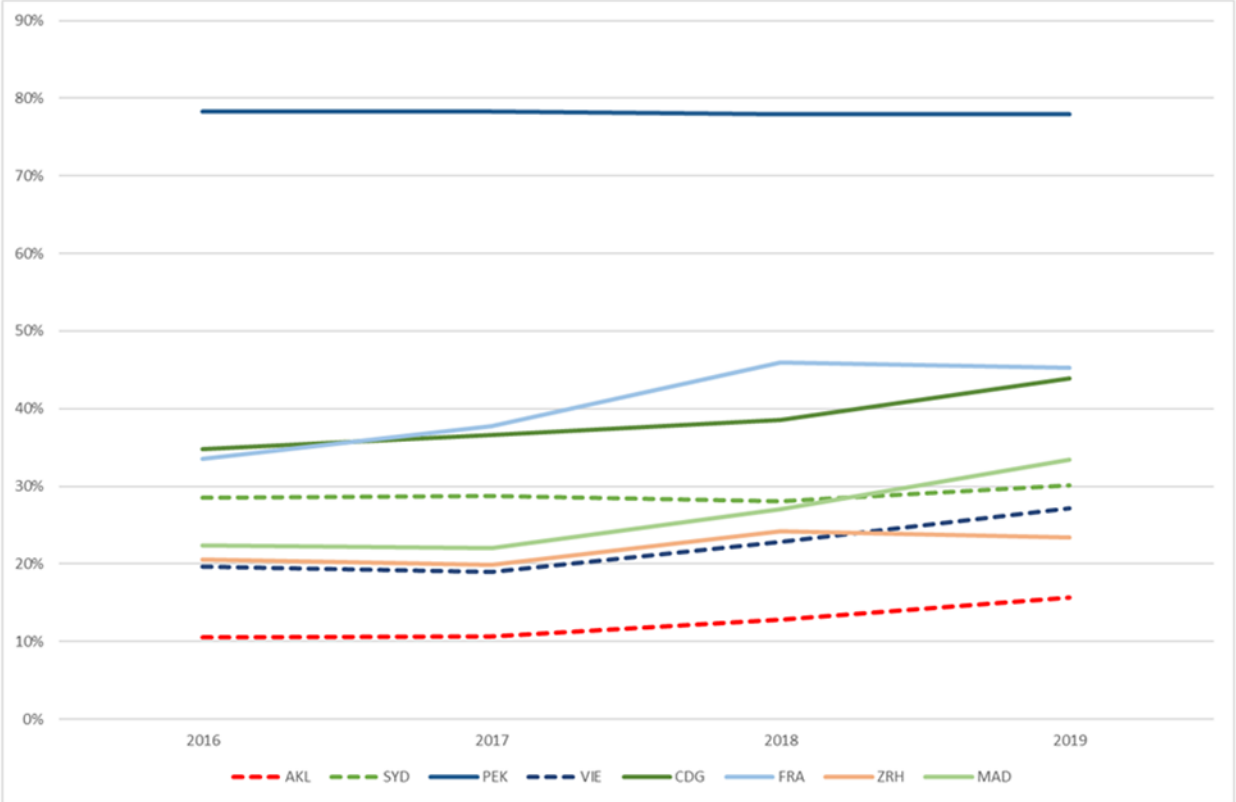
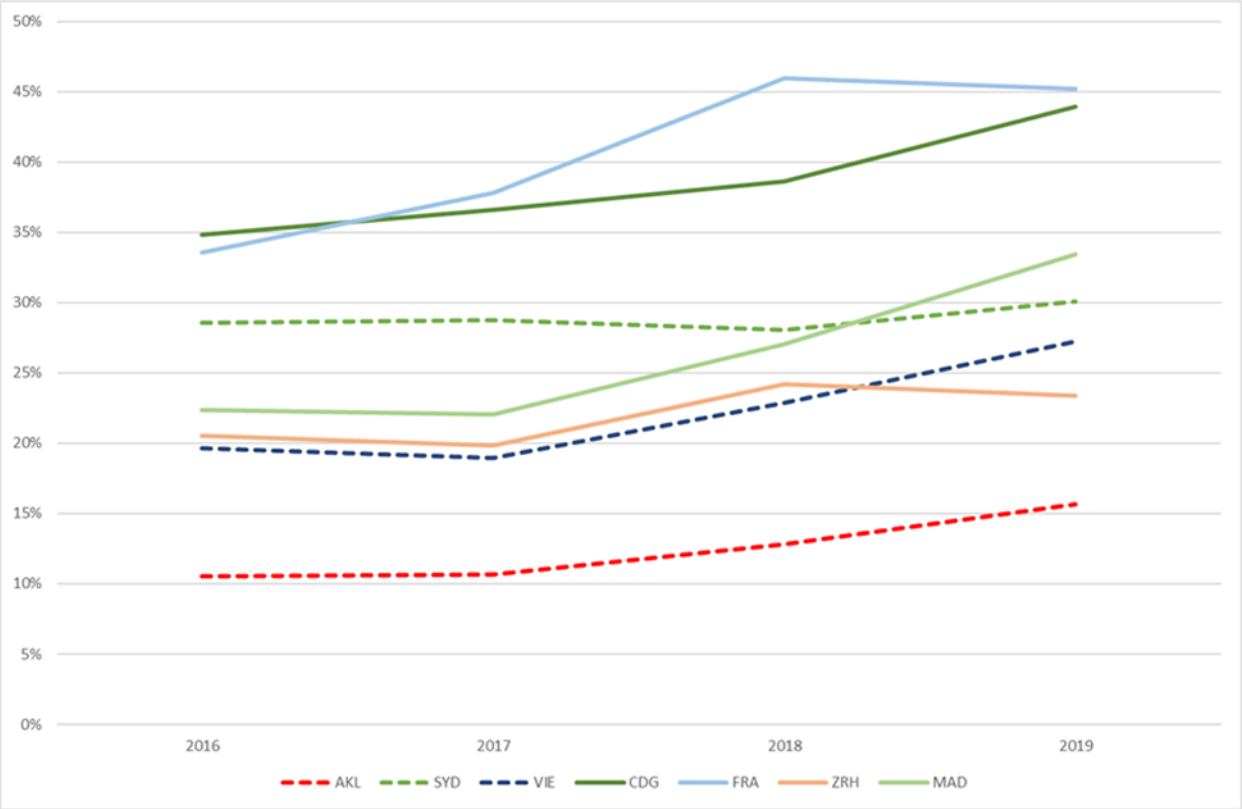


Figure 8-4: peak to shoulder CUI for draft decision sample (excluding Beijing)



254. It can be seen that on this measure AIAL is consistently lower CUI than the other airports in the sample. It is also notable that Beijing's peak to shoulder CUI is very high.

Appendix B Asset beta, uplift and gearing table

Table 8-1: Two five year periods of asset beta, uplift and gearing for the comparator set

		Asset beta			Uplift		Gearing		
Name	**Ticker**	**2013-18**	**2018-23**	**2018-23 (ex Covid)**	**Once in 50 - year (Uplift)**	**Once in 20 - year (Uplift)**	**2013-18**	**2018-23**	**2018-23 (ex Covid)**
Shenzhen	000089 CH Equity	0.96	0.53	0.46	0.01	0.02	1%	3%	6%
HNA	357 HK Equity	0.47	1.19	1.05	0.01	0.03	21%	18%	19%
Guangzhou	600004 CH Equity	1.07	0.83	0.86	-0.00	-0.01	-12%	1%	2%
Shanghai	600009 CH Equity	0.91	0.66	0.59	0.00	0.01	-15%	-1%	-1%
Xiamen	600897 CH Equity	1.25	0.81	0.89	-0.01	-0.02	-15%	-29%	-28%
Beijing	694 HK Equity	0.56	0.80	0.76	0.00	0.01	26%	15%	16%
JAT	9706 JP Equity	1.16	0.96	0.81	0.02	0.05	9%	24%	22%
Vietnam	ACV VN Equity	0.94	0.78	0.61	0.02	0.05	-2%	-10%	-8%
Bologna	ADB IM Equity	0.27	0.78	0.50	0.04	0.10	-1%	3%	2%
ADP	ADP FP Equity	0.43	0.84	0.61	0.04	0.09	23%	33%	30%
AENA	AENA SM Equity	0.43	0.83	0.79	0.01	0.02	32%	25%	24%
AIAL	AIA NZ Equity	0.92	1.03	0.72	0.05	0.11	21%	15%	15%
Thailand	AOT TB Equity	1.25	1.02	0.88	0.03	0.07	-3%	-1%	-1%

		Asset beta			Uplift		Gearing		
Name	**Ticker**	**2013-18**	**2018-23**	**2018-23 (ex Covid)**	**Once in 50 - year (Uplift)**	**Once in 20 - year (Uplift)**	**2013-18**	**2018-23**	**2018-23 (ex Covid)**
Grupo (Sureste)	ASURB MM Equity	0.85	1.07	0.88	0.02	0.06	2%	7%	7%
Zurich	FHZN SW Equity	0.64	0.86	0.57	0.04	0.09	13%	18%	16%
Vienna	FLU AV Equity	0.26	0.51	0.05	0.08	0.17	22%	9%	8%
Frankfurt	FRA GR Equity	0.36	0.55	0.50	0.01	0.02	40%	53%	51%
Grupo (Pacific)	GAPB MM Equity	0.86	1.40	1.19	0.03	0.06	2%	7%	7%
Copenhagen	KBHL DC Equity	0.47	0.29	0.09	0.03	0.06	14%	16%	16%
Malaysia	MAHB MK Equity	1.08	1.03	0.79	0.04	0.08	28%	25%	23%
Malta	MIA MV Equity	0.76	1.24	0.82	0.10	0.19	6%	1%	1%
Grupo (Cent)	OMAB MM Equity	0.92	1.37	1.11	0.03	0.08	6%	5%	6%
Sydney	SYD AU Equity	0.35	0.72	0.33	0.08	0.16	38%	37%	36%
Toscana	TYA IM Equity	0.25	0.42	0.18	0.04	0.08	9%	20%	20%

Appendix C Airport metrics

255. Below describes what each formatting represents:

- Yellow highlights indicate that the airport is included in the sample of the respective metrics.
- Orange text indicates airports that are in NZCC draft decision sample.
- *Italic* text are summary statistics for the metrics.

Table 8-2: Data table

Name	Number of routes	Routes HHI	Country HHI	International country HHI	Peak to shoulder CUI	Peak to average CUI	PAX (million)	Pax volatility
Malta	126	204	1,186	1,186	7%	60%	7.3	4.1%
Grupo (Sureste)	126	544	2,744	3,590	5%	53%	34.2	3.0%
Grupo (Pacific)	65	855	5,901	9,657	8%	71%	48.7	8.9%
Grupo (Cent)	48	1,342	7,602	8,841	3%	71%	23.2	4.0%
Vietnam	100	596	2,199	1,329	26%	77%	55.3	30.2%
AENA	270	121	852	523	31%	76%	275.2	5.2%
Zurich	201	144	574	600	23%	69%	31.5	2.3%
Sydney	106	621	3,853	898	30%	69%	44.4	1.8%
ADP	349	93	523	394	33%	78%	164.7	1.5%
Frankfurt	319	87	442	370	45%	78%	169.0	2.8%
Thailand	176	204	673	595	57%	86%	143.0	6.5%
Malaysia	144	215	1,233	789	59%	86%	105.3	5.2%
Xiamen	114	253	7,137	813	58%	89%	27.4	5.2%
JAT	85	425	6,236	954	54%	88%	175.1	4.8%
Shenzhen	179	362	7,687	767	65%	94%	52.9	2.4%
Guangzhou	195	234	5,457	523	66%	92%	73.4	3.0%
Shanghai	235	141	2,384	760	67%	93%	76.2	4.3%
Beijing	262	206	5,102	558	78%	95%	100.0	2.3%
AIAL	65	520	2,597	2,120	16%	73.1%	21.1	4.3%
Christchurch	24	1,592	5,782	6,656	3%	63%	6.9	3.8%
Wellington	24	1,846	7,305	9,341	12%	53%	6.4	2.0%
New Zealand aggregate	*110*	*465*	*3,113*	*2,875*	*12%*	*65%*	*34.4*	*3.4%*
Two 5-year beta (ending March 2023)	*0.97*	*0.91*	*0.86*	*0.95*	*1.02*	*0.92*	*0.90*	*0.84*
Number of comparators within threshold	*10*	*12*	*8*	*4*	*4*	*6*	*9*	*10*

Name	Number of routes	Routes HHI	Country HHI	International country HHI	Peak to shoulder CUI	Peak to average CUI	PAX (million)	Pax volatility
Average of metric within threshold	*98*	*365*	*2,662*	*2,056*	*9%*	*69%*	*37.6*	*3.2%*
Minimum of metric	*24*	*87*	*442*	*370*	*3%*	*53%*	*6.4*	*1.5%*
Threshold (lower bound)	*45.5*	*181*	*1,110*	*997*	*5%*	*56%*	*13.4*	*2.0%*
Threshold (upper bound)	*174.5*	*749*	*5,116*	*4,754*	*19%*	*75%*	*55.4*	*4.7%*
Average of metric	*153*	*505*	*3,689*	*2,441*	*36%*	*77%*	*78.1*	*5.1% (3.9% excl Vietnam)*
Average of metric in NZCC DD sample excl AIAL	251	212	1,891	557	40%	78%	130.8	2.6%

Source: Airport company websites, annual reports and Bloomberg for pax and pax volatility, Sabre.

256. Note that the average metric in the NZCC draft decision sample excluding AIAL is very different from the New Zealand average of AIAL, CIAL and WIAL.

- The number of routes, both CUI metrics and PAX for the NZCC draft decision sample excluding AIAL are materially higher than the New Zealand average, which suggest they have materially lower risk than the New Zealand airports.
- The routes, country and international country HHI metrics along with PAX volatility for the NZCC DD sample excluding AIAL are materially lower than the New Zealand average, which again suggest that they have materially higher diversification and lower risk than the New Zealand airports.