Review of Aspects of AIAL's Beta for the PSE3 Pricing Decision

A report prepared for the Board of Airline Representatives New Zealand Inc.

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1. Summary

The NZ Commerce Commission has calculated that an appropriate asset beta for New Zealand's major airports, including AIAL, is 0.6. AIAL has argued its direct estimate of its own beta of 0.68 should be used. NERA supports AIAL's proposed beta estimate and suggests an even higher asset beta could be justified as AIAL's observed beta has trended upwards recently. Both AIAL and NERA suggest the underlying reason for the higher observed beta for AIAL relative to the comparator group is its planned capital expenditure program increasing its operating leverage.

This report responds to NERA and considers:

- whether it is appropriate to use AIAL's directly observed beta or to use a comparator sample to derive beta for regulatory purposes;
- whether the industry asset beta estimate should be adjusted for higher capital expenditure that leads to an increase in operating leverage; and
- in the case of AIAL, whether the difference between AIAL's capex and the comparator group's capex is of a magnitude that can be reasonably expected to meaningfully impact its asset beta.

Our conclusions are that the directly estimated beta for AIAL varies substantially depending on the length of estimation period and frequency of observations, as well as over time. Using a sample of comparable companies in the same industry yields a more statistically accurate measure of underlying beta. For this reason, most practitioners and the Commission itself use an industry sample rather than one company to estimate beta, and we would caution against using only AIAL's observed beta.

Nevertheless, it is appropriate to consider if AIAL varies from the comparator group in a way that is likely to have a material impact on its beta. For example, asset betas are adjusted from equity betas by allowing for firm-specific financial leverage. This makes the betas comparable across a given sample of firms and therefore yield an estimate of industry-specific systematic risk.

Capital expenditure increases operating leverage, but it only represents a fixed cost from the time it is contractually committed until it is spent. Before irrevocable commitment the planned capex is a variable cost that can be cancelled or deferred in response to market changes.

We present a derived formula for adjusting beta to reflect increased operating leverage from capital expenditure in a similar manner to the financial leverage adjustment. This yielded an indicative adjustment over the PSE3 period in the order of a 0.01- 0.02 increase – ie, very small in the general estimation error of beta. For projects with a long gestation period the building blocks approach means that increased operating leverage is offset by a certain return achieved through compounding work-in-progress into the Regulated Asset Base.

We also note that the comparator group of airport companies used by the Commission has a wide range of capital expenditure intensity. (We have obtained data on annual capital expenditure, not the preferred metric of committed capital expenditure – but over a sample these two numbers are likely to be correlated.) AIAL's current level of capex is mid-range; and the average level forecast over the PSE3 period is above average, but well below the highest. Given AIAL is not an outlier and our quantitative analysis suggests a very low impact on beta, this supports no need for an operating leverage adjustment.

2. Introduction

The New Zealand Commerce Commission (the Commission or NZCC) has released its draft summary and analysis of Auckland International Airport Ltd.'s (AIAL's) pricing decision for July 2017-June 2022 (PSE3). NERA produced a report, "Response to the NZCC's View on Auckland Airport's Asset Beta", 29 May 2018, on behalf of AIAL in response (this report is referred to as NERA's report no. 2 or NERA 2 throughout this submission). Additionally, we refer to, and cite, NERA's earlier report "A Peer Review of Auckland Airport's Approach to WACC and Target Return for Aeronautical Pricing", 23 March 2017 (referred to as NERA 1) where necessary.

TDB Advisory has been engaged by the Board of Airline Representatives New Zealand (BARNZ) to comment on the recent preceding work and produce this submission to the Commerce Commission.

This submission continues with Section 3 analysing the general principles relating to the use of a comparator sample of firms vs. AIAL in determining the appropriate asset beta for AIAL. Section 4 then presents the theory and conducts an exercise (related to AIAL) on the effect that operating leverage has on asset beta. Section 5 presents an analysis of the Commission's airport comparator sample and where AIAL sits in it. Finally, Section 6 adds an additional comment on rating agencies and equity analysts and Section 7 concludes.

3. Use of a comparator sample v AIAL's beta

We strongly disagree with NERA that AIAL's actual calculated beta should be used for regulatory purposes. Estimates of beta for a single company have a lot of variability. Noise in the returns data can obscure the true beta for a company. As companies in the same industry face similar cyclicality in their revenue and have similar cost structures there are good theoretical reasons why they would have the same underlying asset beta. Taking a large sample of comparable companies reduces the statistical error in the estimation. This approach of using a wide sample of comparable companies has been used consistently by the Commission in a range of industries.

Table 2.2 on page 12 of NERA 1 illustrates the variability or degree of noise surrounding estimates of AIAL's beta. The table (replicated below) shows that differences in the length of the estimation period and in the frequency of observations used can make a sizeable difference in the calculated beta, with estimates ranging from 0.69 to 1.28.

Figure 1: Copy of Table 2.2 from NERA's report

Table 2.2
Auckland Airport Asset Beta Estimates

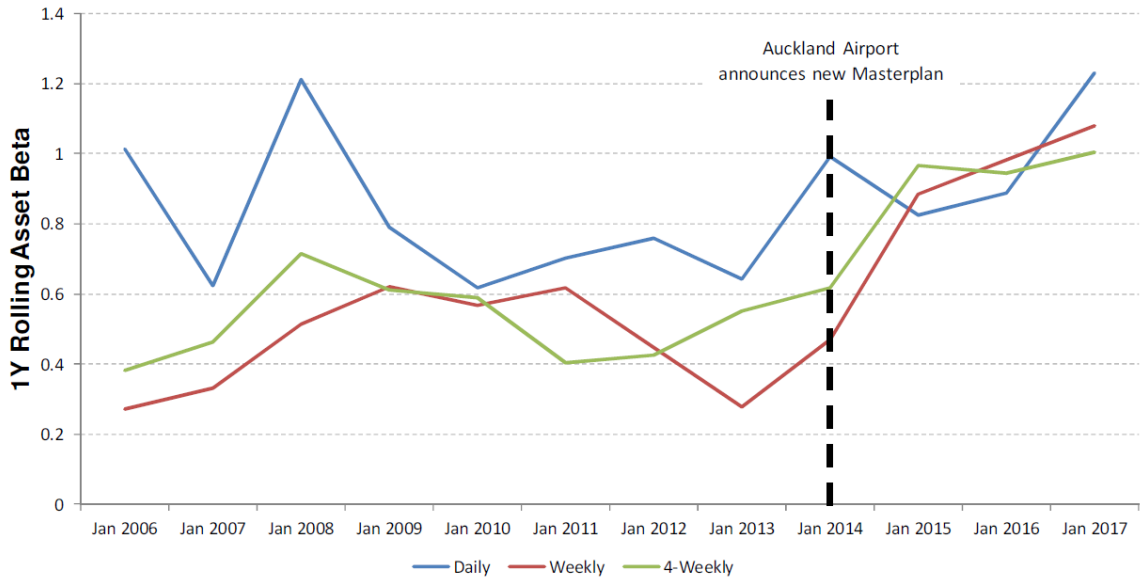
	6M	1Y	2Y	5Y	10Y	20Y (Auckland Airport Window)
Daily	1.28	1.23	1.06	0.93	0.83	0.81
Weekly	1.01	1.08	1.06	0.69	0.70	0.70
4-Weekly	1.19	1.00	0.97	0.82	0.69	0.69
Average	1.16	1.10	1.03	0.81	0.74	0.73
Avg (Weekly and 4-Weekly)	1.10	1.04	1.01	0.76	0.69	0.69

Similarly, Figure 2.5 in NERA's report 1 (replicated below) shows the 1-year rolling asset beta has been quite volatile over time. The daily observation estimates vary between 0.25 and 1.2.

Typically, systematic risk represents a small portion of the total risk of a stock. The firm-specific diversifiable risk outweighs systematic risk and creates a lot of noise in individual beta estimates. We note that using a 1-year calculation period exacerbates the volatility exhibited in beta, and a similar chart of 5-year rolling asset beta would likely show more consistency.

Figure 2: Copy of Figure 2.5 from NERA's report

Figure 2.5
1Y Rolling Asset Beta for Auckland Airport



Because of this variability in individual company beta calculations it is preferable to use a sample of comparable companies in a similar industry. The diversification provided by the larger sample set will reduce the statistical noise from one individual stock's trading and give a better insight into industry-wide airport betas. To the extent that AIAL varies significantly from the average of the sample group of airports in a way that is likely to influence beta, the industry average beta gives an appropriate base to adjust from.

In this case, we understand the argument is that the beta being derived for PSE3 should reflect the higher capital expenditure planned for AIAL during PSE3 compared to historic periods. This raises two questions. First is the proposed capital expenditure of such a scale as to significantly impact capital expenditure? And secondly is the level of capital expenditure markedly different from that incurred or anticipated in the peer group of airports.

4. Framework for considering the impact of capital expenditure on asset beta

We concur with the Commission and NERA that a period of higher capital expenditure can increase operating leverage, which is a fundamental determinant of beta. The most helpful discussion of this we have found is in the textbook "Principles of Corporate Finance" by Brealey, Myers & Allen, 11th Ed. (2014) – widely used in MBA finance courses. In Section 9-3 there is a discussion on what determines asset betas. We repeat the full discussion on operating leverage which we present as Figure 3 on the next page and discuss the issue further following the excerpt.

Figure 3: Excerpt from Brealey, Myers & Allen, 11th Ed. (2014), pp227-228

Operating Leverage A production facility with high fixed costs, relative to variable costs, is said to have high *operating leverage*. High operating leverage means a high asset beta. Let us see how this works.

The cash flows generated by an asset can be broken down into revenue, fixed costs, and variable costs:

$$\text{Cash flow} = \text{revenue} - \text{fixed cost} - \text{variable cost}$$

Costs are variable if they depend on the rate of output. Examples are raw materials, sales commissions, and some labor and maintenance costs. Fixed costs are cash outflows that occur regardless of whether the asset is active or idle, for example, property taxes or the wages of workers under contract.

We can break down the asset's present value in the same way:

$$\text{PV(asset)} = \text{PV(revenue)} - \text{PV(fixed cost)} - \text{PV(variable cost)}$$

Or equivalently

$$\text{PV(revenue)} = \text{PV(fixed cost)} + \text{PV(variable cost)} + \text{PV(asset)}$$

Those who *receive* the fixed costs are like debtholders in the project; they simply get a fixed payment. Those who receive the net cash flows from the asset are like holders of common stock; they get whatever is left after payment of the fixed costs.

We can now figure out how the asset's beta is related to the betas of the values of revenue and costs. The beta of PV(revenue) is a weighted average of the betas of its component parts:

$$\beta_{\text{revenue}} = \beta_{\text{fixed cost}} \frac{\text{PV(fixed cost)}}{\text{PV(revenue)}} + \beta_{\text{variable cost}} \frac{\text{PV(variable cost)}}{\text{PV(revenue)}} + \beta_{\text{assets}} \frac{\text{PV(asset)}}{\text{PV(revenue)}}$$

The fixed-cost beta should be about zero; whoever receives the fixed costs receives a fixed stream of cash flows. The betas of the revenues and variable costs should be approximately the same, because they respond to the same underlying variable, the rate of output. Therefore we can substitute β_{revenue} for $\beta_{\text{variable cost}}$ and solve for the asset beta. Remember, we are assuming $\beta_{\text{fixed cost}} = 0$. Also, PV(revenue) − PV(variable cost) = PV(asset) + PV(fixed cost).[14]

$$\beta_{\text{assets}} = \beta_{\text{revenue}} \frac{\text{PV(revenue)} - \text{PV(variable cost)}}{\text{PV(asset)}} = \beta_{\text{revenue}} \left[1 + \frac{\text{PV(fixed cost)}}{\text{PV(asset)}} \right]$$

Thus, given the cyclicality of revenues (reflected in β_{revenue}), the asset beta is proportional to the ratio of the present value of fixed costs to the present value of the project.

Now you have a rule of thumb for judging the relative risks of alternative designs or technologies for producing the same project. Other things being equal, the alternative with the higher ratio of fixed costs to project value will have the higher project beta. Empirical tests confirm that companies with high operating leverage actually do have high betas.[15]

We have interpreted fixed costs as costs of production, but fixed costs can show up in other forms, for example, as future investment outlays. Suppose that an electric utility commits to build a large electricity-generating plant. The plant will take several years to build, and the cost is fixed. Our operating leverage formula still applies, but with PV(future investment) included in PV(fixed costs). The commitment to invest therefore increases the plant's asset beta. Of course PV(future investment) decreases as the plant is constructed and disappears when the plant is up and running. Therefore the plant's asset beta is only temporarily high during construction.

There are two points we want to draw from the above discussion. First, capital expenditure is only an additional "fixed cost" for the period from commitment until it is spent. Until the money is committed the capital expenditure is a variable cost. Once it is spent it is a sunk cost. Apart from very large projects most capital expenditure occurs relatively quickly. Operating leverage reflects fixed operating costs or future commitments, it does not reflect capital intensity per se. Likewise, share-market valuations and beta reflect cashflows, not sunk costs.

AIAL's annual capital expenditure for the last four years is presented in Table 1 below.

Table 1: AIAL's capital expenditure

Financial Year ($m)	Property, plant and equipment		Investment property	
	Committed*	Annual spend	Committed*	Annual spend
2014	17.6	67.4	36.4	54.1
2015	2.7	80.6	28.4	67.0
2016	4.6	136.8	83.1	80.6
2017	157	289	86.8	85.7

**From notes to the accounts of contractual obligations to purchase or develop at end of prior financial year*

As presented by Table 1, over the last four years, the annual capital spend by AIAL typically exceeded that committed at the beginning of the year. We acknowledge that with larger projects, for example the second runway, commitments may be for a longer period. While AIAL might argue that it is committed to its 5-year plan, the reality is the cost is not fixed until it is contractually committed. The quote from AIAL's CEO in Nera 2 p14 notes that when the GFC occurred certain planned capital investment was treated as a variable cost and sensibly deferred.

The second insight to come from the Brearley, Myers and Allen discussion above is the formula gives a framework for determining the magnitude of impact which committed capital expenditure might have on beta.

$$\beta_{Assets} = \beta_{Revenue}\left[1 + \frac{PV(fixed\ Costs)}{PV(asset)}\right]$$

We can solve for Beta Revenue by simply dividing through by the costs to assets ratio set out above giving,

$$\beta_{Revenue} = \frac{\beta_{Assets}}{1 + \frac{PV(fixed\ Costs)}{PV(asset)}}$$

For this exercise we take as β_{Assets} the NZCC's assessed beta of 0.60 derived from its comparator sample of listed airport companies.

For the PV(asset) we take the market enterprise value of AIAL. Summing its market capitalisation as at 8/6/18 and net debt from its interim FY18 report yields a value of $10.523bn. We use the whole enterprise as this is what we have observable market information on. Also, the additional risk to the enterprise of capital expenditure must be seen in the context of the size of the whole company. Similarly, the comparable company data is based on the whole company, and the comparable companies, like AIAL, include non-aeronautical activities.

For a measure of PV(fixed costs) we first note that in FY17 AIAL had operating expenses of $156.2M. It is difficult for an outsider to determine the proportion of costs which are fixed but in the short run we suspect a high proportion are. However, in the long run many staff and operations costs could be varied to the scale of operations. We have assumed 50% of operating costs are fixed. To obtain a PV we have discounted 50% of the current operating expenses assuming a constant perpetual growth rate (ie, divided by r-g, where r is the equity discount rate and g is the assumed growth rate). r-g is calculated at 3.1%, being the growth rate calculated from applying a constant dividend growth rate model to AIAL's current dividend yield. This, with a 28% tax rate, yields a PV(fixed costs) of 1.818bn. To this we have added a "base" capital expenditure commitment of $88m, being the committed capital expenditure at the end of FY15, before the recent higher levels of expenditure began.

We acknowledge that there are some broad assumptions required in determining PV(fixed costs), however sensitivities of assuming 25% and 75% costs (see below) show the analysis is fairly insensitive to this assumption.

Solving the above formula yields a revenue beta of 0.508.

We can use this revenue beta to look at the impact of increasing the level of capital expenditure to see if there is a significant impact on asset beta, all else being held constant.

As noted above, the base capital expenditure commitment level assumed is $88M, that committed at the end of FY15. We have also considered:

- $280m – the level of committed capital expenditure in the FY018 interim report, the highest observed over the last five years;
- $550m – AIAL's average annual forecast annual regulated capital expenditure for PSE3 is $470m[1]. Rounding up to allow for a similar level of investment property commitments as recent years yields $550m. It should be noted this is annual expenditure – we do not know what contracted commitment levels will be, but historically they have been less than annual spend. Also much of this capex will be added to work-in-progress where it receives a certain return compounded int the RAB as discussed below; and
- $1,750m – this number represents the committed capital expenditure required to get the asset beta up to 0.68 – which AIAL states is its current statistically derived beta.

The results of the estimated asset betas and changing capex are presented in Table 2.

[1] Calculated from Schedule 18 disclosure https://corporate.aucklandairport.co.nz/~/media/Files/Corporate/Regulatory-Disclosures/2017/Price-Setting-Disclosure-schedules.ashx?la=en.

Table 2: Impact of capital expenditure commitments on airport asset beta

AIAL capex commitment	$88m	$280m	$550m	$1750m
Beta (assumed fixed cost proportion=50%)	0.6	0.609	0.622	0.680
Beta (assumed fixed cost proportion=25%)	0.6	0.61	0.624	0.687
Beta (assumed fixed cost proportion=75%)	0.6	0.609	0.621	0.675

Table 2 indicates the increase in capital expenditure levels over the PSE3 period might, in theory increase beta by 0.021 to 0.024, a change less than one third of the size of the 0.08 uplift proposed by AIAL. This change is a small amount given the statistical noise in calculating a beta factor. This size of the increase assumes that the committed level of expenditure averages $550m for the whole PSE3 period. It also assumes that the comparator group has a similarly low starting point as AIAL's FY15 committed capex. We show below in Section 5.2 that the FY18 level may be a more appropriate starting point. The annual capital expenditure level in FY17, which had risen to $375m was mid–pack in the comparison group used by the NZCC in deriving beta. An increase in committed capital spend from $280m to $550m could in theory justify only a 0.013 increase in asset beta.

We note that the formulae derived by Brearley, Myers and Allen appear to be for a competitive firm that is not subject to any regulation. The analysis may differ in this case because AIAL is a monopoly subject to light-handed regulation. However, we consider that any change would likely be toward a lower change in the underlying revenue and asset beta because a regulated firm will have more certainty of future revenue when undertaking a capital project of this nature.

In particular, the "building blocks" methodology for incorporating new assets into the Regulated Asset Base ("RAB") needs to be considered. Assets such as the new domestic terminal, international arrivals / biosecurity hall and second runway have gestation periods of 3-8 years. During the construction period the work-in-progress is compounded into the RAB at WACC. Only when completed is the asset subject to the price path (which has been calculated to earn on the RAB including the compounded return on work-in-progress.

Considering this in the Brearley, Myers and Allen framework above:

$$\beta_{Assets} = \beta_{Revenue}\left[1 + \frac{PV(fixed\ Costs)}{PV(asset)}\right]$$

During the construction period PV(fixed costs) is higher reflecting committed, but unspent capital expenditure. But also, Beta Revenue is minimised as the return is compounded at a certain rate into the RAB regardless of economy wide factors impacting other airport revenue. This offsets any need to compensate for increased operating leverage.

We observed above that determining PV(fixed costs) is difficult but note that changing that number by 50% (fixed cost proportion from 50% to 25% and 75%) had minimal impact on beta. The reason for this is that AIAL's ratio of revenues to expenses (components of EBITDAFI) is 4.0x. This contrasts with a manufacturer, e.g. Synlait where this ratio is 1.1x. Hence AIAL's beta will be influenced by cyclicality of revenue much more than operating leverage compared to manufacturing companies with a revenue-expense structure like Synlait. (In Synlait's case the contractual arrangements it has for its main input cost, milk, will be a major determinant of operating leverage). As an aside this may explain the minimal

relationship found by the Commission between operating leverage (approximated by the %ΔEBIT / %ΔRevenue) and beta.

Finally, this analysis should be considered beside our separate analysis below of the level of capital expenditure in the comparable group. That is, whether the Commission's base derived beta of 0.6, was based on a sample set of companies facing similarly significant capital expenditure. That is, we aim to ask the question of whether AIAL's additional capex is likely to vary in a significant way from the comparator sample that would justify a departure from the Commission's IM's and warrant a meaningful adjustment to the asset beta for AIAL for this pricing period.

5. AIAL's capital expenditure in comparison to beta comparators

5.1 Relative capital expenditure metrics

There has been much discussion of various metrics of Operating Leverage. We agree with Nera's "Response to the NZCC's View on Auckland Airport's Asset Beta", 29 May 2018 (Nera 2) where on p6 NERA states "a more relevant measure of the operating leverage that does not look at accounting measures of fixed cost (such as the EBIT measures cited by the Commission in the draft report), but rather fixed cash outflows such as fixed operating costs and committed capex programmes as measures of fixed (cash) costs." This is consistent with the approach outlined above by Brearley, Myers and Allen. It does not appear that anyone has claimed that AIAL's fixed operating cost structure is significantly different from the comparator group; and as illustrated above, for an airport all operating costs are quite low as a percentage of operating revenue.

Returning to the formula,

$$\beta_{Assets} = \beta_{Revenue}\left[1 + \frac{PV(fixed\ Costs)}{PV(asset)}\right]$$

The key comparison to explain differences in beta from capital expenditure in the comparable airport group would be Committed Capex / PV(asset) = Committed Capex / Enterprise Value (Market value of Equity and Debt. This feeds directly in to the above formula.

Second best alternatives which might be used are:

- annual capex / Enterprise Value – committed as a percentage of annual capital expenditure will vary a lot, but averaged over a sample will give reasonable guidance;
- committed capex or Annual Capex / Total Assets – total assets is an accounting measure with a mix of valuation methods underlying it (which will likely vary between companies – Enterprise value is the market's measure of PV(assets) consistent with the Capital Asset Pricing Model framework; and
- committed capex / RAB and annual capex / RAB – the observations each comparator beta is derived from reflect the full company, not just regulated assets, so this only explains a subset

of the differences. Furthermore, the two sides of the business are very interlinked from a capital expenditure perspective – terminal expansion provides both aeronautical services and retail opportunities. Runway developments aid passenger throughput which aids retail and parking revenue. Conversely hotel development onsite aids passenger throughput.

We don't find metrics like total expenditure / RAB, OCF / revenue and FCF / revenue as useful as they don't focus the denominator on the key variable – committed capex. They also all include variable costs, which should be excluded when considering operating leverage and OCF leaves out capital expenditure altogether. The use of revenue as numerator is a poor proxy for enterprise value.

Next in this report we look at the comparator sample which the Commission derived betas for. We were not able to extract sufficient data on committed capex for this sample group. However, we could get good data on annual capex / enterprise value and annual capex/total assets.

5.2 Capex intensity and the Commission's comparator sample

To consider the analysis put forward in Figures 2.4 and 2.5 of NERA 2, we now analyse the capital spending intensity of the comparator sample employed by the Commission and where AIAL sits in relation to its peers in the last two years (2016 and 2017), where capex is presented relative to both the market and book values of the comparators.

To conduct this analysis, we start with the Commerce Commission's sample of 26 firms for its Input Methodologies on Airport price setting. Table 3 is taken from the Commission's IM decision and presents the firms in the sample as well as the asset beta estimates[2].

[2] This is sourced from http://www.comcom.govt.nz/regulated-industries/input-methodologies-2/input-methodologies-review/cost-of-capital-im-review/

Table 3: Commerce Commission IM airport comparator sample

Airport sample	Name	1996-2001			2001 -2006			2006-2011			2011-2016		
		Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly
000089 CH Equity	Shenzhen Airport Co	-	-	-	0.76	0.68	0.60	0.90	0.69	0.78	0.87	0.85	0.97
357 HK Equity	HNA Infrastructure Company Ltd	-	-	-	0.79	0.40	0.42	0.59	0.68	1.25	0.76	0.81	0.92
600004 CH Equity	Guangzhou Baiyun International	-	-	-	1.05	0.34	0.26	0.83	0.67	0.65	1.04	0.93	0.96
600009 CH Equity	Shanghai International Airport	-	-	-	0.74	0.69	0.65	0.83	0.71	0.80	0.91	0.86	0.81
600897 CH Equity	Xiamen International Airport C	-	-	-	1.05	0.92	0.87	0.89	0.64	0.65	1.04	1.02	1.06
694 HK Equity	Beijing Capital International	0.59	0.11	0.08	0.91	0.88	0.89	0.98	1.04	1.06	0.44	0.38	0.42
8864 JP Equity	Airport Facilities Co Ltd	-	-	-	0.34	0.37	0.32	0.50	0.44	0.48	0.59	0.54	0.62
9706 JP Equity	Japan Airport Terminal Co Ltd	-	-	-	0.55	0.57	0.67	0.73	0.68	0.65	0.90	0.84	0.93
ADP FP Equity	Aeroports de Paris	-	-	-	-	-	-	0.64	0.67	0.66	0.41	0.42	0.40
AERO SG Equity	Aerodrom Nikola Tesla AD Beogr	-	-	-	-	-	-	-	-	-	1.04	1.21	1.13
AIA NZ Equity	Auckland International Airport	0.58	0.34	0.46	0.83	0.87	0.82	0.79	0.71	0.68	0.82	0.60	0.69
AOT TB Equity	Airports of Thailand PCL	-	-	-	0.64	0.10	0.11	0.57	0.55	0.71	0.99	1.05	1.23
ASURB MM Equity	Grupo Aeroportuario del Surest	0.38	0.03	0.04	0.41	0.30	0.69	0.58	0.51	0.68	0.69	0.74	0.69
FHZN SW Equity	Flughafen Zuerich AG	0.14	0.14	0.37	0.09	0.10	0.28	0.30	0.47	0.66	0.49	0.54	0.61
FLU AV Equity	Flughafen Wien AG	-	-	-	0.67	0.48	0.88	0.41	0.49	0.57	0.23	0.27	0.26
FRA GR Equity	Fraport AG Frankfurt Airport S	-	-	-	0.31	0.51	0.61	0.63	0.70	0.74	0.37	0.40	0.40
GAPB MM Equity	Grupo Aeroportuario del Pacifi	-	-	-	0.23	0.00	0.00	0.66	0.65	0.75	0.57	0.63	0.61
GMRI IN Equity	GMR Infrastructure Ltd	-	-	-	-	-	-	0.91	0.82	0.97	0.38	0.40	0.50
KBHL DC Equity	Kobenhavns Lufthavne	0.22	0.24	0.36	0.30	0.34	0.52	0.20	0.21	0.42	0.21	0.24	0.38
MAHB MK Equity	Malaysia Airports Holdings Bhd	0.97	0.10	0.12	1.12	1.11	1.11	0.70	0.66	0.79	0.67	0.85	1.07
MIA MV Equity	Malta International Airport PL	-	-	-	-	-	-	0.24	0.30	0.52	0.36	0.45	0.87
OMAB MM Equity	Grupo Aeroportuario del Centro	-	-	-	-	-	-	0.65	0.61	0.86	0.57	0.56	0.73
SAVE IM Equity	SAVE SpA/Tessera	-	-	-	0.87	0.05	0.07	0.38	0.46	0.70	0.18	0.21	0.25
SYD AU Equity	Sydney Airport	-	-	-	0.90	0.44	0.62	0.48	0.45	0.52	0.34	0.26	0.20
TAVHL TI Equity	TAV Havalimanlari Holding AS	-	-	-	-	-	-	0.39	0.30	0.38	0.40	0.38	0.25
TYA IM Equity	Toscana Aeroporti SpA	-	-	-	-	-	-	0.20	0.21	0.38	0.04	0.12	0.31
Average		0.48	0.16	0.24	0.66	0.48	0.55	0.60	0.57	0.69	0.59	0.60	0.66

Of the 26 companies, we are unable to get information on SAVE SpA/Tessera as it has been acquired and gone private. We are also unable to find public financial information on the four Chinese firms (firms listed on the Shenzhen or Shanghai exchanges) in the sample. We also exclude Aerodrom Nikola Tesla AD Beogr. because its reporting of its cash flow from investing activity is unclear and it seems to report intangible investments with spending on property, plant and equipment.

Our final sample contains HNA Infrastructure Company Ltd (HK listed), Beijing Capital International (HK listed), Airport Facilities Co Ltd, Japan Airport Terminal Co Ltd, Aeroports de Paris, Auckland International Airport, Airports of Thailand PCL, Grupo Aeroportuario del Surest, Flughafen Zuerich AG, Flughafen Wien AG, Fraport AG Frankfurt Airport S, Grupo Aeroportuario del Pacifi, GMR Infrastructure Ltd, Kobenhavns Lufthavne, Malaysia Airports Holdings Bhd, Malta International Airport PL[3], Grupo Aeroportuario del Centro, Sydney Airport, TAV Havalimanlari Holding AS and Toscana Aeroporti SpA.[4]

Figure 4 and 5 present the capex spending relative to market value of the firms (annual capex/EV) for the 2017 and 2016[5] years respectively.

[3] Malta airport appears to be going through changes of ownership, it appears to have highly concentrated ownership and it is unclear whether or not it is currently listed. However, it does have a public active Bloomberg ticker web page that gives a Market Cap, so we have kept it in the sample.

[4] Airport names come directly from the Commission's list and any incomplete names are a result of being cut off when the Commission published its list.

[5] For the 2017 market value we take market cap as at 14/06/2018 and the most recent annual filing reported debt. For the 2016 market cap we assume shares outstanding have not changed and the market cap changes by the change in price over exactly one year. We do this because shares outstanding data in annual reports for some firms is unclear but price data on the public Bloomberg pages is reliable. We assess all changes for any clear indication of major split or share issuances/buy backs and all outcomes are reasonable.

Figure 4: 2017 market- value capital spending intensity

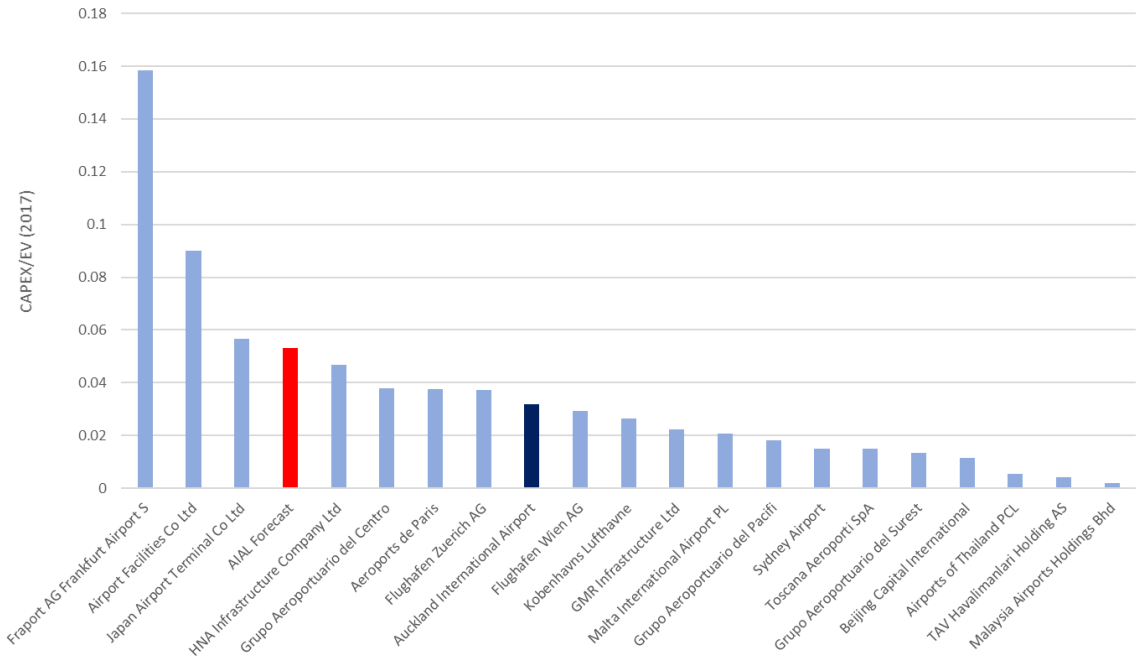
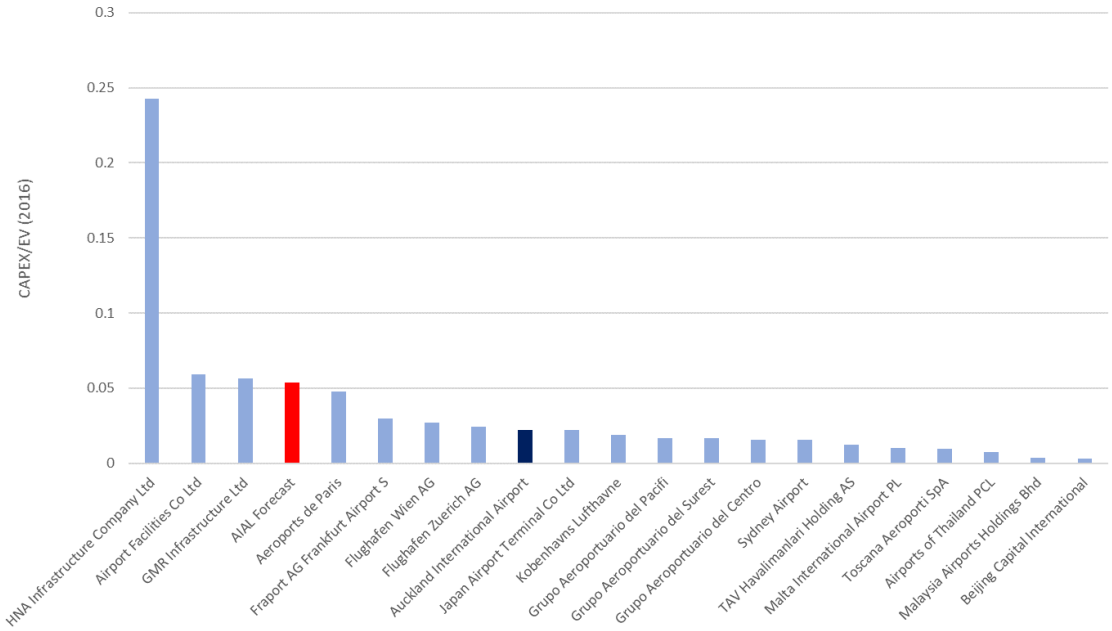


Figure 5: 2016 market-based capital spending intensity



In Figures 5 and 6 the dark blue line represents AIAL's actual capital expenditure (FY16 - $217m and FY17 – $375m) divided by its Enterprise Value. The red line represents the average annual level of AIAL's capital expenditure ($550m – being $470m regulated activities capex and $80m investment property) divided by its 2017 and 2016 Enterprise Value for the respective figures. AIAL's current capital spending intensity is middle of the pack. The peak spend intensity in the next pricing period is at the top of the range, but well below the peak comparator. In both time periods, one company stands out as having very high capex intensity, but it is a different company in each year. This would be expected, with lumpy capex projects from time to time being a feature of airports.

The above analysis tends to suggest that AIAL's current (FY17) capex intensity is around average airport levels and spending intensity through PSE3 is above, but not massively above, the average of the comparator group.

Figure 6 and 7 presents the same analysis for annual capex/total book value of assets. The results are similar to the market-based estimates above.

Figure 6: 2017 book-value capital spending intensity

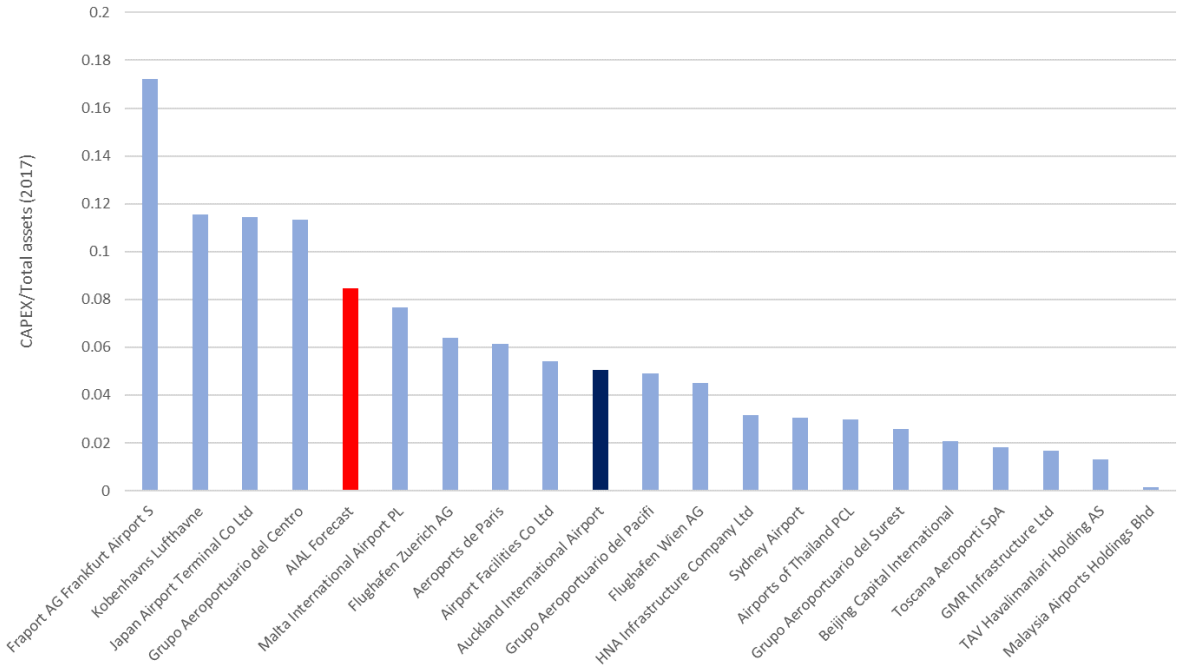
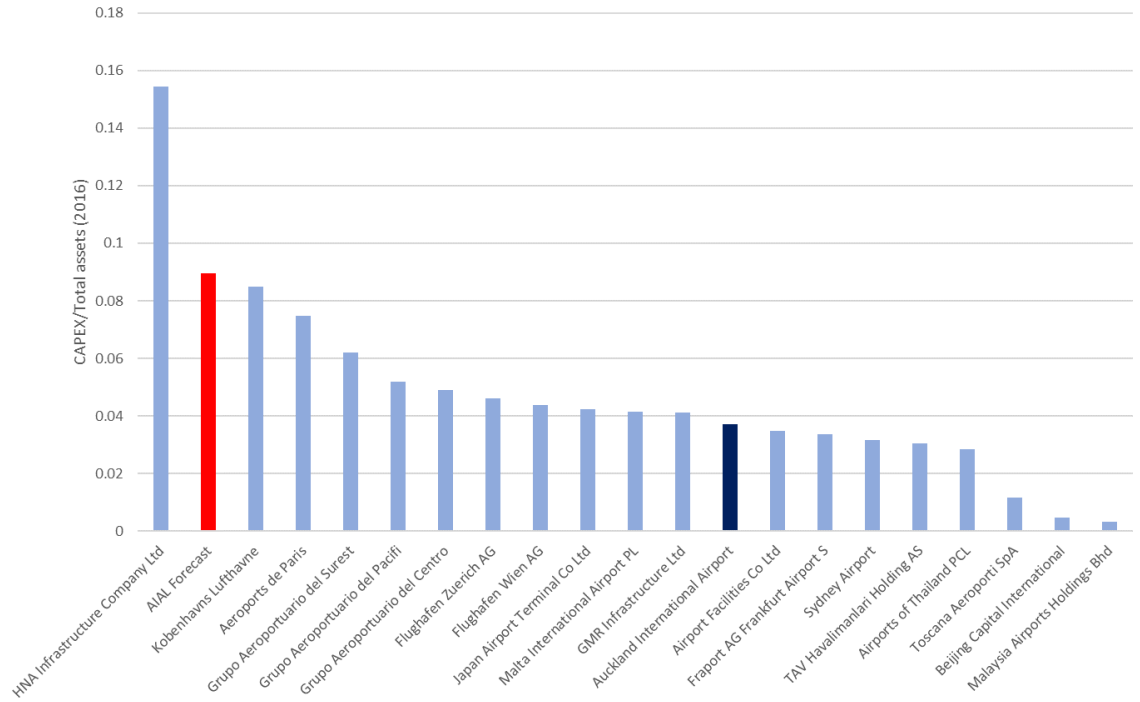


Figure 7: 2016 book-value capital spending intensity



The above analysis highlights that in-terms of capex intensity, AIAL is likely to move up the sample but it is unlikely to become an extreme outlier in the sample. Furthermore, as noted in BARNZ's previous submission on this topic, there is increasing global demand for air travel and other airports in the comparator sample have noted commitments to undertake large future capex spending. This indicates that high capex for individual firms in the sample over specific time periods is likely to continue and even increase, both in terms of the number of firms and the level of spending intensity, which in our opinion places more doubt on the case for departing from the Commission's IMs.

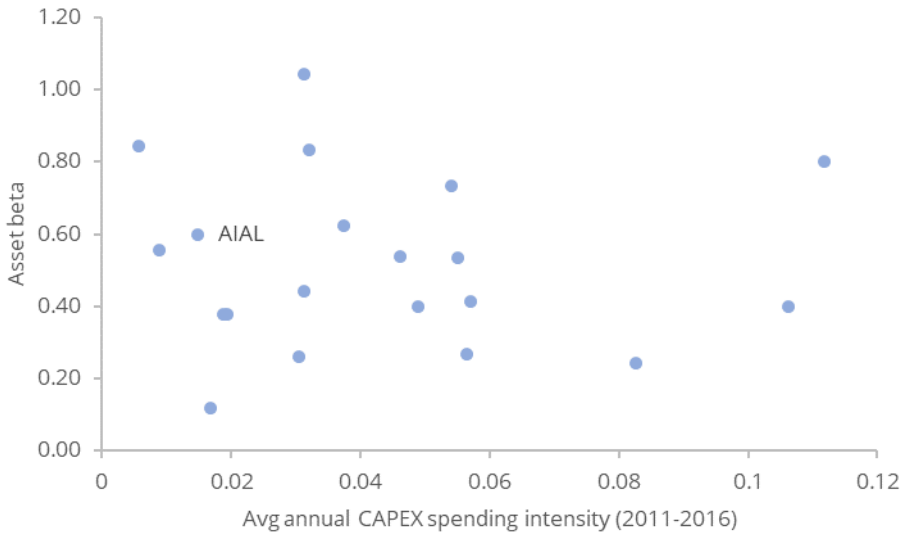
5.3 Capex intensity and asset beta relationship over a pricing period

We now consider the relationship between capex intensity and estimated asset beta over a pricing period. This is an attempt to take a deeper or second look at the previous analysis conducted by NERA.

Taking the five-year asset beta estimates directly from the Commission we collect total assets and capex data on each firm from annual reports over the comparable five-year period. For each year we calculate capex relative to the total book value of assets. Given the asset betas for the individual companies are five yearly and we only have reliable balance sheet and cash flow data for more recent years, we compare the average annual capex intensity for 2011-2016 (technically six observations, but the relationship does not generally change if we exclude 2011 or 2016 annual data points) for each firm with the 2011-2016 asset beta estimated by the Commerce Commission.

Figure 8 below presents a scatter plot of the relationship, with the weekly asset beta estimates on the *y-axis* and the average annual capex intensity on the *x-axis*.

Figure 8: Scatter plot of asset beta estimates and average annual capex intensity



The correlation between the two calculates to be -0.048. Although the relationship is negative (the opposite of what might be expected) it is not statistically significant. It is hard to conclude much from the coefficient and the scatter plot because of the small absolute size of the coefficient and the dispersion of the points.

To further/more formally analyse this relationship we regress capex intensity on asset beta and the result is presented in Table 4 below.

Table 4: OLS results

Regression Statistics	
Multiple R	0.048323223
R Square	0.002335134
Adjusted R Square	-0.053090692
Standard Error	0.244146631
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	1	0.002511314	0.0025113	0.04213079	0.839674
Residual	18	1.072936394	0.0596076		
Total	19	1.075447708			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.540243514	0.097917122	5.5173549	3.07318E-05	0.334527	0.74596	0.3345273	0.74595975
CAPEX intensity	-0.387334769	1.887064219	-0.205258	0.839674017	-4.35191	3.57724	-4.3519096	3.57724004

As expected (due to the small negative correlation coefficient), the regression coefficient is negative but insignificantly different from zero. Meaning again there is no clear relationship between the two over the five-year period. This makes sense as things are smoothed over time and this is somewhat the point of relying on a sample.

There are clearly several caveats to the above analysis and how conclusive it is. We have adopted book value of assets because we do not have access to market data for the five-year period. There are clearly several other caveats to this finding such as we are averaging – which may impede the sampling, the period may need to be lagged (as the betas may be further forward looking), we may need time or firm fixed effects, we are estimating over a relatively small sample and it is a simple single variable OLS so may suffer from omitted variable bias and endogeneity. However, we are not aware of any evidence that changes in these regards are likely to make a significant difference to the results.

The above analysis supports our contention that the impact of capex on beta is small.

Lastly, we note that we conducted this analysis with single year measures of capex intensity (2016 and 2017) based on market and accounting enterprise value and again found no significant relationship.

6. Additional comment on rating agencies' and equity analysts' views

In NERA 2 there is a section "2.2.2 Rating Agencies view large capex programmes as a risk". We accept that as true. However, no effort is made by NERA to distinguish risk from systematic risk. Rating agencies are concerned about total risk – systematic and non-systematic. In particular, as noted in the quote from S&P, the main concern is that the programme will increase leverage. Because asset betas are adjusted for different leverage, and notional leverage is applied to re-levering under the NZCC assumptions, WACC is relatively invariant to capital structure. Also, AIAL can fund its programme in a number of ways including borrowing, raising further equity and reducing dividend.

Equity analysts also look at total risk – they are looking for potential positive or negative alpha in making their recommendations so look at both downside risks and excess returns from any investment programme. Unless specifically stated they are likely to focus more on non-systematic risk (eg, poor investment decisions, cost overruns etc) than systematic risk.

7. Conclusions

Estimating beta with precision is difficult. There are many factors, including statistical noise, which affect the returns of a specific company. The Capital Asset Pricing Model is based on the premise that for portfolio investors much of the volatility in returns for an individual company can be diversified away. The remaining degree of exposure to market-wide or systematic risk is what beta is trying to measure. NERA's analysis shows that calculations of AIAL's beta vary considerably depending on the estimation periods and over time. For this reason, it is common to use an average of a group of comparable companies when determining beta. This gives a larger sample from which to obtain a more accurate and stable estimate of the beta appropriate to that industry.

To check that the industry beta is appropriate for the individual company under consideration, known factors related to systematic risk are often considered, and if necessary an adjustment made to the average industry beta.

It is likely airports have a fairly similar operating cost structure because the nature of the operations undertaken is very similar. However, capital expenditure is lumpy, as shown in our analysis of the comparator group. A commitment to major capital expenditure represents a temporary additional fixed cash outflow. We have reviewed the level of capital expenditure of the comparator group and found that AIAL's most recent levels of capex have been mid-pack, but over PSE3 could be above average, but not the highest.

When we calculated the impact of increased capital expenditure commitments on AIAL's beta (in a similar manner to the financial leverage adjustment), this yielded an indicative adjustment over the PSE3 period in the order of a 0.01 - 0.02 increase – ie, very small in the general estimation error of beta. For projects with a long gestation period the building blocks approach means that increased operating leverage is offset by a certain return achieved through compounding work-in-progress into the Regulated Asset Base. This calculation could be refined with knowledge of exactly how much expenditure will be contractually committed, and the period for which it is protected under the building blocks approach at various points over the PSE3 period.