AUCKLAND AIRPORT'S ESTIMATE OF BETA

Prepared for Auckland Airport

John Earwaker

Dr Harry Bush CB

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About the authors

John Earwaker is a director of the UK economic consultancy First Economics. He has over 20 years experience working in regulation in the UK and overseas, working with companies and regulators on cost of capital assessments in the aviation, energy, rail, telecoms and water sectors. He is a current member of the UK Competition & Markets Authority's expert Cost of Capital Panel.

Dr Harry Bush CB was for eight years to 2011 the UK Civil Aviation Authority Board member responsible for setting price caps for the UK's designated airports (then Heathrow, Gatwick and Stansted) and for NERL, the UK's privately operated air traffic service provider. He oversaw all of the CAA's cost of capital work during this time.

1. INTRODUCTION

This paper, commissioned by Auckland Airport, contains an independent perspective on Auckland Airport's calculation of its airport service beta. We have been asked to consider:

- the extent to which an asset beta derived from AIA's share price is likely to provide an accurate representation of the riskiness of Auckland Airport for the purposes of calculating a cost of equity;
- the usefulness of empirical estimates of the betas of listed global airport companies; and
- in light of our analysis, how the Commerce Commission and other stakeholders should assess Auckland Airport's approach to calculating its cost of equity, and in particular the weight to be given to AIA's own asset beta relative to other evidence.

The paper explains that:

- it is reasonable for Auckland Airport to attach greatest weight to AIA's beta when assessing its WACC and setting prices - this is consistent with UK regulatory practice;
- there are steps that Auckland Airport can take to minimise any estimation error when calculating the beta of a single company;
- a comparator group of global airports can play a role in this as a cross-check on Auckland Airport's own beta; however
- simply defaulting to the global average beta is not appropriate since airports are heterogeneous businesses with potentially very different exposures to systematic risks. This heterogeneity means that the average beta produced by the group cannot be regarded as a low variance estimate of the Auckland Airport beta.

2. BACKGROUND AND PRELIMINARIES

2.1 The concept of an asset beta

Auckland Airport is regulated under an information disclosure regime, which, among other things, requires the airport to explain the methodologies that it uses to calculate the prices of specified airport services. One key input within the pricing methodology is the rate of return that the airport targets when it sets charges. This target rate of return is in turn informed by Auckland Airport's estimate of its weighted average cost of debt and equity capital, i.e.:

$$WACC = g \,.\, K_d + (1 - g) \,.\, K_e$$

where K_d is the cost of debt, K_e is the cost of equity, g is a measure of gearing, and WACC is the resulting weighted average cost of capital.

The cost of debt is observable and directly measurable for many companies, thus lending itself to a benchmarking exercise. However, the cost of equity is inherently unobservable and must be estimated using theoretical models. The model used by Auckland Airport – which is also the model used by the Commerce Commission and by many regulators in other jurisdictions – is CAPM, which

relates the after-tax cost of equity to the risk-free rate (R_f), the expected return on the market portfolio (R_m), and a business-specific measure of investors' exposure to systematic risk (beta or β_e):

$$K_e = [\ R_f + \beta_e . (R_m - R_f)\ ] / (\ 1 - t\ )$$

The focus of this paper is on just one of the parameters in this formula: beta. A firm's equity beta is a measure of the riskiness of a firm – or more specifically, a measure of the systematic risk that a firm presents – relative to the market portfolio. Firms that exhibit a beta of more than 1 can be considered more risky than the average firm in the portfolio and need to pay their investors a higher-than-average return; firms with a beta of less than 1 are less risky and warrant lower returns; and firms with a beta of exactly 1 are seen by investors as being of equal risk to the market portfolio and are expected to generate a return in line with R_m.

Empirical estimates of beta can be obtained by measuring the covariance between movements in a company's share price and movements in the value of the stock market as a whole. Such estimates are sensitive to the capital structure that a company chooses for itself: all other things being equal, the riskiness of a firm's equity returns will increase as its gearing increases and it commits to paying out more of any profit it earns to lenders in fixed interest payments. A regulator may wish to separate the intrinsic riskiness of a firm from the choice of capital structure and this is where the concept of an asset beta proves useful. An asset beta is a hypothetical measure of the beta that a firm would have if it had no debt and were financed entirely by equity. By focusing on asset betas it becomes possible to isolate the underlying systematic risk that a company has and carry out a comparative assessment of the riskiness of different businesses.

The asset beta is calculated using the following formula:

$$\beta_a = (1 - g) . \beta_e + g . \beta_d$$

where β_a is a firm's asset beta, g is gearing and β_d is the firm's debt beta.

2.2 The Commission's input methodology

As part of the information disclosure regime, the Commerce Commission publishes a cost of capital input methodology (IM) which it applies when analysing and appraising the pricing methodologies that the regulated airports use to set charges. The Commission's current IM built an estimate of beta via the following steps:

- point estimate of airport asset beta – the Commission assembled a sample of 26 international airport companies with stock market listings and calculated the average airport asset beta;
- downward adjustment – it then made a downward adjustment to reflect its sense that the regulated aeronautical service is likely to be less risky than the unregulated, non-aeronautical activities that airports engage in.

In settling on this approach back in 2010, the Commission considered and ultimately rejected a number of arguments put forward by other parties. These included:

- comparability of the international airports – the Commission decided that it could not realistically make an airport-by-airport assessment of the comparability of the different airports to those in New Zealand, nor could it make adjustments up or down to control for differences in, say, the regulatory regimes in different countries; and
- differentiation of Auckland, Christchurch and Wellington airports – the Commission decided that, although it accepted that different airports might in principle face different levels of systematic risk, it could not practically set different betas for each individual airport and would instead calculate a single airport service beta.

2.3 Auckland Airport's approach

In its 2017 *Final Pricing Decision for Standard Charges: Reasons Paper*, Auckland Airport explained that it considers empirical estimates of AIA's beta to be the best source of information about investors' perceptions of the risks around future returns at the airport. It highlighted, in particular, how the airport is embarking on a major capital investment programme and sought to show how the risks created by this capital expenditure would differentiate Auckland Airport from other airport companies.

In its pricing decision Auckland Airport nevertheless chose to aim off its airport-specific WACC estimate containing a beta that aligns exactly to the most recent estimate of the AIA beta. Instead, it opted to target a rate of return that sits between the Commission's IM WACC and its own airport-specific WACC, thus, in effect, giving weight both to the comparator beta evidence cited by the Commission and to the information that the AIA beta reveals.

3. ASSESSMENT

Although Auckland Airport did not publish precise point estimates to any individual cost of capital parameter, its approach to beta and its preference more generally for a WACC that is tailored as directly as possible to the risks that investors face in Auckland Airport, as distinct and separate from risks faced by airports generally, has been flagged by the Commission as something that merits further scrutiny.

The main contribution that we think we can make to this debate is to observe that that there is a trade-off to be made between:

- the smaller estimation error that one can often obtain by using bigger sample sizes (as in the Commission's IM); and
- the likelihood of obtaining more direct insights into the riskiness of Auckland Airport from one particular data point – i.e. the AIA beta.

Because these factors pull in opposite directions, care has to be taken when considering the benefits and the costs that there are in steps that lead either to an expansion or a narrowing of the evidence base from which estimates of Auckland Airport's beta are drawn. We elaborate on this below.

3.1 Sample sizes

One of the challenges that there is in using empirical estimates of beta is that there are limited data points from which to observe the long-term relationship that that there is between the value of a firm and the value of the market portfolio. Because of the "noise" that there is in share price data,[1] any point estimate of beta for any individual firm inevitably comes with a non-trivial standard error. As an illustration of this, we tabulate below the average standard errors that the Commerce Commission has previously reported for 26 global airport companies.

Table 1: Average standard error in asset beta estimates across 26 global airport companies

Beta statistic	**Average standard error**
Daily	0.27
Weekly	0.25
4-weekly	0.25

In its IM the Commission cited a slightly lower average standard error of 0.16. This still means that a 95% confidence interval for the beta of any individual company typically extends to ±0.31 around any observed point estimate. It can be seen straight away that the width of this confidence interval is problematic in that an estimation error on this scale equates to a ±250 basis points increase or reduction in the calculated cost of equity[2] – i.e. a margin of error that, if it were to flow through into charges, would translate into substantial supernormal or sub-normal profit for the regulated firm.

The Commission when it has previously contemplated the difficulties that large margins of error cause has taken the view that it can reduce the margin of error around its estimate of the airport service beta by looking at the average beta across a wide sample of airport companies. The implicit assumption appears to be that expanding the underlying data set and making use of a greater number of airports is tantamount to increasing the number of observations of the "true" beta for a firm that is engaged in the provision of airport services.

There is a theoretical basis for this position. When a sample is taken from a distribution with mean μ and variance σ, the distribution of sample mean has a mean of μ and a variance of $\sigma/\sqrt{n}$. It follows that the accuracy of the sample mean as an estimator of μ increases as n grows larger. All other things being equal if there is an opportunity to obtain a bigger sample size, a researcher engaged in empirical analysis will usually take that opportunity to improve the precision of their quantitative analysis.

[1] This noise will most obviously take the form of company-specific news that moves the share price of the firm. A simple covariance calculation will not be able to distinguish between (a) coincidental correlation between movements in a firm's share price and changes in the value of the market as a whole and (b) correlation that is caused by common exposure to systematic risk.

[2] Assuming a market risk premium of 7%.

There is, however, an important proviso. Additional data points only have any worth if they are drawn from the same population as existing data points. If this is not the case and if the additional observations are being drawn from a distribution with, say, mean μ_1 or μ_2 or μ_3, rather than μ, the expansion of the sample size does not contribute to a more accurate estimate of μ. Rather, the additional observations can serve to bias the sample mean away from μ.

It should not be, therefore, that there is always and everywhere a preference for more data points. When we see the Commission using empirical estimates of betas from 26 global airport companies, we think it is important to ask if the large sample size is helping to improve the precision of the estimate of the "true" beta for Auckland, Christchurch and Wellington airports or whether what is actually happening is that the Commission is aggregating observations of different "true" betas into some sort of rough-and-ready, global industry average, the value of which should be expected a priori to be above or below the Auckland, Christchurch and Wellington betas.

3.2 The Commission's comparator sample

We pointed out in our August 2015 paper[3] that airports often exhibit very different characteristics in at least the following areas:

- capacity utilisation – airports can be in very different positions with respect to capacity utilisation. At one extreme, there are some established airports where demand for take-off and landing slots exceeds supply. These airports are relatively robust in the face of economic shocks. Other airports are less mature and cater to more marginal traffic. These airports typically exhibit much greater sensitivity to systematic risks;

- competitive constraints – a closely related factor that defines the riskiness of an airport to an investor relates to the degree of competitive constraint on pricing. An airport that faces limited threat from competition and which can price to some extent independently from the market may be in a better position to maintain its profitability over the economic cycle (though even such airports may be constrained in a downturn by the economics of their airlines). An airport facing greater competition will be more exposed to market uncertainty;

- passenger and airline mix – such differences can be exacerbated by the passenger and/or airline mix at an airport, which will, in turn, vary depending on the mix of international versus domestic traffic. Business and leisure travellers exhibit different sensitivity to systematic risks. The same is true of full-service scheduled carriers, charter carriers and low-cost carriers. This will normally feed through into investor perceptions of an airport's riskiness;

- traffic composition – long haul and short haul traffic may respond differently to both demand and supply shocks. In particular, the former is likely to be affected more by oil price changes given the greater distances involved;

[3] Bush/Earwaker (2015), Evidence relating to the WACC percentile for airports.

- buyer power – some airports are heavily dependent on one or two airline customers. This can give rise to buyer power and constrain an airport's ability to alter its prices in response to economic events. Other airports with a more diverse client mix may not face the same constraints;

- state involvement – an airport's response to economic shocks can sometimes be conditioned by government involvement in the aviation sector. There is a spectrum between airports that operate on a fully commercial basis and airports whose pricing and other decisions are made with wider economic and social considerations in mind;

- regulatory framework – the allocation of risk between airport and users is also very heavily influenced by economic regulation. It is noticeable that there tends to be much greater diversity of regulatory approach in the airport sector as compared to other regulated industries, including: the use of dual till / hybrid till / single till regulation; monitoring versus price cap approaches; and the protections that airports have against other uncertainties. This naturally leads to different exposures to risk and different betas; and

- geographic location – some of these factors will present themselves through the prism of location which may reflect countries' different stages of economic development and/or the centrality of the airport to air transport within a country or broader region, factors which may affect investor perceptions.

Given these differences, we do not think that there can be any presumption that all airports have the same exposure to systematic risk or have the same "true" beta.[4] This is particularly the case when we consider that the Commission's sample of 26 airports is a global sample comprising companies that operate in 14 different countries and 4 different continents. Table 2 reproduces the list of comparators.

[4] We would not necessarily make the same argument in the case of other regulated sectors. As an example, there is an argument that revenue cap regulation for network utilities has created a class of companies across several countries that have certainty of revenue over broadly similar time horizons and face similar cost risks. It is not wholly unreasonable to imagine that investors might perceive these companies to be a class of very similar investments – a line of thinking that points towards the kind of large sample comparator analysis that the Commission has applied in its estimation of electricity and gas network betas.

Table 2: The Commission's IM comparator set

Airport company	**Country**	**Number of airports by country**
AIA	New Zealand	1
Sydney Airport	Australia	1
Flughafen Wien	Austria	1
Beijing Capital International Guangzhou Baiyun International HNA Infrastructure Shanghai International Airport Shenzhen Airport Xiamen International Airport	China	6
Kobenhavens Lufthavne	Denmark	1
Aeroports de Paris	France	1
Fraport	Germany	1
Toscana Aeroporti SAVE	Italy	2
GMR Infrastructure	India	1
Airport Facilities Japan Airport Terminal	Japan	2
Malaysia Airports	Malaysia	1
Malta International Airport	Malta	1
Grupo Aeroportuario del Centro Norte Grupo Aeroportuario del Pacifi Grupo Aeroportuario del Surest	Mexico	3
Aerodrom Nikola Tesla	Serbia	1
Flughafen Zuerich	Switzerland	1
Airports of Thailand	Thailand	1
TAV Havalimanlaria	Various countries	-

A much more reasonable hypothesis is that heterogeneous airports with such very different sizes, operating characteristics, market reach and location will be perceived very differently by investors. Some airports on this list will embody more country risk than others, some will be more sensitive to oil price volatility, some will embody greater growth potential than others, while still others will for reasons of capacity utilisation or their hub characteristics be viewed differently from airports that are more marginal to global air transport networks.

In our opinion, the wide dispersion of betas evidenced in the Commission's comparator sample (i.e. from 0.12 to 1.23 in the period 2011-16) is likely to be partly a function of these different risks. It must also be the case that some of the dispersion is due to sampling error, but it would be wrong to think that noise is the only factor. This is important because, using the notation of section 3.1, if each of the airport betas has a different value – μ_A, μ_B, etc. through to μ_Z – then the sample mean cannot be regarded as a low-variance estimate of the Auckland Airport beta but rather it is an average of multiple different beta values, some of which pull the sample mean up and others of which serve to pull the sample mean down.

It follows that a simple averaging of this group's betas will therefore only by coincidence tell us anything about the beta of any individual airport within the group.

3.3 The usefulness of the AIA beta

The AIA beta offers a single observation of Auckland Airport's exposure to systematic risk. We note that:

- AIA has been listed since 1998, giving a long run of empirical data;
- there is liquid, daily trading in AIA's shares;
- the vast majority of AIA's revenues and profits are earned at Auckland airport, with the group engaging in very few activities outside of this site;
- AIA's share price can be assumed to reflect investors' collective best estimate of the discounted value of future equity returns from the airport's operations; and, similarly
- movements in AIA's share price are likely to be due to investors' reaction to new information about factors that will impact on future airport earnings, including through their perceived impact on traffic volumes, revenues and costs.

The AIA beta therefore stands out from table 2 as the only data point that can be said to be an observation of the "true" Auckland Airport beta. It would therefore seem natural and obvious that the AIA beta should have a different, unique status in any exercise to estimate Auckland Airport's cost of capital.

The concern that there might be about relying too heavily on the AIA beta is that a single observation of beta comes with a relatively wide standard deviation. However, there are steps that one can take to minimise any estimation error:

- sensible selection of beta statistics – some methods of estimating betas are inherently more imprecise than others – e.g. anyone that uses a 1-year, monthly beta has to accept a very wide standard error. There are, though, simple precautions that can be taken in relation to data frequency and time period to secure a basic level of accuracy in beta estimates.
- averaging of betas – some practitioners recommend looking at a basket of beta estimates, calculated using different sampling frequencies and over different time periods. Either averaging across these different measures or, less formally, stepping back and taking stock of

the overall picture that the figures present will eliminate some of the noise in the calculations; and

- history – it can be helpful to consider the value of beta over longer horizons. Repeated sampling over a period of, say, five or ten years creates a pool of observations in which, once again, short-term, one-off factors tend to cancel each other out.

In our experience, it is almost always eventually possible to obtain useful insights as regards a regulated firm's actual beta after a comprehensive interrogation of share price movements. We would not wish to pretend that beta estimation is a precise science or that there is not a need for some degree of judgment when interpreting the evidence, but equally it is unnecessarily defeatist to say that the magnitude of the standard error around any single point estimate of beta renders it impossible to use a singleton company as the anchor for a CAPM cost of equity calculation.

We would also stress again that concerns about sampling error also have to be weighed against the scope for introducing other sources of error. Any imprecision in the observed AIA beta, once the kind of safeguards identified above have been implemented, has to be set against the error that can come from adding unlike comparator evidence to the sample. The scale of the divergence in airport betas, reflecting differences in risk profiles at different airports, means that the biases that will be introduced by adding data points with "true" betas μ_A, μ_B, μ_C etc. to the comparator sample could well outweigh any sampling error benefit. Given this possibility – even likelihood – there are clear merits to basing an assessment of beta on an observation which is clearly related to the riskiness of the airport in question. We now consider how this might best be done.

3.4 Assessment

The key issue is the weight that is to be placed on the AIA beta versus the weight that is to be placed on comparator evidence.

The Commission's IM gives the AIA beta a weight of 1/26th. In effect, the Commission is saying that the AIA beta contains information of equal usefulness to the beta of any other listed airport company, wherever it is located in the world. We think that this is a disproportionately low weight to place on the only direct observation of the Auckland beta. This is particularly so when one considers that the Commission's sample gives much higher weight to observed betas in countries that sit at quite a distance from New Zealand, both literally in terms of geography but also in relation to many of the other factors identified in section 3.2. For example, we note that the weight afforded to betas from China is 6/26ths and the weight given to betas from Mexico is 3/26ths.

There are a number of ways in which the AIA beta could have been / can be given greater prominence by Auckland Airport when it sets its charges. It could:

- downsize the comparator set, with an eye to retaining only the airports that are thought to be close, like-for-like comparators;
- explicitly increase the weight that it gives to the AIA beta and reduce indirectly or directly the weight that it gives to some or all of the international airports; or

- take an entirely different approach, in which the AIA beta is taken out of the comparator analysis and given status as a stand-alone piece of evidence in its own right.

We would advise against the first of these approaches. All of the international comparator airports sit a long way from the New Zealand market and are likely to exhibit differences against most or all of the factors that we listed in section 3.2. We note that the Commission has said previously that it could not adequately assess the structure of the regulatory regime that each individual airport faces, nor could it meaningfully compare those regimes to the regulatory regime in New Zealand.[5] Similar concerns would attach to assessing the other features that might impact upon systematic risk. To think, therefore, that Auckland Airport could work through the full circumstances of more than 20 different airports and sort firms into 'good' and 'bad' comparators is a considerable stretch.

A similar point can also be made about the second approach. The difficulties in assembling an objective justification for restricting the comparator set are likely to be magnified for any attempt to assign precise weightings to each individual airport. We therefore echo the view that has been expressed by a number of stakeholders previously that there are advantages in assembling the largest possible comparator set and in calculating a simple average global airport beta from that comparator group.

Our advice is that it is sensible, however, to separate AIA's beta and the comparator analysis into two distinct pieces of evidence. In this way of approaching the estimation of beta, there is one task to estimate the AIA beta as the most directly relevant piece of information about investors' perceptions of the riskiness of Auckland Airport. There is then a second task to establish whether any further, additional insights can be obtained by looking at the betas of international airports. The first piece of work would provide a first estimate of the relevant service beta and the second piece of work would potentially allow for a cross- or a reasonableness check on that estimate.

The kind of approach that we are recommending would put the empirical comparator evidence on a par with the other forms of secondary benchmarking that the Commission put forward in paragraphs EE8.64 to E8.71 and paragraphs E8.115 to E8.116 of its December 2010 input methodologies decision. Just as the Commission found it helpful to refer to its previous decisions, airports previous beta assessments, and beta assessments made by airport regulators overseas, there would be similar logic in looking at the sense check (or otherwise) that the AIA beta gets from empirical estimates of listed, overseas airports' betas. For example:

- there might be a presumption that the AIA beta should be somewhere "in the pack" with global airport betas. If this were not the case, and if the AIA beta were a clear outlier, there might be a legitimate question mark about the reliance that can be placed on the AIA beta;
- if the comparator evidence shows that the AIA beta is above the global average, it might be necessary for Auckland Airport to justify as part of the information disclosure process why the risks its investors bear are higher than the risks that shareholders take at other airports; and

[5] Commerce Commission (2010), Input methodologies (airport services) reasons paper, paragraph E8.92.

- similarly, if AIA's beta had moved in a way that was atypical for an airport beta, having regard to recent comparator data, Auckland Airport might need to explain the factors that have caused investors' perceptions of riskiness to change before factoring that change in beta into a freshly calibrated target rate of return.

The steps we outline would, in our view, be the proper role for comparator evidence, in contrast to the IM approach of elevating the average global airport beta to be the primary lens through which stakeholders are to look at the cost of equity for a New Zealand airport. They would leave space for a more direct correspondence between the return that Auckland Airport targets and investor perceptions of riskiness at the airport, while still providing a useful sense check on Auckland Airport's estimate of its required return.

4. UK REGULATORY PRACTICE

During the last 30 years, there have been only two listed airport companies in the UK: BAA, which owned the regulated Heathrow, Gatwick and Stansted airports and a number of unregulated airports, and which had a stock market listing from 1986 to 2006: and TBI which owned a number of unregulated airports, and which had a stock market listing until 2004.

Looking back over the succession of price control decisions issued by the CAA, the Monopolies and Mergers Commission and the Competition Commission, it is apparent how the different decision-makers focused very tightly on the observed betas of the two listed companies when making their decisions, both for airports that were part of a listed group (i.e. the regulated BAA airports)[6] and unlisted airports (i.e. Manchester airport)[7]. Moreover, since BAA's delisting in 2006, the CAA and the Competition Commission have continued to place a great deal of weight on the recorded, now historical, BAA beta in preference to the evidence that interested parties have adduced on the betas of international airport companies and a variety of other beta estimation methodologies.

The following excerpt from the Competition Commission's 2007 report on the price controls at Heathrow and Gatwick airports is typical of the regulators' attitudes:[8]

> [Our] methodology gives considerable weight to empirical observations of BAA's historical share price movements. We believe that this approach to the estimation of beta provides by far the most robust insights into investors' perceptions of the riskiness of BAA's shares when it was a listed company and, through this, the riskiness of individual airports.
>
> BAA argued that we should treat data on the historical equity beta for erstwhile BAA plc, and figures derived from it, cautiously and instead give much more weight to indirect asset beta estimates … One method estimates the betas for regulated airports from similar estimates for other airport companies from around the world. We are not persuaded by this methodology. Other airports have different risk profiles from Heathrow and Gatwick and we are especially uncomfortable with the setting allowed returns for these two UK regulated airports in line with

[6] See, for example, Competition Commission (2002), BAA plc.
[7] See, for example, Competition Commission (2002), Manchester Airport plc.
[8] Competition Commission (2007), BAA Ltd: a report on the economic regulation of the London airport companies (Heathrow Airport Ltd and Gatwick Airport Ltd), appendix F, paragraph 77.

> betas for airports that are subject to different forms of regulation or, in certain cases, no regulation at all. Further, this approach lacks robust validation.

The CAA's most recent review, which concluded in 2014, more than seven years after BAA's de-listing, contains the most extensive discussion about the value of international comparators. The parties to the review at different times put forward estimates of betas for a total of 36 international airport companies. In its decision, the CAA concluded that the main use to which it could put this evidence was in identifying whether the betas of the closest comparator airports had declined since the last recorded observations of BAA's beta in 2006 and, hence, whether there might be reason to think that perceptions of Heathrow and Gatwick's riskiness might also have changed (NB: the CAA found that there was not).[9]

The Competition Commission / CAA approach sits squarely in line with UK regulatory methodology more generally. At the time of writing, there are only six owners of UK price-regulated businesses that have a UK stock market listing. UK regulators have nevertheless been content to base cost of capital estimates on empirical observations of the betas of these listed companies. This is especially apparent in the cases of:

- Ofcom's most recent telecoms cost of capital decisions for BT's regulated businesses, which contain estimates of beta that are drawn directly from empirical observations of the BT beta;[10] and
- Ofwat's most recent calculation of the beta for water and sewerage companies, which is based on empirical beta estimates for two firms (Severn Trent and United Utilities).[11]

In each of these cases, as well as the aforementioned airport price control reviews, it is also apparent how the regulators sought to deal with the problem of "noise" around the beta estimate for a singleton company in exactly the way we outlined in section 3.4 – i.e. by assembling a history of evidence, comprising different beta statistics calculated over differing time periods, and making an overall judgment as to where beta(s) appear to sit based on that evidence.

The UK regulatory approach is therefore clear: it is to use wherever available the most direct evidence for estimation of the beta and not to delve too far, or at all, into international comparator evidence. Most pertinently, this applies where there are extant stock market observations of the company in question. But even where there are no current specific company observations, the UK approach is to go to the closest piece of related evidence whether it be of companies in the same sector, as in the water case, or historical evidence as in the Heathrow/Gatwick cases.

5. CONCLUSION

Although a somewhat technical exercise, as evident from this paper, beta estimation is a critical aspect of airport regulation and pricing. It goes to the heart of ensuring that investors are properly

[9] CAA (2013), Estimating the cost of capital: a technical appendix to the CAA's final proposals for the economic regulation of Heathrow and Gatwick after April 2014.
[10] Ofcom (2018), Wholesale local access market review: statement.
[11] Ofwat (2017), Delivering Water 2020: our final methodology for the 2019 price review.

(neither under- or over-) rewarded for the capital they deploy and, in particular, for new investment which may be vital for customers. We have sought in this note to show why it makes sense therefore for Auckland Airport to rely first and foremost on the direct evidence available from the investor perceptions of AIA as embodied in its listed stock, with global comparator evidence playing a secondary, sense checking role. In arguing this, we do not suggest as a matter of principle that comparator evidence should always be of secondary importance. In other more homogeneous sectors, or in the absence of a company-specific beta, there may be more of a role for the sort of broad-based sample deployed in the Commission's IM – though even then there is likely to be a case for examining reliance on the closest possible comparator as a first port of call. But for AIA there is extant and current information stock market evidence on the riskiness of its airport business, and the really quite marked differences between airport businesses (reflected in beta divergence) make a global average a distinct second best when there is such direct evidence available.

We are, of course, alive to the issue of sampling error in observing a single piece of evidence. However, we think this is best dealt with through the deployment of sampling techniques which are designed to minimise standard error and/or maximise the number of useable observations and through the exercise of a degree of judgment when finalising the choice of a sensible beta point estimate. For the avoidance of doubt, we do not recommend that the beta used by Auckland Airport in its pricing should always and everywhere flow directly from market observation, but rather we suggest that account should also be taken of its positioning within the global sample with divergences explained and/or adjusted for. In this way, the global comparator group plays a useful benchmarking role. It would be for AIA to explain the positioning of its beta relative to the group. But to be clear, we would expect it to have to do so because of the inherent limitations for airports of any global averaging exercise. As we suggest, it is likely to be only by coincidence that the global average will tell us anything about the riskiness of individual airports within the group.