NERA
ECONOMIC CONSULTING

Response to the NZCC's View on Auckland Airport's Asset Beta

A Report for Auckland International Airport Ltd

29 May 2018

Project Team

Dr Richard Hern
James Mellsop
Dominik Huebler
Dr Will Taylor
Philipp Kroeger
Lorenz Wieshammer
Robin Mamrak

NERA Economic Consulting
151 Queen Street
Level 18
Auckland, New Zealand, 1010
Tel: 64 9 9283290
www.nera.com

NERA Economic Consulting
Marble Arch House, 66 Seymour Street
London W1H 5BT
United Kingdom
Tel: 44 20 7659 8500
www.nera.com

Contents

1. Introduction and Summary 1

2. Operating Leverage 4
2.1. Operating Leverage for regulated entities 4
2.2. Independent support for NERA's measures of OL 7
2.2.1. Regulatory precedent 7
2.2.2. Rating agencies view large capex programmes as a risk 14
2.2.3. Equity analysts 17
2.3. Further measures show AA has high and increasing OL 18
2.4. Bloomberg measure of OL with fundamental shortcomings 20
2.5. Summary 22

3. Adjusting the Asset Beta for High Operating Leverage 24
3.1. The comparator sample may reflect lower regulatory risk and suffers from data irregularities 24
3.1.1. Lower risk regimes 24
3.1.2. Insufficient liquidity 26
3.1.3. Average asset beta for restricted comparator samples 27
3.2. Recent empirical evidence on AA's own beta supports the Target Rate of Return 29
3.2.1. AA's observable beta reflects the increased riskiness on the airport from the investment programme 29
3.2.2. There is regulatory precedent that AA's empirical beta should be given the most emphasis in assessing the correct beta for cost of equity 31

4. Conclusion 33

Appendix A. Summary of International Airport Regulatory Regimes 35

Appendix B. Auckland Airport's Weekly Five-Year Rolling Asset Beta 38

Appendix C. Bloomberg OL measure with high fluctuation at company level 39

1. Introduction and Summary

In its draft summary and analysis of Auckland Airport's ("AA") pricing decision for July 2017- June 2022 ("PSE3"),[1] the New Zealand Commerce Commission (NZCC) has reached the draft conclusion that Auckland Airport has not yet sufficiently justified its target returns over PSE3.

This is based on Auckland Airport's target return of 7.06% being higher than the NZCC's mid-point airport industry weighted average cost of capital (WACC) of 6.41%. The NZCC notes the difference in WACC is equal to an implicit upward adjustment of the asset beta by 0.08 relative to the NZCC industry wide asset beta estimate for aeronautical activities.

One aspect of Auckland Airport's reason for targeting a return higher than the NZCC's WACC midpoint is Auckland Airport's assessment of its systematic risk, including the impact of its capital expenditure programme on that systematic risk. Part of this assessment, based on advice from NERA,[2] is that the step change increase in capex over PSE3 means that Auckland Airport will face higher operational leverage (OL) than the comparator sample used by the Commission to generate its industry-wide asset beta estimate. OL is the extent to which costs / cash outflows are fixed and therefore a firm can respond to shocks.

The NZCC considers that an adjustment to the industry asset beta estimate may, in principle, be justified if a supplier can demonstrate that:[3]

- its operating leverage is (or is expected to be) significantly higher than the companies in the comparator sample; and
- the difference is of a magnitude that can reasonably be expected to meaningfully impact asset beta.

While the NZCC agrees with the general finding from the literature that OL can increase the asset beta its draft report found that:

- relatively high capex over a short period does not by itself demonstrate that Auckland Airport has higher operating leverage than companies in the sample;
- data on EBIT growth divided by revenue growth – a measure of OL calculated by Bloomberg – suggests Auckland Airport is similar to the average of the sample;
- Auckland Airport has not discussed whether the link between operating leverage and beta would be affected by features of its approach to setting prices.[4] For example: could its approach to setting prices and /or its ability to reset prices partially mitigate the risk to earnings from higher operating leverage?

[1] Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022).

[2] NERA (23 March 2017): A Peer Review of Auckland Airport's Approach to WACC and Target Return for Aeronautical Pricing.

[3] Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), p. 107, para 118.

[4] The NZCC also queried whether the operating leverage for the comparators will not change materially over the forecast period. As we highlight in section 2.3, the future development of OL for the comparators does not affect the result and hence this issue appears to be of limited relevance.

- Auckland Airport relies on estimates of its own asset beta to capture the expected impact of its operating leverage. However, the NZCC considers that asset beta estimates for a single company are unreliable – it believes there is a significant risk of estimation error when focusing on the observed beta for an individual company.

Therefore, the NZCC has requested further evidence in relation to:

- An empirical comparison of a robust estimate of Auckland Airport's forecast operating leverage over PSE3 against comparable estimates of the degree of operating leverage for other companies in the comparator sample;

- Views from independent parties, such as rating agencies or research brokers, indicating whether a forecast increase in operating leverage for other companies in analogous situations was expected to increase the regulated or corporate WACC; and

- Whether other regulatory agencies have made asset beta adjustments due to operating leverage of a similar magnitude to that of Auckland Airport.

We have been asked by Auckland Airport to consider the NZCC's initial assessment of Auckland Airport's asset beta adjustment and the specific evidentiary request repeated above. Our conclusions are as follows:

- Regulators and ratings agencies recognise the link between capex and systematic risk, with variation in cash flows a key issue for regulated airports (independent of volatility in profits). We review a number of examples where regulators have awarded absolute and / or relative asset beta uplifts of comparable size to the difference between the asset beta implicit in Auckland Airport's target rate of return and the NZCC's disaggregated value for the comparator sample;

- For its draft report, the NZCC relies on the measure of "degree of operating leverage" provided by Bloomberg, defined as the percentage change in EBIT relative to the percentage change in revenues (EBIT growth/revenue growth). However, this Bloomberg measure of operating leverage fluctuates wildly across companies and years and suffers from a host of missing entries (also see the appendix), which suggests that it cannot be used as a reliable indicator of OL; especially as it does not capture the cashflow impact of capex (which is not a P&L item reflected in EBIT) in the first place;

- Focusing (appropriately) on cashflow based measures of OL that are affected by capex suggests that Auckland Airport's current and particularly forecast OL is higher than the comparator sample;

- Whether the OL of firms in the comparator sample is expected to increase or not is irrelevant to the current exercise – the question at hand is whether Auckland Airport's *forward looking* beta is higher than the *historical* beta of the comparator sample (including AA's own historical beta) on which the reference value is built. If AA's beta increases relative to the comparator sample (notably due to increasing OL), then an uplift of AA's beta will be justified; if AA's beta relative to the sample average remains unchanged, because the OL of the comparator sample increases overall, then the average beta of the comparator sample will also increase.[5]

[5] The NZCC acknowledges that, conceptually, an increase in OL should increase an airport's systematic risk and hence its asset beta; see Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), Figure A2
Also see Martin Lally (2001): The cost of capital for the airfield activities of New Zealand's international airports, p. 372 and the additional references quoted in section 2.2.

- While Auckland Airport can in theory reset prices during a 5 year pricing period, in practice this option is costly to exercise due to the resource intensive and time consuming nature of the AA consultation process and subsequent regulatory processes. Furthermore, it is not clear that Auckland Airport has more flexibility than the comparator sample. In fact many of the low beta firms in the sample (e.g. Vienna) have more flexibility/shorter pricing periods than Auckland Airport.[6]

- The Commission rejects reliance on Auckland Airport's beta on the basis that estimates for a single company are unreliable. While we accept that beta estimation is subject to statistical estimation error, it must be emphasised that AA's beta provides **the only** direct measure of AA's riskiness, and therefore, in our view, it must be given the highest weight in the overall assessment of beta. There is also no evidence that Auckland Airport's beta estimate is less reliable than the comparator sample when considering liquidity.

- An asset beta higher than the simple average of the comparator sample is further supported by:

  – regulatory precedent, which includes decisions that have allowed uplifts for high operating leverage that are larger than the 0.08 or 13% uplift implicit in AA's target beta. Indeed beta uplifts of 18% (UK CMA) and 26% (BNetzA in Germany) have been applied by regulators in Europe to account for higher operational leverage vis-à-vis comparator samples;

  – the development of Auckland Airport's own beta which is markedly higher than the comparator sample (and which is now also above the value implicit in the target rate of return); and

  – concerns about the liquidity and comparability of some companies in the NZCC sample potentially biasing downward the sample mean; especially when also considering the impact of the increasing capex programme on OL in PSE3.

The remainder of this report is structured as follows:

- Chapter 2 addresses points relating to the measurement of operating leverage, analysis of regulatory and rating agency precedent and the forecast increase in operating leverage for Auckland Airport in PSE3;

- Chapter 3 addresses points relating to the impact of the regulatory framework on the adjustment and the magnitude of the adjustment; and

- Chapter 4 concludes.

[6] For example, charges for the airport in Vienna are negotiated on an annual basis between the airport operator and airport users. See section 3.1 and Appendix A for more details.

2. Operating Leverage

As highlighted in our first report (henceforth "NERA 1") operating leverage (also called "operational leverage" or "operational gearing") directly affects systematic risk through its impact on profits and cash flows.[7] The NZCC concluded that an adjustment for an expected change in operating leverage may be justified in principle but also considered that it was not yet convinced by the empirical evidence. It further suggested that the following would provide useful information regarding the appropriateness of Auckland Airport's implicit adjustment for operating leverage:

- Evidence relating to whether other regulatory agencies have made asset beta adjustments due to operating leverage of a similar magnitude to that of Auckland Airport (discussed in section 2.2.1);
- Views from independent parties, such as rating agencies or research brokers, indicating whether a forecast increase in operating leverage for other companies in analogous situations was expected to increase the regulated or corporate WACC (discussed in sections 2.2.2 and 2.2.3); and
- An empirical comparison of a robust estimate of Auckland Airport's forecast operating leverage over PSE3 against comparable estimates of the degree of operating leverage for other companies in the comparator sample (discussed in section 2.3).[8]

We first highlight some important considerations regarding the concept of operating leverage in the context of regulated airports before answering the points raised above.

2.1. Operating Leverage for regulated entities

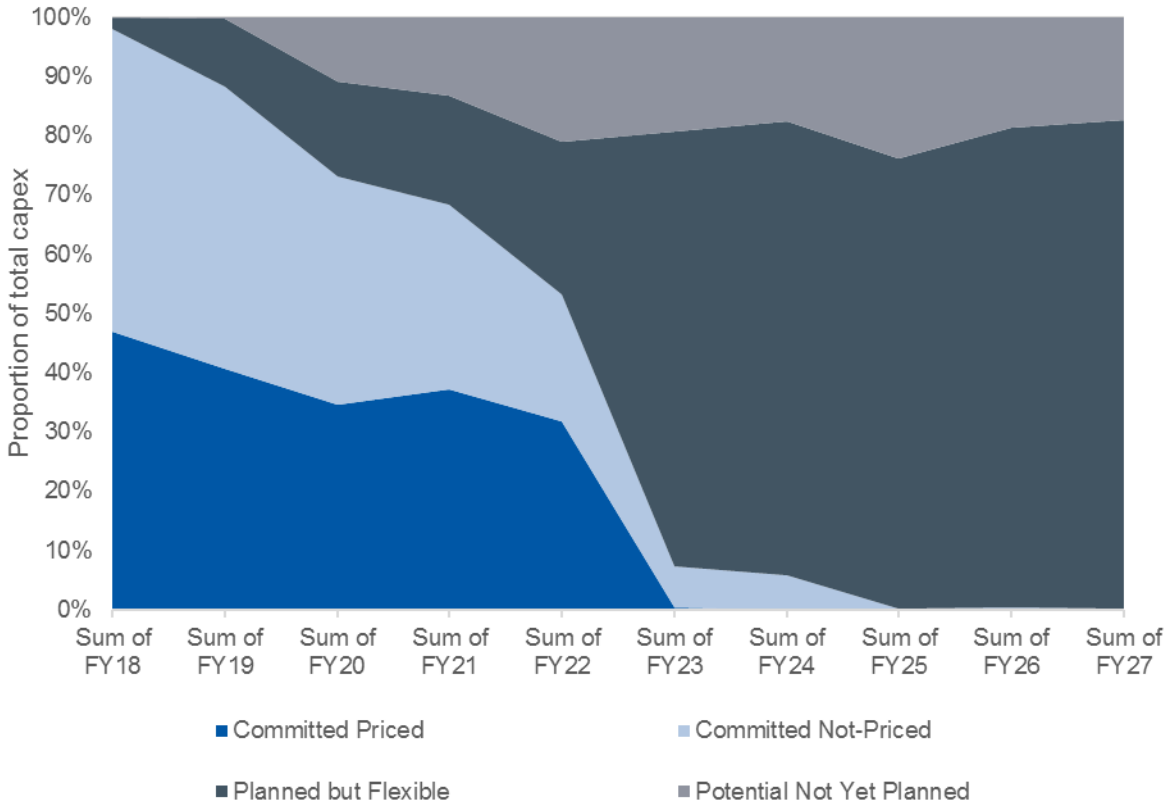
While in theory operating leverage is easily defined to measure the fraction of fixed costs in a company's cost base, it is never completely straightforward to measure what exactly constitutes a fixed cost. In economics, whether a cost is fixed or not depends on the timeframe of the analysis and the magnitude of the demand increment – in the very short run and for small changes in demand, most costs are fixed. Over the longer term and/or if a fundamental change in demand occurred (i.e. another GFC type event), more costs will be variable.

This framework is consistent with how Auckland Airport views the cash implications of its capex programme. Figure 2.1 below shows how Auckland Airport views the fixity of its capex programme as of today.

[7] NERA (23 March 2017): A Peer Review of Auckland Airport's Approach to WACC and Target Return for Aeronautical Pricing (henceforth "NERA 1"), section 2.2

[8] Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), p. 107-108, starting para A121..

Figure 2.1: The majority of Auckland Airport's planned capex over PSE3 is "committed"



Source: Auckland Airport

This demonstrates that Auckland Airport considers its capex over PSE3 to be mostly fixed but beyond that horizon it has flexibility, consistent with the time horizon effecting what is and isn't fixed.

The practical implementation of the OL concept depends on the sector in question, in order to reflect sector specific data availability and the "fixity" of different cost categories. This issue was also considered by Lally (2001), who concluded that while there may be differences in the importance of operating leverage across sectors:

> *the situation facing airports would seem to correspond to that modelled by Rubinstein et. al., and this implies that the high operating leverage of airports should magnify their betas.*[9]

In light of the sectoral differences noted by Lally, it is important to consider the specific measures used to provide insights about operating leverage in regulated industries in regulatory practice. These are likely to provide better guidance on the impact of operating leverage on risk than generic measures calculated by data providers such as Bloomberg.

See section 2.2.1 for different concepts used by different regulators and section 2.4 for a critical review of the theoretical and empirical applicability of the more generic Bloomberg definition of operating leverage.

One issue to note in connection with the estimation of operating leverage for regulated entities is that cost definitions need to take account of the specific role of depreciation in the regulated context. With

[9] Martin Lally (2001): The cost of capital for the airfield activities of New Zealand's international airports, p. 372.

depreciation directly linked to revenues under most regulatory schemes, a more relevant measure of the operating leverage does not look at accounting definitions 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. Lally (2001), reprinted in the NZCC draft decision, para A85, confirms the importance of cash flow based considerations.[10] Likewise, there is substantial regulatory precedent supporting the use of cashflow-based OL metrics, e.g. from UK regulator Ofgem and the UK Competition and Markets Authority, which have allowed beta uplifts as a result of higher OL measured as capex/RAB and operating cashflow relative to revenue respectively (see chapter 2.2.1 for further details on regulatory precedent).

The relevance of using a cashflow-based metric for measuring OL becomes particularly obvious when capex programmes do not enter the asset base until completion of the whole phase, i.e., when capex programmes can lead to multi-annual cash outflows not yet recognised as costs / depreciation and not generating any cash inflows, thus significantly increasing cash operating leverage while not affecting P&L ratios. Under the Input Methodologies, this is the case for airports, with works under construction not entering the asset base until they are commissioned.[11,12] As noted by the NZCC with reference to a previous NERA submission, the risk associated with operating leverage for regulated companies also substantially depends on the regulatory framework, which determines how demand fluctuations translate into revenue volatility. [13] Companies regulated under a revenue cap (as opposed to price) are largely protected from revenue fluctuations by the regulatory mechanism and hence the extent to which they can adjust their costs in response to revenue fluctuations is not a major risk factor. While operating leverage may only affect the profile and volatility of the cash flows for companies under a revenue cap, companies regulated under a price cap will face both revenue and cash flow volatility in direct proportion to demand. This makes their ability to adjust costs a more important risk factor.

We understand from Auckland Airport that there may be a theoretical ability to reset prices more often than every five years but that any such move is unlikely in practice given the operational complexities associated with undertaking a review and consultation process. A price setting event would also trigger a further disclosure requirement and summary and analysis by the Commerce Commission of the Airport's pricing disclosure under 53B(2)(b) of the act, a process which takes close to a year.[14] I.e. the transaction costs of resetting prices are high. We further understand that past history shows that any price changes mid-period are likely to be unfavourable to the airport (e.g. during the GFC planned price increases were not implemented). Hence airports with relatively long-term price caps / price paths (like Auckland Airport) face higher risk from operating leverage than traditional utilities and / or airports with shorter review periods (e.g., one-year price controls at Vienna and Frankfurt airports) and / or more light touch regulatory regimes.

For any given level of operating leverage, airports with relatively longer pricing cycles face higher risk, due to a price control or price path mechanism which does not protect their revenues from demand fluctuations (with only a limited protection through their ability to adjust prices over time).

---

[10] Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), p. 100, para A85f.

[11] Commerce Commission (2010), Input Methodologies (Airport Services): Reasons paper, C4.1-C4.3.

[12] We understand from Auckland Airport that only half of Auckland Airport's approximately $2 billion aeronautical capex programme over PSE3 will enter the asset base during that pricing period.

[13] Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), p. 101, para A90.

[14] For example, during the current process the Commission released a process and issues paper on 24/10/2017 and expects to issue a final report in September / October 2018.

See section 3.1 for a discussion of how a weighted approach to the comparator group may better reflect this differentiation.

2.2. Independent support for NERA's measures of OL

In NERA 1 we used different capex-based measures of operating leverage including capex/revenues, capex/asset base, capex/pax, capex/turnover, to show that Auckland Airport is indeed likely to have a higher degree of operating leverage than the reference airports when assessed using these measures of operating leverage.[15]

The NZCC invited third party comment on whether these constituted relevant evidence supporting an uplift to the asset beta.[16] Below we show that both regulators and rating agencies alike have used operating leverage measures that capture capex and the fixity of *cash flows* more generally to recommend uplifts to the cost of capital.

2.2.1. Regulatory precedent

The NZCC calculates an implicit beta uplift of 0.08 in absolute terms given that Auckland Airport has used a WACC consistent with an asset beta of 0.68 while the NZCC's own estimate of the sample mid-point (after adjusting for non-aeronautical risk) is 0.6. The difference of 0.08 is equivalent to a relative uplift of c. 13%.

The use of OL measures for estimating differences in systematic risk exposure and applying adjustments to asset beta has considerable regulatory precedent. Importantly, precedent is not limited to the recognition of the fact that OL increases risk exposure in principle, but also includes regulators applying significant uplifts to asset beta estimates to correct for above-average levels of OL. Below we set out regulatory precedent for the use of OL measures and implications for asset beta estimates.

Table 2.1 provides an overview of precedent for beta adjustments due to differences in operating leverage.

[15] NERA (23 March 2017): A Peer Review of Auckland Airport's Approach to WACC and Target Return for Aeronautical Pricing, section 2.2.

[16] Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), p. 108.

Table 2.1: Recent regulatory precedent allowing OL uplifts

Regulator	Measure of OL	Difference in OL reported (% points)	Absolute Beta Uplift	Relative Beta Uplift
CC (UK) – Water	OCF/Revenue[17]	9	0.05-0.07	18%
CMA (UK) – Water	OCF/Revenue	6	0.02	13%
CRE (France) – Energy	Opex/RAB, Totex/RAB & Revenue/RAB	Varying (qualitative assessment)	0.03	9%
Ofgem (UK) – Energy	Capex/RAB	13	0.09	26%
BNetzA (GER) – Energy	Not explicit	(qualitative assessment)	0.08	26%

Note: OCF = Operating Cashflow
Source: BNetzA (2011) Beschluss BK4-11-304, pp. 9 & 15; Ofgem (2012) RIIO-GD1: Final Proposals - Finance and uncertainty supporting document; Ofgem (2012) RIIO-T1: Final Proposals for SP Transmission Ltd and Scottish Hydro Electric Transmission Ltd; Ofgem (2012) RIIO-T1: Final Proposals for National Grid Electricity Transmission and National Grid Gas; CMA (2015) Bristol Water plc A reference under section 12(3)(a) of the Water Industry Act 1991; Frontier Economics: Audit des demandes de RTE sur le cadre de rémunération - Un rapport mandaté par la Commission de Régulation de l'Energie (2016).

Various regulators have used operating leverage measures, but their specification may differ depending on the circumstances considered. As a general principle, however, OL measures are employed by regulators to identify heightened risks as a result of particularly high fixed capital/cash commitments, leading to lower resilience in case of revenue shortfalls. The effect is best described by an estimate of free cash flow (FCF) relative to total revenue. Where FCF is not readily available, the choice of an opex- or capex-based measure as the more effective choice for proxying fixed costs will depend on whether a company's ability to absorb adverse revenue shocks is due to high fixed opex commitments or large capital expenditures.

We discuss the individual cases and their choices below; starting with those that did not explicitly tie the concept of OL to capital investment spending before considering those most relevant to the case at hand.

Competition and Markets Authority (UK)

The Competition and Markets Authority (CMA – formerly Competition Commission) was called upon in both 2010 and 2015 to decide on appeals by Bristol Water plc against decisions by the sector regulator Ofwat. One issue in dispute was whether to apply an uplift to the asset beta relative to the market peer group that contained combined water and sewerage operators for Bristol Water, which only provides water services due to differences in operating leverage (called "operational gearing" by the CMA) between the two types of entities.

Historically UK water only companies have had lower regulatory asset values compared to their opex spending than combined water and sewerage companies. Therefore the key issue for Bristol Water was not the size of the capex programme, but rather the relativity between the existing asset base and opex.

[17] The CC / CMA also considered other measures but eventually concluded OCF / revenue was the best proxy for identifying the effect it was primarily investigating.

First, in its 2010 decision, the Competition Commission applied an uplift of 18% to the reference group asset beta on the basis of a difference in operating leverage – measured as operating cashflow to revenue – of 18% between Bristol Water and its peer group.[18]

The CMA confirmed this approach in 2015, when it decided to apply an uplift of 13% to the reference group asset beta following the same methodological approach regarding the calculation of the operating leverage. It observed that *"there is a straightforward theoretical case that operational gearing should have this effect [of moving the company's equity value in the same direction as the wider stock market, i.e. reflecting systematic risk] – as it is comparable in its effect to financial gearing, which is accepted to increase equity betas wherever there is a positive asset beta."*[19]

In its 2015 determination, the CMA confirmed the use of the cashflow-based measure as a valid indicator of operating leverage. The CMA found that Bristol Water's operating cashflow relative to total revenues was only 45%, compared to an average of 51% for the comparator sample. It translated the relative difference directly into an uplift of the asset beta.[20] Recognising that the estimation of the correct magnitude of the beta uplift is subject to difficulties, it still considered that *"this value [13%] continued to reflect an 'in the round' judgement for higher systematic risk faced by Bristol Water than the comparators used to estimate beta."*[21]

Insofar as the NZCC argues that *"these examples [including the CMA precedent] generally resulted in smaller uplifts to the asset beta/cost of capital than Auckland Airport's implicit asset beta adjustment of 0.08"*[22], it is worth noting that a beta adjustment of 8 basis points in the case of AA corresponds to a 16% uplift, which falls into the range of the two CMA adjustments from 2010 and 2015 (18% and 13%, respectively).

To the extent that the CMA's objective was to obtain a general measure of Bristol Water's exposure to systematic risk due to OL, the measure based on operating cashflow arguably was an appropriate proxy for OL.[23] In the situation of AA, however, the principal driver of OL is due to capital expenditure representing a specific category of cash outflow, implying that a measure specifically incorporating capex will be more appropriate to estimate the impact of AA's substantial capex programme on its exposure to systematic risk. To this end, particular attention needs to be given to capex-based measures such as capex/RAB or measures of free cash flow that explicitly account for differences in capex spend.

---

[18] Competition Commission (2010): Notice of Reference: Determination of Adjustment Factor for the period 2010-2015, Appendix N, paragraph 129 pp. & Competition Commission (2010) WATER SERVICES REGULATION AUTHORITY WATER INDUSTRY ACT 1991, SECTION 12 BRISTOL WATER plc Notice of Reference: Determination of Adjustment Factor for the period 2010-2015, Appendix N paragraph 137.

[19] Competition and Markets Authority (2015): Bristol Water plc A reference under section 12(3)(a) of the Water Industry Act 1991, Appendix 10.1 paragraph 124.

[20] The 13% uplift was calculated as the relative difference of OL between Bristol Water and its comparator group, i.e. (51 / 45) – 1; see Appendix 10.1 paragraph 134 of the CMA's 2015 determination.

[21] Competition and Markets Authority (2015): Bristol Water plc A reference under section 12(3)(a) of the Water Industry Act 1991, Appendix 10.1 paragraph 134.

[22] Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), p. 103, para A102.

[23] The CMA also looked at other measures of OL such as Totex/RAb or Revenue/RAB (see NZCC Draft Report paragraph A72), but retained OCF/Revenue for its calculation of the appropriate beta uplift.

CRE (France)

In the context of its 2016 tariff determination for electricity transmission network operators (in particular the principal TSO, RTE), the French energy regulator CRE decided to apply a beta uplift of 3 basis points (9%) relative to electricity distribution system operators on the basis of differences in OL. The regulator's consultant examined different measures for OL: Opex/RAB, Totex/RAB, and Revenues/RAB. It found that all three measures indicated that RTE's operational leverage was at the upper end of the range when compared to a group of peers, and recommended that the regulator choose an asset beta at the top end of its proposed range.[24] The consultant did not specifically calculate the difference in the value of OL for RTE relative to its comparators, but rather inferred from RTE's position at the upper end of the range of OL values that a beta uplift would be indicated. The regulator ultimately allowed the maximum of the proposed range, an asset beta of 0.37. While the OL measures used by the regulator's advisor relied predominantly on opex, the regulator made explicit reference to the potentially large capital expenditures related to the French energy transition (e.g. connection of offshore windfarms) when justifying its decision to increase RTE's asset beta estimate.[25]

The Totex/RAB and revenue / RAB ratio as implemented by the CRE's consultant rely on the revenue *allowance* (i.e. the WACC*RAB allowance and the depreciation allowance). As defined in France these are measure of cash inflows rather than outflows (such as investment spend). A better specification would be to focus on cash outflows (i.e. opex and capital investment spending). Moreover, we note that while the use of a measure Opex/RAB may be useful as a proxy in certain circumstances (when the operating leverage derives from high commitments in the domain of operational expenditures[26] as opposed to a large inflexible capex programme) the ratio Revenues/RAB ratio fails to identify cash-based measures of cash outflows.[27] Given its vagueness and potential confusion of capital costs and capital spending the French experience does not provide a clear benchmark.

Moreover, neither the UK CMA nor the CRE explicitly considered the cash outflow impact of a capex investment programme. For these reasons the above definitions of OL would need to be adjusted to appropriately reflect any significant differences in the capex investment programme. As we now discuss, UK regulator Ofgem developed such an approach when it was faced with starkly differing capex programmes during its RIIO 1 review; as we show below.

Ofgem (UK)

As part of its determination of the current price controls for energy networks (RIIO 1, Revenue=Incentives+Innovation+Outputs) Ofgem stated that it considered companies with a higher CAPEX to RAV (regulated asset value) ratio to be more exposed to cash flow risks and thus higher risk than those with smaller capex programmes:

> *We consider the ratio of capex to RAV to be a better indicator of the riskiness of an investment programme than simply looking at absolute capex levels. This approach is also consistent with the considerations of the major credit rating agencies. Where this ratio is*

[24] Frontier Economics (2016): Audit des demandes de RTE sur le cadre de rémunération, p. 46.

[25] CRE (2016): Délibération de la Commission de régulation de l'énergie du 19 octobre 2016 portant projet de décision sur les tarifs d'utilisation des réseaux publics d'électricité dans le domaine de tension HTB, p. 53.

[26] Although note that RAB-based measures run into trouble when there is no adjustment for how RAB is defined.

[27] In UK and French regulaton totex consists of the revenue allowance to the firm (opex allowance + depreciation allowance + WACC*RAB) rather than the more relevant measure of total cash outflow, i.e. operating spending + investment spending. The latter would be a more relevant measure.

> *higher, we consider the company to be potentially exposed to higher cash flow risk, and vice versa.*[28]

It is worth noting that this cash-based view of operating leverage remains true even for UK networks operating under a revenue cap regime. Based on the assumption that "the (base) allowed return for network companies should reflect their exposure to cash flow risk", Ofgem examined expected capital expenditure and its relative magnitude vs. the RAB for UK energy network operators.[29] Ofgem considers that capex plays a particularly important role in determining a company's cashflow position, noting that

> *…the main factor [that potentially influences cash flow risk] is the way the regulatory framework interacts with the company's expenditure. This manifests itself in two key ways: the scale of allowed investment during the price control period, and the extent to which the company is exposed to cash flow implications of actual expenditure differing from the allowance.*[30]

Importantly, Ofgem considers that risks from capex programs have material implications for the company's asset beta, noting that

> *…[w]e regard the scale of investment as the most significant differentiator of risk affecting both the asset beta (and, therefore, the cost of equity) and the appropriate level of notional gearing.*[31]

In order to assess the network operators' relative exposure to cashflow risks from capex, Ofgem compared average capex-to-RAV (Capex/RAB) ratios across its operator sample group. This analysis informed Ofgem's relative risk assessment, which in turn provided guidance for Ofgem's choice of the appropriate beta estimate (although Ofgem does not seem to state an explicit quantitative relation between capex/RAB measures and final beta estimate).[32] As can be seen from Figure 2.2, Ofgem allowed for higher asset betas, to the extent that companies had a higher OL as measured by average capex/RAB.[33] In quantitative terms, based on this sample of observations and suggesting a linear relationship between OL and beta, Ofgem's approach to taking account of OL in the asset beta estimation would imply that an increase in OL by one percentage point translates into a beta uplift of c. 0.55 basis points.[34]

---

28 OFGEM (2012): RIIO-GD1: Final Proposals - Finance and uncertainty supporting document, para. 3.17

29 Ofgem conducted an "in-depth cash flow risk assessment of NGET and NGGT in RIIO-T1 relative to the existing price controls (TPCR4,11 DPCR5 and GDPCR1), as well as comparing the sectors (electricity transmission, gas transmission and gas distribution) to each other." – Ofgem (2012): RIIO-GD1: Final Proposals - Finance and uncertainty supporting document, para. 3.13.

30 Ofgem (2012): RIIO-GD1: Final Proposals - Finance and uncertainty supporting document, para. 3.14;
Note that Ofgem actually provides a mechanism that includes some share of capex over- / underspend in the regulatory asset base during the course of a regulatory period while Auckland Airport is only able to offset cost overruns after it resets prices. This lower short-term risk for UK energy networks partly offsets the higher long-term risk they face from not being able to recover all differences between planned and actual expenditure.

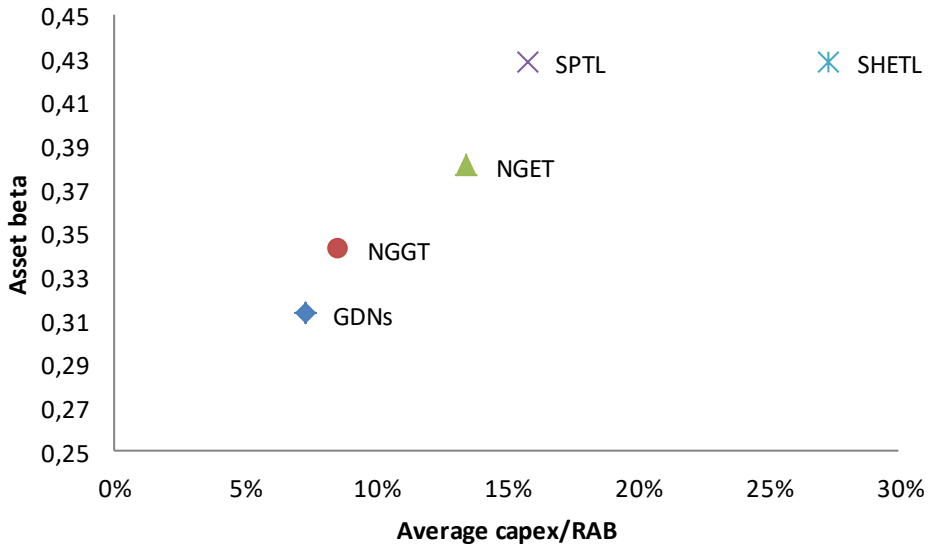
31 Ofgem (2012): RIIO-GD1: Final Proposals - Finance and uncertainty supporting document, para. 3.15 (emphasis added only here).

32 See Ofgem (2012): RIIO-GD1: Final Proposals - Finance and uncertainty supporting document, para. 3.44.

33 Ofgem operationalised this difference by means of higher equity betas and lower gearing for the riskier companies.

34 Calculated based on a simple linear regression using the Ofgem (2012) sample, with OL values as predictor and asset beta as predicted values. Model specification: $y = 0{,}5452x + 0{,}2999$, with $R^2 = 0{,}7155$.

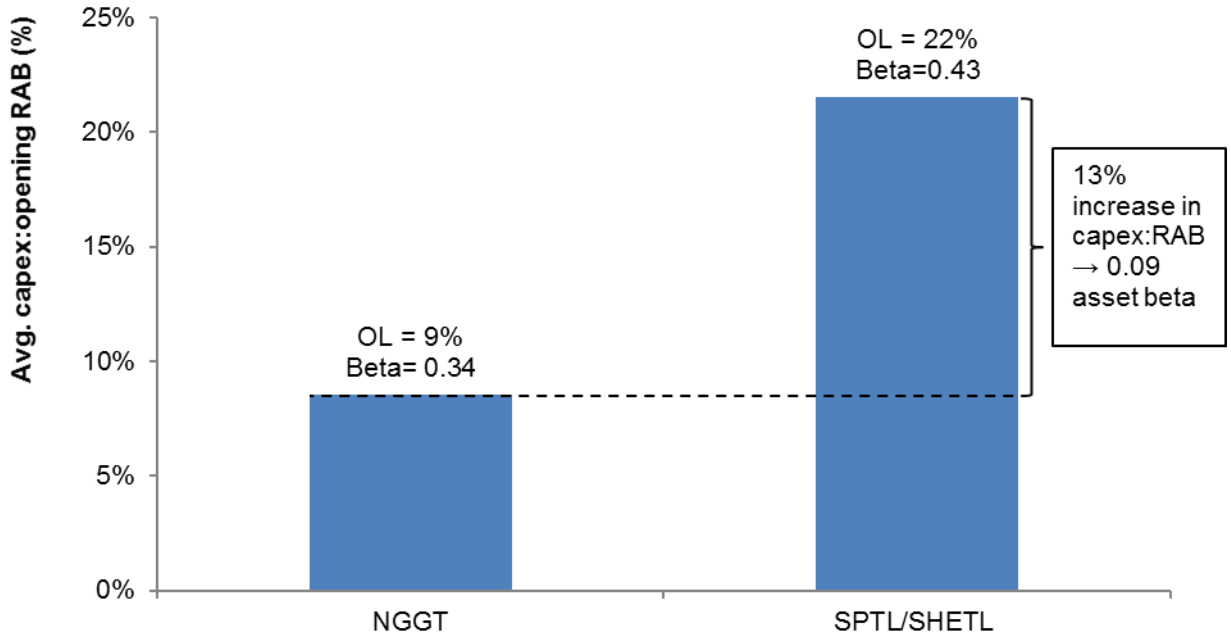
Figure 2.2: OL (Capex/RAB) and asset beta as per Ofgem's RIIO T1/GD1 Determinations



Source: NERA Analysis based on Ofgem (2012) RIIO T1/GD1 Determinations
Note: NGET = National Grid Electricity Transmission, NGGT = National Grid Gas Transmission, SHETL = Scottish Hydro Electric Transmission Limited, SPTL = SP Transmission Limited, GDNs = Gas Distribution Networks

Comparing differences in OL and asset betas directly leads to an even higher estimate of the impact of OL, as illustrated by Figure 2.3. The difference in OL between NGGT on the one hand and SPTL/SHETL on the other is 13 percentage points, while the corresponding difference in asset beta is 0.09; assuming a linear relationship between OL and asset beta, this would imply a beta uplift of 0.69 basis points for an OL increase of one percentage point (when OL is measured as the capex / RAV ratio).

Figure 2.3: Estimate of the relationship between OL and asset beta in Ofgem (2012) sample



Source: NERA Analysis based on Ofgem (2012) RIIO T1 and D1 determinations
Note: Ofgem estimates a beta of 0.43 for SP Transmission Limited (SPTL) and Scottish Hydro Electric Transmission Limited (SHETL) vs. a beta of 0.34 for National Grid Gas Transmission (NGGT), i.e. a difference in beta of 0.09; the corresponding difference in average capex/RAB is (22%-9%=)13%. Assuming a linear relationship between operating leverage as measured through Capex/RAB and asset beta, this allows to make inferences on the appropriate magnitude of beta uplifts for difference in OL.

We note that Ofgem's approach only looks at capex / RAV and does not include any differences in opex / RAV (the very measure used by the CRE and to some extent the CC). Where capex is the main differentiator between different companies and the main driver of differences in OL this approach is sensible. Where there may also be differences in the size of opex relative to the overall cost structure, a combined measure of "free cash flow" that takes account of both the Ofgem and CMA approaches could be an alternative.

Ofgem's approach to assessing relative risks across network operators based on the relative magnitude of their capex programs (capex/RAB) and emphasising the role of cashflow risks provides strong support for the use of capex/RAB as a measure of operating leverage for Auckland Airport, and provides guidance on the size of plausible beta adjustments associated with differences in OL.

BNetzA (Germany)

In its 2011 determination for both gas and electricity TSOs and DSOs, the German energy regulator Bundesnetzagentur (BNetzA) decided to allow a higher equity remuneration compared to the average value generated by the peer group to account for the fact that the so-called Energy Transition, i.e. Germany's ambition to move from fossil and nuclear fuels to increased use of renewable energy would require substantial investments in expanding grid capacity to allow for the connection of increasing renewable generation capacity.

While not calculating differences in operating leverage explicitly, the regulator acknowledged that future capital expenditure due to grid expansion investments would require a higher remuneration of equity capital. The regulator implicitly allowed for an asset beta uplift of 26% (moving to an implied asset beta of 0.39 vs. 0.31) to ensure an appropriate remuneration of changes in systematic risk as a result of substantial new capital expenditure.[35]

2.2.2. Rating agencies view large capex programmes as a risk

Rating agencies also consider capital investment programmes and the deterioration of "operating leverage" ratios as risk factors when assessing the creditworthiness of issuers.

Auckland Airport is exclusively rated by Standard & Poor's (S&P). According to its most recent rating report S&P views the capex programme as a constraint on the rating:

> *We view rating upside for the airport as limited given our expectation that the company's capital investment programme will increase leverage and gradually pressure its metrics.*[36]

While S&P also notes that the capex programme is modular[37], we note that Auckland Airport considers the flexibility it has over capex is over the longer term (i.e. PSE3 is largely committed) or in response to extreme events. For example, at the 2017 Investor day the following interaction occurred between John Middleton, then at ANZ New Zealand, and Auckland Airport CEO Adrian Littlewood.

> ***ANZ New Zealand****: I'm not quite sure I understand the messaging on capex. Sounds like there is flexibility in that number? But if there is flexibility in that number how does that flexibility reflect in price rises with the airlines?*
>
> ***Adrian Littlewood****: When I say flexibility I probably think over 10 years. In the 5-year period we have a confirmed capital plan that we are going to be executing on. Our opportunity is to; can we outperform on passengers and bear the benefit of that. What I was highlighting was that we had an example in PSE1 or PSE2, no the end of PSE1, where the GFC hit, we chose to defer what was planned runway investment and held off the price increase that was scheduled on that basis. So that was an example of a pretty material change where we consulted with the airlines and said we are planning to do this and they said great, that makes sense, let's do it. So over a 10-year period there will definitely be flexibility to wax and wane our capital programme as it's shown in the PSE3 disclosures to match what's required. In this next 5 years, I expect that we will be spending what we will be spending. Question for us, is can we get the same outcome for lower investment than we had otherwise predicted. That is still an opportunity and that is something that should be expected of us and that risk sits and that opportunity sits with us so if it ends up costing us more we bear that risk and if we can do it for less and deliver the same outcome it benefits us as well.*[38]

A more general treatise of how rating agencies view OL can be found in Moody's rating methodology on "Privately Managed Airports and Related Issuers."[39] This more general document that underlies

---

35 BNetzA (2011) Beschluss BK4-11-304, pp. 9 & 15

36 Standard & Poor's RatingsDirect (2018): Auckland International Airport Ltd., p3.

37 Ibid, p. 9.

38 Auckland Airport (2017): Cross-submission on section 53B review, Appendix B - Transcript of the capex comments made during Auckland Airport's investor day (17 November 2017).

39 Moody's (2014): Rating Methodology Privately Managed Airports and Related Issuers;
We understand that S&P does not have a comparable quantitative methodology for assigning rating grades but that the assignment of rating grades involves a larger degree of judgement. We therefore focus on the more quantitative Moody's methodology to illustrate the impact of the capex programme.

how Moody's assigns rating grades gives explicit weight to the size and complexity of the capital expenditure programme. Using this rating methodology, we outline how Auckland Airport's planned investment programme would likely impact its external credit rating and hence increases the cost of debt.

Moody's rates airports according to six different factors, one of which is "capacity and capital", which represents the issuer's "capacity to accommodate expected traffic growth". For each sub-factor, Moody's maps companies to a rating score grid (Aaa, Aa, A, etc.). Scores are then converted to a numerical value that increases as scores deteriorate.[40] Based on the obtained numerical values, an aggregate weighted numerical score is calculated for each company, giving predetermined weights to each (sub-)factor.[41]

Table 2.2 shows the mapping between the score on the capacity sub-factor and the scale and complexity of the capex programme faced by the airport.

Table 2.2: Moody's assessment of "capital and capacity"

Sub-Factor	Sub-factor Weight	Aaa	Aa	A	Baa	Ba	B	Caa
Ability to accommodate expected traffic growth	5%	Ability to accommodate expected future growth is unconstrained and No expansion capex required (maintenance capex only)	Ability to accommodate expected growth is unconstrained in the near and medium term; Accommodation of long-term growth requires moderate, standard capital improvements and The entity has a long history of delivering projects on budget and on time	Accommodation of mid-term growth requires moderate, standard capital improvements; Accommodation of long-term growth may require significant capital investment or lifting of externally imposed operational restrictions. and Project complexity is similar to projects the entity has completed on budget and on time in the past	Accommodation of near to mid-term growth requires significant capital investment or lifting of externally imposed operational restrictions and Project complexity is typically similar to projects the entity has completed on budget and on time in the past	Government action or settlement agreement and/or physical limitations and/or obsolescence of key assets restrict growth or Projects required to address limitations to accommodate growth are fairly complex relative to projects completed by the entity in the past	Government action or settlement agreement and/or physical limitations and/or obsolescence of key assets severely restrict growth or Projects required to address limitations to accommodate growth are very complex relative to projects completed by the entity in the past and/or the entity has a history of significant cost overruns and poor project management	Operational restrictions and/or obsolescence of key assets make it difficult to sustain current levels of operations

Source: Moody's (2014): Rating Methodology Privately Managed Airports and Related Issuers, p. 20.

Below we compare the rating impact of Auckland Airport's capex programme affecting the operating leverage of the company to a counter-factual situation where the airport does not face a large capital programme that comes with a significant deterioration of its operating leverage.

One factor that impacts the rating is the complexity of the projects required to accommodate growth. We understand from Auckland Airport that the complexity and scale of the airport development at Auckland Airport is unprecedented in New Zealand aviation and requires smart planning, sequencing and timing. Projects within the terminal development plan are very large, complex and

[40] Lower scores also receive an additional weight (see Ibid, p. 7).

[41] For instance, the "capacity to accommodate expected traffic growth" contributes to an airport's overall rating with a weight of 5 percent.

interconnected. Because it is an almost entirely brownfields development, there will be considerable disruption and displacement of existing aeronautical and non-aeronautical activity.

In light of Table 2.2 and considering the complexity of the planned capex programme, Auckland Airport would likely score a Baa, Ba or even B rating in terms of capacity and capital if it were rated by Moody's compared to a hypothetical comparator airport that is less constrained in terms of capacity that would be rated Aa (or even Aaa). We can therefore illustratively simulate the impact of the OL impact of a substantial capex programme (such as the one planned by Auckland Airport) on the airport's external credit rating.

Table 2.3: Simulative analysis of the impact of AA's capex programme on rating

	Weight	Reference	Case 1	Case 2	Case 3
Rating on "Capcity & Capital"	5%	Aa	Baa	Ba	B
Base Score		3	9	12	15
Multiplier		1	1.15	2	3
Final Score		3	10.4	24.0	45.0
Difference (Case X - Reference)			7.4	21.0	42.0
Weighted Difference			0.4	1.1	2.1

Source; Illustrative analysis based on Moody's (2014) Rating Methodology Privately Managed Airports and Related Issuers
Note: The table indicates how a difference in the rating for the factor "Capacity and Capital" translates into the aggregate final rating. The factor receives a weight of 5%. The Base Scores and Multipliers for each rating are taken from Moody's (2014), p. 7.

The analysis reported in Table 2.3 shows that Auckland Airport's capex programme alone (which would place it in the Baa, Ba or B category on the sub-factor relating to the capital programme) would lower its aggregate weighted numerical score by 0.4, 1.1 or 2.1 relative to a comparable airport that does not face a similar capex programme. A 1.0-point difference in Moody's scoring grid is equivalent to a one notch reduction in the final rating score (e.g. from A- to BBB+).[42] Given scores on all other factors are identical (i.e., *ceteris paribus*), a difference of 0.4 to 2.1 in the aggregate weighted numerical score may explain a final credit rating for Auckland Airport that is around one notch (and possibly up to two notches) lower than the comparators'.

The capex programme may also affect Auckland Airport's rating in another way. For the factor "leverage and coverage" Moody's computes the following ratios:[43]

- Cash Interest Coverage: (FFO + Cash Interest Expense) / (Cash Interest Expense)
- Funds from Operations (FFO) / Debt
- Moody's Debt Service Coverage Ratio
- Retained Cash Flow (RCF) / Debt

Auckland Airport's capex programme is likely to lead to increased leverage. The NZCC noted on the issue of the financeability of the capex programme that Auckland Airport could also change its dividend policy.[44] Doing so may indeed mitigate the increase in debt, but, given the complexity of the

[42] Moody's (2014), p. 8; This is equivalent to a jump from A3 to Baa1 in Moody's grading.

[43] Ibid, p. 22f.

[44] Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), p. 114, para A145.

aeronautical capex programme, it is questionable whether AA could maintain its current leverage ratio. In fact, Deutsche Bank predicts AA's net debt/equity ratio to increase from 0.5 in 2018 to 0.7 in 2020.[45] Therefore, the likely increase in leverage will in turn affect other ratios, suggesting that the overall impact of the capex programme could be a one- to two-notch lower external rating.

In a second step, we illustrate the impact of the capex programme on debt costs for Auckland Airport. For illustrative purposes we analyse the yield difference between 10-year debt instruments for non-financial companies over the last 10 years.[46]

Table 2.4: Yields and difference at spot (A- vs BBB-Rated)

Time Period	Yield A-Rated	Yield BBB-Rated	Difference
1 Day (31 March 2018)	3.98	4.60	0.62
1 Year	3.68	4.38	0.69
5 Years	3.88	4.63	0.74
10 Years	4.31	5.19	0.88

Source: NERA analysis based on data from iBoxx: IBXU02001 & IBXU02034
Note: Figures indicate the average yield or difference in yields over the indicated time periods from the reference day 31 March 2018.

Table 2.4 indicates that a difference in rating between A and BBB (i.e., three notches) leads to a difference in the cost of debt of between 62 and 88 basis points. It follows that Auckland Airport's capex programme, which may impact its rating by one or two notches, translates into an increase in the cost of debt by roughly 20 to 30 basis points (for a one-notch change), 40 to 60 basis points (for a two-notch change).

As equity (as the residual claimant) is inevitably more sensitive to an increase in risk, the upper bound of the debt risk estimate of 30 to 60 basis points (depending on the rating change) provides a better indication of a *lower bound* for the risk premium on the cost of equity (and the WACC). The above indicates that the 65 basis point difference between Auckland Airport's target WACC and the NZCC's industry reference value does not appear implausible in light of rating agency precedent.

2.2.3. Equity analysts

The NZCC asked Auckland Airport to also provide independent opinions from research brokers.[47] Sector analyst reports, among others by Deutsche Bank, Royal Bank of Canada and Credit Suisse, consistently consider increased capital expenditures as a risk factor when assessing the equity valuation of airports.

Their focus primarily lies on large scale projects such as runways as well as the trajectory of capital expenditures, not the absolute value. This view is shared across regions and such mentioned by analysts of several international airports. This is consistent with the situation faced by Auckland Airport as another runway is planned and such the capital expenditures are increasing.

[45] Deutsche Bank Markets Research (16 February 2018): Auckland Int. Airport, Yield Retail Power, p. 2.

[46] We used yield data in USD, since data in NZD was not available at a sufficient degree of disaggregation. As we are only concerned with relative rather than absolute levels differences in inflation and country risk do not matter for this comparison.

[47] Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), p. 108, para A121.2.

Among other reasons for Royal Bank of Canada to recommend "underweight" European airports, they explicitly name "increasing capex" in tandem with "regulated tariffs limit pricing power".[48] A number of other equity analyst reports also highlight the implications that capex commitments have for free cash flow.[49]

Overall, independent equity sector analysts share our view of increasing systematic risk through large scale projects such as those planned by Auckland Airports.

2.3. Further measures show AA has high and increasing OL

NERA 1 has used various capex-based measures as measures of the level of operating leverage. Section 2.2.1 has reviewed measures used by different regulatory agencies. In light of regulatory precedent we review the two measures of operating leverage that are best capable of appropriately approximating the impact of capex on operating leverage, namely:

- Capex to RAB (used by Ofgem); and
- FCF to revenues (a variant on the measures used by the CMA and the CRE).

We discuss Auckland Airport's relative position against these measures below; also considering Auckland Airport's position during PSE 3 where appropriate.

We note that it is not necessary to calculate expected ratios for the comparators as our task is to assess whether historic comparator data on beta is capable of appropriately predicting the Auckland Airport asset beta during PSE 3.[50] In order to do so we need to compare historic comparator data on OL to expected Auckland Airport data on OL for PSE 3.[51]

The NZCC has considered the three measures of OL used by the CMA for Bristol Water, and their likely evolution over PSE3, noting that according to two out of three measures, the OL is expected to increase significantly over the next regulatory period.[52] In particular, the two measures pointing to an increasing OL over PSE3 are OCF/Revenue and TOTEX/RAB, which are more capable of capturing the OL effects from AA's significant capex programme than the Revenue/RAB measure, which will only pick up capex when it has been commissioned and not when it acts as a fixed cash outflow during construction. The focus on cashflow-based metrics is consistent with e.g. Ofgem's relative risk assessment for its RIIO (Revenue=Incentives+Innovation+Outputs) determinations, where the regulator notes:

[48] Royal Bank of Canada Capital Markets (29 March 2018): Fraport AG Frankfurt Airport Services, Heading into a capex spree, negative FCF generation, p. 5.

[49] See e.g.: Deutsche Bank Markets Research (29 March 2018): Japan Airport Terminal Co, Investor feedback indicate the stock is not well owned; Royal Bank of Canada Capital Markets (16 March 2018): Flughafen Wien Aktiengesellschaft, Not immune to airport's challenges, downgrade to U/P.

[50] We note that in any case, if OL were to increase in a like manner for other comparator companies, the comparator group's average asset beta would increase as well. It is the relative difference in OL compared to the group's average OL which may require a company-specific beta uplift to compensate differences ins systematic risk exposure.

[51] This finding is not to say that future OL for comparators will not be different but rather to argue that any future changes in OL for reference airports will not affect the historically observed beta, which forms the basis for the NZCC assessment of the industry beta.

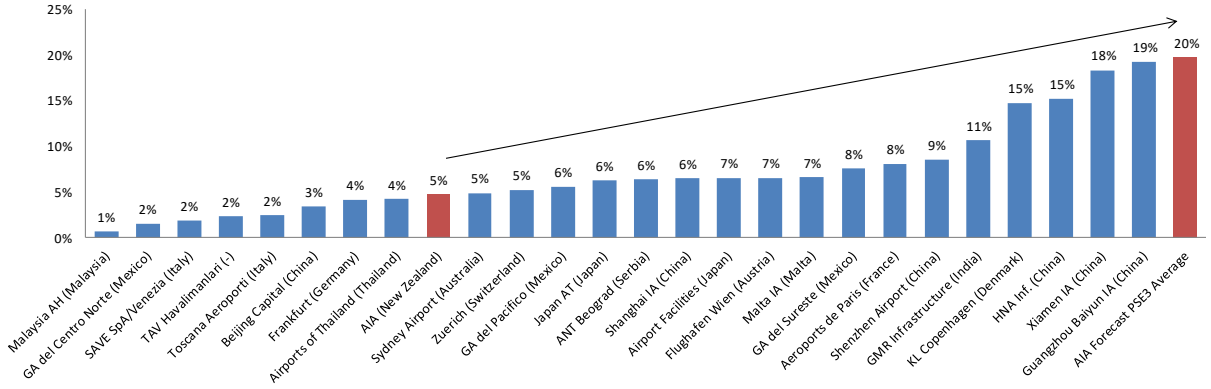
[52] Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), table A4 and para A73.

> *One of the key principles introduced as part of the RIIO approach is that the (base) allowed return for network companies should reflect their exposure to cash flow risk.*[53]

In addition, and contrary to the NZCC view that the change in OL is likely immaterial, we note that the projected changes in OL as estimated by the NZCC are at least of similar magnitude as the changes calculated by the CMA in 2010/2015 (6-9% in the CMA determinations vs. 14-20% for the two cashflow-based metrics in Table A4 of the NZCC's Draft Report).[54] Differences of this order of magnitude led the CMA to apply beta uplifts of 13-18%, indicating that the expected changes in OL for AA are material indeed.

Figure 2.4 shows OL as measured by the ratio of capex and RAB for Auckland Airport both today and during PSE3 and the comparator sample. This measure was also used by the British energy regulator Ofgem when setting tariffs for the regulated energy networks at the most recent review.

Figure 2.4: Capex/RAB (higher value means higher OL)



Source: NERA analysis of Bloomberg data[55]

Figure 2.4 illustrates that as a result of AA's capex programme, which primarily involves aeronautical capex, the degree of OL Auckland Airport is set to face over PSE 3 is the highest relative to the current values for the comparator group.[56] The sample average (excluding AA) amounts to 7% on average for the relevant time period while Auckland Airport's capex to RAB ratio is expected to increase to about 20% (2017-22 average).[57] It is worth noting that Ofgem allowed a beta uplift of 0.09 for OL elevated by a similar 13 percentage points.

Figure 2.5 shows OL as approximated by free cash flow to revenue. In principle, this cash-flow-based measure would be a precise indicator of OL. However, its high volatility makes it sensitive to short-term fluctuations and means any results need to be interpreted with caution. Figure 2.5 shows averages over the period 2012 to 2017 to limit the impact of outliers brought about by one-off items.

---

53 Ofgem (2012): RIIO T1: Final Proposals for National Grid Electricity Transmission and National Grid Gas, Finance Supporting document. paragraph 3.11.

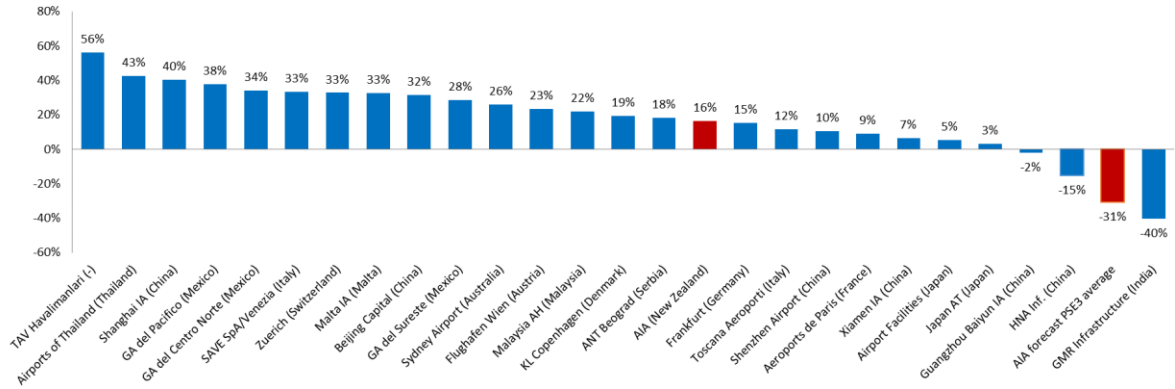
54 The 20% change corresponds to the change in the OCF/Revenue measure and is calculated as (41%-33%)/41%.

55 Bloomberg provides data for total assets and total capex of AA and the comparators. We multiply the resulting ratios by 1.47. This number is the average ratio of (regulated capex / regulated assets) and (total capex / total assets) for Auckland Airport for the years 2012 to 2016. We make this adjustment to ensure that the ratios of the comparators are comparable to those forecasted in Figures 2.3 and 2.4 of the NERA 1 report.

56 Bloomberg does not provide sufficient data to calculate that ratio for the year 2017 in the case of AA.

57 See NERA 1, Figure 2.4.

Figure 2.5: FCF/Revenue (lower value means higher OL)



Source: Auckland Airport and NERA analysis of Bloomberg data.

According to this measure, Auckland Airport's current operating leverage amounts to 16% not accounting for the expected impact resulting from the investment programme. The sample average amounts to 19%. AA's OL according to FCF/revenue is therefore about 3 percentage points (or 16%) below the sample average indicating that AA has comparably high OL even before accounting for the full impact of the capex programme.

Once the upcoming capex programme is accounted for, this measure is forecast to become materially negative over PSE3 placing it within the top two ariports for high OL when comparing PSE3 to the periods over which the NZCC comparator betas have been estimated.

2.4. Bloomberg measure of OL with fundamental shortcomings

For its draft report, the NZCC relies on the measure of "degree of operating leverage" provided by Bloomberg, defined as the percentage change in EBIT relative to the percentage change in revenues (EBIT growth/revenue growth).[58]

The NZCC calculates the average of this measure for each of the beta comparator companies over the years 2013 to 2017.[59] Comparing these averages of "degree of operating leverage" across the peer group sample, the NZCC concludes that AA's OL corresponds to the median of the comparator group, and lies below the group's mean.[60]

We note that the measure of operating leverage supplied by Bloomberg is not used by any of the regulators discussed in section 2.2.1 and appears to suffer from a number of methodological shortcomings, which limit its ability to inform Auckland Airport's relative position in terms of OL. In addition to the limitations already set out by the NZCC,[61] we consider that the following shortcomings are of particular relevance:

[58] Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), p. 92, para A57.

[59] Ibid, Figure A3.

[60] Ibid, para A57.

[61] Ibid, p. 93f, para A60.

- The ratio varies substantially both across years and comparator companies, and these variations are seemingly driven primarily by accounting-related factors rather than actual changes in the degree of operating leverage as we show below:
  - Across the total set of Bloomberg data for the group of comparator companies over the years 2012-17, values for % change in EBIT / % change in revenue ratio range between a minimum of -4.26x to a maximum of 125.8x.[62]
  - Values fluctuate over time without any recognisable pattern, a further indication that the ratio is mostly driven by accounting developments other than the evolution of OL.
  - As a result of the wide – and seemingly noisy – fluctuation of values over time, the use of averages is unlikely to produce any meaningful results either, but will only tend to conceal the lack of explanatory value of the underlying data.[63]
- Bloomberg claims to report values only if the numerator (EBIT growth) and denominator (revenue growth) have the same sign, recognising the fact that a negative value would most likely be a statistical artefact. This approach, potentially combined with a genuine lack of data availability for certain comparator companies, leads to a considerable lack of data points.
  - As a result, averages may in some cases be calculated based on as little as a single observation.
  - In addition, the significant number of missing data points, which is presumably a result of different signs in numerator and denominator, is by itself a strong indication for the limited informative value of the ratio, as it seems to be producing a significant number of unusable results. For example, for FY 2017 the NZCC itself notes that Bloomberg only reports data for 17 of the 26 airports, i.e. for about one third of comparator companies there is no value reported.[64]
  - Despite Bloomberg's definition that should in principle exclude negative OL values, Bloomberg reports negative values in several instances, adding further doubt over the quality of the data.[65]

The NZCC itself mentions the role of accounting-related factors limiting the informational value of the Bloomberg OL measure (e.g. effects from accounting-related factors such as depreciation).[66] These are not easily resolved by simply adjusting Auckland Airport's ratios when all comparators are likely to suffer from these distortions. Instead and in line with Lally's suggestion to use a cash-based measure of "cost", the most useful approach to estimating operating leverage is likely to be to use a cashflow-based measure in the first place, which more effectively and appropriately measure a company's risk exposure due to relatively high fixed capital commitments.

---

62 For Fraport AG in 2014 and Grupo Aeroportuario del Pacifico SAB de CV in 2012, respectively.

63 As evidence for "noisy" fluctuations in the BBG OL measure, we observe for example that the coefficient of variation (i.e. standard deviation over mean) for the whole BBG OL measure sample (i.e. across all comparator countries and years 2012-17) is 3.06, significantly higher than for example the CFO/revenues measure with a coefficient of variation of 0.42

64 Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), footnote 242.

65 Airport Facilities Co Ltd in 2015, Flughafen Zuerich AG in 2014, Fraport AG in 2013, Malaysia Airports in 2014.

66 Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), p. 93f, para A60.

We observe that no regulator has relied on the Bloomberg operating leverage measure (cf. section 2.2.1), providing further indication for the measures methodological inferiority and suggesting that cashflow measures allow more reliable inferences of operating leverage.

Moreover, the Bloomberg measure is by its very composition backward-looking while simpler ratios such as the capex/RAB ratio are most easily converted to forward-looking measures. The differentiation between forward-looking and backward-looking measures is particularly stark during times of high investment when significant parts of Auckland Airport's capex programme will not be commissioned during PSE3 and thus will not show up in RAB and EBIT yet (but still affect the cash position).

2.5. Summary

In a regulatory context, operating leverage is a measure of a company's ability to absorb adverse developments in economic activity; in other words, it represents a measure for a company's economic and financial resilience. To the extent that revenue shortfalls are correlated with economic activity in general, operating leverage increases a company's exposure to systematic risk, and hence its asset beta. Regulators across different industries and countries have therefore evaluated differences in operating leverage and applied corresponding adjustments to beta estimates.

In theory operating leverage is defined as the fraction of fixed costs in a company's cost base, assuming that a relatively large share of fixed costs leaves little room for a company to absorb adverse economic shocks. While this definition is simple in concept, in practice, it is hard to measure empirically. Whether costs are fixed or variable depends on the timeframe and increment of demand in question. Furthermore, any analysis of should be forward looking, limit "noise" from accounting-related effects without incidence for a company's cash position, and allow for robust cross-company comparisons.

As emphasised by Ofgem in the context of its RIIO relative risk assessment, a company's risk compensation should reflect its exposure to *cashflow*-risk, which in turn is significantly driven by capital expenditure. Our preferences is therefore for cashflow based measures that capture the impact of capex on OL. Our views on the relevance of each OL measure in the present context are summarised in Table 2.5 below.

Table 2.5: Relevance of operating leverage measures for capex-driven risks

Measure of OL	Relevance for measuring Impact of Capex on Beta
Δ EBIT/ Δ Revenues (Bloomberg)	Highly volatile accounting-based measure; fails to measure impact from capex on systematic risk
OCF/Revenue	Cashflow-based measure but doesn't capture the impact from capex-related capital outflows
FCF/Revenue	Cashflow-based measure that captures impact from capex-related capital outflows. Volatile due to lumpy nature of capex
Opex/RAB	Fails to capture effect from capex
Totex/RAB	Accounts for impact from capex and opex. However, where the totex allowance is used (as by e.g. CRE) it includes a non-cash depreciation charge and an annualised allowance rather than the cash outflow generated by current capex
Revenue/RAB	Less effective for measuring capex-specific effects
Capex/RAB	Accounts for impact from capex

Note: OCF = Operating Cashflow, FCF = Free Cash Flow
Source: NERA Analysis of operating leverage measures

As summarised above, our preferred measures in the current context are capex/RAB and FCF/revenue. To a lesser extent, OCF/Revenue and Totex/RAB are also useful since OCF is a cashflow measure and totex captures increased capex.

This view is also supported by regulatory precedent for the estimation of operating leverage. Ofgem used the Capex/RAB measure for the relative risk assessment underlying its 2012 RIIO determinations, finding evidence for material risk differences due to capex-driven cashflow risks. Other regulators like CRE in France and the BNetzA in Germany awarded beta uplifts to compensate risks deriving from particularly large capex programmes. In the UK, the CMA used the Operating Cashflow/Revenue measure in the context of two different determinations for Bristol Water (2010 and 2015). There however, the issue in question was the relativity between opex and the RAB, as opposed to capex.

Based on these operating leverage measures, our analysis shows that AA's substantial capex programme will likely result in a significant increase of AA's operating leverage over PSE3, implying that AA's operating leverage would then be located at the upper end of the range observed for the group of comparator companies. Differences in operating leverage of a magnitude similar to the one that will likely hold for AA over PSE3 have led regulatory authorities like the CMA to apply beta uplifts of a magnitude of 13-18%, which would be consistent with increasing AA's asset beta estimate from 0.60 to 0.68 (+13%).

3. Adjusting the Asset Beta for High Operating Leverage

The NZCC determines an industry-wide asset beta for aeronautical activities by first selecting a broad comparator sample of listed airports and then adjusting the simple arithmetic average of the sample (0.65) downward by 0.05 in order to account for the fact that airports also undertake other activities that are not part of the regulated aeronautical till. When comparing the adjusted industry beta of 0.6 to the asset beta implied by Auckland Airport's target rate of return (0.68), the NZCC notes a difference of 0.08 that it has asked Auckland Airport to justify. As shown above European regulatory precedent supports a similar adjustment for the difference in OL between Auckland Airport and the comparator group.

We also note that the resulting industry average beta is significantly below the observed beta for Auckland Airport itself. When comparing the implied asset beta in the target rate of return (0.68) to Auckland Airport's own beta, the target return is actually below the mid-point of the empirically observed beta range for AA.[67] This may be partly due to the fact that the observed asset beta for Auckland Airport already reflects the risk of the *expected* increase in OL.

Below we take a closer look at the possible scope and dimension of the adjustment for operating leverage in light of our findings on the robustness of the beta estimate for Auckland Airport and its comparators.

3.1. The comparator sample may reflect lower regulatory risk and suffers from data irregularities

The NZCC asked for evidence on how operating leverage affects returns under different regulatory regimes. Our review of different regulatory regimes highlighted that certain companies included in the sample relied on by the NZCC operate under different and potentially lower risk regimes (see section 3.1.1). Additionally, data irregularities may bias beta estimates for certain comparators.

Following the Commission's approach of using a comparator sample to determine the beta, the points outlined hereafter indicate that an uplift of at least 0.08 for AA (relative to a comparator beta of 0.60) appears appropriate. We note that a similar outcome would be achieved by using Auckland Airport's observed beta as the starting point.

3.1.1. Lower risk regimes

The NZCC acknowledges that differences between regulatory frameworks affect the impact of operating leverage on risk.[68] In fact, the regulatory regime determines the risk profile of an airport more generally.

The beta factor measures the exposure of an airport to fluctuations in the business cycle. Hence, the ability to secure stable revenue streams when, e.g., passenger numbers increase or decrease due to economic up- or downturns critically impacts the beta. For this reason, revenue cap regulation transferring volume risk to customers induces less risk than price cap regulation leaving volume risk

[67] In NERA 1, we estimated an asset beta for AA in the range from 0.73 to 0.81. These values consider higher operating leverage and are above AA's own beta estimate (0.68).

[68] Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), p. 101, para A90.

with airports. In addition, the ability to frequently reset prices reduces risk borne by the airport operators.

When selecting the sample of comparators, the NZCC does not specifically take into account the regulatory regimes under which potential comparators operate.[69] To select the comparator sample, the NZCC considers all firms containing "airport" in the descriptions of their Bloomberg tickers. Firms are excluded from the sample if the nature of their business is not considered sufficiently comparable, or if no trading data is available for at least five years back or if the market equity value is below USD 100 million.

In the appendix, we review the regulatory regimes under which the comparator airports operate. In summary, it appears that five airports operate under regimes that leave less risk with investors than is the case for Auckland Airport:

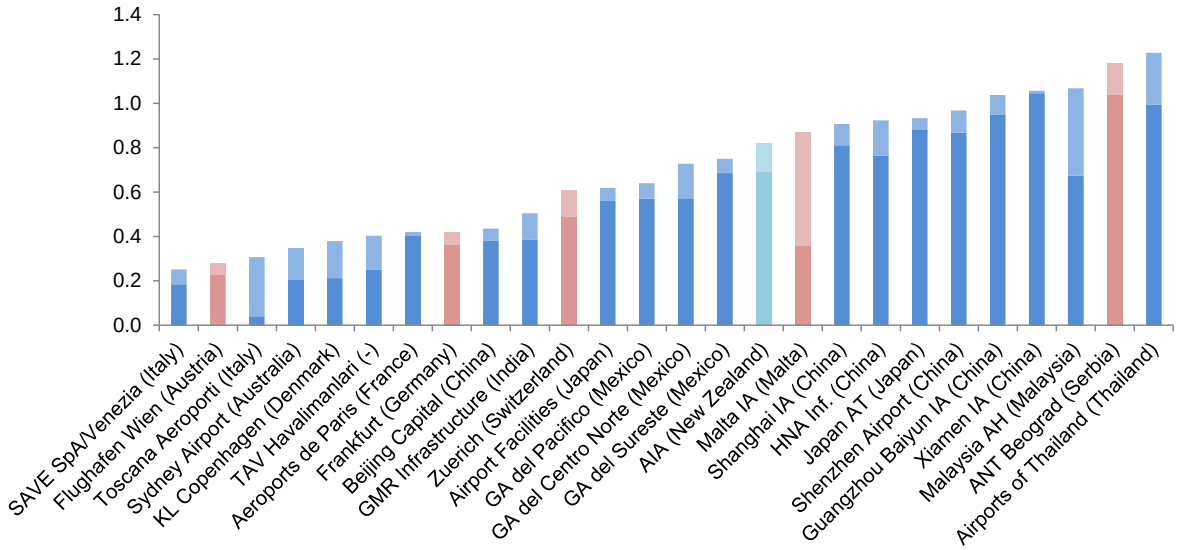
- **Frankfurt** airport is subject to a price control regime with negotiated length. In the past most price paths have only been one or two years.
- In **Vienna**, charges are negotiated on an annual basis between the airport operator and airport users.
- For **Zurich** airport, the regulatory period has a maximum length of four years, but the airport operator is free to schedule earlier tariff revisions.
- In **Malta**, the airport operator may propose adjustments to airport charges each year.
- For **Beograd** airport in Serbia, the operator negotiates tariffs directly with the airlines and consultations have to take place every year.

The regulatory regimes of all of these airports provide for faster price resets at lower levels of complexity and cost than Auckland Airport, allowing them to adjust airport charges more regularly than Auckland Airport. It is important to note that while Auckland Airport also has the theoretical ability to reset prices more frequently than every five years any such attempt is unlikely in practice save for extreme changes in conditions because of the length of the regulatory process (i.e., a total of roughly two and a half years for consultation with customers and price review by the NZCC) and the related costs for AA. In contrast, an airport such as Frankfurt, has frequently made use of their pricing flexibility in practice adjusting charges at annual intervals in many cases. As a consequence, the above-mentioned comparators are likely to face lower ceteris paribus systematic risk than Auckland Airport.

Figure 3.1 shows the range of asset betas as estimated by the NZCC and highlights in red those comparators with greater pricing flexibility.

[69] Commerce Commission (2016): Input methodologies review decisions, Topic paper 4: Cost of capital issues, p. 119, para 460ff.

Figure 3.1: Asset Betas of Comparators with Different Regulatory Regimes



Source: NERA analysis of NZCC data
Note: The airports mentioned above are highlighted in red, as they have regulatory regimes for which the operating leverage effect is likely to be less pronounced.

Figure 3.1 shows that airports with more pricing flexibility (such as Vienna, Frankfurt and Zurich) have betas that are on average below AA's value and also below the mean of the sample. Although the two other airports highlighted above (Malta and Beograd) have betas higher than AA, these values have to be taken with cautions, because the underlying stock data show insufficient liquidity (see section 3.1.2).

In summary, the comparators with more pricing flexibility and lower risk than AA will tend to reduce the NZCC sample average relative to the asset beta commensurate with the risk faced by AA (during this significant investment phase).

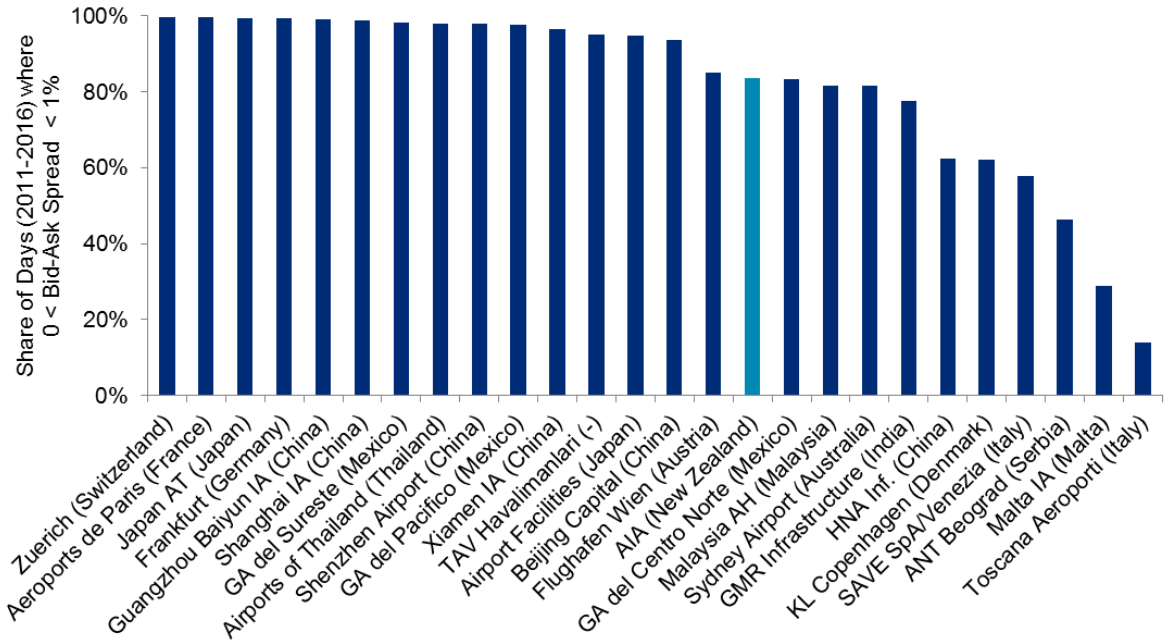
3.1.2. Insufficient liquidity

The data that are used to estimate the comparators' asset betas should also be sufficiently reliable. This is all the more the case since the NZCC's draft report rejects the use of AA's observed beta for unreliability reasons.

Bid-ask spreads are an established indicator of liquidity among regulators. Potential comparators are commonly excluded from samples if the bid-ask spread exceeds 1%.[70] For each of the comparators relied upon by the NZCC, Figure 3.2 depicts the share of days (2011 to 2016) for which bid-ask spreads did not exceed 1%.

[70] This criterion is used in electricity and gas network regulation across Europe including Germany, France, Luxemburg and Austria.

Figure 3.2: Liquidity of Comparator Sample's Stocks: % of Days with Bid-Ask Spreads below 1% (low bars indicate low liquidity)



Source: NERA analysis based on Bloomberg data

The vast majority of the comparators and AA itself exhibit high liquidity. There are six comparators whose stocks are traded liquidly on less than three out of four days (i.e., 75 percent). Liquidity is exceptionally low for the airports in Beograd (AERO SG Equity), Malta (MIA MV Equity) and Toscana (TYA IM Equity). These comparators meet the criterion of a bid-ask spread below 1% on less than every second day.

We do not consider the data for the comparators with bid-ask spreads in excess of 1% for more than half the year to be sufficiently reliable. Including these airports in the comparator sample runs counter to the NZCC's aspiration to derive a reliable beta.

3.1.3. Average asset beta for restricted comparator samples

In the following section, we analyse whether the average asset beta estimated by the NZCC based on the entire comparator sample is sensitive to the exclusion of:

1. five comparator airports, identified in section 3.1.1, which face a lower-risk regulatory regime than AA; and

2. three comparators, identified in section 3.1.2, for which stock market data may not be sufficiently reliable.

In doing so, we use data from the NZCC that show each comparator's five-year asset beta for the time periods 2006-2011 and 2011-2016 (i.e., at the reference dates 31 March 2011 and 31 March 2016, respectively) and for different estimation methods (i.e., daily, weekly, 4-weekly).[71]

[71] Commerce Commission (2016): Input methodologies review decisions, Topic paper 4: Cost of capital issues, p. 245.

Table 3.1: Asset Betas for Different Comparator Samples

Sample	2006-2011			2011-2016			Average
	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	
Entire Comaprator Sample	0.60	0.62	0.69	0.59	0.62	0.66	0.64
Excluding 5 Airports (Reg. Regime)	0.64	0.64	0.71	0.61	0.62	0.67	0.65
Excluding 3 Airports (Liquidity)	0.63	0.65	0.71	0.60	0.62	0.65	0.65
Excluding 6 Airports (Reg. Regime + Liquidity)	0.66	0.66	0.72	0.64	0.65	0.68	0.67

Source: NERA analysis based on NZCC data

The first row of Table 3.1 replicates the NZCC's average asset betas for the entire sample of comparators.[72] As shown in the second and third row, excluding the comparators described above increases betas for almost all of the different estimation approaches.

The average beta rises from 0.64 to 0.65 when excluding comparators with a regulatory regime for which the effect of operating leverage is likely to be less pronounced than in the case of AA. Similarly, the beta increases to 0.65 when excluding the three airports with the lowest liquidity.

In the last row, we combine the two previous steps. This means excluding only seven companies, as the airports in Beograd and Malta both have lower-risk regulatory regimes and show insufficient liquidity. The joint effect leads to an average asset beta of 0.67, which is 0.03 above the value obtained when using the entire sample of comparators.

We have also analysed how the average asset beta varies when excluding three additional airports that have bid-ask spreads below 1% on at least one out of four days. In this case (not shown in Table 3.1), the effect is even more pronounced. The average asset beta rises to 0.67 when excluding the six airports with insufficient liquidity and to 0.70 when excluding all airport that stand out due to liquidity and regulatory regimes.

We stress that the purpose of this analysis is not to suggest that the selected airports should be excluded from the comparator sample. Yet, the results show that the average asset beta for the entire comparator sample seems to be dragged down by airports with regulatory regimes that are different to the one of AA as well as by data irregularities in terms of insufficient liquidity.

Against this background, a beta uplift of 0.08 (relative to the sample average of 0.60) appears appropriate not only because of AA's high expected OL but also to account for differences in regulation and data irregularities. As our illustrative analysis above indicates, an uplift of roughly 0.03 may account for differences in regulatory regimes and data impurities. Therefore, to get to Auckland Airport's implied asset beta uplift of 0.08 would require a further uplift to account for OL of 0.05, which would still be a smaller OL uplift than seen in regulatory precedent (see section 2.2.1).

[72] The average beta for the whole sample deviates from the value of 0.65 determined by the Commerce Commission. This is due to two reasons. First, the Commerce Commission gives higher weight to weekly and four-weekly estimates. Second, the Commerce Commission also considers data for the time periods 1996-2001 and 2001-2006 to obtain its final asset beta. However, we do not use these time periods, since asset betas are not available for a number of companies that are required for the purpose of our illustrative analysis.

3.2. Recent empirical evidence on AA's own beta supports the Target Rate of Return

In addition to the potential tiering of the comparator sample with a view to excluding airports that are not comparable in risk profile to AA, a more detailed look at Auckland Airport's own beta highlights the impact of OL on observed beta.

3.2.1. AA's observable beta reflects the increased riskiness on the airport from the investment programme

The NZCC acknowledges that OL has an impact on the asset beta and the NZCC also considers it likely that AA's OL is going to increase. However, the NZCC is not convinced that AA's OL will be significantly above the OL of the comparators and that the link between OL and asset betas would justify an uplift of 0.08. With that in mind it is instructive to also consider AA's beta alone, which is likely to reflect any known changes to the business risk of AA.

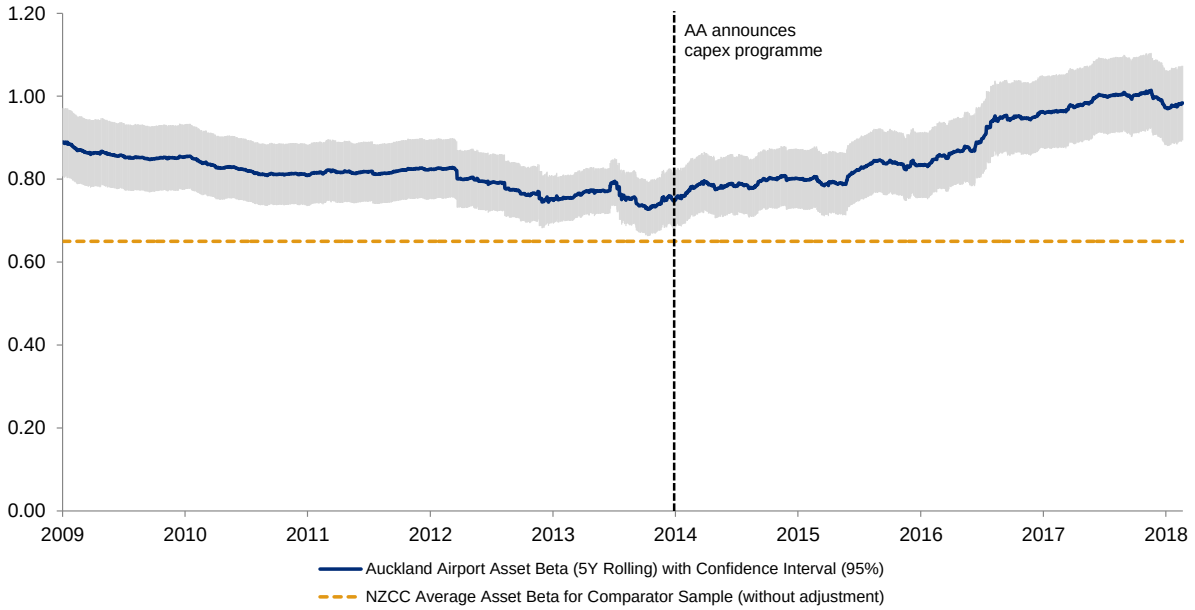
We have demonstrated in NERA 1 that the build-up of the capex programme since Auckland Airport's first announcement of a markedly increasing investment programme in 2014 (the new masterplan) is consistent with a marked increase in AA's asset beta.[73]

Figure 3.3 shows an updated analysis of the evolution of AA's asset beta. The beta is calculated using daily returns over the last five years for each trading day. Confidence intervals (95%) are depicted in grey.[74]

[73] NERA (2017): A Peer Review of Auckland Airport's Approach to WACC and Target Return for Aeronautical Pricing, page ii).

[74] Loosely speaking, the confidence interval is defined such that the "true" beta of AA lies between its boundaries with 95% probability. More precisely, if one repeatedly draws samples of stock market data and constructs a confidence interval for each sample, 95% of all intervals will contain the "true" value.

Figure 3.3: Auckland Airport Daily 5-Year Rolling Asset Beta and Confidence Level



Source: NERA illustration of Bloomberg data for Auckland Airport
Note: The labels on the x-axis refer to 31 March of each year, which is also used as reference day by the Commerce Commission. The underlying data are daily returns and net debt/equity from Bloomberg from 1 April 2009 to 21 May 2018.

Figure 3.3 confirms that AA's asset beta has increased by about 0.20 points since the first announcement of AA's increasing investment programme in 2014, with the steepest uplift coinciding with AA's consultation with airlines regarding the PSE3 aeronautical infrastructure investment programme and heightened investor relations disclosures of the expected increasing future capex profile.

Table 3.2 shows that the increase is significant in a statistical sense on the 95% confidence level. That is, the upper bound of the confidence interval of AA's beta from March 2014 (i.e., following the masterplan announcement) is still clearly below the lower bound of the confidence interval as of March 2018. This implies that the increase in AA's beta since 2014 is substantial and statistically significant, even accounting for the statistical uncertainty in estimating the beta from observed stock data.

Table 3.2: Auckland Airport's Daily 5-Year Rolling Beta and Confidence Level on Selected Days

	5Y Asset Beta	Lower bound	Upper bound
30.03.2018	0.97	0.88	1.06
31.03.2016	0.83	0.75	0.91
31.03.2014	0.75	0.68	0.82
30.03.2012	0.82	0.75	0.90
31.03.2010	0.85	0.78	0.93

Source: NERA illustration of Bloomberg data for Auckland Airport
Note: The table shows the values of AA's 5-year rolling beta as depicted in Figure 3.3 for selected reference days. The columns on "lower bound" and "upper bound" refer to the 95% confidence interval.

Both Figure 3.3 and Table 3.2 show that under AA's regulatory regime, investor's perception of risk has gone up – comparing investor perception of risk for Auckland Airport against itself before it first

announced a materially increasing forecast aeronautical capex programme leads to a significantly higher increase in asset beta than the implied 0.08 point uplift compared with the NZCC's sample average.

Figure 3.3 also illustrates that AA's beta (estimated over a five-year period using daily stock returns) is significantly above the NZCC's non-adjusted beta of 0.65 in a statistical sense. In other words, we can be statistically confident that AA's actual asset beta is greater than 0.65 over the long term. Given the statistically significant increase in recent years, we can be even more confident that this is the case in the years since AA's substantial future aeronautical capex programme has been disclosed to the market. This implies that investors consider AA to face significantly higher systematic risk than the average of the NZCC's airport comparator sample.

3.2.2. There is regulatory precedent that AA's empirical beta should be given the most emphasis in assessing the correct beta for cost of equity

Although stating that AA's observable beta was a useful reference point,[75] the NZCC does not assign special weight to it. The NZCC considers it appropriate to focus on the comparator sample-based asset beta instead of AA's own asset beta.[76] The NZCC provides three reasons supporting this view:

- The NZCC considers asset betas noisy and believes there is significant risk of estimation error when focusing on beta estimates for individual companies.
- The NZCC notes that AA's observable asset beta reflects the entire business and not only the aeronautical part.
- The NZCC cites precedent cases and consultant views supporting the sample-based estimation of the asset beta.

We comment on these arguments in turn.

Attributing the observable increase of AA's asset beta to noise is against statistical convention. AA's asset beta as of 2017/18 is above AA's historical asset beta at any conventional significance level (see Figure 3.3).[77] The same holds true when comparing AA's asset beta to the unadjusted NZCC sample average of 0.65.

The NZCC state that AA's observed beta reflects AA's non-aeronautical business in addition to aeronautical business. However, this does not imply that a sample-based beta should be used instead. This is the case because the airport comparators are not purely aeronautical either.[78] What is more, AA's investment programme and the related increase in OL primarily concern the aeronautical till. Even if AA's observable beta as depicted in Figure 3.3 overestimated the beta of aeronautical business, the increase in AA's asset beta can primarily be attributed to increased risk in the aeronautical till where most of the capex takes place.

As regards regulatory precedent, it is true that regulators often rely on comparator samples to determine betas for regulated companies. However, in the majority of cases regulated companies are

[75] Commerce Commission (2018): Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), p. 101.

[76] Ibid, p. 102.

[77] This is the case because the confidence interval (95%) as of 2017/18 does not confine 0.8, i.e. the level of AA's asset beta in 2013/14.

[78] See Lally (2016): REVIEW OF WACC ISSUES, p. 26f.

not listed and regulators have no choice but looking at comparators. In cases where the regulated firm is listed, regulators do rely on the observable betas. In the airport sector, the cost of capital determinations for Frankfurt and Paris airports are based on the observable betas of the listed operators.[79] When BAA was responsible for the operation of Heathrow airport London, the company's observed beta was used to set its cost of capital, too.[80] Outside the airport sector, there is precedence of the British telecommunications regulator Ofcom setting the betas for British Telecom's (BT) regulated branches based on BT's observable beta.[81]

In sum, the NZCC's arguments do not necessarily justify treating AA's observable beta as if it was no more relevant than any other comparator. At best, it should be the primary and, at the very least, it should be used as a specific cross-check. When considering the following:

- The broad sample average appears to be pulled down by some unreliable estimates and illiquid stocks; and
- AA's daily observed beta has increased in a statistically significant way. Also, its measured value is statistically significantly higher than NZCC's sample average.[82]

The results from the estimation of AA's own beta can provide some useful insight, namely the increase in OL has already begun to be felt by AA's investors and looks set to justify an uplift as high, if not higher than the one currently implicit in the target rate of return.

[79] Journal Officiel de la République Française (2015): Avis de la commission consultative aéroportuaire sur la saisine du secrétaire d'Etat chargé des transports, de la mer et de la pêche en date du 23 avril 2015 dans le cadre de la préparation du contrat de régulation économique d'Aéroports de Paris pour la période 2016-2020, p. 86.

[80] Civil Aviation Authority (2008): Economic Regulation of Heathrow and Gatwick Airports 2008-2013, p. 133; Note that BAA is de-listed since 2008. However, prior to that, the CAA relied on the observed beta.

[81] Ofcom (2017): Wholesale Local Access Market Review – Annexes, Annex 16: Cost of capital, p. 281ff, para A16.77ff.

[82] See Figure 3.3 and Table 3.2 in section 3.2. For the daily five-year rolling asset beta, the upper limit of the 95% confidence interval as of 2014 (when the capex programme was announced) is below the lower limit of today's 95% confidence interval. Also, the NZCC's asset beta of 0.65 is always outside the 95% confidence interval.

4. Conclusion

Auckland Airport has targeted a return of 7.06% across its aeronautical pricing and other regulated activities reflecting its company specific factors, supported by empirical regression analysis and downward adjustments as recommended by the NZCC. The difference relative to the NZCC's mid-point airport industry weighted average cost of capital (WACC) of 6.41% corresponds to an implicit upward adjustment of the asset beta by 0.08 relative to the NZCC industry wide asset beta estimate for aeronautical activities.

The implicit beta adjustment of 8 basis points relative to the industry average is supported by evidence on differences in operating leverage, a measure of a company's capacity to absorb adverse economic developments and therefore a determinant of its exposure to systematic risk. Auckland Airport has committed to a substantial capex programme over PSE3 which will nearly triple its RAB (once substantial capex held as works under construction in PSE3 hits the RAB in PSE4). This period of high capex will result in a substantial increase in AA's operating leverage.

Operating leverage is defined as the proportion of total costs that are fixed. While OL is a relatively straightforward theoretical concept, assessing whether a cost is fixed or variable depends on the time frame of the analysis and the increment of demand that is being assessed.

Hence a number of proxy measures for OL have been put forward in the economic literature and regulatory practice. The most common proxies used in the regulatory context are discussed in Table 4.1 with a view to whether they have regulatory support and whether they can reflect the impact of a capex programme on the airport's cash flow position.

Economic analysis and regulatory precedent shows that the selection of an appropriate empirical measure should be guided by a focus on cashflow risks. Crucially, an increase in fixed overheads can expose a firm to the same cash flow risk as a committed capex plan. In addition to capturing the effect of capex, the emphasis on cashflow risks reflects the observation that variation in cashflows, rather than changes in accounting measures (which may have no direct implications for a company's ability to maintain its economic activity) are the key determinant of a company's economic resilience (i.e. its operating leverage).

Table 4.1
Relevance of operating leverage measures for capex-driven risks

Measure of OL	Relevance for measuring Impact of Capex on Beta
Δ EBIT/ Δ Revenues (Bloomberg)	Highly volatile accounting-based measure; fails to measure impact from capex on systematic risk. No regulatory precedent
OCF/Revenue	Cashflow-based measure but doesn't capture the impact from capex-related capital outflows. Used by UK CMA
FCF/Revenue	Cashflow-based measure that captures impact from capex-related capital outflows. Volatile due to lumpy nature of capex. Proxied by CMA
Opex/RAB	Fails to capture effect from capex. Used by CRE
Totex/RAB	Accounts for impact from capex and opex. However, where the totex allowance is used (as by e.g. CRE) it includes a non-cash depreciation charge and an annualised allowance rather than the cash outflow generated by current capex. Used by CRE
Revenue/RAB	Less effective for measuring capex-specific effects. Used by CRE
Capex/RAB	Accounts for impact from capex. Used by Ofgem.

Note: OCF = Operating Cashflow, FCF = Free Cash Flow
Source: NERA Analysis of operating leverage measures

The precise cashflow measure that is used to measure OL depends on what drives OL in the sector in question: high fixed costs or large fixed capex programs. In the present context, capex is the key driver of Auckland Airport's OL so it is important that any consideration of OL uses measures which pick up increased cash outflows due to the large capex programme.

Based on these considerations, measures like Free Cash Flow/Revenues and Capex/RAB are the most appropriate for measuring operating leverage in the present regulatory context. According to these measures, AA's operating leverage is expected to increase by approximately 14%-20% over the course of PSE3. Regulatory authorities and rating agencies apply uplifts of about 60 bps on WACC and / or 9% to 26% on the asset beta when considering the impacts of similar changes in OL. Regulatory precedent in particular from the UK shows that a change in operating leverage of a lesser magnitude (6%-9%) has resulted in a beta uplift of 13%-18%. An asset beta uplift of 8 basis points (13%) would be consistent in terms of both relative and absolute magnitude with the adjustments applied by regulators in case of differences in operating leverage.

If AA's asset beta was calculated based on its own empirical beta estimate (rather than the average of that of a comparator group), the NZCC's assessment of the appropriate target return would already be higher than the level AA has targeted even before taking account of risk-enhancing effects from increases in operating leverage, as already pointed out in our previous report (see NERA 1). In fact, there is insufficient support for the NZCC's claim that AA's own empirical beta estimate cannot be used on grounds of insufficient statistical reliability. Quite in contrast, AA's observed asset beta has increased in a statistically significant way since the announcement of the materially increasing capex programme and the significant difference between AA's beta and the NZCC's sample average cannot be solely attributed to "noise". In addition, there is also evidence of some comparator companies not being representative for AA's business due to differences in the regulatory regimes or because they produce unreliable estimates due to low trading liquidity. The NZCC's approach of estimating AA's beta based on the average of a comparator sample hence also has its limitations. At the very least, AA's empirical beta should be used as a cross check on the comparator sample.

Appendix A. Summary of International Airport Regulatory Regimes

In the following, we briefly review the regulatory regimes under which the comparator airports operate. Public information is not available for all comparator airports. The regulatory risk faced by a comparator cannot be reliably assessed if the company operators several major airports in different countries such as TAV Havalimanlari Holding AS (Turkey, Tunisia, Latvia, Saudi-Arabia among others).

- **Copenhagen:** Copenhagen Airport, operated by Copenhagen Airports A/S (CPH, Bloomberg ticker: KBHL DC Equity), is the largest Northern European airport with c. 29 million passengers and revenues of DKK 4,422 million (c. EUR 594 million[83]) in 2016.[84] As the largest Danish airport it automatically falls under the Danish Transport, Construction and Housings Authority's (DTCA) "*Regulation on payment for using airports*".[85] This regulation stipulates that "*Airport charges shall to the greatest extent possible be determined according to agreement between the airport managing body and the airport users*".[86] In case CPH and the airport users cannot agree on a tariff scheme, Art 8 of the Regulation stipulates that the DTCA steps in and calculates allowed revenues for CPH based on a hybrid till CPI-X approach. The **revenue cap is based on a regulatory period of two years**.

- **Frankfurt:** Frankfurt Airport is Germany's largest airport with over 60 million passengers in 2016. The airport is operated by Fraport AG (Bloomberg ticker: FRA GR Equity), a partially listed but predominantly state-owned company. The economic regulation of Fraport is mainly set out in the German Air Traffic Act. The Hessian Ministry of Economy, Transport, Urban and Regional Development assumes the responsibilities of a regulatory authority and has to approve the airport charges. Fraport is required to consult with airlines annually and allowing it to apply for charge adjustments during these consultations.[87] Historically price paths have rarely exceeded two years and have sometimes involved multiple adjustments in one year.[88]

- **Paris:** Charles de Gaulle Airport as well as Paris Orly Airport are both owned and operated by Groupe Aéroports de Paris (ADP, Bloomberg ticker: ADP FP Equity). In 2017 traffic volume at both airports combined surpassed 100 million passengers. Currently, ADP is regulated by the *Contract of Economic Regulation* between the state and ADP, which was entered into in June 2015 and covers the period 2016-2020.[89] The regulatory framework is set by national law and the **length of a regulatory period is five years**. ADP submits a proposal for the Regulatory Contract to a consultative commission (Cocoaero) which may submit propositions of its own.[90] There are no negotiations between airlines and ADP, but Cocoaero allows both stakeholders to officially

[83] For converting currency, we use the average conversion rate for the respective year, provide by the European Central Bank.

[84] Copenhagen Airports (2016): Annual Report 2017, p. 12.

[85] DTCA (2017): BL 9-15, Edition 4, 16 November 2017, Art 1.2.

[86] DTCA (2017): BL 9-15, Edition 4, 16 November 2017, Art 7.1.

[87] See https://www.fraport.com/en/business-partner/airlines-cargo/airport-charges.html

[88] See http://www.aero.de/news-9351/Entgelte-am-Flughafen-Frankfurt-steigen-in-Staffelung.html (German only)

[89] Group ADP website, http://www.parisaeroport.fr/en/group/finance/investor-relations/regulation.

[90] Group ADP website, https://www.parisaeroport.fr/docs/default-source/groupe-fichiers/finance/relations-investisseurs/r%C3%A9gulation/2016-2020/19012015---a%C3%A9roports-de-paris---dossier-public-de-consultation-cre-2016-2020.pdf?sfvrsn=852206bd_2 for the ADP proposal and https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000030784765 for the Cocoaero proposition.

and publicly raise concerns. Since July 2016, the new dedicated regulator ASI has the power to review and approve tariffs, with no intervention on specific details.

- **Vienna:** Vienna Airport is a leading hub in Central and Eastern Europe with more than 23 million passengers served in 2016.[91] It is owned and operated by Flughafen Wien AG (VIA, Bloomberg ticker: FLU AV Equity). The Austrian Ministry for Transport, Innovation and Technology assumes the role of the regulatory authority. The federal law on the determination of airport charges (Flughafenentgeltgesetz – FEG) sets out the guidelines for charge setting.[92] The charge setting is primarily based on negotiations between VIA and the airport users. The **charges are renegotiated each year** with the current charges coming into effect on 1 January 2018.[93] During the negotiations, VIA is required to disclose information to airport users on the tariff calculation methodology, expenses for aeronautical services, past revenues from airport charges, prospective charges and planned investments, past utilization of the airport infrastructure and others. VIA is not required to disclose costs or revenues from non-aeronautical services.

- **Zurich:** Zurich Airport is Switzerland's largest airport. It served c. 28 million passengers in 2016. The airport is owned and operated by Zurich Airport AG (ZAG, Bloomberg ticker: FHZN SW Equity). The largest shareholder, the canton of Zurich, is legally obliged to hold at least one third of shares. ZAG was granted the operating concession by the Swiss department for environment, traffic, energy and communication in 2001. The operating regulations which have to be approved by the Federal Office of Civil Aeronautical (FOCA) stipulate, among other, that the airport operator can charge tariffs for access to the airport.[94] An ordinance on airport charges specifies the economic regulation of Zurich airport.[95] The tariffs of ZAG have to be revised at least every four years.[96] Hence, **the length of the regulatory period is flexible but capped at four years. It falls into the discretion of ZAG to schedule a tariff revision**.

- **Sydney:** Sydney Airport (Bloomberg ticker: SYD AU Equity) is subject to a **light handed** information disclosure and aeronautical prices are set by negotiations with airlines. This price monitoring regime was set by the Australian Competition & Consumer Commission (ACCC) in 2002 and gives a lot of discretion to the airport operator. Agreements between the airport and airlines usually last for five up to 17 years. In 2015-16 Sydney Airport implemented the latest agreement with airlines that sets prices for the next five years but there is no ability for a regulator to express opinion on a particular negotiation or price-setting. Hence it would be relatively faster to reprice should Sydney wish to re-consult prices with airlines than for the regulated airports in New Zealand.

- **Venice, Florence, and Pisa:** The comparator SAVE SpA/Tessera (Bloomberg ticker: SAVE IM Equity) operators the Venice airport. The comparator Toscana Aeroporti SpA (TYA IM Equity) operates the airports in Venice and Florence. In Italy, the Autorita di Regolazione dei Transporti is responsible for the economic regulation of airports. Airports with more than five million passengers per year, i.e. Venice and Pisa, are subject to a **price cap regulation with regulatory**

---

91 See Vienna International Airport website, https://www.viennaairport.com/unternehmen/flughafen_wien_ag/facts__figures_fwag_gruppe.

92 See Flughafenentgeltegesetz – FEG, http://www.ris.bka.gv.at/Dokumente/BgblAuth/BGBLA_2012_I_41/BGBLA_2012_I_41.pdf.

93 Vienna International Airport (2017): Airport Charges Regulations 2018. See https://www.viennaairport.com/jart/prj3/va/uploads/data-uploads/Charges%20Regulations%202018.pdf.

94 Flughafen Zürich (2017): Betriebsreglement für den Flughafen Zürich vom 30. Juni 2011 (Stand am 1. Dezember 2017), Art. 5.

95 Schweizerischer Bundesrat (2012): Verordnung über die Flughafengebühren vom 25. April 2012 (Stand am 1. Juni 2012).

96 Ibid, Art 10.

control periods of four years.[97] Similar but simplified regulation applies to smaller airports, i.e. Florence.

- **Malta:** Under the Maltese regime, the Airport Charges Regulatory Board is responsible for the determination, review and regulation of airport charges.[98] The **airport operator**, (Bloomberg ticker: MIA MV Equity) whose representative is a board member, **is entitled to propose adjustments to the level of airport charges at the annual meeting of the board**. The airport operator has to consult changes to the airport charges with the Airport User Committee at least four month before they are expected to enter into force. After communicating its proposals to the AUC, the airport operator submits its proposals to the Airport Charges Regulatory Board, taking into account, insofar as is reasonably possible, any views put forward by the airport users. The Airport Charges Regulatory Board has to issue a decision on the proposed charges adjustment not later than three month after the airport operator submitted to proposal. In summary, airports operating under the Maltese regime have the opportunity to adjust airport charges annually in a timely manner.

- **China:** Several comparators (Bloomberg tickers 000089 CH Equity, 7 HK Equity, 600004 CH Equity, 600009 CH Equity, 600897 CH Equity, 694 HK Equity) relate to airports in China. Chinese airport deregulation has started in 1990.[99] Since 2002 the Civil Aviation Administration of China (CAAC), which became the owner of significant airports after these have been separated from the military in the 1980s, no longer owns and operates airports. It has been transformed into an independent regulator. The "Civil Airport Charges Reform Plan" from December 2007 liberalised airport charges by giving airport operators more freedom to price services according to the nature of the business. Airport charges are price-cap regulated.[100]

- **India:** The airport in Delhi, which served 55 million passengers in 2017 and hence is the 7th largest airport in Asia, is operated by GMR Infrastructure Ltd. (Bloomberg ticker GMRI IN Equity). Since 2009, all major Indian airports are regulated by the Airports Economic Regulatory Authority of India (AERA). The regulatory regime to determine tariffs for aeronautical services is a **price cap model** with respect to the aeronautical yield per passenger. Tariffs are set for a **regulatory period of five years**. Regulation follows a single-till approach, implying that non-aeronautical revenues are also taken into account for determining tariffs.

- **Beograd:** The Serbian airport regulations applying to the airport of Beograd, the capital of Serbia, are compliant with European Union legislation. The airport operator, i.e. Aerodrom Nikola Tesla AD Beograd (Bloomberg ticker: AERO SG Equity), is obliged to regularly consult with airport users on the level of airport charges amongst others as set out in article 7 of the Serbian regulation on airport charges.[101] The **airport operator has the opportunity to reset charges annually** as the consultation between airlines and the airport operator has to take place at least once year unless agreed on differently in previous consultations. In case airport operator and airport users cannot reach an agreement, an independent supervisory authority determines the level of charges.

---

97 Cambini, C. & Perrotti, L. (2015): The New Transport Regulation Authority in Italy: Structure, Competencies, and First Regulatory Decisions, page 5.

98 See SUBSIDIARY LEGISLATION 499.19 - AIRPORT ECONOMIC REGULATIONS 1st October, 2002, LEGAL NOTICE 299 of 2001, as amended by Legal Notices 448 of 2004, 194 and 411 of 2007, and 132 of 2011.

99 See Yang, X. & Yu, H, (2010): Deregulatory Reform of China's Airports: Attracting Non-state Investors.

100 See Yang, X. & Yu, H, (2010): Deregulatory Reform of China's Airports: Attracting Non-state Investors, page 8.

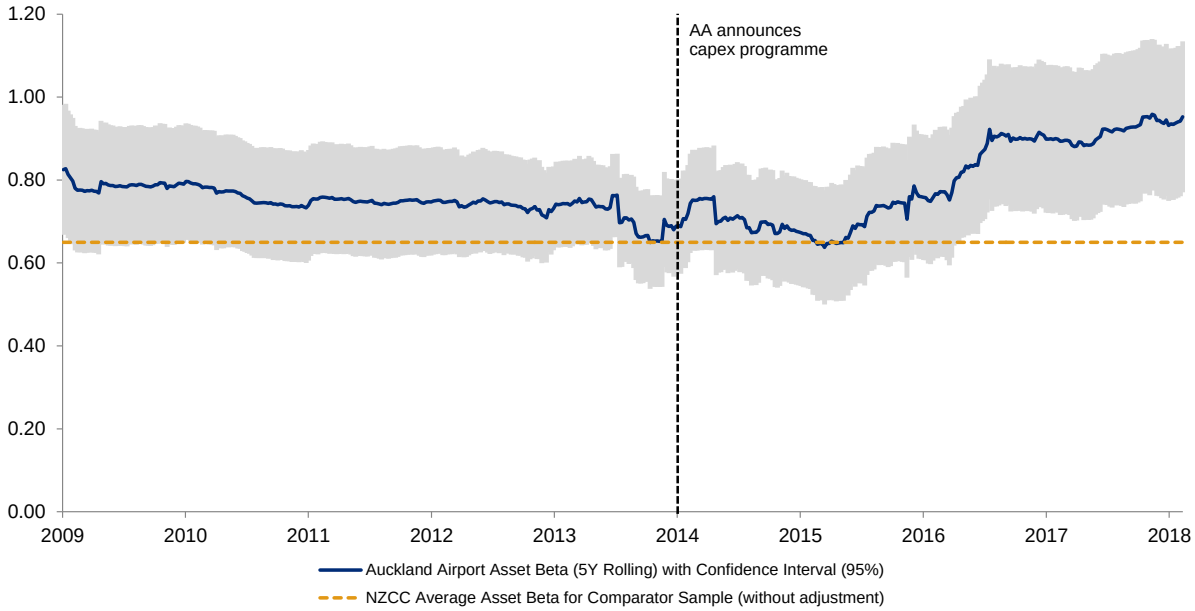
101 Management Board of the Civil Aviation Directorate of the Republic of Serbia, regulation on airport charges.

Appendix B. Auckland Airport's Weekly Five-Year Rolling Asset Beta

In addition to calculating AA's five-year rolling beta based on daily stock data (see section 3.2.1), we perform a similar analysis using weekly observations. We do so by using weekly returns provided by Bloomberg. The result is shown in Figure 4.1.

Figure 4.1

Auckland Airport Weekly 5-Year Rolling Asset Beta and Confidence Level



Source: NERA illustration of Bloomberg data for Auckland Airport
Note: The labels on the x-axis refer to 31 March of each year, which is also used as reference day by the Commerce Commission. The underlying data are weekly returns and net debt/equity from Bloomberg from 1 April 2009 to 11 May 2018.

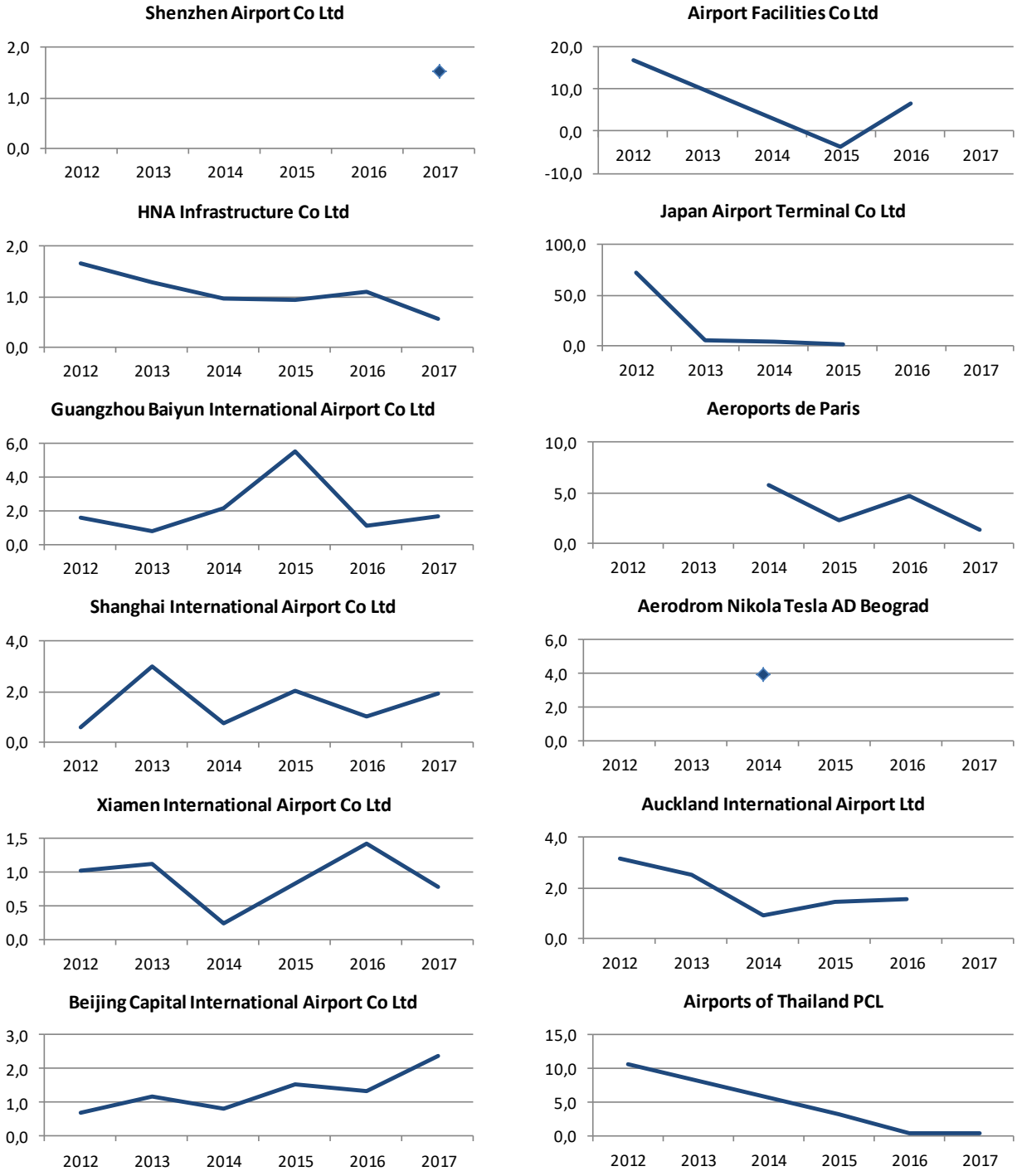
We note that using weekly stock data from Bloomberg does not exactly replicate the analysis undertaken by the Commerce Commission, where the weekly beta is estimated by averaging across all trading days of one week. Nonetheless, our approach allows us to observe how AA's asset beta has developed from 2009 until now and, in particular, since the announcement of the capex programme.

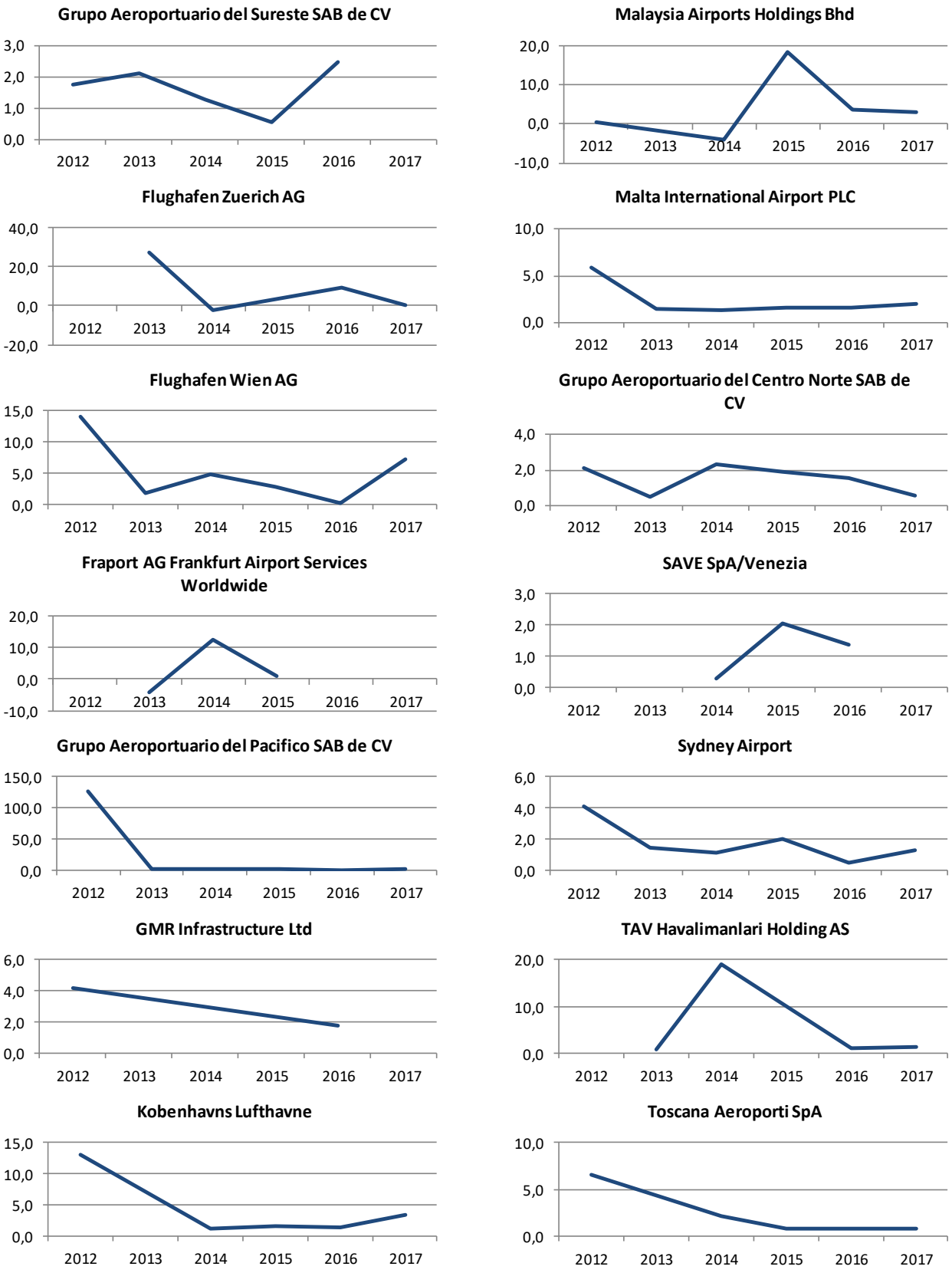
When using weekly observations as in Figure 4.1, the pattern of a statistically significant increase in AA's beta since 2014 (in terms of the 95% confidence interval) is less pronounced. This is mainly due to the fact that confidence intervals are much larger for weekly estimates, as each regression (over a five-year period) is based on fewer observations. The increase in AA's asset beta since 2014 is nevertheless apparent when using weekly data. In particular, despite the larger confidence intervals, AA's asset beta is significantly above the NZCC's average beta of 0.65 since 2016.

Appendix C. Bloomberg OL measure with high fluctuation at company level

Figure 4.2 shows the different values for the Bloomberg measure of operating leverage across companies and years. As shown below, for individual companies the variation over time is substantial.

Figure 4.2
Degree of Operating Leverage (Bloomberg), 2012-17





Source: NERA analysis based on Bloomberg data

Qualifications, assumptions and limiting conditions

This report is for the exclusive use of the NERA Economic Consulting client named herein. This report is not intended for general circulation or publication, nor is it to be reproduced, quoted or distributed for any purpose without the prior written permission of NERA Economic Consulting. There are no third party beneficiaries with respect to this report, and NERA Economic Consulting does not accept any liability to any third party.

Information furnished by others, upon which all or portions of this report are based, is believed to be reliable but has not been independently verified, unless otherwise expressly indicated. Public information and industry and statistical data are from sources we deem to be reliable; however, we make no representation as to the accuracy or completeness of such information. The findings contained in this report may contain predictions based on current data and historical trends. Any such predictions are subject to inherent risks and uncertainties. NERA Economic Consulting accepts no responsibility for actual results or future events.

The opinions expressed in this report are valid only for the purpose stated herein and as of the date of this report. No obligation is assumed to revise this report to reflect changes, events or conditions, which occur subsequent to the date hereof.

All decisions in connection with the implementation or use of advice or recommendations contained in this report are the sole responsibility of the client. This report does not represent investment advice nor does it provide an opinion regarding the fairness of any transaction to any and all parties.

NERA
ECONOMIC CONSULTING

NERA Economic Consulting
151 Queen Street
Level 18
Auckland, New Zealand, 1010
Tel: 64 9 9283290
www.nera.com

NERA Economic Consulting
Marble Arch House, 66 Seymour Street
London W1H 5BT
United Kingdom
Tel: 44 20 7659 8500
www.nera.com