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A Peer Review of Auckland Airport's Approach to WACC and Target Return for Aeronautical Pricing

A Report for Auckland Airport

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Executive Summary

Auckland Airport has estimated its target return for the next pricing period with reference to the Commerce Commission's own industry-wide post-tax WACC estimate of 6.29%, but adjusted for Auckland-specific factors. Auckland Airport concludes on a post-tax target return of 7.0% for PSE3 in its draft pricing proposal.

In light of the Commission's view that it will consider other factors that result in Auckland Airport's target return being different from its industry-wide post-tax WACC estimate of 6.29%, we have considered whether such Auckland-specific factors exist, and if so, how they may be reflected in the target return. Our report focuses on the airport-specific parameters of the cost of capital, specifically the beta and the cost of debt, to determine whether these should be different from the Commission's industry-wide estimates in its WACC decision.

Review of Auckland Airport's target return calculations – Asset beta

In its draft pricing proposal, Auckland Airport uses the Commission's estimate of Auckland Airport's asset beta based on a statistical regression of Auckland Airport's stock returns against a market index. This contrasts to the Commission's approach of using empirical estimates for international airport comparators in setting an industry-wide WACC. The Commission estimates an asset beta of 0.60 in its latest estimate of the WACC for airports. This is lower than the Commission's estimate of Auckland Airport's beta, which is 0.68 based on a 20-year estimation window.[1]

We agree with Auckland Airport's approach of adopting an Auckland Airport-specific beta, rather than using the Commission's industry-wide beta estimate. The expected increase in Auckland Airport's capital expenditure is likely to increase its systematic risk relative to international comparators through an increase in operational leverage. Operational leverage measures the proportion of total costs that are fixed. The higher the operational leverage, the greater the difficulty in scaling back costs in response to market demand shocks, and therefore the greater the volatility in cash flows. By increasing its capital expenditure, Auckland Airport's operational leverage increases, and we agree with Auckland Airport that this is best captured through the Commission's estimate of Auckland Airport's own beta rather than considering international comparators.

To capture the increase in systematic risk from the anticipated capex programme, Auckland Airport should estimate the beta over a shorter estimation window than its selection of 20 years. As shown in Figure 1, Auckland Airport's beta appears to have increased consistently since its Masterplan was originally announced in 2014 with a high implied capex programme. We propose to estimate an asset beta range based on a 5-year estimation window, as well as the 20-year estimation window that Auckland Airport adopts. A 5-year estimation window captures the recent increase in Auckland Airport's beta, which appears to be a result of the increase in planned capital expenditure. ***This provides an asset***

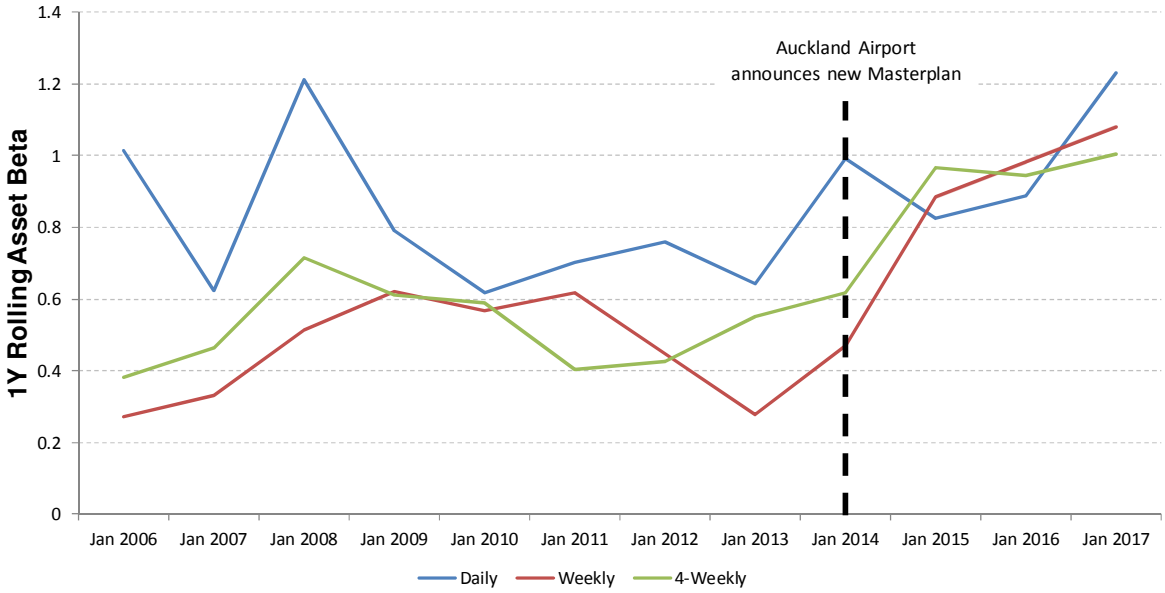
[1] In its draft pricing proposal, Auckland Airport reported an asset beta of 0.68 using a 20-year estimation window using the Commission's estimates in its draft input methodologies decision. However, the Commission corrected some of its beta estimates in its final input methodologies decision, which was released after the draft pricing proposal. Using the corrected data results in Auckland Airport's beta based on 20 years of data increasing from 0.68 to 0.705.

beta range of 0.73 – 0.81, higher than Auckland Airport's own estimate in its draft pricing proposal of 0.68 (which also uses an earlier data cut-off date of 1 April 2016 based on the Commission's draft input methodologies decision).

Using a 5-year estimation window may still underestimate the impact of Auckland Airport's planned capex on the beta [ ].

Once the market prices in the impact of this higher capital expenditure, the beta observed in the market may increase above the current level, and above the estimate of 0.81 based on a 5-year window.

Figure 1
Recent increase in Auckland Airport's asset beta supports use of shorter estimation window



Source: NERA analysis of Bloomberg data with cut-off date of 22 February 2017; chart shows Auckland Airport's 1Y rolling asset beta.

We note that adopting our proposed asset beta range of 0.73 – 0.81 instead of the 20 year estimate of 0.68[2], as used by Auckland Airport in its Draft Proposal, would result in the post-tax target return increasing from 7.0% to 7.4% - 8.0%.

[2] As already noted, Auckland Airport derived this beta from the Commission's beta data set. Using the Commission's corrected data set, which was released after the draft pricing proposal, would result in a higher 20 year beta of 0.705, and therefore a higher WACC estimate.

Review of Auckland Airport's target return calculations – Cost of debt

In its draft pricing proposal, Auckland Airport estimates the cost of debt based on its own expected financing cost over the pricing period. This approach recognises the fact that companies refinance themselves continuously as existing debt matures and as new capital expenditure needs to be financed. Auckland Airport estimates an average cost of debt of 4.32% over PSE3. This is lower than Auckland Airport's existing cost of financing of 5.09% as Auckland Airport considers that it will benefit from lower rates at the time of refinancing its existing debt over the next pricing period. It is also only marginally higher than the Commission's industry-wide cost of debt estimate of 4.25%, which is based on comparator bond debt premiums over the last five years.

In general, we consider that the cost of debt for PSE3 should be based on a weighted average of the cost of embedded debt and new debt:

$$Cost\ of\ Debt = Weight\ on\ Embedded\ Debt * Cost\ of\ Embedded\ Debt + Weight\ on\ New\ Debt * Cost\ of\ New\ Debt$$

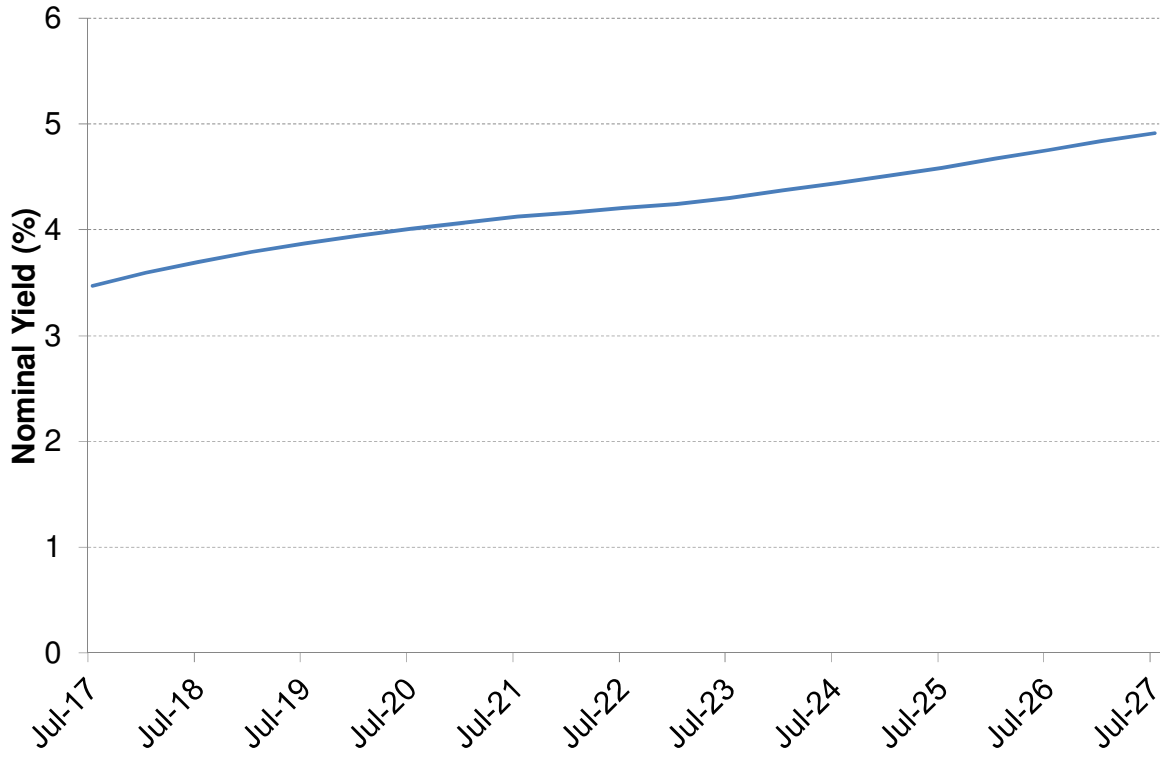
Under this approach, the weights are calculated based on how much new debt is expected to be raised over the pricing period.

Auckland Airport notes that its estimate is at the lower end of the range for the forecast actual cost of debt in PSE3, but we see no reason for selecting the lower end when setting the target return. The target return should reflect Auckland Airport's view of the fair return based on *expected* risk, and not the most conservative scenario possible. In the absence of any evidence that the expected cost of debt is at the lower end of the forecast range, the target return should be based on the mid-point of the forecast range.

We have assessed Auckland Airport's view that interest rates are projected to increase over the next pricing period. In its calculation of the cost of new debt, Auckland Airport assumes an increase in the base rate on any bond financing from 3.29% in 2017 to 3.99% in 2021.

Figure 2 shows the forward curve for NZ sovereign debt with maturity of 10 years. This forward curve represents the market's expectation of future yields on a 10-year NZ government bond.

Figure 2
NZ 10Y sovereign forward curve shows interest rates are expected to increase



Source: Bloomberg; Note: Forward curve as of 16 February 2017

As shown above, NZ 10-year government bond yields are forecast to increase to around 4.2% by the end of the next pricing period in June 2022. By comparison, Auckland Airport is forecasting the base rate to increase to 3.99% in the last round of its bond refinancing in 2021. ***This suggests that Auckland Airport has been somewhat conservative in forecasting the base rate over PSE3, by around 20 basis points.***

In addition to the base rate on new debt issuances, Auckland Airport assumes that the margin on new debt will be in line with the margin achieved on its historical debt. This assumption does not take account of the possibility that Auckland Airport's debt margins on new debt may increase over the next pricing period as its overall debt levels increase to finance higher levels of new capital expenditure. Higher debt levels may result in Auckland Airport breaching the credit metric thresholds for its current A- credit rating, which may increase its cost of debt relative to Auckland Airport's assumed level of 4.32%. Therefore, Auckland Airport's current assumption that debt margins will not increase relative to historical levels is conservative. We return to this below.

Overall, we estimate that Auckland Airport's cost of debt estimate for PSE3 could be up to 20 basis points higher than its current estimate of 4.32%, reflecting a greater level of increase in the base rate on new debt issuances relative to Auckland Airport's assumption. This would lead to a cost of debt estimate of 4.52%. Compared to Auckland Airport's post-tax target return estimate of 7.0%, a cost of debt of 4.52% would lead to a post-tax target return of 7.1%.

Target Return relative to the WACC

Auckland Airport estimates its target return with reference to the Commission's industry-wide WACC estimate, as well as UniServices' report on the WACC. To calculate the target return, Auckland Airport adjusts the beta and cost of debt assumptions in the UniServices WACC report to reflect Auckland-specific factors, as discussed above.

Auckland Airport's adjustments to UniServices' industry-wide WACC estimate is based on the same overall WACC framework as the Commission, but makes use of company-specific data instead of industry-wide data.

We have considered factors outside the Commission's WACC framework that would mean Auckland Airport's target return may be different from the WACC. We consider two specific factors:

- **Financeability**: any target return estimate that results in a reduction in Auckland Airport's A- credit rating will cause its cost of debt to increase and will hence be inconsistent with Auckland Airport's cost of debt estimate of 4.32%. Our analysis of Auckland Airport's credit metrics shows that both the Commission's post-tax WACC estimate of 6.29% and Auckland Airport's post-tax target return estimate of 7.0% would result in Auckland Airport breaching the credit metric thresholds for an A- rating. This reduction in the credit rating would mean that the Auckland Airport's cost of debt estimate of 4.32% (based on an A- rating) is inconsistent with the financing outcomes over the pricing period.

  If Auckland Airport is exposed to considerable risk to its financeability as a result of the anticipated capital investments, the target return should be set above the Commission's estimate of the WACC and Auckland Airport's estimate of the target return.

- **Impact of discretionary capex on target return**: with respect to capital expenditure, we consider whether the hurdle rate for Auckland Airport's planned capex is higher than the WACC due to loss in flexibility from undertaking it earlier than under fully commercial plans. If Auckland Airport has planned capital expenditure under pressure from the government, airlines or for wider public policy reasons, it may have undertaken expenditure earlier than it would independently as a commercial organisation. We note that, following feedback from Air NZ and other airlines, Auckland Airport has changed its draft plan for domestic integration to have both domestic carriers moving to the planned new facility at the same time. As a result of this feedback, Auckland Airport has increased its capital envelope.

  In other words, Auckland Airport may have lost some flexibility as to the timing and scale of its capital expenditure. This flexibility is known in the academic literature as a 'real option' and investors should be remunerated for its loss if there is external pressure to undertake investment before Auckland Airport may have done if it were making the decision independently.

To take account of these Auckland Airport-specific factors, we consider that Auckland Airport should set the target return at the top end of the estimated range. By setting the target return above the 50th percentile, we better ensure that Auckland Airport is able to maintain its

current credit rating of A- and is compensated for the real option value of losing flexibility when undertaking capex now under pressure from airlines.

Other Parameters in Target Return

Auckland Airport estimates its target return with reference to the Commission's industry-wide WACC estimate, as well as UniServices' report on the WACC. To calculate the target return, Auckland Airport adjusts the beta and cost of debt assumptions in the UniServices WACC report to reflect Auckland-specific factors, as discussed in the sections above.

- **Risk-free rate:** in the context of setting a target return, historically low interest rates in and of themselves are not a concern, as a potential rise will be captured by the forward rate mechanisms. ***However, we have two concerns with the Commission's methodology:***
  - ***Recent volatility in interest rates means that the date of the analysis can have a material impact on the estimated risk-free rate; and***
  - ***The Commission's 3-month estimation window will lag any rise in interest rates.***

  Our analysis of the latest market evidence and the Reserve Bank of New Zealand's (RBNZ) own projections of interest rates shows that the risk-free rate is expected to increase by up to 20 basis points by the mid-point of the pricing period relative to the prevailing rate. We therefore estimate a risk-free rate of 2.80%, 20 basis points higher than the Commission's estimate to take account of market forward curve evidence and RBNZ's forecasts. Our adjustment to the Commission's risk-free rate estimate is based on the same reasoning as our adjustment to the base rate within Auckland Airport's cost of debt estimate, described above.
- **Tax adjusted market risk premium:** UniServices concludes that the appropriate estimate of the market risk premium as at 1 April 2015 is 7.25%, which is 0.25% higher than the Commission's estimate of 7.00%. ***We support UniServices' adjustments to the Commission's approach, which ensures that estimates based on long-run historical data do not fluctuate based on current market data.***

Indicative NERA Estimate of the Target Return

Table 1 shows our estimates of the post-tax target return after we adjust Auckland Airport's approach on the:

- Beta: We adopt a range based on 5-year and 20-year estimation windows instead of Auckland Airport's 20-year window. We have also used the latest data up to 22 February 2017.
- Cost of debt: We have added 20 basis points to Auckland Airport's cost of debt estimate of 4.32% to take account of forward curve evidence.
- Risk-free rate: We use the latest forward curve evidence and RBNZ's interest rate projections to adjust the Commission's risk-free rate estimate upward by 20 basis points.

As a result of these adjustments, we estimate a range for the post-tax target return of 7.5% to 8.1%, compared to Auckland Airport's estimate of 7.0%.

Table 1
NERA Estimate of Target Return

	Commission	UniServices	Auckland Airport Target Return	NERA Target Return	
	Dec 16	**Dec 16**	**Dec 16**	**Low**	**High**
Risk-free rate	2.60%	2.60%	2.60%	2.80%	2.80%
Debt premium	1.45%	1.40%			
Leverage	19%	20%	19%	19%	19%
Asset beta	0.6	0.6	0.68	0.73	0.81
Debt beta	0	0	0	0	0
TAMRP	7.00%	7.25%	7.25%	7.25%	7.25%
Corporate tax rate	28%	28%	28%	28%	28%
Investor tax rate	28%	28%	28%	28%	28%
Debt issuance costs	0.20%	0.20%			
Equity beta	0.74	0.75	0.84	0.90	1.00
Cost of equity	7.06%	7.31%	7.96%	8.55%	9.27%
Cost of debt	4.25%	4.20%	4.32%	4.52%	4.52%
Vanilla WACC/Return	6.52%	6.69%	7.3%	7.8%	8.4%
Post-tax WACC/Return	**6.30%**	**6.45%**	**7.0%**	**7.5%**	**8.1%**

Source: Commerce Commission (December 2016), Auckland UniServices (December 2016), Auckland Airport Draft Pricing Proposal (December 2016), NERA analysis.

To take account of other Auckland Airport-specific factors affecting the target return, including the effect on financeability and the impact of discretionary capex that results in loss of flexibility, Auckland Airport should set a point estimate for the target return at the top end of our estimated range. In particular, we consider that Auckland Airport should set its post-tax target return at a rate higher than 7.8%.

1. Introduction

This report has been prepared by NERA Economic Consulting for Auckland Airport as part of consulting services in relation to a peer review of Auckland Airport's approach to the weighted average cost of capital (WACC) and target return for aeronautical pricing. In particular, Auckland Airport has requested NERA to produce an expert report to review the calculation of the target return component of its charges, prior to Auckland Airport's revised pricing proposal.

Auckland Airport is subject to information disclosure regulation, under which Auckland Airport's pricing decision is reviewed by the Commission. This form of regulation is intended to provide incentives for Auckland Airport to behave in line with efficient market outcomes through two channels:[3]

- By providing transparency about how well a supplier is performing relative to other suppliers and over time; and
- Through the threat of further regulation.

Auckland Airport has calculated prices in its draft pricing proposal using a 'building block' approach, in which the target return is the block that remunerates Auckland Airport's investors for the risk they bear in committing their capital to the asset. Auckland Airport has estimated its target return with reference to the Commission's own industry-wide post-tax WACC estimate of 6.29%, but adjusted for Auckland-specific factors (estimated as at 1 April 2016). Auckland Airport concludes on a post-tax target return of 7.0% for PSE3, the next pricing period running from 1 July 2017 to 30 June 2022.

We understand from Auckland Airport that the Commission is open to considering factors that would mean Auckland Airport's target return may be different from the industry-wide WACC. In its final IM decision from December 2016, the Commission stated that it "*continue[s] to consider that there may be legitimate reasons for an airport to target returns that are different to our mid-point WACC estimate (…). These factors could include whether the assessment is taking place on an ex–ante or ex-post basis, airport-specific circumstances, or other factors that should be taken into account in assessing airport profitability*".[4] The Commission also noted that this "…*does not prevent airports targeting (ex-ante) returns above the mid-point when they have legitimate reasons for doing so. However, the airports will be required to provide information and evidence to explain those reasons to interested parties*."[5]

The Commission's own adviser, Professor George Yarrow, supported this view in his expert report, in which he noted that there is a conceptual difference between WACC estimates and

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[3] Commerce Commission (31 July 2013): "Final report to the Ministers of Commerce and Transport on how effectively information disclosure regulation is promoting the purpose of Part 4 for Auckland Airport", Section 56G of the Commerce Act 1986, paragraph 2.1.2, p14.

[4] Commerce Commission (December 2016), Final IM Decision, Topic Paper 6, paragraph 91.

[5] Commerce Commission (December 2016), Final IM Decision, Topic Paper 6, paragraph 94.

an appropriate target rate of return since the business' appropriate rate of return must reflect its own individual circumstances.[6]

In light of the Commission's view that it will consider other factors that result in Auckland Airport's target return being different from its industry-wide post-tax WACC estimate of 6.29%, we have considered whether such Auckland-specific factors exist, and if so, how they may be reflected in the target return. Our report focuses on the airport-specific parameters of the cost of capital, specifically the beta and the cost of debt, to determine whether these should be different from the Commission's industry-wide estimates in its WACC decision.

This report does not provide a detailed opinion on the general market parameters used to calculate the WACC, including the risk-free rate and MRP. We broadly accept the Commission's methodology in applying the Brennan-Lally CAPM and the methodology used to calculate the risk-free rate and TAMRP in the WACC calculation, although we consider some specific adjustments to take account of the latest market evidence and UniServices' analysis on the TAMRP.

This report is structured as follows:

- Section 2 considers the asset beta estimate used to calculate Auckland Airport's target return;
- Section 3 assesses the appropriate cost of debt for Auckland Airport' target return over the next pricing period;
- Section 4 evaluates whether the target return may be higher than the WACC due to factors not captured in the traditional WACC estimation framework used by the Commission;
- Section 5 reviews the other parameters in the target return calculation; and
- Section 6 concludes.

[6] Yarrow, G (February 2016): "Responses to questions raised by the Commerce Commission concerning WACC estimates for information disclosure purposes in the airports sector".

2. Asset Beta

In this section, we consider the asset beta estimate used by Auckland Airport to calculate its target return. The asset beta parameter remunerates investors for the systematic risk associated with their investment, which is the risk they cannot diversify away within their portfolio.

In its draft pricing proposal, Auckland Airport uses the Commerce Commission's estimates of Auckland Airport's asset beta based on a series of statistical regressions of Auckland Airport's stock returns against a market index. This contrasts to the Commission's approach of using empirical estimates for 26 international airport comparators in setting an industry-wide WACC, including Auckland Airport. The Commission estimates an industry-wide asset beta of 0.60 in its latest estimate of the WACC for airports. This is lower than the Commission's data on Auckland Airport's beta, which is 0.68 based on a 20-year estimation window.[7]

We have considered whether Auckland Airport's substantial recent and forecast capital expenditure programme means that more weight should be placed on a shorter estimation window that captures the changes in systematic risk. In this section, we describe the theoretical link between large capital expenditure programmes and the beta, and then proceed to consider what estimation window may best capture the forward-looking systematic risk for Auckland Airport over PSE3.

2.1. Auckland Airport Capex Programme

In its draft pricing proposal, Auckland Airport notes that it has calculated its target return in light of the expected increase in capital expenditure over the next pricing period. This expected increase is material – approximately five times the level of historic investment.

We understand the bulk of this investment relates to the international terminal programme, the domestic terminal integration project and the airfield programme.[8] Each of these capital programmes are likely to have an impact on the risks faced by Auckland Airport:

- International terminal programme: The expansion of capacity at the international terminal may increase the risk profile faced by Auckland Airport if international traffic exhibits more co-variance with the market than domestic traffic. If the demand for international flights is more sensitive to changes in the economy than demand for domestic traffic, and the international terminal programme results in the overall passenger mix moving towards international traffic, then Auckland Airport will face greater systematic risk overall.
- Domestic terminal integration project: As Auckland Airport notes, most domestic traffic is carried by just two airlines. Domestic traffic is likely to be sensitive to price, and

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[7] In its draft pricing proposal, Auckland Airport reported an asset beta of 0.68 using a 20-year estimation window using the Commission's estimates in its draft input methodologies decision. However, the Commission corrected some of its beta estimates in its final input methodologies decision, which was released after the draft pricing proposal. Using the corrected data results in Auckland Airport's beta based on 20 years of data increasing from 0.68 to 0.705.

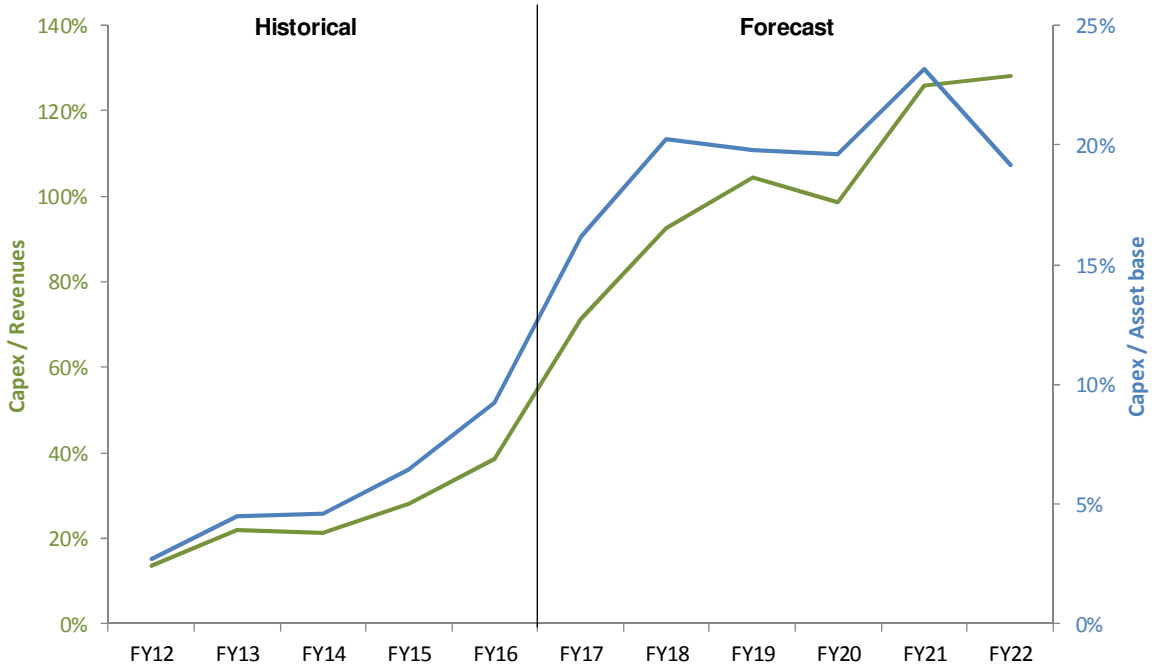
[8] Auckland International Airport Limited (15 December 2016): "Draft Proposal for Standard Charges", p11.

airline prices are a function of capacity. Therefore if one of the two major players reduced capacity (e.g. on certain routes to and from Auckland), domestic volumes through the airport would be affected.

- Airfield programme: Under this programme, Auckland Airport expects to increase the number of international stands, taxiways and commencing planning for a second runway. As for the international terminal programme, this may increase Auckland Airport's overall risk profile if it results in an increase in the international traffic mix.

Over the course of the upcoming pricing period, Auckland Airport anticipates a large increase in capex relative to its revenues and asset base, compared to previous years. This is illustrated in Figure 2.1, showing historical and forecast ratios of capex to revenues and asset base, which proxy for Auckland Airport's operational leverage. The data in this Figure relates to Auckland Airport's regulated aeronautical assets. Based on this data, we conclude that due to its large capex programme, Auckland Airport will be subject to higher risk from operational leverage than it was in the previous pricing period.

Figure 2.1
Historical and forecast aeronautical capex ratios for Auckland Airport (FY2012-22)



Source: Annual Reports, Auckland Airport Draft Pricing Proposal, Auckland Airport Capital Investment Outlook Draft Programme Descriptions

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[redacted]

Based on the market's current expectation, any measure of risk based on current market evidence is likely to underestimate the effect of the capital expenditure programme over the next pricing period. We now examine how capital expenditure affects the risk faced by Auckland Airport.

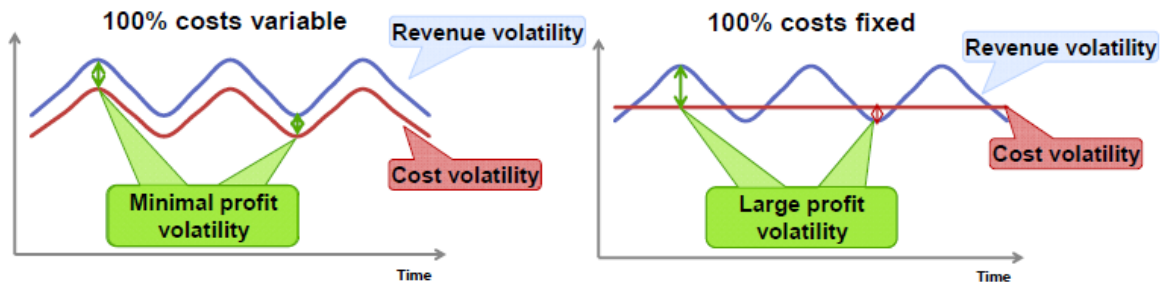
2.2. Theoretical Impact through Operational Leverage

The effect of Auckland Airport's capital expenditure programme on its asset beta can be assessed by considering Auckland Airport's operational leverage. Operational leverage measures the fraction of fixed costs in a company's cost base. If a firm's capital expenditure increases, all else being equal, the proportion of total costs that are fixed are likely to increase, because capital expenditure programmes are typically difficult to scale back with changes in customer volumes.

Companies with higher proportion of fixed costs cannot adjust their cost base in response to demand and revenue fluctuations. Consequently, their profits are more volatile, leading to greater risk for investors.

Figure 2.2 shows the impact of demand/revenue fluctuations on a company's profit margin, depending on the company's underlying cost structure (fixed vs. variable).

Figure 2.2
Impact of cost structure (fixed vs. variable) on companies' profit margins



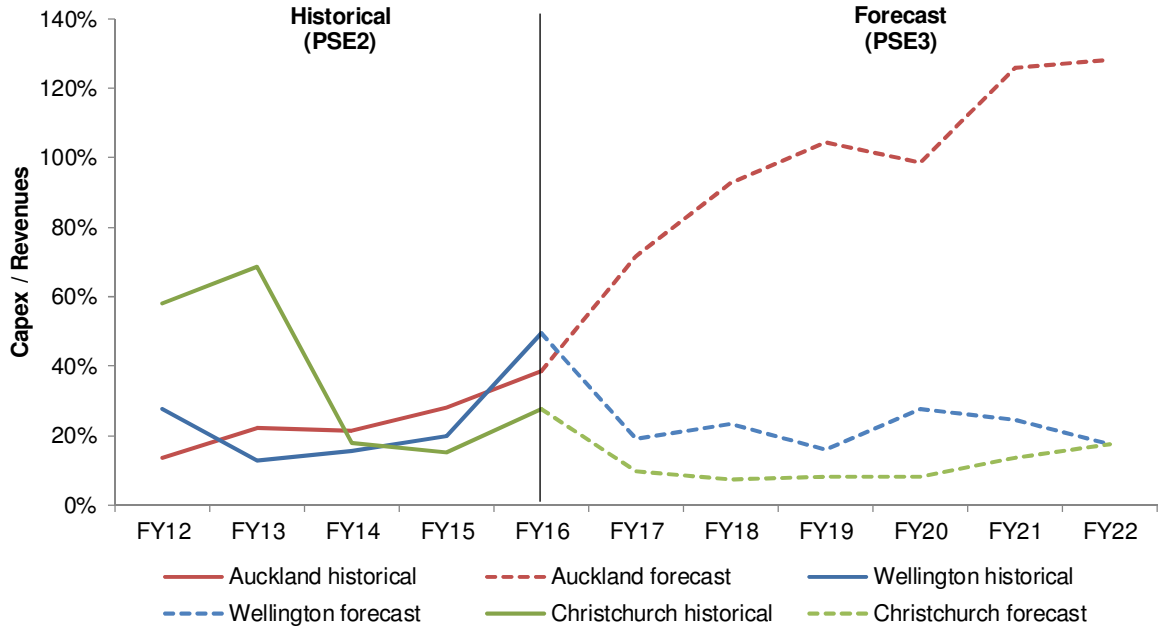
The first chart in Figure 2.2 shows that a company for which all costs are variable maintains a constant profit margin, since it is able to completely adjust its costs in response to demand/revenue fluctuations. In contrast, a company for which all costs are fixed will

experience its profit margin fluctuate with the underlying demand, because it cannot adjust its costs (see second chart).

Auckland Airport sets a price path for 5 years, and is hence subject to volume risk during that period. In the upcoming pricing period PSE3 (1 July 2017 to 30 June 2022), Auckland Airport is likely to face a relatively higher share of fixed costs than in previous years, due to large investment programmes for both terminals as well as significant airfield investment. Specifically, it will face large cash outflows during the construction process, which cannot be scaled back or reversed easily (i.e. they are likely to be largely sunk) in case of a material decrease in demand, e.g. due to a change in economic conditions. These cash outflows can hence be considered fixed. During the construction phase, Auckland Airport is therefore expected to have higher operational leverage than in the past and relative to comparators that do not undertake such large-scale capex projects.

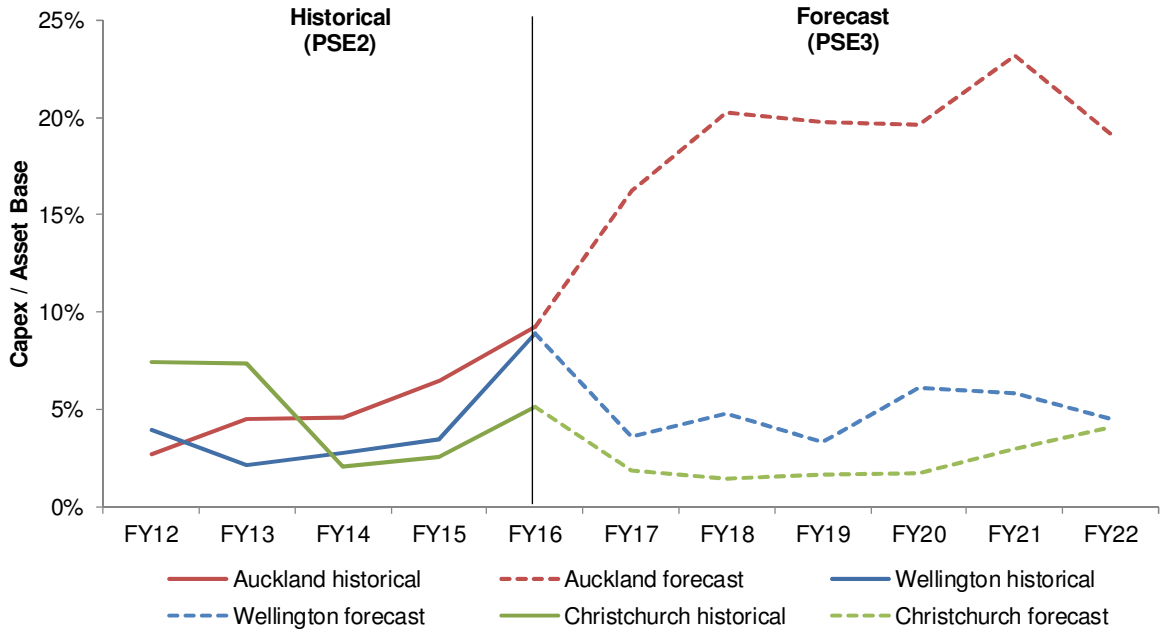
Figure 2.3 and Figure 2.4 below provide evidence that Auckland Airport's planned capital expenditure on regulated activities, relative to both regulated revenues and its regulated asset base, is considerably higher than the capital expenditure planned by the other regulated airports in New Zealand, i.e. Christchurch International Airport and Wellington International Airport.

Figure 2.3
Auckland Airport plans higher capital expenditure relative to revenues than other regulated NZ airports



Source: NERA analysis of annual regulatory disclosure documents (historical period) and latest pricing decision documents (forecast period)

Figure 2.4
Auckland Airport plans higher capital expenditure relative to its asset base than other regulated NZ airports



Source: NERA analysis of annual regulatory disclosure documents (historical period) and latest pricing decision documents (forecast period)

Auckland Airport's operational leverage is expected to increase from an average of 8% (capex as a proportion of asset base) in PSE2 to 20% in PSE3. Moreover, Auckland Airport's operational leverage can be compared to the other airports in the Commission's beta comparator set.

Table 2.1 shows that Auckland Airport's capital expenditure per passenger and capital expenditure as a proportion of revenue is higher than the average of a subset of the Commission's beta comparators, showing that its operational leverage is higher. The data in the table below relates to the latest historical year for which data is available for all airports (2015). Since then, Auckland Airport has announced plans to increase its capital expenditure above its historical level, as shown in Figure 2.3 and Figure 2.4 above. Therefore, the gap in operational leverage between Auckland Airport and the Commission's beta comparators is likely to widen during Auckland Airport's next pricing period, assuming the capital expenditure programmes of the Commission's beta comparators do not change materially.

Table 2.1
Auckland Airport's capital expenditure is higher than the comparators in the Commission's beta sample

Airport(s)[1]	Company in Commission's asset beta sample	Capex per pax (SDR)[2]	Capex as a percentage of turnover (%)	Average asset beta 2006-2016, using weekly and 4-weekly	Average asset beta 2011-2016, using weekly and 4-weekly
Beijing	Beijing Capital International	0.67	7.3	0.73	0.40
Tokyo Narita	Japan Airport Terminal Co Ltd	7.1	21.4	0.77	0.88
Aeroports de Paris	Aeroports de Paris	3.72	14.4	0.54	0.41
Auckland	Auckland International Airport	5.45	30.1	0.67	0.65
Airports of Thailand	Airports of Thailand PCL	1.75	20.5	0.88	1.14
ASUR	Gurpo Aeroportuario del Surest	1.28	11.2	0.65	0.71
Zurich	Flughafen Zuerich AG	7.13	27.9	0.57	0.57
Vienna	Flughafen Wien AG	2.71	14.5	0.40	0.27
Fraport	Fraport AG Frankfurt Airport Services	3.73	28.5	0.56	0.40
GAP	Grupo Aeroportuario del Pacifico	1.25	12.6	0.66	0.62
Delhi	GMR Infrastructure Limited	0	0	0.67	0.45
Copenhagen	Kobenhavns Lufthavne	4.29	25.1	0.31	0.31
Malaysian Airports	Malaysia Airports Holdings Bhd	0.34	6.3	0.84	0.96
Sydney Airport	Sydney Airport	3.83	22.8	0.36	0.23
Average		3.09	17.33	0.62	0.57
Auckland Airport (as at year end FY15 for capex data)		5.45	30.1	0.67	0.65

Source: LeighFisher Airport Performance Indicators 2016; Notes: [1] This table shows the companies that appear in the Commission's comparator sample for which capex performance data is available through international performance benchmarking studies. The companies shown represent over half of the Commission's comparator sample set (14 out of 26). [2] LeighFisher uses Special Drawing Right (SDR) rates as a unit of comparison for capex per passenger between airports, where the capex per passenger in each airport's local currency is converted into SDR. The SDR is an international reserve asset, created by the IMF in 1969 to supplement its member countries' official reserves and is based on a basket of five major currencies—the U.S. dollar, euro, the Chinese renminbi (RMB), the Japanese yen, and pound sterling. Source: http://www.imf.org/external/np/exr/facts/sdr.htm

Overall, the empirical evidence above shows that Auckland Airport's capital expenditure in the next pricing period is expected to be much higher than its own historical levels, and also in excess of the levels observed for the Commission's beta comparators. Auckland Airport has a different operational leverage to the Commission's beta comparators, and this has implications for the way in which the beta should be estimated when setting Auckland Airport's target return.

Operational leverage is a risk captured by the Capital Asset Pricing Model, specifically by the beta term.[9] The beta parameter captures the systematic risk faced by investors, which cannot be diversified away by holding the market portfolio. Higher operational leverage results in greater co-variance of a company's returns to market shocks, implying greater systematic exposure and a higher beta. Under the assumption that markets are efficient, a higher risk due to an anticipated increase in operational leverage would be captured by Auckland Airport's own beta, if estimated using the latest data. In contrast, an outdated estimate or an estimate based on comparators' betas will not capture the risk Auckland Airport faces as a result of higher operational leverage during the period of investment that is substantially higher than its historical baseline and comparators' average investment. Not using a recent estimate of Auckland Airport's own beta is therefore likely to underestimate the Auckland Airport's systematic risk, cost of capital, and target return for the upcoming pricing period.

The link between operational leverage and the asset beta has been extensively documented in the academic literature. Hamada (1972) and Rubinstein (1973) were among the first to recognise that the systematic risk faced by a listed stock is comprised of both operating risk and financial risk.[10] Lev (1974) and Mandelker and Rhee (1984) later found empirical evidence that operational leverage was a determinant of systematic risk.[11] Damodaran provides a formula for decomposing the unlevered beta into business and operational leverage components:[12]

$$Unlevered\ beta = Pure\ business\ beta * (1 + \frac{Fixed\ costs}{Variable\ costs})$$

The above formula shows that the higher the ratio of fixed costs to variable costs, the higher the unlevered beta of the firm. The implication is that if Auckland Airport increases its capital expenditure programme relative to historical levels, such that its ratio of fixed costs to variable costs increases, its unlevered (asset) beta should increase. The academic literature therefore supports a higher asset beta for setting Auckland Airport's target return to take account of higher operational leverage arising from its capital expenditure programme. In practice, applying the above formula can be difficult for individual firms since information on airports' fixed and variable costs is often limited, and there are often no strict definitions of fixed and variable costs. Nevertheless, the academic literature provides a firm theoretical underpinning for setting a higher asset beta to calculate Auckland Airport's target return relative to the asset beta used to calculate the Commission's industry-wide WACC estimate.

This link between the effect of higher capital expenditure on operational leverage and beta has been recognised by regulators elsewhere, as we discuss in section 2.4.

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9 For example, see Prof. Aswath Damodaran's discussion of beta determinants: http://people.stern.nyu.edu/adamodar/pdfiles/eqnotes/discrate2.pdf.

10 Hamada, R (May 1972): "The Effects of the Firm's Capital Structure on the Systematic Risk of Common Stock", Journal of Finance, p435-452. Rubinstein, M (March 1973): "A Mean-Variance Synthesis of Corporate Financial Theory", p167-182.

11 Lev, B (September 1974): "On the Association Between Operating Leverage and Risk", Journal of Financial and Quantitative Analysis, p627-641. Mandelker, G and Rhee, G (March 1984): "The Impact of the Degrees of Operating and Financial Leverage on Systematic Risk of Common Stock", Journal of Financial and Quantitative Analysis, p45-57.

12 Damodaran, A: "Estimating beta", p70. Source: http://people.stern.nyu.edu/adamodar/pdfiles/eqnotes/discrate2.pdf.

We note that in addition to this operational leverage channel, higher capital expenditure can affect the beta by increasing the riskiness of dividend payments when the company is attempting to maintain its credit rating. If Auckland Airport prioritises the maintenance of its A- credit rating over dividend payout, equity holders will bear the risk of financing the capital expenditure. This increases equity holders' systematic risk exposure because dividends are at greater risk following any downside market shocks. The impact of Auckland Airport's desire to maintain its A- credit rating on the target return is discussed in section 4.1.

2.3. NERA Analysis of Auckland Airport's Beta

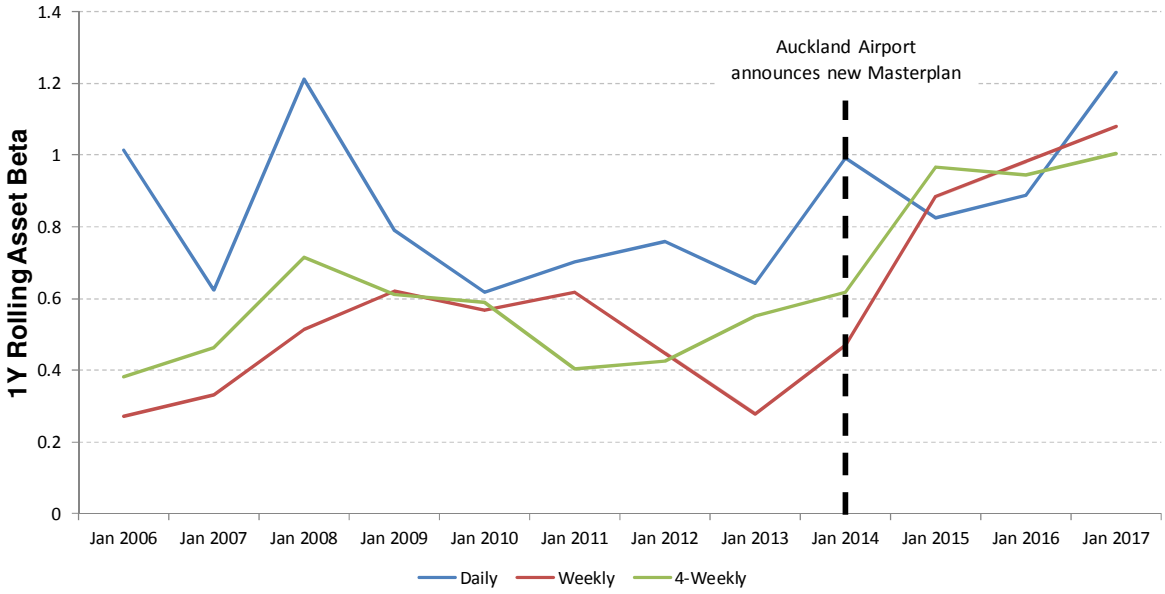
In its draft pricing proposal, Auckland Airport adopts an asset beta of 0.68. This is estimated from actual Auckland Airport data over the 20 year period 1996-2016, as reported in the Commission's draft input methodologies decision. We think Auckland Airport is correct to use a specific beta for itself, rather than using an industry wide beta.

Whilst a longer time series provides more data points to estimate the beta, and can result in a more statistically robust estimate, it may not capture recent relevant trends in a company's systematic risk exposure. This appears to be the case for Auckland Airport as we discuss below.

We have analysed historical share price and dividends data for Auckland Airport over the period January 2006 to January 2017, being the last 10 years (the data analysed by Auckland Airport for its draft pricing proposal only went through to June 2016). Figure 2.5 below presents rolling 1 year beta estimates for Auckland Airport[13] over this time period, using daily, weekly and 4-weekly data in accordance with the Commission's methodology.

[13] i.e. each data point is the beta estimate at that point in time using the preceding year as the estimation window.

Figure 2.5
1Y Rolling Asset Beta for Auckland Airport



Source: NERA analysis of Bloomberg data with cut-off date of 22 February 2017

Figure 2.5 demonstrates that the beta estimate was quite volatile during the global financial crisis (demonstrated by the dispersion in beta estimates using the different estimation windows) before becoming relatively stable between 2010 and 2013. However, more recently the beta estimate has become more volatile and has also begun to increase quite sharply, approaching levels experienced during the global financial crisis.

The recent rise also means that the beta is higher than Auckland Airport's own beta estimate in its draft pricing proposal of 0.68.

Given the recent increase in the beta estimate for Auckland Airport, we have considered whether the beta estimation window should be different from the 20 years that Auckland Airport itself uses. By adopting a long estimation window, Auckland Airport assumes that the systematic risk over the past 20 years is a reasonable predictor of systematic risk over the upcoming pricing period. However, we know that Auckland Airport's capital expenditure is of greater size than historical levels (see section 2.1). Auckland Airport began to signal this capital expenditure programme with the release of its Masterplan in 2014 and Figure 2.5 shows that Auckland Airport's beta appears to have increased consistently since then. Our explanation for this is that the market considered that the capital expenditure programme implied by the Masterplan would increase Auckland Airport's systematic risk exposure and this was priced into its shares. Moreover, as noted in section 2.1, the forecast capital expenditure for the upcoming five-year pricing period is 35% higher than the latest guidance that the market has received from Auckland Airport. Even a beta estimate based on a very short estimation window may not capture the full impact of planned capital expenditure on Auckland Airport's systematic risk profile.

The implication is that a long estimation window of 20 years is unlikely to capture forward-looking systematic risk over the upcoming pricing period. A shorter estimation window that

places more weight on the period when the market priced in the impact of capital expenditure may be more suitable for determining the appropriate target return. However, even the most recent beta estimate may not fully reflect the impact of the latest capital expenditure plan on Auckland Airport's systematic risk. This is because the updated plan has not been fully released yet, i.e. the 2014 forecast capital expenditure implied by the Masterplan and ongoing market guidance are lower than the latest capital expenditure plan that Auckland Airport is currently consulting on with airline customers. It is therefore even more important to use a shorter estimation window.

We note that the feedback received from Air NZ supports the use of an estimation window shorter than the one Auckland Airport has used, as "*Air NZ notes that the Commission also commented on its rationale for favouring the two most recent five-year periods as providing "an appropriate balance between the number of observations and the best reflection of beta for the future.*"".[14]

We show the beta estimate for Auckland Airport using different estimation windows in Table 2.2. The table clearly shows that the asset beta for Auckland Airport is higher for shorter estimation windows, consistent with Figure 2.5 above.

Table 2.2
Auckland Airport Asset Beta Estimates

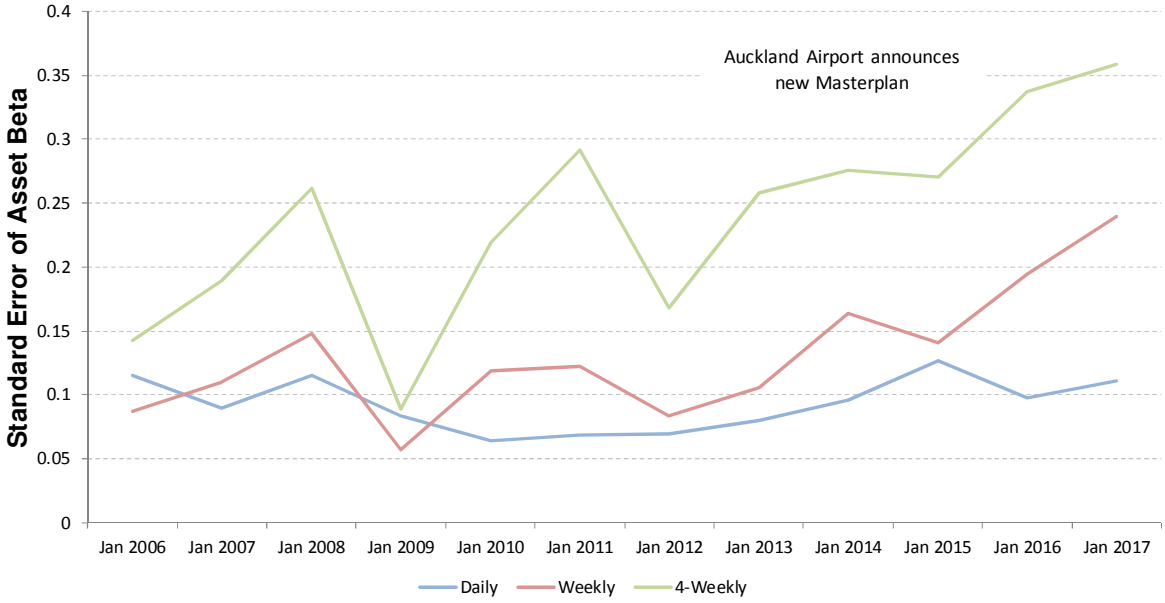
	6M	1Y	2Y	5Y	10Y	20Y (Auckland Airport Window)
Daily	1.28	1.23	1.06	0.93	0.83	0.81
Weekly	1.01	1.08	1.06	0.69	0.70	0.70
4-Weekly	1.19	1.00	0.97	0.82	0.69	0.69
Average	1.16	1.10	1.03	0.81	0.74	0.73
Avg (Weekly and 4-Weekly)	1.10	1.04	1.01	0.76	0.69	0.69

Source: NERA analysis of Bloomberg data with cut-off date of 22 February 2017

Figure 2.6 below shows the standard errors of the 1Y rolling asset beta estimates. Standard errors have increased in recent years and for the estimates based on weekly and four-weekly data frequency, standard errors have increased above the levels experienced during the financial crisis. The higher standard errors reflect a higher uncertainty around recent beta estimates, and hence about Auckland Airport's current and future systematic risk. Capturing the recent increase in beta estimates, and hence systematic risk, is even more important in light of the increase in uncertainty around these estimates.

[14] Air NZ (22 February 2017): "Auckland Airport – Draft Proposal for Standard Charges, Air New Zealand Response", p8.

Figure 2.6
Standard errors of Asset Beta Estimates for Auckland Airport



Source: NERA analysis of Bloomberg data with cut-off date of 22 February 2017

We conclude that the target return should be set with reference to an estimation window that captures the effect of the announced capital expenditure programme. A shorter estimation window of five years, using the latest market data, would place more weight on the market's perception of Auckland Airport's systematic risk exposure, particularly from the time period when Auckland Airport announced its Masterplan and the significant capital expenditure programme implied by that plan in 2014.

Overall, we propose to estimate an asset beta range based on the 5-year estimation window and the 20-year estimation window that Auckland Airport adopts. This provides an asset beta range of 0.73 – 0.81, higher than Auckland Airport's own estimate of 0.68 (which uses an earlier cut-off date than our own analysis).

The use of a two to five year estimation windows for beta estimation is common amongst international regulators. For the current Q6 regulatory period, the UK Civil Aviation Authority (CAA) and its consultant PwC adopted an estimation window of five years when estimating the beta of the airport comparators.[15] In explaining the rationale for the five year estimation period, PwC noted that it is less affected by short-term variation and therefore appropriate for the purpose of assessing long-term changes in systematic risk.

Moreover, in its analysis of Bristol Water's beta, the UK Competition and Markets Authority (CMA) presented beta estimates for **i)** a two-year estimation window (with daily and weekly data frequency) and **ii)** a five-year estimation window (with weekly and monthly data

[15] PwC (April 2013), Estimating the cost of capital in Q6 for Heathrow, Gatwick and Stansted, p.67

frequency). The CMA considered that the "most robust method is to consider a number of sampling frequencies and periods when estimating the asset beta". It should be noted that they did not use estimation windows or averaging periods longer than five years, respectively. In this context, the CMA noted that since CAPM is a single-period model, an unsuitably long estimation window would come at the risk of introducing inconsistencies, e.g. where the analysis spans multiple pricing periods subject to different regulatory frameworks.[16]

In addition, the Commission itself uses a shorter estimation window as referenced in the airline feedback provided by Air NZ, as it favours beta estimates based on the two most recent five year windows. We have used an average of daily, weekly and 4-weekly beta estimates. The Commission does not place any weight on daily data because daily data can be distorted by low liquidity. However, in this case for Auckland Airport, we have not found any evidence that its daily share price is affected by low liquidity,[17] and therefore, under the Commission's own reasoning, there is no reason to reject its use in this case.

2.4. Precedent for Taking Account of Capex Risk in Beta

International regulators of monopoly industries and the Competition Authority in the UK have taken operational leverage into account when determining regulated companies' allowed rate of return.

For example, the UK Competition Commission (CC), when deciding on the cost of capital for Heathrow, Gatwick, and other airports that were owned by the company BAA (British Airports Authority) Ltd. in 2007, assessed relative riskiness on the basis of demand risk, riskiness of the client airlines as well as operational leverage. They found that Heathrow was less risky than Gatwick as its passenger numbers were less affected by September 11, it had excess demand and its client airlines were relatively low risk. In this context, the CC also noted that Heathrow has lower operational leverage than Gatwick.

Taking all the evidence together, the CC decided that Heathrow was subject to lower systematic risk than Gatwick and therefore set an asset beta for Heathrow that was 0.05 lower than Gatwick's asset beta, which it set at the point estimate for BAA as a whole. The size of the adjustment was somewhat arbitrary, but fell within the range of the adjustments proposed by BAA (0.03) and the CAA (0.065 – 0.085). The CC noted that it expected the systematic risk of Gatwick to be higher but not substantially higher than Heathrow, as both airports were regulated businesses, subject to five-year price cap resets, and operated in the same capacity-constrained market.[18]

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[16] Competition and Markets Authority (2015), *Bristol Water plc - A reference under section 12(3)(a) of the Water Industry Act 1991 – Report*, Appendix 10.1.

[17] The average bid-ask spread on Auckland Airport's share price over the last five years is 0.60%, well below the 1% threshold that international regulators typically consider relates to an illiquid stock. (See for example, Bundesnetzagentur (2008): Beschlusskammer 4, p18.) Source: Bloomberg

[18] Competition Commission (2007), *A report on the economic regulation of the London airports companies (Heathrow Airport Ltd and Gatwick Airport Ltd),* para 4.83 to 4.85*;* and Appendix F on the Cost of Capital, p28-29. Note that the CC imposed the constraint that the weighted average of Heathrow's, Gatwick's, and other airports' asset betas had to equal the asset beta of BAA as a whole.

The GB energy regulator Ofgem also considers relative risk in the context of capital investments under its new RIIO regulatory framework. In its handbook for implementing this framework, Ofgem states that the size of a company's planned investment programme relative to its existing regulated asset value is a key factor for potential differences in relative risk between companies. Moreover, the regulator considers the ratio of capex to the regulated asset value to be a better indicator of the riskiness of an investment programme than absolute capex levels. Ofgem added that this approach is also used by major credit rating agencies.[19]

The UK Competition and Markets Authority (CMA), in its final price determination for Bristol Water in 2015, decided to add a premium to Bristol Water's asset beta based on the argument that Bristol faces higher operational leverage than the comparator sample.

This decision was in line with an earlier decision by its predecessor CC (2010), which stated that the difference in risk due to operational leverage justified an uplift of Bristol's asset beta. Based on a measure of Bristol Water's (a water-only company's) operational leverage relative to comparator water and sewerage companies, the CC (2010) applied an uplift of 18 per cent over comparator companies' beta estimate. Specifically, the CC calculated Bristol Water's operating cash flow as a percentage of its revenue, and compared this metric to public comparators for which asset betas had been calculated.

The CMA, in its 2015 decision, used the CC's measure of operational leverage and applied an uplift of 13 per cent to Bristol Water's asset beta, which increased the midpoint of its range from 0.28 to 0.32.[20]

Regulators in other European countries have also taken into account new investment risk when estimating the cost of capital. For example, the Austrian Regulator applied a 0.8% uplift on the cost of equity for gas transmission networks in order to create an "incentive for future investments".[21] The Council of European Energy Regulators (CEER, 2016) has presented an overview of premiums on the cost of capital, including for new investments. For example, the French energy regulator CRE allows for a 300 basis points premium on the cost of capital for investments designed to relieve congestion, under certain circumstances.[22]

2.5. Conclusion

We conclude that the target return should be set with reference to an estimation window that captures the effect of the announced capital expenditure programme. A shorter estimation window of 5 years, using the latest market data, would place more weight on the market's perception of Auckland Airport's systematic risk exposure. Even this short estimation

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19 Ofgem, para 3.17.

20 Competition and Markets Authority (2015), *Bristol Water plc - A reference under section 12(3)(a) of the Water Industry Act 1991 – Report*, para 10.143 – 10.165.

21 Gas Connect Austria, *Methode gem § 82 GWG 2011 fuer die Fernleitungen Oesterreichischer Fernleitungsnetzbetreiber*, p7.

22 CEER (14 March 2016), *CEER Report on Investment Conditions in European Countries*, p 97 – 100. CRE (2012), Délibération de la Commission de régulation de l'énergie du 13 décembre 2012 portant décision sur le tarif d'utilisation des réseaux de transport de gaz naturel, p6.

window may not capture the full impact of Auckland Airport's planned capital expenditure, since the market has not yet received full guidance about its level.

Our approach of reflecting the impact of higher capital expenditure and operational leverage using a shorter estimation window is equally valid to the approach used by other international regulators, which often use comparators with higher operating leverage. In this case, because Auckland Airport's latest beta estimate already appears to partially factor in the impact of higher operating leverage due to the planned capital expenditure, we have used it as the most direct source of evidence for estimating the beta.

Overall, we propose to estimate an asset beta range based on the 5-year estimation window and the 20-year estimation window that Auckland Airport adopts. This provides an asset beta range of 0.73 – 0.81, higher than Auckland Airport's own estimate of 0.68 (which uses an earlier cut-off date than our own analysis).

Table 2.3 below summarises the approaches and estimates presented by the Commerce Commission, Auckland Airport, and NERA.

Table 2.3
Overview of Approaches and Results of Beta Estimation

	Commerce Commission	Auckland Airport	NERA
General approach	Average of 26 airport betas (including Auckland Airport)	Auckland Airport's own beta	Auckland Airport's own beta
Adjustment	Subtract 0.05 to reflect lower risk of regulated activities	None	None
Appropriate estimation window	Two most recent 5 year windows	20 years	5 years and 20 years
Data frequency	Average of weekly, and 4-weekly estimates	Average of daily, weekly, and 4-weekly estimates	Average of daily, weekly, and 4-weekly estimates
Estimation date	01 April 2016	01 April 2016	22 February 2017
Asset beta used	Point estimate	Point estimate	Range (lower bound based on latest 20Y average)
Asset beta estimate	**0.60**	**0.68**	**0.73 - 0.81**

Source: Commerce Commission (June 2016), Input Methodologies review decisions; Auckland Airport (December 2016) Draft Pricing Proposal; NERA analysis.

3. Cost of Debt

The Commission estimates the cost of debt with reference to corporate bonds with a 5-year maturity and a BBB+ rating. In particular, it estimates a debt premium of 1.3% above the risk-free rate in its July 2016 cost of capital determination for Auckland Airport.[23] It also includes an allowance of 35 basis points for debt issuance costs to derive an overall cost of debt estimate of 3.81%. In its IM review decision, published after the July 2016 estimate, the Commission adjusted its approach to estimating the cost of debt by using a five-year historical average of the debt premium, instead of the prevailing estimate, and also reduced its allowance for debt issuance costs from 0.35% to 0.20%. At this review, the Commission estimated a cost of debt of 4.25% as of 1 April 2016.

In this section, we consider the cost of debt that Auckland Airport calculates to determine its target return. Auckland Airport's estimate is specific for its own conditions, whilst the Commission's estimate is based on a variety of bonds from other issuers.

3.1. Auckland Airport Cost of Debt Estimate

In its draft pricing proposal, Auckland Airport estimates the cost of debt based on its own expected financing cost over the pricing period. It adopts a weighted average approach, where the overall cost of debt is determined as a weighted average of embedded debt costs and new debt costs for any debt issuances over the pricing period. This approach recognises the fact that companies refinance themselves continuously as existing debt matures and as new capital expenditure needs to be financed. Auckland Airport applies this framework specifically to its own debt costs, rather than considering industry-wide debt costs, to take account of its own company-specific factors in estimating the target return. We note that in the airline feedback provided by BARNZ, BARNZ's consultant, John Small, supports Auckland Airport's portfolio approach to debt management.

Table 3.2 summarises the approach Auckland Airport takes to estimating the cost of embedded debt, cost of new debt and share of new debt for each type of debt instrument in its current debt portfolio.

[23] Commerce Commission (29 July 2016): "Cost of capital determination for information disclosure year 2016 for Transpower, gas pipeline businesses and suppliers of specified airport services (with a June year-end)", p19.

Table 3.1
Auckland Airport approach to estimating its cost of debt

Instrument	Cost of embedded debt	Cost of new debt	Share/amount of new debt
Bonds	Based on actual cost of bonds outstanding over PS3 (fixed interest rates weighted by amounts outstanding)	Base Rate + 1.35% (which is margin over BKBM of Nov 2016 issue)	Assumes that all bonds that mature in PS3 will be renewed on their maturity date (with same maturity); amount issued includes: • the matured amount • additional amount required over PS3 Forecasts of additional debt financing needed over PS3 taken from corporate model Total additional debt amount spread over different instruments based on desired debt composition (value pasted, from corporate model?) Total additional bond amount spread over the renewed bonds based on their share of the total amount matured/renewed over PS3
Swaps (FV)	Based on actual cost of existing swaps (interest received - interest paid)	-	Assume no new swaps for bonds (existing swaps mature in October 2017)
Floating rate notes (FRN)	Based on actual cost (i.e. spread over BKBM FRA)	Average of the spread of the two notes maturing before the end of PS3, BKBM FRA as forecast; 2 notes issued in 2017 and 2019 have an expected spread of 1.9%	Same approach as for bonds
Swaps	Same as for bonds		New swaps as of 2021 are related to maturity of fixed rate bond
Bank Facilities	Based on actual cost (i.e. spread over BKBM BID)	Same spread as matured loans, BKBM BID as forecast	Same approach as for bonds
Swaps	Same as for bonds		Swaps generally renewed at maturity (like debt instruments)
Commercial Paper	Based on actual cost (0.3% spread over BKBM FRA)	Same as historical (0.3% spread over BKBM FRA)	Same approach as for bonds, but none of the CP tranches matures in PS3 (in place until 2026). To achieve additional debt target for CP, new tranche will start in November 2021
Swaps	Same as for bonds		Swaps generally renewed at maturity (like debt instruments)
US Private Placement Notes (USPP)	Based on actual cost (fixed rate)	6%	Same approach as for bonds
Swaps	Same as for bonds (spread over BKMB FRA)		Same approach as for bonds; hedge amounts increased in line with note amounts
Line Fees and Establishment fee amortisation	Existing fees spread over term of instrument	-	Does not take fees of new issues into account (except 2021 bond issuance)

Source: Auckland Airport

Based on the above approach, Auckland Airport estimates an average cost of debt of 4.32% over PSE3. This is lower than Auckland Airport's existing cost of financing of 5.09% as Auckland Airport considers that it will benefit from lower rates at the time of refinancing its existing debt over the next pricing period. It is also only marginally higher than the Commission's industry-wide cost of debt estimate of 4.25% (estimated as at 1 April 2016), which is based on comparator bond debt premiums over the last five years.

The cost of debt estimate of 4.32% assumes that Auckland Airport maintains its existing optimal debt mix, and scales it up in accordance with debt requirements based on the capital expenditure programme. The margins and fees for the cost of new debt are assumed to be similar to that achieved in the past.

Auckland Airport notes that this cost of debt estimate is at the lower end of the range for its forecast actual cost of debt. Since interest rates are forecast to increase in the next pricing period, estimating the cost of new debt based on the historical level of margins is likely to underestimate the actual cost of debt. Auckland Airport's estimate of the cost of new debt for its bond financing component (which represents approximately 35% of the total debt in FY16) is shown in Table 3.2.

Table 3.2
Auckland Airport Cost of New Debt for Bond Financing

	Year of Refinancing	Maturity	Forecast Base Rate	Margin	Total Interest Rate
New Bond 1	2017	7	3.29%	1.35%	4.64%
New Bond 2	2019	7	3.69%	1.35%	5.04%
New Bond 3	2021	7	3.99%	1.35%	5.34%

Source: Auckland Airport cost of debt analysis.

As shown in Table 3.2, Auckland Airport forecasts the base rate on any new bond issuances to increase slightly to reflect the likelihood that interest rates are likely to increase. However, it estimates the margin (which reflects its corporate debt risk) will remain constant over the pricing period.

In its draft pricing proposal, Auckland Airport notes that its margin is likely to increase relative to historical levels because of the material change in debt volume requirements resulting from the increase in capital expenditure (we discuss this point in section 2.1).

Auckland Airport notes that its estimate is at the lower end of the range for the forecast actual cost of debt in PSE3, but we see no reason for selecting the lower end when setting the target return. The target return should reflect Auckland Airport's view of the fair return based on *expected* risk, and not the most conservative scenario possible. In the absence of any evidence that the expected cost of debt is at the lower end of the forecast range, we consider that the target return should be based on the mid-point of the forecast range. Doing otherwise would mean that, on an *expectations* basis, Auckland Airport would be setting prices that would not recover its cost of debt.

In our view, the lower end of the forecast range is based on very conservative scenarios on the likely increase in interest rates over PSE3 and Auckland Airport's ability to maintain the

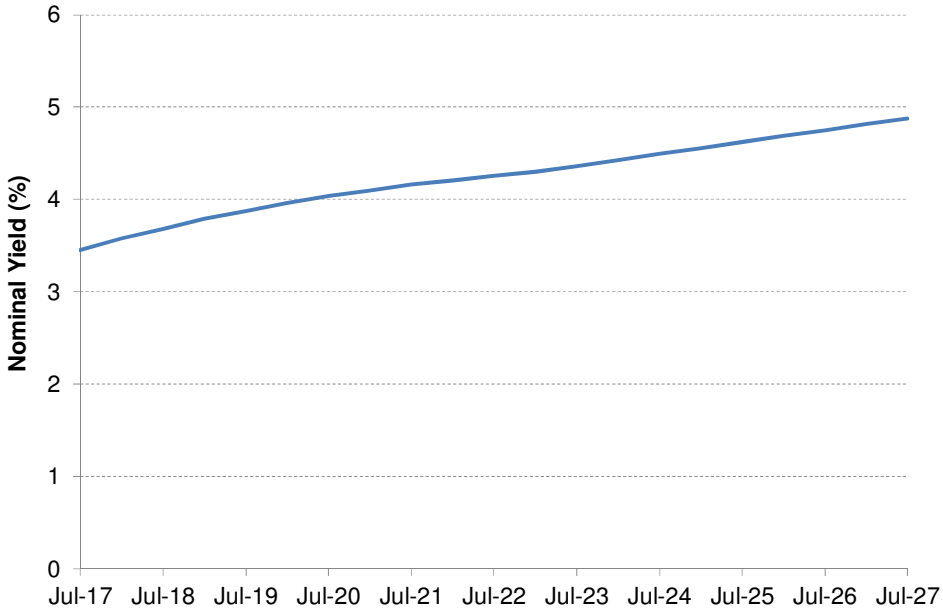
debt margins on its historical debt costs for new debt despite the forecast increase in debt volumes. We assess both of these factors in the next section.

3.2. Alternative Evidence in Calculating the Cost of Debt

We have assessed Auckland Airport's view that interest rates are projected to increase over the next pricing period. In its calculation of the cost of new debt, Auckland Airport assumes an increase in the base rate on any bond financing from 3.29% in 2017 to 3.99% in 2021.

Figure 3.1 shows the forward curve for NZ sovereign debt with maturity of 10 years. This forward curve represents the market's expectation of future yields on a 10-year NZ government bond.

Figure 3.1
NZ 10Y Sovereign Forward Curve



Source: Bloomberg; Note: Forward curve as of 1 March 2017.

Auckland Airport's forecast of the base rate component of the cost of new debt can be compared against the forward curve for NZ 10-year sovereign bonds above.

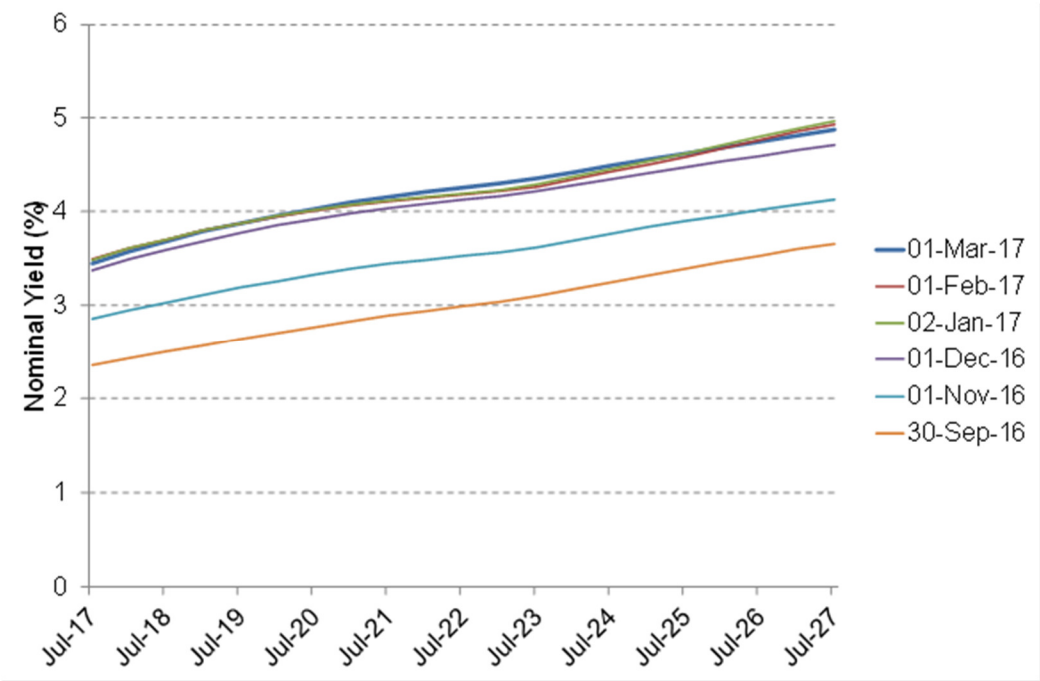
As shown above, NZ 10-year government bond yields are forecast to increase to around 4.2% by the end of the next pricing period in June 2022. By comparison, Auckland Airport is forecasting the base rate to increase to 3.99% in the last round of its bond refinancing in 2021. This suggests that Auckland Airport has been somewhat conservative in forecasting the base rate over PSE3, by around 20 basis points.

We note that forecasting the base rate projection is inherently uncertain since market projections for future interest rates tend to be volatile. This is captured by Figure 3.2, which shows the same NZ 10-year sovereign forward curve as in Figure 3.1, but estimated at the beginning of each of the past six months. Figure 3.2 shows that the forward curve on 1

March 2017 was approximately 100 basis points higher than the forward curve on 30 September 2016 (i.e. six months earlier).

The volatility in the forward curve across these dates demonstrates that the market's expectation of future interest rates is continually shifting, and any projection of the base rate may under- or overestimate the actual base rate.

Figure 3.2
NZ 10Y Sovereign Forward at Different Curve Dates



Source: Bloomberg

Because of this volatility in projections of future interest rates, we see no reason why Auckland Airport should select the lower end of its forecast cost of debt range. We note that Figure 3.2 shows that even if the forward curve is estimated further back in time in January 2017, the expected increase in yields is greater than forecast by Auckland Airport in its calculation of the cost of new debt for bond refinancing. The January 2017 forward curve shows that yields are expected to increase to around 4.1%, higher than the base rate forecast of .99% assumed by Auckland Airport.

By taking the lower end its forecast cost of debt range, Auckland Airport faces the risk that interest rates increase by more than current market expectations, and its actual cost of debt is higher than the assumption in its target return. We would therefore suggest that Auckland Airport selects the average of its range, where the range is determined by the forward curve evidence above on future interest rates.

In addition to the base rate forecast, Auckland Airport assumes that the margin on its cost of new debt remains constant over PSE3, even though it expects to increase debt levels above historical levels.

Table 3.3 compares Auckland Airport's margin assumption for new bonds (1.32% equal to the margin on its latest bond issuance) to the margin it has achieved for historical bond issuances since 2005.

Table 3.3
Margin on Auckland Airport Historical Bond Issuances

Bond	Issue date	Years to maturity	Margin (Coupon - swap rate)
AIANZ 3.97 11/02/23 Corp	11/2/2016	7	1.32
AIANZ 4.28 11/09/22 Corp	11/9/2015	7	0.89
AIANZ 5.52 05/28/21 Corp	5/28/2014	7	1.00
AIANZ 4.73 12/13/19 Corp	12/13/2012	7	1.21
AIANZ 5.47 10/17/17 Corp	10/17/2011	6	1.28
AIANZ 8 11/15/16 Corp	11/15/2008	8	1.87
AIANZ 8 08/10/16 Corp	8/10/2009	7	2.22
AIANZ 7.25 11/07/15 Corp	11/7/2005	10	0.36
Average			1.27

Source: Bloomberg, Auckland Airport

Table 3.3 shows that Auckland Airport's assumed debt margin of 1.32% is broadly in line with the average margin on its existing debt issuances. Although the margin has varied across bonds, Auckland Airport's assumed margin remains well below the highest margin of 2.22% on its bond issuance in 2009. We note that the evidence that Auckland Airport has presented in its draft pricing proposal shows Auckland Airport's existing margins are at the low end of existing margins.[24] BARNZ's consultant, John Small, notes that this evidence only shows that debt margins can vary considerably amongst similar issuers.[25]

Although Mr Small is correct to note that debt margins can vary considerably among similar issuers, he does not provide any evidence for whether Auckland Airport's existing margins are a suitable indicator of future margins as its debt levels increase. In theory, if Auckland Airport's planned capital expenditure results in an increase in its leverage, it may cause its credit rating to decline below its current rating of A-. Any reduction in the credit rating will increase the achieved debt margins on new debt issuances relative to historical debt issuances. Our analysis in section 4.1 suggests that the Commission's WACC estimate would result in Auckland Airport's credit metrics falling below the thresholds for an A- credit rating, and therefore, the cost of debt is likely to increase above the level assumed by the Commission. Even with Auckland Airport's post-tax target return of 7.0% in its draft pricing proposal, the credit metrics fall below the A- threshold, implying the actual cost of debt estimate of 4.32% is inconsistent with maintaining the current credit rating.

[24] Auckland International Airport Limited (15 December 2016): "Draft Proposal for Standard Charges", p92.

[25] Small, J (11 February 2017): "WACC for Auckland Airport", p2.

We therefore conclude that Auckland Airport's cost of debt estimate of 4.32%, derived from a debt margin assumption of 1.32% for new bond issuances, is conservative, and if it is to maintain its current credit rating, it should estimate a target return higher than 7.0%.

3.3. Conclusion

We conclude that Auckland Airport's current forecast cost of debt of 4.32% is conservative. It does not fully take into account the projected increase in interest rates over PSE3 and it does not allow for any potential increase in debt margins as Auckland Airport's debt level increases to fund its planned capital expenditure.

On the basis of the projected increase in interest rates derived from the NZ sovereign forward curve, we consider the cost of new debt over PSE3 could be at least 20 basis points higher than Auckland Airport's own estimate. The cost of new debt may be even higher if debt margins increase as a result of higher capital expenditure, a factor that is not captured by Auckland Airport's current assumption of achieving the same debt margin as its historical debt issuances. We do not make any adjustment to reflect this potential increase in the debt margin, which means that our proposed cost of debt estimate of 4.52% (20 basis points higher than Auckland Airport's estimate), remains a conservative forecast for the pricing period.

4. Target Return Relative to WACC

Auckland Airport estimates its target return with reference to the Commission's industry-wide WACC estimate, as well as UniServices' report on the industry-wide WACC. To calculate the target return, Auckland Airport adjusts the beta and cost of debt assumptions in the UniServices industry-wide WACC report to reflect Auckland-specific factors, as discussed in the sections above. These changes explain the difference between its post-tax target return estimate of 7.0% and UniServices' post-tax WACC estimate of 6.45%.

Table 4.1
Comparison of Commission and UniServices WACC Estimates to Auckland Airport Target Return

Commerce Commission industry-wide WACC estimate (post-tax) (December 2016)	6.29%
UniServices industry-wide WACC estimate (post-tax) (December 2016)	6.45%
Auckland Airport target return estimate (post-tax) (December 2016)	7.0%

Source: Commerce Commission IM Review (December 2016), UniServices IM Review (December 2016), Auckland Airport Draft Pricing Proposal (December 2016)

Auckland Airport's adjustments to UniServices' industry-wide WACC estimate is based on the same overall WACC framework as the Commission, but makes use of company-specific data instead of industry-wide data. We have provided our comments on the use of company-specific data for the beta and cost of debt in section 3 and 4 respectively.

In this section, we consider factors outside the Commission's WACC framework that would mean Auckland Airport's target return may be different from the industry-wide WACC. We consider two specific factors in this section.

Firstly, we consider whether the Commission's WACC (post-tax) estimate of 6.29% would allow Auckland Airport to remain financially sustainable and if it is consistent with it being able to achieve its forecast cost of debt of 4.32%. If it does not, there is a strong case for setting the target return above the industry-wide WACC to ensure its target return is consistent with the cost of debt. We consider this issue in section 4.1.

Secondly, with respect to capital expenditure, we consider whether the hurdle rate for Auckland Airport's planned capex is higher than the industry-wide WACC due to loss in flexibility from undertaking it earlier than under fully commercial plans. If Auckland Airport has commenced capital expenditure under pressure from the government, airlines or for wider public policy reasons, it may have undertaken expenditure earlier than it would independently as a commercial organisation. In other words, Auckland Airport may have lost flexibility as to the timing of its capital expenditure. This flexibility is known in the academic literature as a 'real option' and investors should be remunerated for its loss if there is external pressure to undertake investment before Auckland Airport may have done if it were making the decision independently. This review of the real option associated with discretionary capex is set out in section 4.2.

4.1. Financeability

The ability of Auckland Airport to maintain its current A- credit rating is an important factor to be taken into account when assessing whether Auckland Airport's target return will allow it to maintain financial stability over the upcoming pricing period. If Auckland Airport's post-tax target return estimate of 7.0% prevents it from raising debt at an average cost of 4.32% (equal to its cost of debt estimate for PSE3), then its target return is inconsistent with its cost of debt estimate and must increase. Any target return estimate that results in a reduction in credit rating will cause Auckland Airport's cost of debt to be higher than the cost achieved historically, and will therefore be inconsistent with the cost of debt estimate of 4.32%.

International regulators often consider whether their allowed rate of return allows the company to finance its activities at the cost of debt assumed in the WACC calculation. If this is not the case, they adjust the allowed rate of return to ensure the company can achieve the cost of debt assumed in the WACC calculation. Most regulators in the UK (e.g. Civil Aviation Authority, Ofgem, Ofwat) have such a "financing duty" which requires them to ensure financeability when setting prices or revenues.[26]

Even in the absence of a statutory obligation, ensuring financeability is a key concern for the financial sustainability of a company subject to price or revenue caps over a certain period of time. Where financial sustainability is at risk, companies may be discouraged from making new investments. Equally for Auckland Airport, which is subject to information disclosure regulation, financial sustainability is a key concern in ensuring the price path it sets will enable it to fund efficient investment over the pricing period, without risking financial distress.

Regulators often address the importance of not disincentivising investment in their decisions. For example, the CAA in the UK conducted a financeability test when setting the allowed cost of capital for Heathrow and Gatwick airports. For this test, the CAA calculated six key financial ratios (including FFO interest cover and FFO to debt) based on Heathrow's forecast performance, and compared them with rating agencies' thresholds for a solid investment grade credit rating (e.g. Moody's Baa2).[27]

In this context, the CAA maintained that:

> *"setting a price control condition that is aligned with an efficient operator being able to finance its business is consistent with, and is not in conflict with, present and future passengers' interests or with the need to promote efficiency and economy. The CAA therefore considers it appropriate to establish whether [its final view on the price control condition] would enable an efficient [airport] to finance its operations, including its capex programme (…)".*[28]

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[26] See for example the Civil Aviation Act 2012 for CAA's financing duty.

[27] CAA (2013), *CAP1103 Economic regulation at Heathrow from April 2014: final proposals*, Chapter 10.

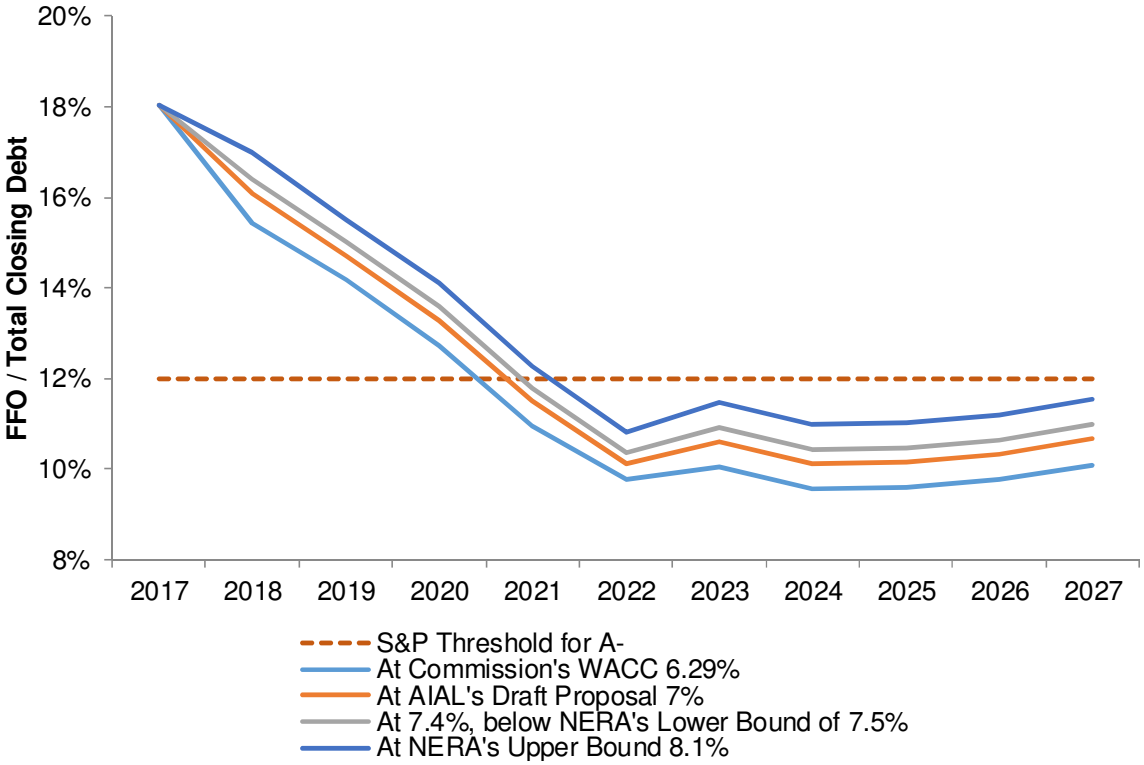
[28] CAA (2013), *CAP1103 Economic regulation at Heathrow from April 2014: final proposals*, Chapter 10.

Given that Auckland Airport is planning to undertake large capital investments over the upcoming pricing period, it is likely to face greater risks to its financial stability than comparators that do not undertake such investments during that period. Implementing these investments will require Auckland Airport to raise funding, especially in the form of debt. An increase in leverage is likely to increase Auckland Airport's credit risk and may lead to a credit downgrade, which in turn is likely to raise its financing costs. In this situation, it may make sense to include headroom in Auckland Airport's cost of debt to account for unexpected increases in financing costs during the period over which prices are fixed.

Risks related to financeability are not captured in the CAPM and are hence not reflected in the WACC. Therefore, if Auckland Airport is exposed to considerable risk to its financeability as a result of anticipated capital investments, there is a strong case for setting the target return above its WACC.

Figure 4.1 below shows that with both the Commission's industry-wide WACC estimate of 6.29%, and Auckland Airport's proposed post-tax target return estimate of 7%, Auckland Airport forecasts the FFO to Debt ratio to fall below the S&P threshold of 12% for an A- rating. This implies a considerable risk to financeability, as S&P would downgrade Auckland Airport when the ratio is below the threshold at the time of its rating review, entailing an increase in Auckland Airport's cost of debt. As a result, Auckland Airport's target return is likely to be inconsistent with the cost of debt estimate of 4.32% and must increase above Auckland Airport's current target return estimate of 7%. We note that even under NERA's proposed target return range (see section 6), the FFO to Debt ratio falls below the threshold for an A- rating from 2021/22. This suggests that NERA's proposed range is conservative, in the sense that it only just allows AIAL to maintain its current investment-grade credit rating of A- up to 2021/22 and risks a downgrade beyond that period.

Figure 4.1
Commission's and Auckland Airport's WACC estimates do not pass financeability test



Source: NERA analysis of Auckland Airport forecasts

4.2. Impact of Discretionary Capex on Target Return

In this section, we consider how the nature of Auckland Airport's planned capital expenditure programme may affect the target return. We understand that the Commission does not wish to discourage efficient investment at the airport, and that Auckland Airport currently faces pressure from the general public, media and airlines to undertake capital expenditure to expand capacity at the airport.

For example, we understand that Auckland Airport's earlier capital plan information shared with airlines through consultation had a smaller, staged development of the new domestic facility based on an assumption that Jetstar would move first. Based on strong feedback from Air New Zealand, and feedback from other carriers, Auckland Airport developed a revised capital plan that had both domestic carriers moving to the new facility at the same time, which involved a substantially higher capital envelope. [29]

The discretionary nature of some of these programmes means that Auckland Airport has the ability to either commence the programmes today or to wait till a later date. By undertaking the expenditure today due to pressure from airlines, Auckland Airport is giving up the option

to delay investment. For example, any investment that Auckland Airport undertakes in response to airline feedback that it otherwise may have delayed or delivered in a staggered manner means that Auckland Airport is giving up this option. These investments may not only relate to the overall level of investment, but also to the type. For example, if investments in quality of service or stand types affects the risks faced by Auckland Airport, then Auckland Airport loses the option to delay investment to a time when it may understand these risks better.

This option to delay investment may be valuable if there is benefiting in waiting, for example, if the cost profile of the capital expenditure may be better understood by waiting.[30] Since the target return is intended to remunerate Auckland Airport's investors fairly for all risks associated with investment opportunities, the value of this option to delay investment should be incorporated within the target return. In the finance literature, this type of option is known as a real option. The academic theory behind real options is set out in Appendix A.

In a regulatory context, real option analysis and resulting WACC uplifts are accepted in a number of regulated sectors including airports, telecommunications and energy.

In its recommendation for airport charges in 2002 the UK Competition Commission lists real options as one of reasons for an uplift of 25 bps to the CAPM-WACC: *"…It is arguable that, in keeping with its responsibilities as a regulated company, BAA is undertaking construction of T5 earlier than might otherwise have been the case and in doing so is giving up its option on timing; something for which it should be compensated."*[31]

The UK telecoms regulator, Ofcom, says: *"…real options are likely to be greatest in the cases of next generation access networks."*[32] Similarly, in the Netherlands, OPTA (2010) included a 3.5% uplift to WACC for asymmetric risk of new generation access networks (NGA); their analysis included real options: "*Some authors also argue that access at cost based charges gives the entrants a risk free option to enter the market…*".[33]

More recently, Ofgem (2012) considered real options in the context of UK regulated energy networks: *"[R]eal options approach should help decision making where the investment environment is characterised by uncertainty and management flexibility in responding to investment needs."*[34]

In practice, quantifying a real option premium is difficult without a detailed understanding of the expected returns from different possible capital programmes that Auckland Airport is considering. However, we note that the post-tax target return of 7.0% that Auckland Airport current estimates in its draft pricing proposal does not take account of the impact of discretionary capex and the loss of a real option.

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30 This equally applies in a situation where an investment has already been delayed and further delay is being considered.

31 Competition Commission (2002): *BAA plc: A report on the economic regulation of the London airports companies (Heathrow Airport Ltd, Gatwick Airport Ltd and Stansted Airport Ltd)* para 4.71

32 Ofcom (2005): Ofcom's approach to risk in the assessment of the cost of capital - Final Statement

33 OPTA(2011): Regulation, risk and investment incentives Regulatory Policy Note 06

34 Ofgem (2012): Real Options and Investment Decision Making

would tend to make the 7.0% target return an underestimate for the true fair rate of return. To take account of any real option premium, Auckland Airport should consider setting a target return towards the top end of its estimated range. By selecting a point estimate above the 50th percentile of the range, it would implicitly allow for the loss of real options when undertaking investments today. Accordingly, in section 6, when we conclude on the appropriate target rate of return, we consider a target return towards the top end of the estimated best reflects the full set of risks that Auckland Airport faces.

5. Other Parameters in Target Return

This section sets out our review of Auckland Airport's estimates for the general market parameters, namely the risk-free rate and tax adjusted market risk premium. Although these parameters are not Auckland Airport-specific, there may be some reasons for adopting a different assumption to the Commission's own estimates when setting a target return.

5.1. Risk-free Rate

In its IM review, the Commission estimates the risk-free rate using the 3-month average of daily NZ government bond yields with a 5-year maturity.[35] In its December 2016 report, it estimated a risk-free rate of 2.6%, which is an estimate as of 1 April 2016.

In its draft pricing proposal, Auckland Airport estimates a post-tax target return of 7.0%, which it calculates using the Commission's risk-free rate estimate of 2.6%. However, Auckland Airport notes that this risk-free rate estimate has been calculated at a time when global interest rates and government bond yields are at unprecedented lows. This is demonstrated in Figure 5.1 below, showing the implied 5 year NZ government bond yields (the same instrument the Commission uses to estimate the risk-free rate) since 2007.

[35] Commerce Commission (December 2010): "Input Methodologies (Airport Services)", Reasons Paper, Appendix E4, p222; Commerce Commission (December 2016): "Input methodologies review decisions – Topic paper 4, Cost of Capital Issues", p23.

Figure 5.1
NZ 5Y Government Bond Yields

Source: NERA analysis of RBNZ data

In the context of setting a target return, historically low interest rates in and of themselves are not a concern. However, we have two concerns with overly relying on the estimate calculated on the price setting day using the Commission's methodology:

- Global interest rates have been volatile in recent times, meaning the day on which the Commission conducts its analysis can have a material bearing on the risk-free rate estimate; and
- The Commission's 3-month estimation window will lag any recovery in interest rates towards the long-run historical level.

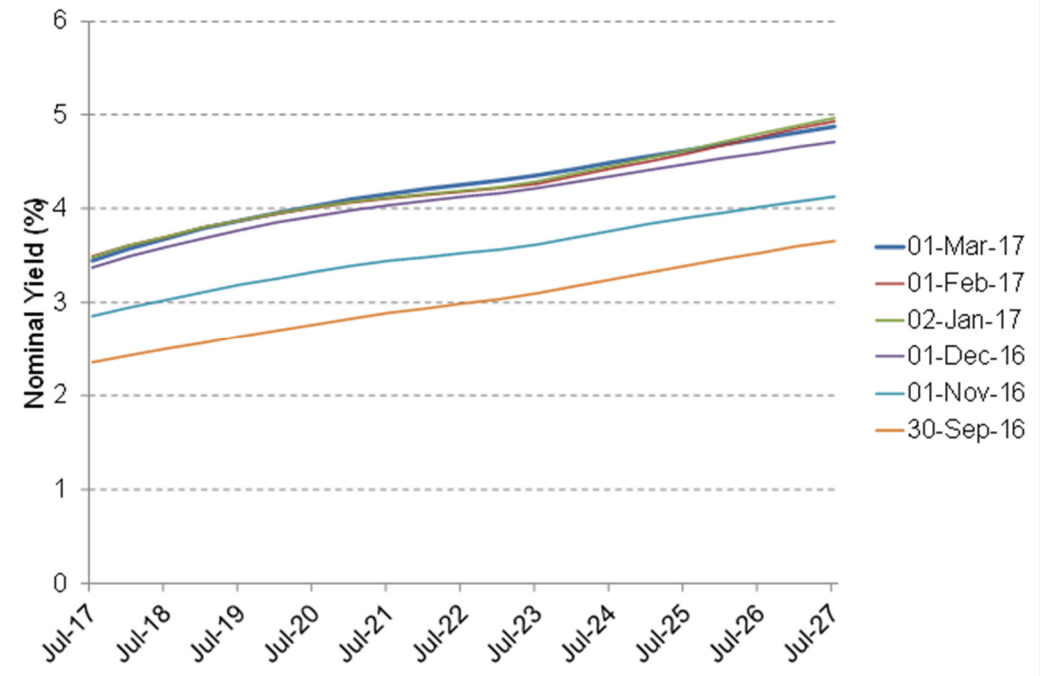
5.1.1. Volatility

Recent volatility in interest rates means the date the analysis is conducted on can have a material impact on the estimated risk-free rate. The Commission estimates a risk-free rate of 2.6% as of 1 April 2016, but since then NZ 5-year government bond yields have declined to a low of 1.7% in August 2016, before increasing up to 2.6% in March 2016. The wide range in yields demonstrates that interest rate expectations are currently unstable.

This is captured by Figure 5.4 below, which shows the NZ 10-year sovereign forward curve estimated at the beginning of each of the past six months. In this case, the forward curve on 1 March 2017 was approximately 100 basis points higher than the forward curve on 30 September 2016 (i.e. six months earlier). The adjustment in forward rates shows that market expectations for interest rates are continuously evolving, and the date at which the

Commission estimates its risk-free rate may result in an estimate very different to the rate over the pricing period, or even the rate a few months after the Commission's estimate.

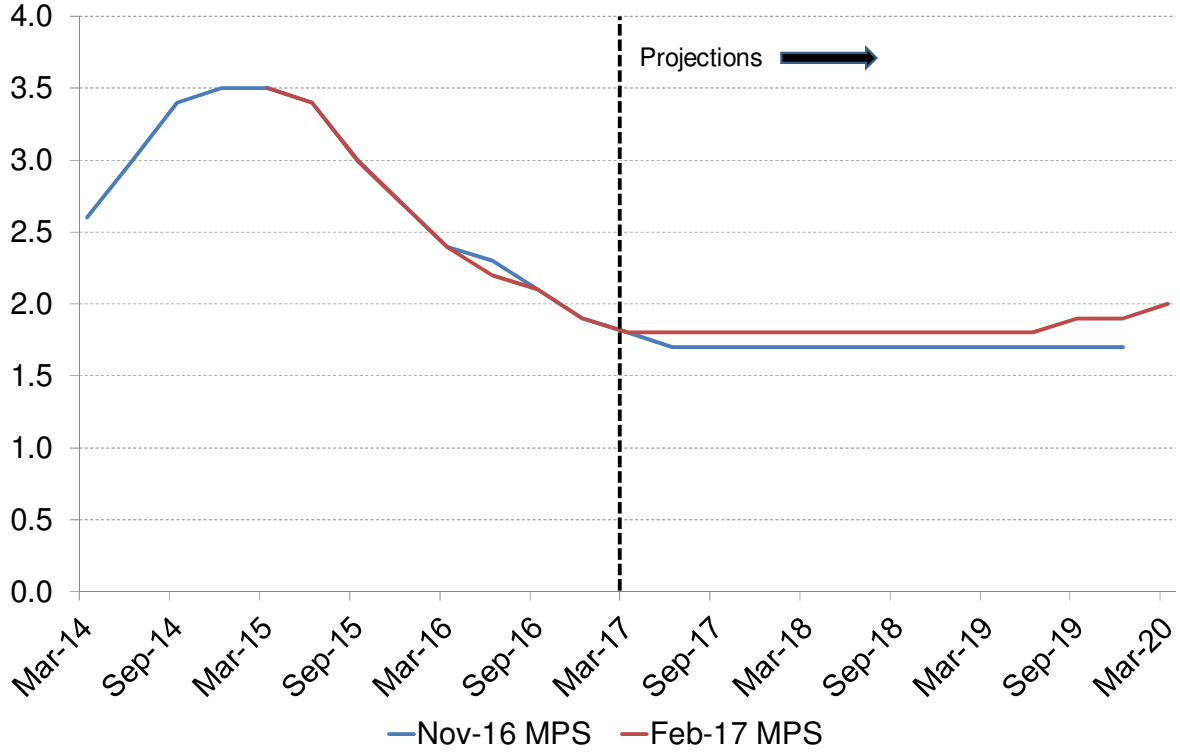
Figure 5.2
NZ 10Y Sovereign Forward at Different Curve Dates



Source: Bloomberg

The changes in interest rate expectations are also discussed in the Reserve Bank of New Zealand's (RBNZ) Monetary Policy Statements. Figure 5.3 shows how RBNZ's forecast for the Official Cash Rate has changed between its November 2016 and February 2017 Monetary Policy Statements. RBNZ's forecasts have increased by 0.1% up to mid-2019 and by up to 0.3% by the beginning of 2020. This again highlights that the Commission's risk-free rate estimate of 2.6% as of 1 April 2016 may not be appropriate for Auckland Airport to set the target return over the pricing period. An up-to-date estimate taking account of the latest market expectations is more likely to reflect the risk-free rate over the pricing period.

Figure 5.3
Reserve Bank of New Zealand Official Cash Rate Projections



Source: Reserve Bank of New Zealand Monetary Policy Statements November 2016, February 2017

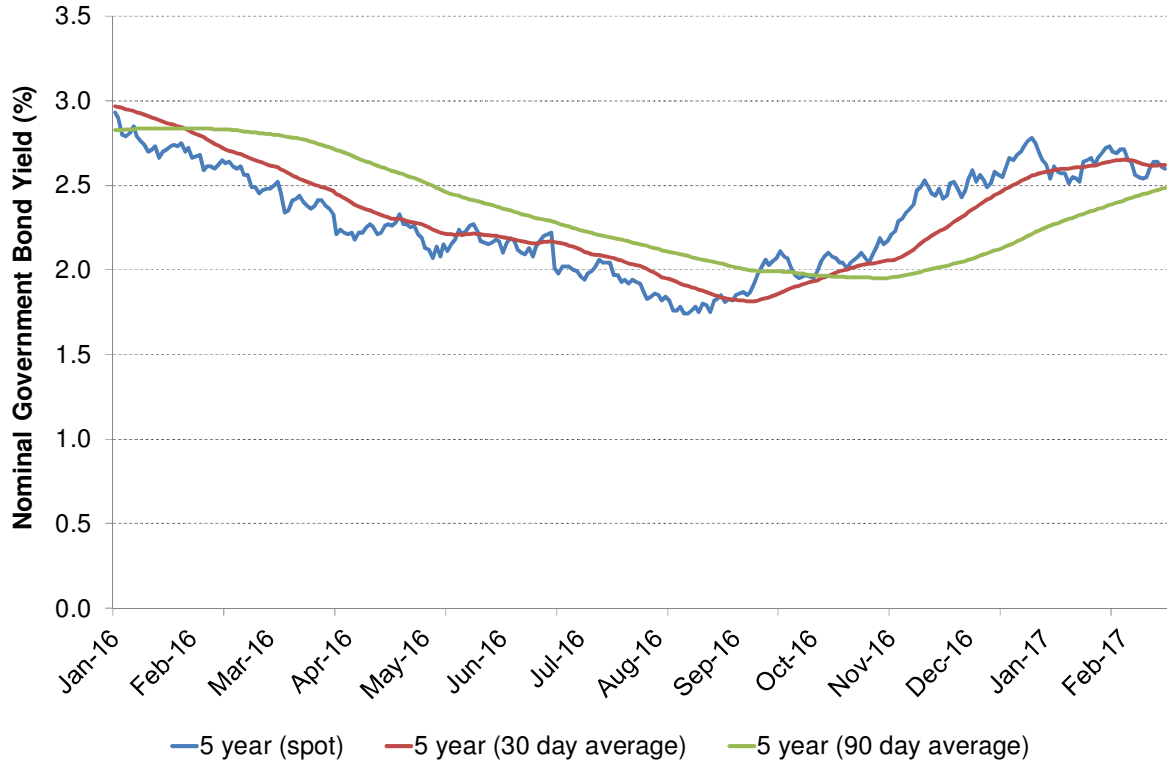
The Commission attempts to take account of interest rate volatility by using a trailing average approach using three months of data, but as we now discuss, when rates are changing this causes other issues.

5.1.2. Estimation window

In the December 2016 decision papers on the IM review, the Commission decided it would estimate the risk-free rate by taking a 3-month average of the 5 year NZ government bond yield, instead of the 1-month average it previously used.[36] While this change helps smooth out short term volatility in interest rates, the exact same mechanism results in the estimated risk-free rate lagging any broad trends that are occurring. For example, rates have begun to rise sharply recently, a trend which will be blunted by the use of the 3-month historical average of the 5 year rate. This is demonstrated by Figure 5.4 below, which shows the 3 month trailing average 5 year rate versus the spot 5 year rate prevailing on that date. For example, over the last year the 5 year government bond rate was falling for an extended period of time before rising again since around August 2016. When the spot rate is falling the 3 month average is above the spot, and the opposite occurs when the spot rate is increasing.

[36] See, Commerce Commission, *Input Methodologies review Decisions: Topic Paper 4 Cost of capital issues*, 20 December 2016.,

Figure 5.4
Impact of 30 day versus 90 day average on risk-free rate estimate



Source: NERA analysis of RBNZ data.

In the current environment where rates may continue to increase, the 3-month average approach therefore risks underestimating the forward looking risk-free rate over the pricing period.

5.1.3. Conclusion on Risk-free Rate

In setting the target return, Auckland Airport should consider all factors that might affect the risk-free rate over the pricing period. The Commission's current estimate of 2.60% as of 1 April 2016 does not capture the changes in interest rate expectations since then. Our review of the most recent evidence up to March 2017 shows that NZ government bond yields have been increasing for the past six months (Figure 5.1) and that forward curves show the market is currently expecting interest rates to increase over the pricing period (Figure 5.2). This is supported by RBNZ's own projection of its policy rate, which it currently expects to increase by 0.3% by early 2020 relative to the forecast in November 2016 (available at the Commission's December 2016 IM review).

In light of this evidence, we consider that the Commission's risk-free rate estimate of 2.60% is likely to underestimate the risk-free rate over Auckland Airport's pricing period, which runs up to June 2022. The latest market evidence and RBNZ's own projections suggest that interest rates may increase by around 20 basis points by the mid-point of the pricing period.

Therefore, we estimate a risk-free rate of 2.80%, 20 basis points higher than the Commission's estimate to take account of RBNZ's projected rate of increase in the policy rate by the mid-point of the pricing period.[37]

5.2. Tax Adjusted Market Risk Premium

In the IM Review decision,[38] the Commission estimates a tax adjusted market risk premium (TAMRP) of 7.0%, based on Dr Lally's analysis of TAMRP.[39] The final estimate is determined to be the median value (rounded to the nearest 0.5%) of five different estimation approaches, and each of these five approaches is applied in both the New Zealand market and the offshore market.

The Commission estimates the TAMRP using the Brennan-Lally CAPM. Under the Brennan-Lally CAPM, the TAMRP is defined as below:

$$TAMRP = E[R_m] - R_f (1 - T_c)$$

Where: $E[R_m]$ = expected market return,

R_f = risk-free rate

T_c = the corporate tax rate

The standard CAMP market risk premium ("MRP") is E[Rm] – Rf.

Table 5.1 compares the Commission's and UniServices' TAMRP estimates using a five-year risk-free rate. Whilst agreeing with some the Commission's approaches, UniServices addresses a number of issues associated with the Commission's methods and provides its own revised estimates, which are shown in bold in Table 5.1.

[37] By adjusting the Commission's risk-free rate estimate by the expected increase in the RBNZ's policy rate, we are assuming there is a one-for-one relation between the policy rate and 5-year NZ government bond yield.

[38] Commerce Commission (20 December 2016): "Input methodologies review decisions", Summary paper, p126.

[39] Lally, M., 2015, Review of submissions on the Cost of Debt and the TAMRP for UCLL and UBA Services, 13 October 2015, Website of the Commerce Commission. http://www.comcom.govt.nz/

Table 5.1
Estimates of the TAMRP with a five-year risk-free rate

	Lally / Commerce Commission		Revised UniServices estimates	
	New Zealand	Other Markets	New Zealand	Other Markets
Ibbotson estimate	7.1%	7.0%	7.1%	**7.9%**
Siegel estimate: version 1	5.9%	5.9%	5.9%	**6.7%**
Siegel estimate: version 2	8.0%	7.5%	8.0%	7.5%
DGM estimate	7.4%	9.0%	7.4%	9.0%
Survey evidence	6.8%	6.3%	**6.9%**	**6.5%**
Median	7.1%	7.0%	7.1%	7.5%
Average	-	-	7.0%	7.5%
TAMRP estimates	**7.0%**		**7.25%**	

Source: Auckland UniServices (2016)

Below we summarise the Commission's approaches and UniServices' critique and proposed estimates.

5.2.1. Ibbotson estimate

The Ibbotson estimate is derived based on the average of the observed or historical market excess returns (i.e., market return less the risk-free rate) measured over a number of years.

For the New Zealand market, the Commission proposes to use Lally and Marsden's estimate of the TAMRP for the period 1932-2002.[40] It applies the same general approach to estimate the ex-post TAMRP for the period 2003-2014, calculates an aggregate estimate using the averages for the periods 1932-2002 and 2003-2014, and adjusts the estimate for an average estimate of the difference between five and ten-year risk-free rates. This approach results in the New Zealand Ibbotson estimate of TAMRP of 7.1%, which UniServices accepts.

For the offshore market, the Commission takes the average of Dimson, Marsh and Staunton's long-run historical estimates of the market risk premium in 20 foreign markets (using a 10-year risk-free rate),[41] adjusts for the average differential between five and ten-year US rates over the period 1953-2014, and take the current New Zealand five-year risk-free rate multiplied by the corporate tax rate to convert the MRP measure to an equivalent TAMRP. This results in the offshore Ibbotson estimate of TAMRP of 7.0%.

UniServices disagrees with this approach, specifically with the use of current New Zealand five-year risk-free rate. UniServices points out that the use of the current risk-free rate to adjust historical estimates means that the historical estimate of the TAMRP can vary widely

[40] Lally, M. and A. Marsden, 2004a, Tax-adjusted market risk premiums in New Zealand: 1931 – 2002, Pacific-Basin Finance Journal 12, 291 – 31.

[41] Dimson, E., Marsh, P. and Staunton, M. 2015, Credit Suisse Global Investment Returns Sourcebook 2015, Credit Suisse.

depending on the current New Zealand risk-free rate, which is implausible. UniServices notes that the Commission's approach results in a 0.6% change due to the addition of only one year (i.e. 2015) to a long-term average historical TAMRP measured over the period 1900-2014 or 114 years.

UniServices proposes the following method to derive an offshore Ibbotson estimate of the TAMRP: use historical estimates of the MRP in foreign markets, convert the MRP to a five year estimate by adjusting for the average differential between five and ten-year US rates over the period 1953-2014, and take the average of the long-term historical risk-free rate in New Zealand multiplied by the corporate tax rate to convert the MRP measure to an equivalent TAMRP. This approach of adjusting using the long-term historical NZ risk-free rate instead of the Commission's short-run estimate ensures the TAMRP based on long-run date is not sensitive to current market conditions. UniServices derives an offshore Ibbotson estimate of the TAMRP of 7.9%.

5.2.2. Siegel estimate: version 1

The Siegel estimate is derived by adding the historical long-term average risk-free rate back to the standard market risk premium and then deducting an expected (or improved) estimate of the long-term risk-free rate. Siegel argues that very low real rates of return on bonds over the 1926-1990 period causes upward bias of the Ibbotson or historical measure of the MRP.[42]

For the New Zealand market, the Commission combines the estimate from Lally and Marsden for the period of 1931-2002 and the estimate from Lally for the period of 2003-2014, and adjust for the difference between five and ten-year risk-free rate. This method gives the Siegel version 1 estimate of the TAMRP of 5.9%, which UniServices accepts.

For the offshore market, the Commission starts with Dimson, Marsh and Staunton's long-run market risk premium estimates for 20 foreign markets, adds back the average real yield on bonds, and deducts an estimate of the expected long-term real yield on bonds, and then takes the average across the 20 markets. The Commission then adds the average differential between the ten and five year US risk-free rate over 1953-2014. This results in a market risk premium of 5.1%, which is converted into a TAMRP of 5.9%.

UniServices disagrees with the Commission's approach and proposes the following method: start with Ibbotson estimate of TAMRP, add back the historical average real yield on New Zealand bonds (net of tax effect), and deduct a proxy for the historical average of market expected real yield on New Zealand bonds (net of tax effect). This results in a Siegel version 1 estimate of 6.7%. By adjusting for the difference between NZ historical and expected government bond rates, UniServices ensures the TAMRP adjusts for current market expectations in NZ, which the Commission's estimate does not account for.

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[42] Siegel, J (January 1992): "The Equity Premium: Stock and Bond Returns since 1802", Financial Analysts Journal, p28-38.

5.2.3. Siegel estimate: version 2

Under this version of the Siegel estimate, the expected real return on the market is assumed to be stable over time.

For the New Zealand market, the Commission takes Dimson, Marsh and Staunton's 1900-2014 average real return in the New Zealand market, applies an expected inflation rate of 2.0% (midpoint RBNZ target range), and adds an adjustment equal to the current five-year risk-free rate adjusted for the corporate tax rate to derive the TAMRP of 8%.

For the offshore market, the Commission takes Dimson, Marsh and Staunton's 1900-2014 average real return for 20 foreign markets, adds an expected inflation rate of 2.0% (midpoint of RBNZ target range), and applies an adjustment equal to the current five-year risk-free rate adjusted by the corporate tax rate to derive the TAMRP of 7.5%.

UniServices agrees with the approach used by the Commission for the Siegel estimate (version 2).

5.2.4. Dividend growth model estimate

The dividend growth model (DGM) is an ex-ante measure of the TAMRP derived using forward looking or expected dividend yields on listed shares.

For the New Zealand market, the Commission applies a three stage DGM as described by Lally[43] and Pratt and Grabowski[44] with the following assumptions on the parameters: Bloomberg expected forecast dividend yields for the NZ equity market for 2015, 2016 and 2017 expressed as a proportion of the index value (as at 1 Sept 2015), long-term expected growth rate in dividends of 4%, and an adjustment for the current New Zealand five-year risk-free rate (August 2015 average). Using this method, the Commission estimates a TAMRP of 7.4%.

For the offshore market, the Commission only considers the Australian market and applies the same approach with the following assumptions: Bloomberg expected forecast dividend yields for the Australian market for 2015, 2016 and 2017 expressed as a proportion of the index value (As at 1 Sept 2015), long-term expected growth rate in dividends of 4.6%, and an adjustment for the current Australian five-year risk-free rate (August 2015 average). Under this approach, the Commission calculates the offshore DGM estimates of TAMRP to be 9.0%.

In respect to both New Zealand and offshore DGM estimates of TAMRP, UniServices agrees with the Commission's approaches.

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[43] Page 32, Lally, M., 2015, Review of submissions on the Cost of Debt and the TAMRP for UCLL and UBA Services, 13 October 2015, Website of the Commerce Commission. http://www.comcom.govt.nz/

[44] Pratt, S., and Grabowski, R., 2010, Cost of Capital: Applications and Examples, 4th edition, John Wiley and Sons, Hoboken.

5.2.5. Survey evidence

Under this approach Dr Lally derives an ex-ante or forward looking estimate of the TAMRP based on the median of survey forecasts by academics and practitioners.

For the New Zealand market, the Commission draws on the survey data in Fernandez et al[45] and derives the TAMRP estimate of 6.8%, after adjusting the market risk premium with the current five year New Zealand government bond yield (as at August 2015) and the tax rate.

For the offshore market, the Commission applies a similar method using the median survey estimate of the market risk premium for 21 advanced countries, and adjusts with the current five year New Zealand government bond yield (as at August 2015) and the tax rate. The Commission derives a TAMRP estimate of 6.3% for the offshore market.

UniServices disagrees with the Commission's approaches for both New Zealand and offshore markets. In particular, UniServices points out that the adjustment term of the risk-free rate multiplied by the tax rate should be estimated based on a risk-free rate at the time the surveys were undertaken, i.e. April 2015 rather than August 2015. Also, UniServices notes that an adjustment is necessary to account for the differential between 5 and 10 year rates. Using this revised approach, UniServices calculates a TAMRP of 6.9% for the New Zealand market and 6.5% for offshore market.

5.2.6. Conclusion on the TAMRP

UniServices applies the same five approaches used by the Commission to estimate the TAMRP, but makes adjustments in three of the approaches.

Overall, we consider UniServices' adjustments are appropriate, and support the 7.25% TAMRP estimate used to calculate Auckland Airport's target return:

- Ibbotson estimate (offshore markets): This approach is based on long-run historical data, and UniServices correctly points out that an estimate based on historical data should no fluctuate with current interest rates. Part of the rationale for using long-run historical data to estimate a rate of return, is that it ensures stable prices across pricing periods, and the Commission's adjustment based on current interest rates defeats the purpose of using historical data. We therefore support UniServices' alternative adjustment to historical returns based on long-run data, which does not vary with current interest rates.
- Siegel estimate, version 1 (offshore markets): Under this approach, UniServices adjusts the Commission's estimate for the difference between NZ historical and expected government bond rates. We support this adjustment because it takes account of the NZ-specific market conditions, unlike the Commission's approach.
- Survey evidence (New Zealand and offshore markets): UniServices corrects the Commission's estimate for the fact that its adjustments to the survey evidence make use

[45] Fernandez, P., Ortiz, A., and Arcin, I., 2015. 'Discount Rate (Risk-free rate and Market Risk Premium) used for 41 Countries in 2015: A Survey', IESE Business School working paper (http://www.valuewalk.com/wpcontent/uploads/2015/05/SSRN-id2598104.pdf).

of data at a different point in time to when the surveys were conducted. We agree that the adjustment should be made using data at the same point in time as the survey.

Based on our support for UniServices' adjustments to the Commission's approach, we adopt a TAMRP estimate of 7.25% to estimate Auckland Airport's target return.

6. Conclusion

NERA has been asked to provide a peer review of Auckland Airport's approach to the weighted average cost of capital (WACC) and target return for aeronautical pricing presented in its draft pricing proposal, prior to the submission of its revised pricing proposal.

In this context, we have reviewed both the Commerce Commission's and Auckland Airport's approaches. Auckland Airport has estimated its target return with reference to the Commission's own industry-wide post-tax WACC estimate of 6.29%, but adjusted for Auckland-specific factors. Auckland Airport concludes on a post-tax target return of 7.0% for PSE3 in its draft pricing proposal.

In light of the Commission's view that it will consider other factors that result in Auckland Airport's target return being different from its industry-wide post-tax WACC estimate, we have considered whether such Auckland-specific factors exist and how they may be reflected in the target return. First, we have considered whether the airport-specific parameters of the cost of capital, i.e. the asset beta and the cost of debt, should be different from the Commission's industry-wide estimates in its WACC decision. Second, we have considered Auckland-specific factors which indicate that the target return should be different from the post-tax WACC. Last, we have assessed Auckland Airport's approach regarding the risk free rate and TAMRP.

Regarding the asset beta, we agree with Auckland Airport's approach of estimating an Auckland Airport-specific beta, rather than using the Commission's industry-wide beta estimate (0.6). The expected increase in Auckland Airport's capital expenditure is likely to increase its systematic risk relative to international comparators through an increase in operational leverage, which captures the proportion of total costs that are fixed. The higher the operational leverage, the greater the difficulty in scaling back costs in response to market demand shocks, and therefore the greater the volatility in cash flows. By increasing its capital expenditure, Auckland Airport's operational leverage increases, and we agree with Auckland Airport that this is best captured through Auckland Airport's own beta estimate rather than considering international comparators.

However, we find that it would be more appropriate for Auckland Airport to estimate the beta over a shorter estimation window than its selection of 20 years, as a shorter window is more likely to capture the recent increase in systematic risk from the anticipated capex programme. We therefore propose to estimate an asset beta range based on a 5-year estimation window (upper bound), as well as the 20-year estimation window that Auckland Airport adopts (lower bound). This results in an asset beta range of 0.73 – 0.81, higher than Auckland Airport's own estimate of 0.68 (which also uses an earlier data cut-off date).

Regarding the cost of debt, Auckland Airport estimates the cost of debt based on its own expected financing cost over the pricing period. We agree that the cost of debt estimate should be Auckland-specific. However, we consider that Auckland Airport's current forecast of the cost of debt of 4.32% is conservative. It does not fully take into account the projected increase in interest rates over PSE3 and it does not allow for any potential increase in debt margins as Auckland Airport's debt level increases to fund its planned capital expenditure. On the basis of the NZ sovereign forward curve, we consider the cost of new debt over PSE3

to be at least 20 basis points higher than Auckland Airport's own estimate. This leads to a cost of debt estimate of 4.52%.

We have also considered two Auckland-specific factors which indicate that the target return should be higher than the post-tax WACC:

- **Financeability**: our credit metric analysis suggests that both the Commission's WACC estimate of 6.29% and Auckland Airport's own estimate of 7% will to be insufficient for Auckland Airport to maintain its A- credit rating, when taking into account the anticipated capital investments. A downgrade is expected to cause its cost of debt to increase and will hence be inconsistent with Auckland Airport's cost of debt estimate of 4.32%. The finding that Auckland Airport is exposed to considerable risk to its financeability as a result of the anticipated capital investments supports our view that the target return should be set above Auckland Airport's WACC estimate.
- **Impact of Discretionary Capex on Target Return**: We understand that Auckland Airport has planned capital expenditure primarily to respond to growth, but also to respond to influence from the government, airlines and for wider public policy reasons. By investing now, Auckland Airport is giving up the option to delay investment (known as "real option" in the finance literature), which it should be compensated for through its target return. Whereas quantifying a real option premium is difficult without a detailed understanding of the expected returns from different possible capital programmes, Auckland Airport should consider setting a target return towards the top end of its estimated range to allow for the loss of real options when undertaking investments today.

Lastly, we have also assessed the other parameters of Auckland Airport's target return:

- **Risk-free rate:** we find that latest market evidence and RBNZ's own projections suggest that interest rates may increase by around 20 basis points by the mid-point of the pricing period. In light of this evidence, we consider that the Commission's risk-free rate estimate of 2.60% is likely to underestimate the risk-free rate over Auckland Airport's pricing period. Therefore, we estimate a risk-free rate of 2.80%, where reflecting RBNZ's projections.
- **Tax adjusted market risk premium:** UniServices concludes that the appropriate estimate of the market risk premium as at 1 April 2015 is 7.25%, which is 0.25% higher than the Commission's estimate of 7.0%. We agree with UniServices' adjustments to the Commission's approach.

Table 1 presents our estimates of the post-tax target return after we adjust Auckland Airport's approach on the risk-free rate, asset beta, and cost of debt. As a result of these adjustments, we estimate a range for the post-tax target return of 7.5% to 8.1%, compared to Auckland Airport's estimate of 7.0%.

Table 1
NERA Estimate of Target Return

	Commission	UniServices	Auckland Airport Target Return	NERA Target Return	
	Dec 16	**Dec 16**	**Dec 16**	**Low**	**High**
Risk-free rate	2.60%	2.60%	2.60%	2.80%	2.80%
Debt premium	1.45%	1.40%			
Leverage	19%	20%	19%	19%	19%
Asset beta	0.6	0.6	0.68	0.73	0.81
Debt beta	0	0	0	0	0
TAMRP	7.00%	7.25%	7.25%	7.25%	7.25%
Corporate tax rate	28%	28%	28%	28%	28%
Investor tax rate	28%	28%	28%	28%	28%
Debt issuance costs	0.20%	0.20%			
Equity beta	0.74	0.75	0.84	0.90	1.00
Cost of equity	7.06%	7.31%	7.96%	8.55%	9.12%
Cost of debt	4.25%	4.20%	4.32%	4.52%	4.52%
Vanilla WACC/Return	6.52%	6.69%	7.3%	7.8%	8.4%
Post-tax WACC/Return	**6.30%**	**6.45%**	**7.0%**	**7.5%**	**8.1%**

Source: Commerce Commission (December 2016), Auckland UniServices (December 2016), Auckland Airport Draft Pricing Proposal (December 2016), NERA analysis.

To take account of other Auckland Airport-specific factors affecting the target return, including the effect on financeability and the impact of discretionary capex that results in loss of flexibility, Auckland Airport should set a point estimate for the target return at the top end of our estimated range. In particular, we consider that Auckland Airport should set its post-tax target return at a rate higher than 7.8%.

Appendix A. Real Option Theory

The basic premise behind real options models is that they recognise the possibility that an investment can be deployed, expanded or abandoned later as better information arises. In situations where there is significant uncertainty that is expected to resolve over time, investors will therefore demand a premium to compensate for investing before all information is known. Real option analysis formally recognizes uncertainty and examines how current decisions limit or expand our ability to learn and react in the future.

There are four necessary conditions for real options analysis to arise:

1. First, there must be **uncertainty**. Without uncertainty, there is no need to consider the possibility of switching strategies in the future. The future is known and the best decision under certainty can be made now. It can be made deterministically.
2. Second, there must be **learning**; that is, the state of information regarding uncertainty must change over time. With uncertainty but without learning, the future may not be known but that state of knowledge (or lack thereof) remains constant. There is no reason to postpone any decision-making and the best decision under uncertainty can be made now. It can be made probabilistically.
3. Third, there must be **flexibility**; that is, there must be the possibility of acting on the basis of new information over time. With learning but without flexibility, there is no ability to take advantage of that learning and switch strategies. The decision can then be optimised deterministically or probabilistically depending on the case and criteria.
4. Fourth, there must be **irreversibility**. Any decision cannot be undone without incurring additional cost to reverse the decision. In other words, any expenditure is considered sunk.

Where factors 1, 2, and 3 are present investors will include real option analysis in their decision making.

These factors all apply in the case of Auckland Airport's capital expenditure:

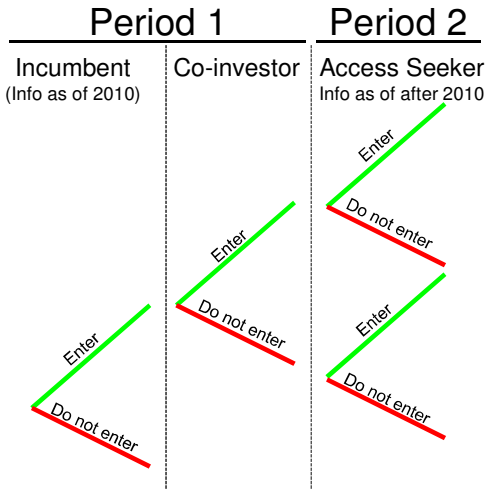
- The expected returns from the planned capital expenditure are **uncertain**, since they depend on actual demand and costs;
- Auckland Airport has the ability to **learn** about forecast demand and costs over time, based on actual trends at the airport; and
- Auckland Airport has **flexibility** in adjusting its capital expenditure or in delaying it.
- Auckland Airport's capital expenditure is **irreversible** in the sense that it is a sunk cost.

Given this real option, Auckland Airport should be remunerated for giving up the flexibility to delay investment if there is pressure from the Commission or airlines to undertake investment today. This will provide reasons to set the target return above the WACC, where the difference is partly explained by the loss in the real option to delay investment, which is not captured in the WACC.

Box A.1
Real option application in the FTTH context

In France the telecommunications regulator ARCEP has included real options considerations in its guidelines for determining the allowed risk premium it will use in assessing (ex post) whether interconnection charges for "fibre to the home" (FTTH) networks are risk reflective.[46]

The decision tree for investment decisions (in FTTH networks) under resolution of uncertainty over time below is based on ARCEP's guidelines and illustrates that later entrants / access seekers face lower risk than initial investors because they can wait for uncertainty to resolve before making a significant investment while initial investors face potential asset stranding risk if customer demand does not turn out to be as high as expected.[47]



The decision tree based on ARCEP (2010) illustrates that access seekers have a real wait and see option and, unlike the incumbent, can observe the resolution of the uncertainty in the first period.

ARCEP further sets out that it will allow the magnitude of the real option premium to evolve over time according to the following two countervailing factors: i) resolution of uncertainty, ii) amount of early adoption benefits accruing to the initial investor. Based on the above considerations ARCEP has not rejected an uplift to the CAPM-WACC of c. 500 basis points for NGA when deciding on a number of disputes between operators.[48]

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46 There is no ex ante regulation of the FTTH sector in France. Details of ARCEP's model based on conversations between NERA and ARCEP staff and ARCEP presentation (Mar 2010): Modélisation de la prime de risque pour les investissements dans la partie terminale des réseaux FTTH

47 This asset stranding risk is considered to be present for FTTH investments as the regulator cannot guarantee that any losses on the FTTH network can be recouped via the legacy copper network as there is a degree of intermodal competition from cable and mobile.

48 ARCEP (2010): Décision n 2010-1312 en date du 14 décembre 2010; ARCEP (2011): Projet de recommandation Consultation publique du 7 avril au 4 mai 2011

Appendix B. Airline Feedback on Draft Pricing Proposal

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B.1. Air New Zealand Response

Air NZ disagrees with Auckland Airport's post-tax target return on 7.0%, and provides comments on each of the parameters for which Auckland Airport's estimate differs from the Commission's.

On the asset beta, Air NZ notes that Auckland Airport has adopted an average of daily, weekly and 4-weekly beta estimates, whilst the Commission uses an average of weekly and 4-weekly beta estimates. The Commission's approach results in an asset beta estimate for Auckland Airport of 0.65, compared to Auckland Airport's estimate of 0.68. Air NZ supports the use of the Commission's data frequency in estimating the beta. Air NZ also supports the Commission's 0.05 downward beta adjustment, which adjusts the empirically derived beta estimate because it relates to the entire business, whereas the target return only relates to the less risky regulated business.

On the market risk premium, Air NZ notes that the Commission has provided detailed justification for its 7% estimate, and there is no sound rational for departing from this estimate. It rejects Auckland Airport's 7.35% TAMRP estimate, based on UniServices' analysis.

Finally, Air NZ suggest that Auckland Airport's investors have historically earned a return above any risk-based measure, and in the face of significant investment to address historical shortfalls, must accept lower levels of return in the early life of those assets when they are commissioned.

B.2. BARNZ Response

BARNZ disagrees with Auckland Airport's post tax target return of 7.0%, and provides comments on the MRP, asset beta and cost of debt/leverage. More generally, they also argue that the overall estimate exceeds the available benchmarks.

Regarding available benchmarks, BARNZ cite:

- The Commission's July 2016 WACC estimate for Auckland Airport (5.94% mid-point, 6.92% 75th percentile)
- Forsyth Barr's December 2016 60th percentile WACC estimate of 6.5% calculated using the Commission's draft IM;
- Its own estimate of what the Commission's mid-point WACC estimate would be today of 6.25%.

Regarding the market risk premium, they argue that the graphs showing that a higher MRP results in a valuation that more closely tracks Auckland Airport's share price undermines Auckland Airport's financeability concerns, given the graphs show that the share price is in excess of Auckland Airport's valuation. BARNZ then notes the UniServices arguments for a higher TAMRP have recently been rejected by the Commission in its review of the Input Methodologies.

Regarding beta, BARNZ argue that it is not appropriate to use the asset beta of the entire airport, since this includes unregulated commercial activities which have different risk profiles than the aeronautical activities. BARNZ argues that the Commission's estimate of 0.60 for regulated airport services is the appropriate value to be used for aeronautical pricing.

Regarding the cost of debt, BARNZ notes that both the Commission and the High Court have rejected using the actual airport cost of debt because it would not provide incentives for the airport to efficiently manage its debt. BARNZ argues that a better approach is to use an estimate of the efficient debt costs and leverage of a notional business. They note that using the Airports IM would deliver this outcome.

BARNZ also make the more general arguments that:

- Inflation in construction costs is not a justification for a higher WACC as national data shows no recent inflation in "non-residential" or "heavy and civil" construction costs;
- Funding risks are not very large for a monopoly business;
- Scaling back the Airport's capex program would mitigate any alleged funding risks.

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