Attachment 5

DETERMINATION OF COST OF EQUITY AND WACC IN RESPECT OF AIAL'S IDENTIFIED AIRFIELD ACTIVITIES

Introduction

1. This attachment sets out in more detail AIAL's approach to the calculation of the WACC for its Airfield activities over the period new charges were finalised in consultation with the airlines.

Definition of post-corporate tax WACC

2. Funds come from two classes of investors; debtholders and shareholders. They provide debt and equity capital respectively. Both groups expect to receive a rate of return that compensates them for the level of risk they accept.

3. The WACC is the required rate of return or cost of debt and equity weighted by their relative proportions or weights in the company's overall capital structure.

4. The standard definition of the WACC to discount nominal post-corporate tax cashflows is:

$$WACC = k_e \frac{E}{V} + k_b(1 - t_c)\frac{D}{V}$$

where:

k_e	=	cost of equity
k_b	=	cost of debt
t_c	=	effective corporate tax rate
E	=	market value of equity
D	=	market value of debt
V	=	$E + D$

1 AIAL expects no real growth in land values over the period to the next pricing review.

2 The asset beta estimated here is regarded as consistent with the beta degearing formula used in this Attachment 5. A number of beta degearing formula are possible, which can impact on the assumed relationship between the asset and equity betas. A higher asset beta would be warranted if an alternative beta degearing formula to that used in Attachment 5 were adopted.

3 This recognises higher systematic risk or beta for AIAL's non-airfield activities.

4 As at 31 December 2000, PricewaterhouseCoopers estimated AIAL's overall asset beta to be 0.72. Source: http://www.pwcglobal.com/Extweb/pwcpublications.nsf/docid/748F5814D61CC2618525693A007EC870, April 2001.

Estimation of parameters required to determine the WACC

5. **Cost of equity:** The most common model used to determine the cost of equity capital is the capital asset pricing model (CAPM). AIAL has consistently used a modified version of the CAPM. This is the Brennan-Lally CAPM that takes into account New Zealand's dividend imputation system.

6. The cost of equity capital using the Brennan-Lally CAPM model under a dividend imputation system is: [5]

$$k_e = Div \times T_{div} + r_f(1 - T_d) + \beta_L(PTMRP)$$

where:

k_e	=	cost of equity capital after corporate tax
β_L	=	levered or geared beta
r_f	=	risk free rate, proxied by the promised return on Government bonds
$PTMRP$	=	post tax market risk premium
Div	=	dividend yield of the company
T_{div}	=	a weighted average of investors of $(t_{divi} - t_{gi})/(1 - t_{gi})$, where t_{divi} is the investor i's tax rate on cash dividends from the company and t_{gi} is investor i's tax rate on capital gains.
T_d	=	a weighted average of investors of $(t_i - t_{gi})/(1 - t_{gi})$, where t_i is the investor i's tax rate on interest income and t_{gi} is investor i's tax rate on capital gains.

7. **Comment:** Common practice in Australia, including the Australian regulatory authorities such as the ACCC is to use the capital asset pricing model based on the work of Officer (1994).[6] The Officer CAPM models imputation as a reduction in corporate taxes and assumes personal taxes on gross dividends, interest and capital gains are identical.

8. In contrast to the Officer model the Brennan-Lally model treats imputation as reducing personal taxes. Lally (2000) shows this is only a matter of form rather than any substance. [8]

9. Under the New Zealand tax regime and dividend imputation system, however, personal taxes on interest and capital gains are not identical. The tax rate on capital gains is likely to be considerably less than the tax rate on interest income (or gross dividend income including imputation credits). First, many individual investors in New Zealand are exempt from capital gains tax. Second, even where investors are liable for capital gains tax, the tax is normally only payable when the asset is sold or realized. This ability to defer the payment of the tax lowers the effective tax rate on any capital gains.[9]

10. The Brennan-Lally CAPM model provides for differences in personal tax rates on interest income and capital gains[10] and has been widely adopted by practitioners and Government organisations in New Zealand in preference to the Officer model.

11. The parameter estimates used in the Brennan-Lally model are discussed next page:

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5 This model is a domestic CAPM model under dividend imputation based on work by Brennan (1970) and Lally (1992). See Brennan, M., 1970, Taxes, Market Valuation and Corporate Finance Policy, National Tax Journal 23, 417-427. Also see Lally, M., 1992, The CAPM under dividend imputation, Pacific Accounting Review, Vol. 4, 31-44

6 Officer, R.R., 1994, The cost of capital of a company under an imputation tax system, Accounting and Finance 34, Accounting and Finance, 1-18.

8 Lally, M., 2000, The cost of equity capital and its estimation, Vol 3, McGraw-Hill Series in Advanced Finance, The McGraw-Hill Companies Inc.

9 The ability to defer capital gains lowers the effective tax rate due to the time value of money and the possibility to realise the asset when tax rates are lower. Investors can also seek to time the realisation of any capital losses to offset against capital profits.

10 Lally (2000) shows how the Brennan-Lally model collapses to the Officer model when the tax rate on interest income and capital gains is assumed to be identical.

12. **Risk free rate:** New Zealand New Zealand Government stock interest rates offer a close proxy for the risk free rate. However, the CAPM is essentially a single period model - and debate often arises over whether a short or long term rate of interest is applicable. Short-term rates are typically subject to greater variability; and common practice is to use a long-term rate consistent with the investment horizon or the set of cashflows occurring over the time-frame under consideration.

13. Over the period in which AIAL was finalising its charges in consultation with the airlines, the average weekly yield[11] on long-term Government stock rates was:

Period: March 3, 2000 to 1 September 1, 2000

Government stock maturity date	Average of weekly yields[12] (%)
3/02	6.92%
4/03	6.92%
4/04	6.91%

14. Government stock maturing 4/03 and 4/04 spans the time period between the latest price increases in the year 2000 and the envisaged next price review for AIAL's Airfield activities.

15. In the calculation of the WACC for AIAL's Airfield activities the risk free rate was assumed to be 6.92% p.a.

16. **Investors' tax rate on interest income income - T_d:** The investors' weighted average tax rate on interest income is assumed to be 33%. This rate equals the corporate tax rate of 33%. A rate of T_d equal to 33% is broadly consistent with the assumption of tax neutrality between debt and equity finance under New Zealand's dividend imputation system.

17. **Investors' tax rate on dividend income - T_{div}:** Lally (2000)[13] shows that under New Zealand's dividend imputation and tax regime T_{div} can be expressed as:

$$T_{div} = T_d - U(1 - T_d)\frac{IC}{DIV}$$

where: U = the weighted average of investors' utilisation rates for imputation credits.

DIV = the annual cash dividend from the company.

IC = the imputation credits attached to the cash dividend.

If one assumes:

- T_d equals 33%;
- imputation credits are fully valued by investors and the value of U is close to one;[14] and
- maximum imputation credits are attached to dividends such that the ratio of IC/DIV = 0.33/ 0.67 = 0.4925

then T_{div} is zero as follows:

$$T_{div} = T_d - U(1 - T_d)\frac{IC}{DIV} = 0.33 - 1\,(1 - 0.33)\,\frac{0.33}{0.67} = 0$$

11 At a theoretical level using spot rates rather than the yield to maturity is a more correct conceptual approach. However, the yield curve in New Zealand is relatively flat. Moreover, if the risk free rate changes over different time periods and estimation of the market risk premium is related to the risk free rate, then a set of forward market risk premiums may be required.

12 Data sourced from Bloomberg.

13 Lally, M., 2000, The cost of equity capital and its estimation, Vol 3, McGraw-Hill Series in Advanced Finance, The McGraw-Hill Companies Inc.

14 This is regarded as a conservative assumption. Even if investors can fully utilize imputation credits, there would typically be some time delay in the utilization of the credits. This would suggest a value of U less than one.

18. The model then becomes a simplified version of the Brennan-Lally CAPM as follows[15]:

$$k_e = r_f - (1 - T_d) + \beta_L (PTMRP)$$

19. This simplified version of the Brennan-Lally CAPM is used to estimate the cost of equity capital for AIAL's airfield activities. This model is widely used in New Zealand. Entities that use or have recommended this form of the Brennan-Lally CAPM include the New Zealand Treasury[16], Ministry of Economic Development[17] and PricewaterhouseCoopers in their cost of capital report publications.[18]

Beta

20. One parameter that is often troublesome in applying the CAPM is the estimation of beta, the measure of systematic risk.

21. Beta measures the risk of the company relative to the market (e.g. the sensitivity of its cashflows to changes in GNP, interest rates, etc.). This risk is not diversifiable, and it is systematic risk in that returns vary systematically with the market returns. The CAPM posits that investors are only rewarded for systematic risk because investors can avoid unsystematic risk by forming a diversified portfolio. Only systematic risks are properly included in the CAPM and beta. Other unique and adverse diversifiable risks should be taken into account in the cashflows.

22. Beta estimates depend upon a number of factors including the industry, the type of customers, the structure and term of any pricing contracts, the presence of any real options and operating leverage. The average market equity beta is one.

Estimation of the asset beta

23. To estimate an asset beta common practice would be to look for New Zealand listed companies that produce the same set of products/services as AIAL's airfield activities and face the same business risks. Estimates of equity betas for these listed companies can then be derived on the basis of empirical share price data. These equity betas are then adjusted for the companies' gearing to derive asset betas reflecting the systematic risk or asset beta of the industry.

24. Other than AIAL there are no other listed airport companies in New Zealand. In addition there are only a small number of offshore listed airport companies. Empirical beta estimates based on a small sample size will likely have a wide 95% confidence interval.

25. At the start of the AIAL Consultation, AIAL's approach to estimate the asset beta for its airfield activities was to therefore review asset betas of electricity and gas utility companies that enjoy some degree of monopoly power. Subsequently during the AIAL Consultation, AIAL reviewed decisions by the ACCC for airport companies, including the ACCC decision for Adelaide Airport and more recently the ACCC draft decision for SACL.

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15 The assumption that T_{div} = 0 means the model is more tractable and less complex to apply in practice.

16 See Estimating the Cost of Capital for Crown Entities and State-Owned Enterprises, A Handbook Prepared for the Treasury, October 1997.

17 Handbook for Optimised Deprival Valuation of System Fixed Assets of Electricity Line Businesses, Ministry of Economic Development, October 2000. See the MED website: http://www.med.govt.nz/ers/inf_disc/odv04/odv04-09.html#P4522_110865 , April 2001

18 PricewaterhouseCoopers in their March 2000 publication titled "New Zealand Equity Market Risk Premium" assume T_{div} is close to zero (trivial) and can be dropped from the equation. However, they appear to assume T_d = 28% in their WACC input assumptions in the cost of capital publications. The lower the value of T_d the greater the term $r_f(1-T_d)$ in the Brennan-Lally CAPM.
See the PWC website http://www.pwcglobal.com/Extweb/pwcpublications.nsf/docid/A9DB3D0C9D9B0D3B852569420014F6B6, April 2001

26. Estimates of asset betas for electricity and gas distribution business typically fall within the range of 0.3 to 0.55. Recent regulatory decisions in Australia by the ACCC, ORG or IPART also conclude that asset betas for gas and electricity distribution and transmission assets are in the range of 0.35 to 0.60.

27. In the initial stage of the AIAL Consultation adopted an asset beta estimate of 0.4. However, this was subsequently reviewed as pricing negotiations continued; and an asset beta of 0.4 was regarded as being at the very low end of any plausible range. AIAL now considers an asset beta for its airfield activities in the range of at least 0.45 to 0.55 is justified for the following reasons.

- As a major New Zealand hub airport AIAL faces considerable revenue volatility. Holiday travel is a discretionary activity and demand is highly elastic. Business travel will fluctuate in accordance with changes in economic conditions. Passenger numbers would be expected to exhibit a non-trivial correlation with the state of the economy;
- Changes in passenger numbers will impact on the number of aircraft landing and AIAL's revenues. Aircraft operators (airlines) have considerable flexibility to change the type of aircraft in response to changes in demand and passenger numbers. The flexibility on the part of aircraft operators to expand or contract in response to changes in demand will result in AIAL's revenues on its airfield and other aeronautical assets being sensitive to changes in economic conditions and/or GNP (and other) shocks. Arriving international passenger numbers will fluctuate according to changes in the global economy (sometimes significantly such as during the Asian economic crisis) and because of other externalities (eg. overseas disruptions caused by outbreaks of war and political 'hotspots');
- It is also likely that earnings on the airfield assets will become more volatile in the future as aircraft operators make further use of the inbuilt flexibility in the One World/Star Alliance airline alliances, modernise their fleets and respond to the relaxation of international air service agreements (cf. the effects of the single aviation market between Australia and New Zealand);
- AIAL has high capital costs, high land values and high operating leverage. This limits the ability of AIAL to respond to changes in demand conditions and means profits will be quite variable in response to changes in economic conditions;
- For the reasons above revenue fluctuations to AIAL's airfield activities in response to economic shocks or changes in economic conditions are likely to be greater than revenue fluctuations and changes in demand for gas and electricity assets; and
- The beta of a company also reflects the sensitivity of the company's returns relative to the market and returns change with unexpected changes to both cashflows and discount rates. Unexpected changes to the discount rate come from factors such as unexpected changes in interest rates, inflation rates, exchange rates, the market risk premium and taxes. AIAL's pricing policy is to fix prices for a period of years with no review for unexpected changes in inflation rates, interest rates, exchange rates, the market risk premium and taxes that impact on the discount rate. Returns to AIAL will therefore be sensitive to shocks to the discount rate; and this should to be taken into account when determining an appropriate beta; and
- The recent decision by the ACCC for Adelaide Airport and SACL would support an asset beta for AIAL's airfield activities in the range of 0.45 to 0.55 (as discussed below). In the ACCC decision for Brisbane Airport[19] the ACCC used an even higher asset beta of 0.7.

19 See ACCC, Brisbane Airport, Proposal to increase aeronautical charges to recover the costs of necessary new invetment, April 2000, page 25.

Beta degearing formula

28. Betas are also affected by the leverage of a company.

In its pricing consultations with the airlines, AIAL used the following formula to convert an asset beta to equity beta:[20]

$$\beta_L = \beta_A \left(1 + \frac{D}{E}\right)$$

where: β_A = the unlevered or asset beta.

and the other terms are as already defined.

Comparison with the recent ACCC decisions for Sydney and Adelaide Airports

29. The asset beta used by the ACCC for the Adelaide Airport Terminal was 0.61 The corresponding ACCC draft decision on SACL's aeronautical pricing proposals used an asset beta of 0.60. The corresponding equity betas and gearing are set out below.

	Asset beta	Gearing (Debt: Equity)	Equity beta
Adelaide Airport	0.61	68:32	1.60
Sydney Airport	0.60	60:40	1.367

In making reference to these recent ACCC airport decisions, it needs to be borne in mind that the ACCC used a different beta-degearing formula to derive its asset beta.[21]

20 This beta degearing formula is consistent with the approach suggested by The Treasury in its Handbook of October 1997. The asset beta estimated for AIAL's Airfield activities is regarded as consistent with this beta degearing formula. Note: some academics and practitioners suggest a beta degearing formula that includes a beta for debt. However, estimation of a debt beta is problematic as it requires an estimate of liquidity and default premiums.

21 The ACCC uses the following beta-degearing formula based on the work of Appleyard and Strong (1992). See Appleyard, T.R. and N.C. Strong, 1992, Investment appraisal, taxes and the security market line, Journal of Business Finance and Accounting 19(1), 1-24:

$$\beta_L = \beta_A + (\beta_A - \beta_d)\left[1 - \frac{k_b t_c}{1+k_b}\right]\frac{D}{E}$$

Where: β_L = levered or equity beta.

β_A = asset beta.

β_d = debt beta .

k_b = cost of debt

t_c = corporate tax rate

D/E = debt to equity ratio.

There are a large number of possible beta degearing formulae that can be used depending on the assumptions made with respect to the value of debt tax shields and debt policy. The beta degearing formula adopted by the ACCC for SACL is based on the assumption that the initial tax shield has the same risk as debt interest payments. If all debt tax shields are assumed uncertain (and if the beta of debt is also assumed to be effectively zero) the beta degearing formula collapses to the one used by AIAL.

30. Based on the equity betas and target capital structures used by the ACCC, and applying the beta de-gearing formula adopted by AIAL the "comparable" asset betas are 0.512 and 0.547.

$$\beta_L = \beta_A \left(1 + \frac{D}{E}\right)$$

(Adelaide)

$$1.60 = \beta_A \left(1 + \frac{0.68}{0.32}\right)$$

$$\rightarrow \beta_A = 0.512$$

(Sydney)

$$1.367 = \beta_A \left(1 + \frac{0.60}{0.40}\right)$$

$$\rightarrow \beta_A = 0.547$$

31. Note that under this analysis the "comparable" asset beta for Adelaide Airport of 0.512 is below the "comparable" asset beta of 0.547 for SACL. This directional outcome (i.e. lower "comparable" asset beta for Adelaide) is different to the ACCC assumptions of an asset beta of 0.61 for Adelaide and 0.60 for SACL and arises due to the different gearing assumptions. It does, however, support AIAL's arguments for an asset beta of 0.45 to 0.55 under the beta degearing formula used by AIAL.

Estimation of equity beta

32. Using the beta degearing formula adopted by AIAL and a long run target gearing ratio *(D/E)* = 40/60 (see discussion under the heading "Capital Structure") the equity or levered beta for AIAL's Airfield activities is between 0.75 to 0.917, as follows:

	Unlevered or asset beta estimate	Levered or geared beta estimate
Airfield assets	0.45	**0.750** = 0.45 * (1+ 40/60)
Airfield assets	0.55	**0.917** = 0.55 * (1+ 40/60)

Post-tax market risk premium

33. The post tax market risk premium *(PTMRP)* represents the expected post-tax return on the market portfolio of assets over the risk free rate.

    The definition of *PTMRP* is:

    $$R_m - D_m T_m - r_f(1 - T_d)$$

    where: R_m = expected return on the market portfolio before personal tax

    D_m = dividend yield of the market portfolio

    T_m = weighted average over assets of the firms' T_{div}

    And the other terms are as already defined.

    Estimates of the *PTMRP* frequently used in the New Zealand market range from 8% to 9%.[24] AIAL adopted a rate of 9% in the AIAL Consultation. AIAL regards a *PTMRP* of 9% as falling within the plausible range for estimates of the post-tax market risk premium.

34. In March 2000, PricewaterhouseCoopers published a position paper titled "New Zealand Equity Market Risk Premium" advocating a fall in the *PTMRP* from 9% to 8%. PricewaterhouseCoopers noted in their paper (page 6) that while their estimate of the *PTMRP* of 8% to 9% for the New Zealand market may appear high by comparison to figures cited in the US market of 5% to 6%, overseas figures are not directly comparable due to differences in the CAPM specifications. They further noted that *"if the classical CAPM model, as commonly used in the US (and which does not incorporate any allowance for personal taxes / dividend imputation), is applied to New Zealand data our historical MRP estimate would also be in the order of 5% to 6%".*

35. Estimates of the market risk premium *(MRP)* (equal to $R_m - r_f$) in Anglo-Saxon markets and based on historical time series data range between 6.5% to 8.7%.[25] In a recent survey of over 150 financial economists Welch (2000)[26] reports average arithmetic equity risk premium consensus forecasts in the range of 6% to 7%.

    For the purposes of calculating the WACC in this attachment AIAL has taken a more conservative position and used a *PTMRP* of 8%. A *PTMRP* of 8% was adopted by Air New Zealand in its interim response to AIAL during the pricing consultations.[27]

Cost of debt capital

36. The cost of debt will normally be the cost on funds attributable to the assets on the basis that the funds are borrowed on a non-recourse basis.

37. The cost of debt in respect of AIAL's airfield assets is estimated to be 1.0% above the risk free rate. A debt margin of 1% is consistent with the recent decision by the ACCC for SACL and less than the 1.3% debt margin in the ACCC decision for Adelaide Airport.

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24 The Treasury in its Handbook of October 1997 regards 9% as a reasonable estimate of the *PTMRP*. In their 2000 annual report both Airways Corporation and Transpower use a *PTMRP* of 9%.

25 As at 1997 Ibbotson (1997) estimates the MRP ($R_m - r_f$) for the US at 8.2%. Dimson and Marsh (1982) obtain 8.7% for the UK over the period 1919 - 1982, Officer (1989) obtains 7.9% for Australia for 1982 - 1987 and Chay, Marsden and Stubbs (1995) estimate the MRP at 6.49% for New Zealand between 1931 - 1994. See Chay, J., Marsden, A. and R. Stubbs, 1995, Investment returns in the New Zealand market: 1931 - 1994, New Zealand Investment Analyst 16, 19 - 27; Dimson, E. and P. Marsh, 1982, Calculating the cost of capital, Long Range Planning 15, 112 - 120; Ibbotson Associates, 1997 Stocks, Bonds, Bills and Inflation: 1997 Yearbook, Ibbotson Associates, Chicago; and Officer, R.R., 1989, Rates of return to equities, bond yields and inflation rates: An historical perspective, in Ball, R., Finn, F., Brown, P. and R. Officer. Share Markets and Portfolio Theory, 2nd edition, University of Queensland Press.

26 Welch, I., 2000, Views of Financial Economists on the equity risk premium and on professional controversies, Journal of Business 73, No 4, 501-537.

27 Paragraph 3.2.2, Page 7, "Air NZ Further Interim Response to AIAL Pricing".

Capital structure

38. Theories on what constitutes the optimal capital structure are mostly concerned with trade-offs between the tax advantages of debt, its agency costs, and wasteful investment and bankruptcy.

For the purposes of calculating its recent charges, AIAL assumed a target capital structure or debt to equity ratio of 40:60.[28]

Application of parameters to estimation of the post tax nominal WACC

a) Cost of equity:

The cost of equity capital under the simplified Brennan-Lally model can now be calculated as follows:

Levered beta	CAPM Model $k_e = r_f(1 - t_d)\beta_L(PTMRP)$	Cost of equity capital
0.750	6.92 x (1-0.33) + (0.750 x 8%)	10.64%
0.917	6.92 x (1-0.33) + (0.917x 8%)	11.97%

b) AIAL estimation of post tax nominal WACC:

The post tax nominal WACC can now be calculated in accordance with the formula as set out earlier in this report. That is:

$$WACC = k_e \frac{E}{V} + k_b(1 - t_c)\frac{D}{V}$$

Estimated Cost of Equity Capital	Ratio of E/V	Estimated After Tax Cost of Debt equal to 7.92% ((1-tc) where tc = 33%	Ratio of D/V	WACC (nominal)
10.64%	0.60	5.31%	0.40	8.5%
11.97%	0.60	5.31%	0.40	9.3%

In summary AIAL's estimate of its nominal post-tax WACC for its airfield activities is in the range 8.5% to 9.3%.

Comparison with the recent draft ACCC decisions for Sydney Airports

39. If one assumes:

- An asset beta of 0.60 and a debt beta of 0.08 as adopted by the ACCC in the recent draft SACL decision;
- The beta degearing formula adopted by the ACCC;
- A debt to equity ratio of 60:40 adopted by the ACCC for SACL;
- Other parameters (e.g. risk free rate, post-tax market risk premium etc) as applied by AIAL; then:

the resulting WACC is 9.4% as follows:

28 Under the dividend imputation capital asset pricing model and beta degearing formula adopted in this report, the WACC for the Airfield assets will be relatively insensitive to changes in the target gearing ratio.

WACC Parameters	
Debt	60%
Equity	40%
Risk free rate	6.92%
Post tax market risk premium = *PTMRP*	8.0%
Asset beta = β_A	0.60
Debt beta = β_d	0.08
Equity beta[1] = β_L	1.361
Corporate tax rate = t_c	33%
Debt margin	1.0%
Nominal cost of debt = k_b	7.92%
Cost of equity (CAPM)[2] = k_e	15.52%
WACC[3] %	9.4%

Notes

1. $\beta_L = \beta_A + (\beta_A - \beta_d)[1-\frac{k_b t_c}{1+k_b}]\frac{D}{E}$

   $\beta_L = 0.60 + (0.60 - 0.08)[1-\frac{0.0792*0.33}{1+0.0792}]\frac{60}{40} = 1.361$

2. $k_e = r_f(1 - t_d) + \beta_L(PTMRP)$ = 6.92 x (1 - 0.33) + (1.361 x 8%) = 15.52%

3. $WACC = k_e\frac{E}{V} + k_b(1 - t_c)\frac{D}{V}$

   $WACC = 0.1552*\frac{40}{100} + 0.0792*(1 - 0.33)\frac{60}{100} = 9.4\%$

This suggests AIAL's estimate of the WACC for its Airfield Activities is reasonable based on the systematic risk and beta degearing formula adopted by the ACCC for SACL.

Conversion to a Real Pre-Tax WACC

40. In converting the nominal WACC to a real pre-tax WACC, AIAL adopted the following approach.

- Convert the nominal post-tax WACC to a nominal pre-tax WACC by grossing up the factor 1-tc. Thus if the nominal post-tax WACC is 8.5% and tc = 33%, then the nominal pre-tax WACC is 12.69%
- Then adjusting the nominal post-tax WACC as follows to derive a real pre-tax WACC.

(1+ nominal pre-tax WACC) = (1+ real pre-tax WACC) ((1+ inflation rate)

If the expected inflation rate is 1.5%, then:

(1+ 0.1269) = (1+ real pre-tax WACC) ((1+ 0.015)

and the real pre-tax WACC is 11.02%