PRICEWATERHOUSECOOPERS

Airservices Australia

Review of the Weighted Average Cost of Capital for Regulated Services

27 November 2003

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Executive Summary

PricewaterhouseCoopers (PwC) was appointed by Airservices Australia (AsA) to provide an estimate of the regulatory weighted average cost of capital (WACC) of AsA, using the Australian Competition and Consumer Commission (ACCC) approach, as part of a process to reach a new five year price path for aeronautical services with the ACCC and various industry stakeholders (eg airlines).[1]

The setting for a number of WACC parameters has a degree of subjectivity and contention. This Report presents an assessment of the issues and a proposed WACC.

AsA is a Commonwealth Government owned monopoly business with a core responsibility to provide safe air traffic management services to the aviation industry in the Australian Flight Information Region (ie all Australia's sovereign airspace and international airspace over the Pacific and Indian oceans or 11% of the world's airspace). Specific services include en route and terminal air traffic services, aeronautical data, tower services at 26 airports, aviation rescue and fire fighting services at Australia's 16 busiest airports, design and management of airspace usage. AsA provides services to over 3m aircraft movements annually, earning commercial revenue of $600.3m from a $418m non-current asset base spread over 600 sites around Australia with 2,885 staff. Customers include airlines; the general aviation industry, with its sport and recreational flying activities; the Australian military; and airport owners.

The Report provides a detailed discussion of AsA business issues and risks. It then proceeds to provide analysis and discussion on reasonable setting for each specific WACC parameter. The table below summarises the position of key stakeholders and the view of PwC.

[1] Other related parts of the project include completing an asset valuation, as well as reviews of capital expenditure plans, depreciation and efficient operating costs to develop a price path using the ACCC building block approach.

Measure	**AsA's view**	**BARA view**	**ACCC view**	**PwC proposal**
	March 2003	November 2003	June 2003	November 2003
Risk Free Rate	4.82%	5 year bond	4.82%	5.83%
Real risk free rate	np	np	np	3.39%
Asset Beta	0.7	0.46 or 0.55 – 0.60^	0.55-0.75**	0.55-0.65
Equity Beta	1.1	0.9	0.9-1.2	1.0-1.3
Debt beta	0.07	*np*	0	0
MRP	6%	6%	6%	6%
Debt margin	0.42%	0.42%	0.42%	0.6%-0.8%
Cost of Debt	5.44%	Rf+0.42%	5.44%	6.5%-6.7%
Gearing (D/V)	40%	50%	40%	40%-50%
Tax rate	30%	30%	Calc via cash flows	Calc via cash flows
Dividend Imputation	50%	>50%	50%	50%
Cost of Equity (post tax nom)	12.5%	np	10.0%-11.5%	11.8%- 13.6%
Nominal Vanilla WACC	9.01%	np	8.1%-9.0%	9.4%-10.1%
Post tax nominal WACC*	np	np	np	6.9%-8.2%

** ACCC commented that final view likely to be toward the lower end of this range. np: not provided.

* To calculate the post tax WACC we have assumed an effective tax rate of 25%, based on the Jun-03 ACCC outcome. The ACCC calculates effective tax rate from analysis of cash flows. This will be updated by the ACCC and may change results slightly.

^ BARA recommend 0.46 if AsA retains a 1 year price path and 0.55 to 0.60 for a 5 year path.

Of the WACC parameters, the asset beta is the most significant driver to determining the overall WACC result that has been subject to debate (and variation) in recent regulatory decisions. PwC recommends that an asset beta range of 0.55 to 0.65 provides a reasonable estimate of the likely range that the Australian Competition and Consumer Commission (ACCC) may utilise. This preliminary view has been formed based on consideration of key comparative asset beta estimates including:

- The July 2003 ACCC AsA Draft Decision utilised a range of 0.55-0.75 but significantly commented that final view is likely to be toward the lower end of this range.
- A view that AsA has slightly less risk than that identified in previous ACCC asset beta decisions for Australian airports which have a market value weighted average of 0.64.
- Earning volatility analysis presented by BARA suggesting AsA has volatility in between Sydney and Canberra airports which have ACCC regulatory asset betas of 0.6 and 0.65 respectively.
- Empirical asset beta analysis of 29 stock exchange listed Transport and Utilities Companies and 9 listed International Airports which suggested market capitalisation weighted average asset betas of 0.57 and 0.51 respectively.

- Analysis from AsA suggesting an asset beta of 0.7, offset against analysis from BARA (recommending 0.46 with a 1 year price path and 0.55 to 0.60 otherwise) and Virgin Blue (0.45 to 0.55).

Additionally, assuming no carry forward of under/over recoveries, PwC acknowledges that the proposed change to a five year price path provides a risk of slightly higher earnings volatility and our recommended asset beta range reflects this issue.

Based on the parameters and issues above, the preliminary PricewaterhouseCoopers view is that a reasonable regulatory nominal vanilla WACC for AsA lies in the range of 9.4% to 10.1%. PwC's recommended nominal vanilla WACC is the simple midpoint of this range which is 9.75%.[2]

PwC notes that this suggested WACC (mid-point) is approximately 1.2% higher than the midpoint of the view expressed by the ACCC in June 2003. In summary the difference is due mainly to:

- A rise of approximately 1.2% in the risk free rate over the period; and
- PwC suggesting a rise of approximately 0.3% in the debt margin from a base of 0.42% suggested by AsA and accepted by the ACCC. PwC views the early level as potentially understating the likely efficient borrowing margin of a similar entity.

Section 2 of this Report provides a discussion of key issues which were considered in recommending a regulatory WACC for AsA. Section 3 of the report provides a detailed commentary of issues associated with estimating individual WACC parameters.

Section 3.3 provides a sensitivity analysis of WACC calculations and assesses the impact of changes in the WACC on the total regulated revenue of AsA. In summary, sizable changes in WACC do not generate significant changes in net indicative revenue. The difference between the PwC proposed low (9.4%) and high value (10.1%) vanilla WACC estimates translating to a +/-$2.7m change which equates to a +/-0.5% change of total net indicative revenue which was estimated by the ACCC in June 2003 at $530m.

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[2] Alternatively, if the mid-points are selected for individual parameters where a range is used (ie debt margin, gearing & asset beta) the nominal vanilla WACC is 9.73%.

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1 Introduction

1.1 Airservices Australia

Airservices Australia (AsA) is a government owned commercial authority formed in 1995 from the separation of the Australian Civil Aviation Authority into two entities:

- AsA took on service provision for the Australian airways.
- The Civil Aviation Safety Authority (CASA) took on the regulatory role.

AsA's specific service responsibilities include airspace management, air traffic flow management, air traffic control, traffic and flight information, navigation services, aeronautical telecommunications, aeronautical information, search and rescue (SAR) alerting and aviation rescue and fire fighting in accordance with the Chicago Convention on International Civil Aviation, to which Australia is a contracting State. Other functions include consultancy and management services related to its legislated functions and the provision of services and facilities both within and outside Australian territory.

AsA is divided into three market-oriented business groups - Air Traffic Management, Airport Services and Infrastructure Support Services. A Corporate Services Group provides governance and business partner services, and Head Office coordinates the needs of the Board and Chief Executive Officer. AsA is currently engaged in consultation with its customers on a longer term approach to pricing its airway services based on a framework of risk sharing, charging prices aimed at delivering a reasonable medium term level of return, while accepting business cycle risks within the financial period.

AsA serves approximately 11% of the world's airspace, its major customer is Qantas, which currently accounts for 45% of AsA's revenue. In aggregate the Sydney Airport and its associated airspace account for the greatest part of its revenue.

1.2 Background to Review

In July 2002, the Australian Competition and Consumer Commission (ACCC) approved a temporary average 5.1% nominal price increase (2.2% in real terms). The increase was to be reversed at the end of June 2003. On 1 January 2003 AsA reversed the increase relating to en route charges. This reduced the average price increase over the financial year to 3.6% (0.7% in real terms).

As part of the temporary price increase, AsA has been instructed to develop a long term pricing policy. PricewaterhouseCoopers has been appointed by to provide weighted average cost of capital advice to AsA as part of this process.

AsA requires advice on its WACC for price regulated services. The ACCC bases its assessment criteria for price regulated airservices under the *Prices Surveillance Act 1983* (PS Act).

In assessing notifications lodged under s22 of the PS Act, the ACCC adopts a 'building block' cost-based approach to assessment, unless otherwise directed by the Government or as otherwise agreed with the notifying company. The criteria for assessing notifications are set out in s17(3) of the PS Act. In light of these criteria, the ACCC has stated that in assessing notifications, it "will direct its attention to:

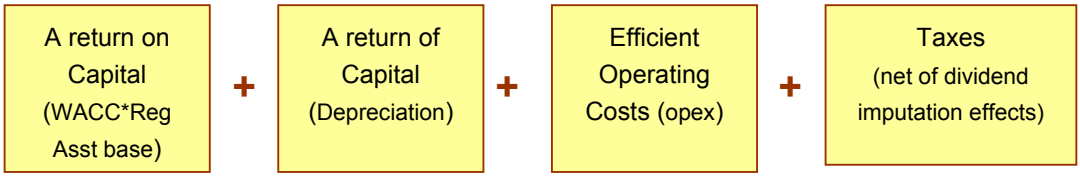
- The efficiency of the cost base that the declared company is working from to earn a return.
- The reasonableness of the rate of return that the company is seeking."[3]

Increasingly, the ACCC has been making judgements about the reasonableness of rates of return (ie WACC) from a standard model – the ACCC's Post Tax Revenue Model (PTRM). The PTRM was released in October 2001 and has been applied by the ACCC to assessments in the electricity, natural gas, postal and air services industries. The ACCC's assessment of costs and rates of return in relation to AsA's proposed 2003 price increase appears also to have been made on the basis of the framework provided by the PTRM.[4]

Modelling completed by the ACCC using the PTRM is generally designed to arrive at prices that return post-tax revenues (over a reasonable period, such as 5 years) which embody, in the ACCC's view, efficient costs and a reasonable rate of return as per its statement above.

The PTRM applies conventional WACC formulas to regulated asset base values in order to determine the return on capital component within the building block revenue calculation, as shown in the schematic below. Under the PTRM, the WACC values input to the model are also confirmed as Internal Rates of Return (IRRs) arising from the building block revenue calculation (this is because the PTRM outcomes rely on an effective tax rate, rather than the statutory rate. However, in order to apply an effective tax rate, the model must first determine taxable revenues).[5]

Debate remains about some of the key WACC parameter values such as the asset beta. The ACCC applies its building block model to determine whether the revenue levels from the regulated prices are reasonable. This model determines allowable revenues as the sum of:



[3] ACCC's "Draft Statement of Regulatory Approach to Price Notifications"

4 Page 12 of the ACCC Decision, Airservices Australia Proposed Price Increase, June 2003.

5 The PTRM contains functionality to overcome the inherent circularity of determining post-tax revenues by applying a tax rate calculated from taxable revenue.

The ACCC's preliminary building block calculation for 2003/04 is illustrated below:[6]

BUILDING BLOCK CALCULATION 2003/04 (DUAL TILL)	**Airservices**	**ACCC**
Indicative Revenue Estimation		
Return on Capital for Regulated Assets	$33.9m	$28.3m
Return of Capital for Regulated Assets	$58.9m	$53.6m
O&M Regulated	$444.2m	$444.2m
+ Net taxation payable	$9.2m	$7.4m
- Dividend Imputation Benefit	($4.6m)	($3.7m)
= Net Indicative Revenue	**$541.6m**	**$529.8m**
Total Airways Revenue at proposed prices[69]	***$518.3m***	***$518.3m***
Over / (Under) Indicative Revenue	**($23.3m)**	**($11.5m)**
Less net CSOs (Subsidy less Costs)	$11.1m	$11.1m
Net Over / (Under) Recovery	**($12.3m)**	**($0.4m)**

PwC analysis of the above table suggests that the ACCC based their WACC estimate, used to calculate the $28.3m return on regulatory assets was 8.55% (midpoint of nominal vanilla WACC range), which implies an asset value of $331 million.

AsA's proposed return on capital of $33.9 million, was based their proposed nominal vanilla WACC of 9.01% which implies a proposed regulatory asset base of $376 million.

Overall, AsA is unlike most regulated infrastructure entities in that over 83% of revenue from the building block approach is derived from non-capital costs with the remainder from capital costs (depreciation 10% and rate of return 7%). By contrast most regulated infrastructure entities derived over 70% of maximum revenue from capital costs. Consequently, whilst WACC remains an important input to AsA maximum prices, it is comparatively less significant and changes in WACC yield relatively smaller changes in maximum prices.

[6] ACCC decision: Airservices Australia: Proposed Price Increase, June 2003.

2 Key Issues

2.1 Duration of pricing

To date AsA's prices have been reset on an annual basis. This has benefited AsA by allowing for a rapid response to unexpected changes in demand, such as economic downturns, the September 11 terrorist attacks and the outbreak of SARS.

This ability to respond rapidly has also been a factor in its ability to obtain an investment grade stand alone credit rating resulting in it being able to borrow funds at more favourable interest rate.

The ACCC has indicated that AsA should adopt a long term pricing plan in its June 2003 decision as "that could encourage and reward improvements in long-term cost efficiency." The ACCC is of the opinion that "a longer-term price path provides much stronger incentives for AsA to minimise the costs of providing its services than the current short-term approach." The ACCC also indicated that the returns afforded to a AsA should decrease the shorter the duration of pricing ie the asset beta (as the measure of risk) should be slightly higher for longer duration price paths, subject to any agreements to reset prices following material deviations in actual volume from forecast volume.

The majority of the asset betas for airports where determined in the context of the airport accepting risk on traffic volumes varying from 3 to 15 years, with 5 years the normal time period applied for pricing resets.

To that end AsA's is currently working with industry to develop a 5 year pricing path based on a framework of risk sharing; charging prices aimed at delivering a reasonable medium term level of return to its owner, while accepting business cycle risks within the financial period.

2.2 Volatility of earnings

The AsA's Corporate Plan states that: "Over the last few years, the aviation industry environment has been highly turbulent. Following the dramatic slowdown in 2001-02, domestic and international aviation markets started to recover. However, global economic uncertainty, the current situation in the Middle East and continuing terrorist incidents in various parts of the world have reversed the recovery. Many international airlines are continuing to report significant losses and the global airline industry is being re-engineered due to these adverse factors and the rise of value based airlines. While our major domestic carriers appear to be in a strong position due to the strength of the Australian economy, some regional operators are struggling to remain profitable."

"As airlines lose money and re-engineer, their problems increasingly become the industry's problems. Airline realities create pressures on suppliers including Air Navigation Services Providers (ANPS), who have come under pressure to further modernise, restructure, rationalise and become more commercial in an increasingly competitive environment. The corporatisation of AsA is an important element in positioning the corporation to meet these challenges."

The alternative school of thought is that AsA has relatively modest earnings volatility vis-à-vis individual airports or airlines due to geographic diversification and due to ASA being a monopoly business. This theme is explored in section 3.2.7.

2.3 Carry forward of over/under recoveries

Long term prices are set on the basis of forecast activity. Even if the forecasts are accurate on average, there will still be unavoidable deviations around those forecasts. This means that in any particular year the actual revenue will differ from the allowed rate of return.

There are several options for dealing with short term fluctuations. Firstly AsA could wear the risk of activity falling below forecast in any particular year and also retain the additional revenue if activity exceeds forecasts. This would be the simplest course of action, but this was been recognised by IPART in an April 1999 decision on the rail access regime as providing something of an incentive for companies to underestimate activity levels.

Secondly, AsA could bear the risk of any shortfall below the forecast, while providing refunds when the rate of return is exceeded. This situation applied to Rail Access Corporation in the late 1990s, which sought to mitigate this unsatisfactory form of asymmetric risk (i.e. no upside to earnings, only downside, meaning low probability of achieving maximum return on assets over the long term). An implication of this policy is that realised revenue would be less than forecasted revenue. The total size of under-recovery over the course of the pricing policy would be dependent on the standard deviation of activity around forecast levels. Prices should then be increased by the expected level of under-recovery. This would be more complicated than the first proposal. Alternatively under- and over-recoveries could be carried forward in a separate account. Over recoveries would be retained against future under recoveries and vice versa. IPART argued that this approach requires a regulator to confirm the calculations of the unders and overs accounts and noted that reconciliations could be complex and time consuming.

AsA typically bears the risk that net present value of revenue is less than expected due to random variation around the forecasts. In the first proposal, in the second case AsA bears the risk that realised under-recoveries are less than the value of the increase in the average level of prices designed to compensate for the expected level of under-recoveries. Where separate accounts are set up AsA bears the risk that the account will end up with a negative value. It could be possible for the level of under-recovery or over-recovery to be taken into account in setting prices in the next 5 year period.

2.4 Application of the WACC to an ODRC asset valuation

2.4.1 The ODRC method

Where an entity operates in a competitive environment, the demand it experiences and the prices it receives in the market are determined by market forces. The value of its assets is determined accordingly. Because AsA operates in a non-competitive environment, a hypothetical market value of its assets must be determined so that an appropriate return on assets can be calculated. AsA's assets are currently being valued under the ACCC's Optimised Depreciated Replacement Cost (ODRC) methodology. This approach involves three stages:

- Establishing the Gross Current Replacement Cost (GCRC): the gross service potential embodied in the existing assets by reference to modern engineering equivalent assets (MEERA). This means that the assets are valued as if they had been built with current technology. This method reduces the value of the assets by the cost savings that have resulted from technological improvement.
- Adjusting the GCRC for over-design, over-capacity and/or redundant assets. This is the final part of the 'optimisation' process. Only those assets that are needed to serve current demand (with reasonable allowances for growth) are considered. The effects of any so-called 'gold-plating' are removed.
- Depreciating this value to reflect the anticipated effective working life of the asset from new, the age of the asset and the estimated residual value at the end of the asset's working life.

2.4.2 Implications of ODRC for WACC

Given the capital intensive nature of most regulated businesses, the return on capital component of the regulated revenue often accounts for a large percentage of annual aggregate revenue. However, this is less of an issue for AsA as operating costs are relatively higher than most regulated businesses. The mandated return is equal to the regulated rate of return applied to the regulated asset value. An optimal return therefore requires an appropriate WACC and an appropriate measure of the value of capital invested in the enterprise.

Ensuring that regulated revenue provides a commercial return for the regulated business is important because where revenue falls below commercial returns, future investment in infrastructure is compromised, undermining the quality of service provided to users. Conversely, if regulated returns are set too high, the business would earn a return in excess of their cost of capital. This would distort price signals to consumer and investors, resulting in a misallocation of resources and sub-optimal economic outcomes.

Rational investors seek to maximise their return on investments. They also seek similar expected returns from investments of similar risk. If not, they will switch to investments offering higher returns for similar risk. Hence, a utility may be unable to attract capital to meet service demand and maintain viability unless it can offer an expected return comparable to investments of similar risk.

QANTAS has emphasised the importance of not compromising service quality when seeking efficiency savings and the industry has committed to eliminate the risk of insufficient investment by AsA due to inadequate revenues

2.5 AsA's Corporate Plan

AsA's corporate plan is threefold, firstly to maintain and improve safety, secondly to develop its global role and thirdly to provide value for stakeholders. The Corporate strategic priorities developed to achieve the above objectives include:

- Promoting the implementation of safe and operationally sound airspace reforms.
- Assisting the government in the corporatisation of AsA.
- Becoming the dominant regional provider of ATM and related services, jointly providing services with in Australia and the Asia-Pacific region.
- Implementing rolling five year transition plans based on the Australian ATM Strategic Plan AsA are aiming to be a world leader in the evolution and implementation of autonomous flight concepts.
- Unified ATM system for Australia – Implementing the Defence Support Initiative which involves an Integrated Operating Concept (IOC) for the merging of civil and defence ATM systems.
- Implementing technology development initiatives, such as Automatic Dependent Surveillance Broadcast (ADS-B) capability, satellite based navigation systems and life cycle upgrades and improvements to the Australian ATM system.

The need to fund a significantly enlarged capital program while remaining within approved target gearing ratios has resulted in the curtailment of an earlier capital repayment program. This has also led to increased borrowings and higher interest payments. As a result, operating profit after tax will improve only moderately beyond 2003-04.

The following table summarises AsA's expected capital expenditure items over the next 5 years and indicates timing of that expenditure.

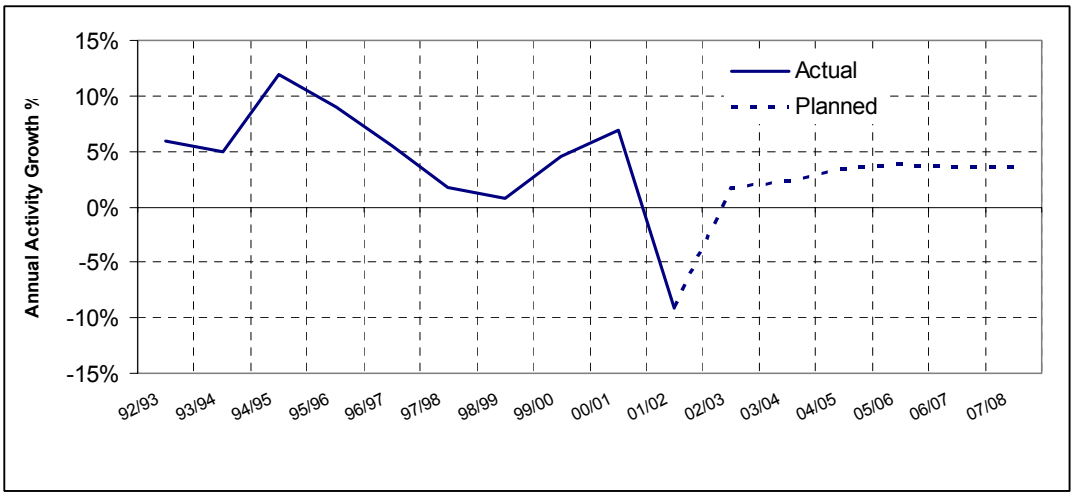
Description	2003/04 Plan ($M)	2004/05 Plan ($M)	2005/06 Plan ($M)	2006/07 Plan ($M)	2007/08 Plan ($M)	5 Year Plan Total ($M)
Eurocat Ongoing functional Upgrade (Software & Hardware)	13.7	16.1	12.8	10.0	10.0	62.6
Enroute Surveillance Enhancement Program			1.4	31.0	27.0	59.4
Terminal Radar replacement program		1.4	18.0	18.0	18.0	55.4
Navaids Replacement Program	4.2	13.2	10.7	11.5	11.1	50.7
Very High Frequency (VHF) System Upgrade Projects (inc. new sites)	9.9	10.1	7.0	6.0	3.0	36.0
Satellite Based Communication Project - Mark II			12.6	17.4		30.0
Fire Vehicle Replacement Program	5.7	15.5				21.2
Fire station infrastructure	4.5	3.5				8.0
High Frequency (HF) Rationalisation & Modernisation Project	4.0	6.9	6.8			17.7
Automatic Data Surveillance Broadcast (ADS-B) Initial Sites	1.0	7.0	6.0			14.0
Tower Data Processing & Display System	0.2	2.0	4.0	4.0	2.0	12.2
Surface movement guidance & control systems	1.2	3.6	4.8	2.4		12.0
ATM Collaborative Decision Making with industry		1.0	0.5	3.0	6.0	10.5
Flexible Use Airspace		0.5	3.0	3.0	1.0	7.5
National Aeronautical Information Publication System (NAIPS) enhancement	0.3	3.0	3.0			6.3
AFTN review & upgrade / replacement	0.2	2.0	3.0			5.2
Parallel Approach Runway Monitor		5.0				5.0
User Preferred Routes/Trajectories		1.0	1.0	1.5	1.5	5.0
Other Capital Items <$5m	27.4	24.8	31.6	18.5	17.7	120.0
Total Program	**72.3**	**116.6**	**126.1**	**126.3**	**97.3**	**538.6**

Source: AsA Draft 2003-2008 Corporate Plan

2.6 Aviation industry activity growth forecasts

AsA's revenue and consequent measures of revenue volatility is highly dependent on forecasts of activity within the aviation market. Forecasting short to medium term trends in activity is made difficult by the highly volatile state of the market with the terrorist attacks in the US, the removal of Ansett, the war in Iraq and the outbreak of SARS.

Overall growth has been predicted to return to the long term average growth rate of approximately 3.5% over the next few years as the graph below shows:



Source: AsA Draft 2003-2008 Corporate Plan

The volume of domestic activity has been predicted to grow at between 3% and 3.9% per annum over the next fiver years, after a 12% fall in activity in 2001/02 due to the Ansett collapse.

Enroute forecasts are made on the basis of international economic and industry specific business drivers. These include

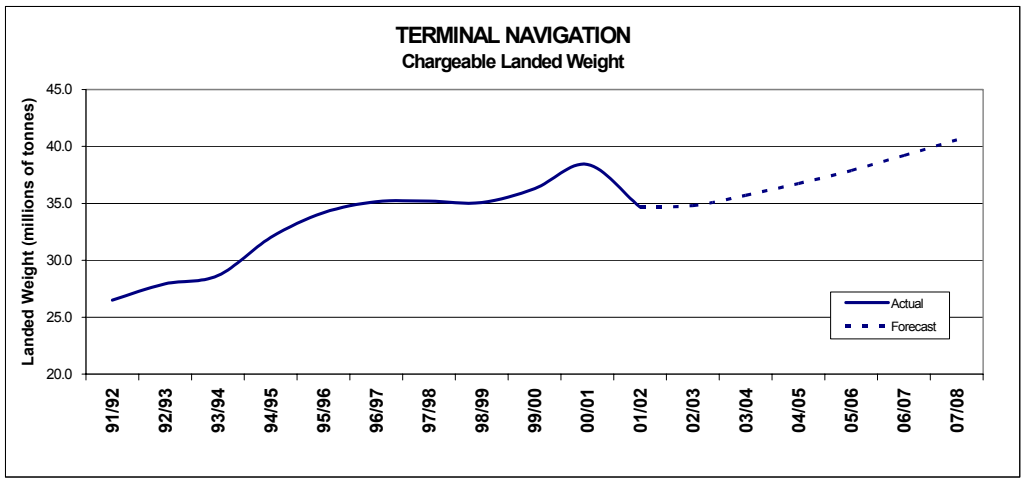
- The changing profile of aircraft fleets and average distances flown,
- Current world security concerns,
- Expected airline rationalisation and partnering internationally, and
- Expected fleet expansion domestically.

International growth over the first half of the 1990s averaged around 10%, but fell to 1.2% in 1998/97 due to the Asian crisis. Growth picked up during the Olympics but has fallen after the September 11 attacks.

Growth in domestic activity is likely to be strong, but the effect on AsA's revenue will be tempered by the following:

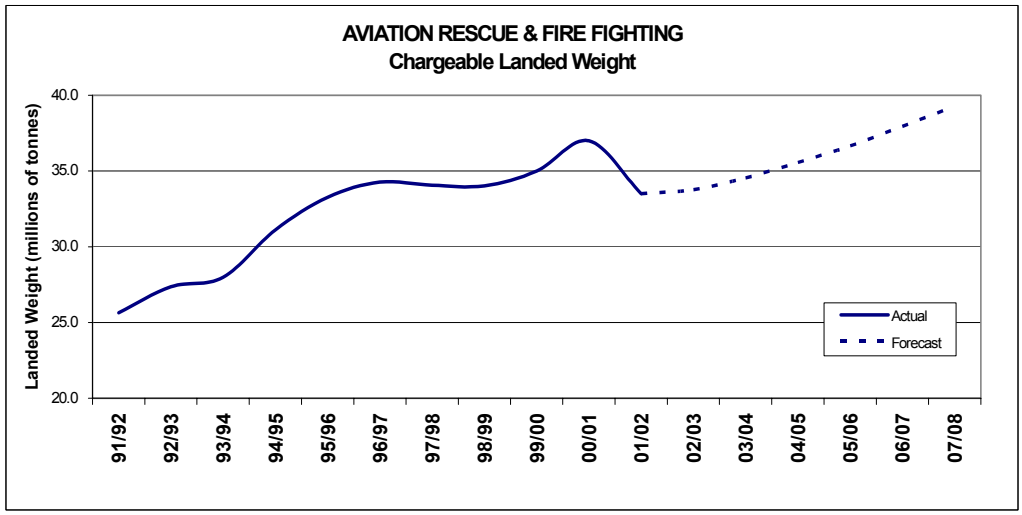
- Flow-on effects of reduced international traffic levels,
- The use of more efficient aircraft which reduce passenger to weight ratios,
- Better yield management by airlines.

Forecasts for Terminal Navigation (TN) and Aviation Rescue & Firefighting (ARFF) are presented in the graphs below:



Source: AsA Draft 2003-2008 Corporate Plan

The graph above illustrates that AsA is forecasting a 17% rise in landed weight tonnages offers over the 6 year period to 2008.



Source: AsA Draft 2003-2008 Corporate Plan

AsA provides rescue and firefighting at fewer facilities and is expecting a 15% rise in landed weight tonnages over the 6 year period to 2008 for those facilities.

AsA is likely to have a greater exposure to changes in the volume of air traffic than the individual airports. Approximately 95% of AsA's revenue derives from air activity, whereas airports derive roughly 60% of their revenue from non-traditional sources such as retail and industrial property. Naturally, a substantial proportion of airports' non-traditional revenue (particularly from retail) is indirectly derived from air travel.

It has been argued that this greater dependence on air traffic should be reflected in AsA's asset betas relative to the asset betas previously set for airports by the ACCC. In reality, such direct comparisons are problematic as, at the time the ACCC reviewed the airports, the non-traditional sources of revenue were much less significant to airports and the ACCC specifically considered only the airports' regulated income (i.e. that revenue directly sourced from air travel).

The growth in tonnage landed has not matched the growth in passenger numbers as airlanes have been substituting lighter types of aircraft. This trend is expected to continue. Compounding this is AsA's lower ability to substitute costs as easily as the airlines.

QANTAS has suggested that the activity forecasts contained above may be low compared to current forecasts.

2.7 The impact of technological change in the industry

Over the next five to twenty years technology is expected to reshape the services delivered by AsA. The major shifts are expected to be:

- A move to more extensive use of satellite based Communication, Navigation and Surveillance (CNS), and reduced use of ground based systems,
- Development of ground and flight deck air traffic management (ATM) tools,
- Reduction through merger of ATM providers.

Technology improvements in CNS systems potentially support better ATM service delivery in terms of capacity, safety, efficiency and the delivery of new ATM services, where cost effective. The increased development and exploitation of satellite navigation and communication systems, together with digital technologies, data link communications and advanced computer technology, offers improved accuracy, timeliness and availability of aviation related information and changing roles for humans within ATM operations. Surveillance is expected to transition from radar and procedural methods to Automatic Dependent Surveillance – Broadcast (ADS-B), a system in which aircraft position and velocity data (determined by on-board navigation systems) is broadcast regularly by an aircraft both to ground stations and other aircraft.

A basic set of ground based navigation and communication systems is likely to be retained for security reasons.

The increased availability of key ATM related information to all airspace and airport users will result in more effective collaborative decision making, involving airlines (e.g. flight operations) and airport (e.g. gate management) staff, as well as

controllers and pilots. The introduction of enhanced flight management systems (FMS) in aircraft, to process information and computer driven decision support tools in both the air and ground facilities, will support more cooperative and efficient ATM.

Technological advances are coupled with the trend to increasing globalisation and deregulation of the aviation industry. Towards this end, AsA is actively exploring with suitable partners in the region, ways to integrate en-route services which would lead to more efficient and safer service delivery.

2.8 AsA's balance sheet and accounting policies

AsA complies with Australian Accounting Standards with accounts audited annually by the Australian National Audit Office.

Property, plant and equipment are brought to account at cost or at valuation, less, where applicable, accumulated depreciation or amortisation. Assets purchased by AsA are initially valued at cost. Labour and direct overheads incurred in installation are capitalised and added to the cost. Assets constructed by AsA are initially recognised at cost of materials, labour and direct overheads.

Property, plant and equipment, excluding software, was progressively valued during the year as part of a three year revaluation cycle.

Assets within a class that are acquired after the commencement of a revaluation cycle are not included in the revaluation in progress. Revaluation increments and decrements are accounted for separately for each class of assets.

AsA's main liability is its Treasury Note Issue of approximately $100 million due to expire in 2006.

AsA pays company tax to the Australian Taxation Office ($16.7m in 2003). In the 2003 financial year AsA paid the government $14.9 million in dividends ($11.4 million in 2002). This represents 46% of post tax profit in each year. This level can adjusted with the approval of the Commonwealth Department of Transport and Regional Services (DoTRS), for instance during periods of high capital expenditure.

AsA also receives Community Service subsidies of $7 million per annum for non-commercial activities mainly related to general aviation services at regional airports where prices are capped at below fully allocated costs.

2.9 Government policy and Safety

AsA's principal objective is to maintain world leading safety performance, this is reflected in its corporate plan and government charter. In October 1999, the Commonwealth Government issued a public policy statement and a Charter Letter to the AsA Board which set out strategic guidance on matters critical to the achievement of the government's commitments to aviation safety. The Minister reaffirmed these strategic directions in September 2002. Some of the main thrusts of these guidelines are listed below:

- AsA has a legislated responsibility to promote and foster aviation.
- It has legal responsibility for airspace design and management.

- AsA, the Australian Transport Safety Bureau (ATSB) and CASA have separate and distinct functions but work together as part of an integrated system to provide aviation safety.
- Competition for control tower and aviation rescue and fire fighting services continues to be government policy. The 1999 Ministerial Policy Statement "A measured approach to Aviation Safety Reform" indicates that competition will not extend to terminal area navigation services at this time and en-route air traffic services will remain a monopoly. AsA will continue to provide control tower services at Sydney Airport.
- The government supports location specific pricing for tower air traffic control services and aviation rescue and fire fighting services.
- AsA should seek export and local development opportunities where consistent with core business, subject to Ministerial approval for significant new business ventures. Government reputation, risk/return, legal exposure, other liabilities and diplomatic relations are issues requiring special attention and management.
- The government will review the appropriateness of AsA retaining its regulatory responsibilities with regard to airspace and the environment.

In line with the safety objective AsA has begun a new and expanded safety management training regime for internal staff and contractors as well as implementing Benchmarking of the Safety Management System. AsA is committed to ensuring air safety, irrespective of the cost implications. The table in Section 2.5 details the expected costs of the capital component of investments in safety over the next 5 years.

AsA must comply with a range of Acts and regulations. Relevant Legislation includes:

- *Air Services Act 1995*
- *Air Navigation Act 1920*
- *Civil Aviation Act 1988*
- *Airports Act 1996*
- *Prices Surveillance Act 1983*
- *Commonwealth Authorities and Companies Act 1997*

2.10 Potential Corporatisation of AsA

AsA has expressed a view that corporatisation during 2003-04 will allow it to trade and diversify in a competitive environment, respond to customers' interests more flexibly, provide improved opportunities for staff, and enhancing the corporation's value for the owner, while at the same time continuing to manage its safety and social obligations responsibly.

In general corporatised government entities face greater expectations and pressures to deliver commercial financial returns with DoFA becoming a shareholder and being likely to require higher levels of performance reporting and returns on equity. However, AsA already operates as a government business enterprise which contains many of the key governance and performance requirements of a corporation. These include reporting to an independent board of directors, returning dividends to its existing shareholder and paying taxation. As a corporation, AsA is likely to have slightly more freedom to operate on a more arms length basis from government and explore other commercial opportunities both in Australia and internationally.

3 Approach and Methodology

3.1 Project management approach

3.1.1 Review of ACCC's CAPM Approach

The Capital Asset Pricing Model (CAPM) is the conventionally accepted method for determining the return on equity component of the WACC for a business subject to economic regulation. The CAPM is adopted by the ACCC in the PTRM, we briefly summarise the application and processes used by the ACCC in WACC calculations and explain these steps for this report.

As part of this process we will re-evaluate the risk conditions to examine ongoing relevance and consider if there are any other risks that exist now that were not considered in the original calculation. We identify these new risks and where appropriate incorporate them into our calculations of the CAPM and WACC estimates.

As part of scoping the potential effects of the asset valuation calculation (developed under a separate project), we assess what assets which are included in the regulated asset base, the risks of such assets and examine the appropriate allocation/recovery of common costs for any risk issues.

Problems with CAPM

An underlying assumption of CAPM is that returns follow a normal distribution. It is argued that under a regulatory regime, asymmetric distribution of returns may result (eg investment disallowance by a regulator). If this happens, all the regulatory risk faced by the company is not captured by CAPM. Some regulators have allowed a margin over CAPM midpoint to reflect this issue, but to date the ACCC has not.

3.1.2 Post vs Pre Tax, Real vs Nominal Rates of Return

As noted above, the ACCC has applied a post tax nominal rate of return in its recent regulatory decisions. This does not appear likely to change in the immediate term. However, in recent determinations different Australian jurisdictional regulators have adopted alternative approaches to the determination of WACC. The three key approaches used by other regulators include:

- Nominal post-tax
    - Used by ACCC.
    - Queensland Competition Authority
- Real pre-tax
    - Independent Pricing and Regulatory Tribunal, NSW (IPART),
    - Independent Competition Regulatory Commission (ACT),
    - Office of the Rail Access Regulator, WA (ORAR); and
    - Office of Gas Access Regulation, WA (OffGAR).
- Real post-tax
    - Essential Services Commission, Vic (ESC).

The ACCC and ESC previously used real pre-tax measures.

Arguably, post-tax tends to be heavy handed and introduces other complexities.

There are also arguments for and against the use of real or nominal rates of return as well as pre and post tax. In theory, the use of real or nominal rates should yield the same result if indexation is applied consistently and correctly. In practice, there are advantages and disadvantages in using either a real or nominal rate of return. The use of a real rate of return is consistent with past regulatory practice and is easy to apply to a real regulatory asset base but is inconsistent with market practice. While a nominal approach is consistent with market practice, it imposes risk given the inflation assumption over the pricing period is fixed and requires the regulatory asset base to be deflated.

As AsA seek a PwC WACC analysis consistent with the ACCC's methodology we base our recommendations on the nominal post tax approach. However we also calculate the pre-tax figures and real rates for the WACC input values (as these are also derived by the PTRM).

3.2 Parameters in CAPM and WACC calculations

Cost of Equity Parameters

As stated above, using the CAPM to estimate WACC conforms with the methodology used by the ACCC to set maximum revenues or prices. This section of our report evaluates the appropriateness of the parameters that are used in this approach. The classical CAPM uses the following formula to estimate the cost of equity:

$k_e = (r_f + (r_m \times ß))$

where:

k_e = cost of equity

r_f = the nominal risk free rate

r_m = the Australian market risk premium (MRP)

ß = the systematic risk of equity

We evaluate the reasonableness of the estimated parameters used in the previous calculations to determine the cost of equity with current market conditions. Of particular concern is the estimate of the MRP and equity betas, however, the risk free rate shall also be examined to ensure the most suitable measures are used. Our approach provides an accurate and detailed focus on those key parameters which produce the largest change in WACC and where contention may exist in estimation.

3.2.1 Risk Free Rate

The technically correct approach for the estimation of the risk free rate is to forecast a rate over the term that the regulated prices are to apply. In practice regulators use the recent average of the current rate as a proxy for the forecast due to the subjectivity inherent in forecasting interest rates. This rate is based on that for a Government security having the same term as the regulated prices (eg 5 year Commonwealth Bonds rates). The pros and cons of feasible alternative methods for determining the risk free rate are evaluated.

The risk free rate depends on the time to maturity of the relevant bond. The 1999 ACCC Draft Statement of Principles for the Regulation of Transmission Revenues suggests that either the 10 year interest rate on Government Bonds or the 5 year interest rate will provide acceptable measures of the risk free rate. The 10 year rate is generally used in determining the market risk premium variable but the 5 year rate better corresponds to the regulatory period and frequency of reviews. The ACCC's recent decisions have been in line with the view that the risk free rate is best measured by the redemption yield on a government bond with the same time to maturity as the regulatory control period.

In the case of the Murraylink project a 10 year term was chosen. However, the likely AsA regulatory control period is 5 years.

It is general regulatory convention to average the risk free rate over a number of days to remove any short term volatility. Earlier decisions suggested that the rate should be averaged over at most a 40 day period. However, in 3 recent decisions (Murraylink, TransGrid and Powerlink) the ACCC has averaged yields over 10 days. The ACCC has argued that 'this offers a degree of protection from transient volatility while ensuring that the selected rate closely reflects the most recent market activity.

The 5 year Commonwealth Government Bond was trading at an average yield of 5.58% over the 10 trading days to 27 October 2003. On November 5, the RBA announced an increase in the cash rate of 0.25%. In the 10 days to 22 November, the 5 year bond rate has averaged 5.83%. This is the rate used in the analysis that follows.

Virgin Blue have noted that while the ACCC use a 5 year bond for the risk free rate all other regulators use a 10 year rate.

3.2.2 Inflation Rate

The ACCC's view is that expected inflation rate can be measured either from financial markets data or from Commonwealth Treasury modelling. The financial markets indicator is generally preferred by the ACCC and is calculated as the difference between a CPI linked government bond and a non-index linked (nominal) bond of equivalent or similar maturity. The index and nominal bonds rarely have the same term to maturity, the ACCC extrapolates the indexed bond rate to estimate the rate for the term to maturity of the nominal bond.

A linear interpolation of the yields on index linked bonds maturing in August 2005 and August 2010 have been calculated at 12 November as 3.39%. The Fisher equation is then used to determine the inflation rate. The current forecast for the inflation rate over the next 5 years is calculated to be 2.39%.

3.2.3 Market Risk Premium

The market view is that the Market Risk Premium (MRP) is relatively constant through time at between 6% and 8%. The ACCC has conventionally used a value of 6%. An alternative school of thought sees the MRP as now being at 5% or lower, given the change to a low inflation environment, taxation and superannuation reform and the growth of dividend imputation. A further measurement issue in is whether the use of a geometric or arithmetic mean in estimating MRP[7].

Various studies have tried to estimate the MRP in the Australian market, these studies are summarised in the table below. Based on these surveys regulated entities have proposed MRPs of up to 8%..

[7] The arithmetic mean is the most commonly used form, it is the sum of the values to be averaged, divided by the number of observations. The geometric mean is derived by multiplying the values and then taking the root to the power of the number of observations; that is the n-th root is taken where there are n values.

Recent MRP studies:

Study	Time period of study	MRP	Method of averaging
Officer (1989)	1982-1987	7.9%	Arithmetic
		6.6%	Geometric
Officer (1989) Updated	1982-1997	7.1%	Arithmetic
		5.7%	Geometric
Hathaway (1996)	1882-1991	7.7%	Arithmetic
Hathaway (1996)	1947-1991	6.6%	Arithmetic
Centre for Research in Finance (1999)	1974-1998	4.8%	Arithmetic
		2.8%	Geometric
Centre for Research in Finance (1999) – excluding Oct 1987	1974-1998	6.4%	Arithmetic
		4.9%	Geometric
Ibbotson Associates (1999)	1970-1998	3.4%	Arithmetic
Dimson, Marsh and Staunton (2000)	1900-2000	7.6 (nominal)	Geometric
		6.5 (real)	
Welch (Survey 2000)	Oct 98-late 98	7.1%	Arithmetic
Welch (Survey 2001)	Aug 2001	5.5%	Arithmetic
Graham & Harvey (2001)	June 00-Sep 01	3.6 – 4.7%	Survey of 1,107 CFOs
Mercer Investment Consulting (2002)	May 02	3.0%*	Arithmetic
		4.0% (incl franking credits)	
		3.0-6.0%	Broker survey

Source: IPART, 2002: Weighted Average Cost of Capital Discussion Paper. *This value reflects that used by Mercer Investment Consulting in is asset allocation advice to institutional investors. In addition, Mercer Investment Consulting also surveyed various brokers on their assumptions of the equity risk premium.

It is thought to be unlikely that the ACCC will change from their preferred estimate of the market risk premium in the near future. Consequently an MRP of 6% has been assumed.

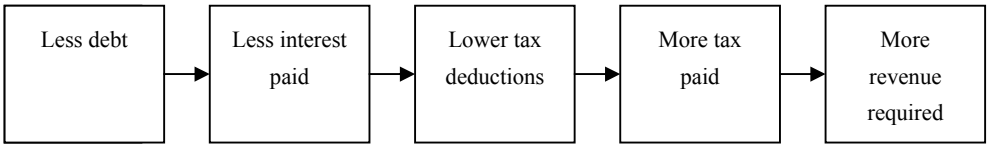
3.2.4 An Efficient Capital Structure (Gearing Ratio)

The CAPM does not use AsA's actual gearing ratio (Debt: Debt + Equity). Rather it bases the regulatory gearing ratio on the ideal capital structure that would be possessed by a generic firm providing the same services as AsA. That said, AsA's actual and target gearing ratios do provide reference points. The regulatory gearing ratio, is therefore subject to a degree of subjectivity.

The ideal capital structure is one that sets gearing on a forward looking basis to minimize the WACC, whilst still enabling the retention of an investment grade credit rating and the financing of necessary investments.

In 2001 AsA obtained expert advice from Grant Samuel as to an appropriate capital structure. The medium to long-term recommended proportion of debt funding for the organisation was in the range 30-40% a range used to reflect changes in debt depending on place in the capital expenditure life cycle.

In 2002, the ACCC initially recommended a gearing ratio of 60% which is the conventional level it applies to a variety of regulated business. AsA argued that 40:60 more appropriately matched their capital structure. The ACCC noted that a lower debt to equity ratio had the following effect:



However, it was noted that the difference between a gearing ratio of 60% and one of 40% was marginal and ACCC endorsed a 40% gearing ratio.

Overall there is some potential that the ACCC may prefer to reset gearing to a ratio of 60% consistent with other decisions. BARA argue that the gearing ratio for AsA should be no lower than 50% consistent with the level set for the UK air traffic control service (NATS) and ACCC decisions on Australian airports. BARA's main argument is that AsA's superior credit rating should ensure that lenders are prepared to provide debt funding to at least the level provided for airports.

Our view is that AsA is likely to be able to retain a regulatory gearing ratio in the range of 40% to 60%.

3.2.5 Debt Margin

The regulatory debt margin is the spread between the risk free interest rate and the rate at which a regulated firm would be able to borrow if it possessed the ideal capital structure. This implies that the debt margin should not be company specific, although the actual entity will provide again provide a reference point. The costs associated with borrowing (bank fees, treasury and administrative costs) should be incorporated into estimates of the debt margin.

AsA currently has very low levels of debt and a AAA stand alone Standard & Poor's credit rating. Its MTNs were issued with a very low spread of 65 basis points over the risk free rate. In March this had fallen to a low of 42 basis points. This value was submitted by AsA in its pricing proposal to the ACCC, and later accepted. The spread has since widened to 49 basis points.

It is apparent that 42 or even 49 basis points may not be appropriate regulatory debt margin. This is because it is currently low by historical standards and the debt margin should be forward looking. Furthermore, such a margin does not take into account the fees associated with issuing the debt ($0.21 million), nor the ongoing AsA costs of managing that note issue. Most importantly, the actual spread is based on AsA's current minimal gearing and high credit rating. Were AsA to move its actual levels of gearing toward the proposed regulatory gearing (40% to 50%), it is likely that the increased level of debt would push up the spread on its debt and lead to pressure on its credit rating, further increasing its spread.

In a large range of other regulatory decisions (including some for AAA rated entities) the ACCC has frequently used a debt margin level of 1.2%.

Consequently, our view is it is more reasonable to assume that the ACCC would be prepared to accept a debt margin more in the range of 0.6% to 0.8%. Virgin Blue has argued that a debt margin of 0.6% should be considered the upper limit as it does not believe that the fact that the current debt margin is low by historical reasons should be considered. This apparently assigns a low weight to the effect of the regulatory gearing ratio being higher than AsA's actual ratio.

3.2.6 Tax Rate and Imputation Factor

The issue of the use of an effective or statutory tax rate has become prominent with the move from a pre-tax to post-tax regime by some regulators. In moving to a post-tax regime, the ACCC, QCA and ESC have adopted an effective tax rate rather than the statutory tax rate.

It is noted that AsA is likely to have a large future income tax benefit. However, the ACCC tries to look at the industry in general and not rely on firm specific factors. The ACCC calculates effective tax rates based on an analysis of cash flows. We have not conducted this analysis ourselves. Further analysis of cash flows may result in the ACCC adopting a different effective rate, which may change the results slightly. The following analysis assumes an effective tax rate of 25%

The WACC estimate must be adjusted to properly reflect the returns provided to shareholders via franked dividends. Gamma is included in the WACC calculation to represent the proportion of franking credits which can, on average , be used by shareholders of the company to offset tax payable on other income. The higher the gamma, the lower will be the required return to equity holders and therefore the lower the estimated WACC. The setting of Gamma is based on industry efficient private ownership and is the company specific detail of AsA's shareholders not paying tax is disregarded.

Regulators in Australia tend to adopt a gamma value of 50%. There remains considerable debate over the most appropriate value to use with various studies indicating a value of between zero and 100%. The ACCC contends that imputation credits should be fully valued on the basis that the form of the CAPM used by regulators is a domestic CAPM and that changes in the Ralph Review allow individuals to fully benefit from imputation credits, regardless of tax actually paid.

As the PwC role is to estimate WACC consistent with the ACCC approach and given that the ACCC is unlikely to change its position in the short term we suggest a gamma of 50%.

3.2.7 Estimating a Regulatory Beta for AsA

The CAPM model, as it is based on portfolio theory, requires that the risks facing AsA be classified as either systematic or specific risks. The two types of risks are defined as follows:

- *Systematic risks* are the risks that affect the entire economy, not just AsA, as such these risks are not able to be avoided by holding a diverse portfolio of assets. Such risks include, inflation, threats to economic growth, taxation and monetary policy, these are measured in CAPM by the equity beta.
- *Specific risks* are risks unique to AsA or to the class of companies similar to AsA. These risks are not addressed in the WACC model as they can be minimised by holding a diverse portfolio of assets. They are instead included in the projected cash-flows.

The key risks for AsA have been canvassed in Section 2 above.

Equity betas are usually measured by calculating the companies share price volatility relative to the broader market using historical data. AsA is unlisted and so the equity beta is calculated from the asset beta using the Monkhouse formula.

Asset Beta

In 2002, the ACCC set a range for AsA asset beta of between 0.55 and 0.75, with an apparent preference for the higher end of the range. In 2003 the ACCC followed the same range, but preferred the lower end of that range, given the ability of AsA's counter-cyclical short-term pricing policy to moderate or smooth returns. AsA is now moving away from that policy.

The ACCC has sought to compare AsA to the following:

- Australian airports that have had an asset beta calculated by the ACCC, and,
- Comparable International entities and
- Comparable transport, infrastructure and utility entities with a share market listing.

Other Australian Airports

The ACCC has previously estimated AsA's asset beta by generating a range of betas based on its decisions in assessing Australian Airports and then comparing AsA to those airports. The ACCC, however, will not necessarily be bound by the betas calculated for other airports as AsA operates at regional airports not previously examined by the ACCC and provides services to international flights that do not land or depart from Australia. It should also be noted that is now 2 to 3 years since the ACCC examined these airports as the ACCC is no longer actively involved in the price regulation of airports (but retains a price monitoring role).

The larger airports were awarded lower regulatory asset betas acknowledging factors such as larger, more diverse and more stable demand. We note that Sydney Airport and surrounding flight paths drive an estimated 50% of AsA's revenue. However, companies involved in the ownership of Sydney Airport have not currently been listed for an adequate enough period to derive sufficiently accurate equity betas.

A particular airport's asset betas is generally set by comparing the airport's elasticity of income to that of other airports with previously determined betas.

The factors influencing the ACCC's decisions on airports are:

- returns are correlated strongly to revenues;
- changes in market returns are correlated to changes in GDP; and
- changes in GDP are correlated to changes in passenger income.

The following are previous ACCC decisions:

Airport	Date of Decision	Asset Beta
Adelaide	October 1999	0.61
Brisbane	April 2000	0.70
Perth	April 2000	0.70
Canberra	June 2000	0.65
Melbourne	June 2000	0.70
Alice Springs & Darwin	September 2000	0.73
Sydney	May 2001	0.60
Launceston	June 2001	0.80
Simple Average		**0.69**
Privatisation Proceeds Weighted Average		**0.64**

The ACCC estimates AsA' beta by comparing the range of average volatility of AsA' revenue drivers to those of the airports listed. Revenue drivers are determined by:

- The volatility of AsA's earnings.
- The duration of pricing paths.
- Any carry forward of any under/over recoveries.

BARA makes the following points:

Volatility of earnings: Traffic flows determine the revenue of both the airports and AsA. AsA is likely to experience less volatility than the airports. Competition between Australian airports for travellers has less of an affect on AsA than the airports themselves as a traveller switching airports has a minimal (if any) effect on AsA.

AsA has provided the airlines with activity volumes for the period of 1995-96 to 2002-03. Examining the volatility of this data can test the hypothesis that AsA has less volatile traffic compared to individual airports over the period in which airport asset beats were determined. One way this can be done, is to:

- convert the activity outcomes of airports (landed tonnes) and AsA (landed tonnes terminal navigation, tonne-kilometres and weighted average activity outcomes) to a simple index (1995-96 = 100); then
- regress each index against an index of Australia's GDP to remove the trend component from each output index; then
- calculate and rank the standard deviation of the residuals from each regression from least (1) to most volatile (12).

The results of BARA's analysis are:

Airport	Rank of earning volatility	Standard Deviation
Adelaide Airport	1	4.0
Brisbane Airport	2	4.0
Canberra Airport	3	4.3
AsA weighted average	**4**	**4.6**
AsA TN	**5**	**4.7**
AsA en-route	**6**	**4.9**
Sydney Airport	7	5.3
Launceston Airport	8	5.5
Alice Springs Airport	9	6.0
Melbourne Airport	10	6.1
Perth Airport	11	6.1
Darwin Airport	12	11.8

It would appear that AsA has lower traffic volatility than the majority of airports, airports given betas of between 0.70 to 0.80 (Perth, Darwin and Melbourne) and similar volatility to Sydney and Canberra that were awarded betas of 0.60 and 0.65 respectively. BARA argue that the low volatility of Canberra is related to the dominance of public sector traffic at that airport. Adelaide and Brisbane suffered smaller downturns in traffic in recent years, probably due to the lower levels of traffic to and from Bali in previous years.

There is little difference in volatility of AsA's landed tonnes compared to its tonne-kilometres.

Duration of pricing: The ACCC has indicated that the returns afforded to a provider should decrease the shorter the duration of pricing. The 5 year time frame for AsA is in line with those of the airports. The airports had price path durations of between 3 and 15 years, with 5 years being the most common.

AsA has a view that the proposed change from single year price paths to a five year price path has the potential to significantly increases earnings volatility. This view is based on the rise in forecasting error risk associated with completing forecasts for the five year period from 2004 to 2008 for volumes, operating costs, the ODRC asset base, depreciation etc by June 2004 and using these forecasts to calculate and 'lock-in' a specific five year price path. Over a five year period small differences between assumed and actual growth rates can result in significant deviations due to the impacts of compounding.[8] However, to some extent it is probable some forecasting errors may balance one another out eg volume growth may be above forecast increasing revenue offset by cost growth above forecast. Offsetting the risk of some greater volatility in earnings, AsA should extract benefits related to added price level certainty such as improved financial planning ability . Overall, PwC supports the AsA view that earnings volatility is slightly higher with a five year path vis-à-vis a single year path. The extent of additional volatility could be minimal if arrangements to allow the carry forward of under and over recoveries are implemented, but this does not appear likely (discussed below).

Carry forward of under and over recoveries: Consistent with Australian airports, it is expected that AsA will not carry forward under or over recoveries due to differences in activity levels or operating costs. However, capital expenditure will be recorded at actual values with the asset base adjusted at appropriate periods. This approach is consistent with previous Necessary New Investment decisions by the ACCC with airports, where forecast price increases were adjusted based on actual capital expenditure.

International Experience

The beta's of similar overseas entities may be considered as a guide, but betas do differ across countries as they are measures of risk relative to the (country specific) market.

BARA recommends considering the following UK entities:

- Manchester Airport; owned by a local government authority and regulated by Competition Commission (CC), UK and the Civil Aviation Authority (CAA), the most recent decision on a reasonable WACC for MA by the regulator was 7.75% on a pre-tax real basis. This decision was not accompanied by a detail CAP-M and asset beta analysis, but the regulator discusses using market data from BAA adjusted for differences in gearing.
- BAA London Airports, the listed owner of London's Heathrow, Gatwick and Stansted Airports. It is also regulated by the CC and CAA. BAA has a market cap of 5.2 billion GBP and gearing of 30%. Its equity beta is 0.69[9]. The re-geared or asset beta for BAA is therefore 0.49 using the simple formula. The regulator has recently used an equity beta of between 0.8 and 1.0 with gearing of 25% for regulatory purposes. This gives a regulatory asset beta of between 0.6 and 0.75.

8 For example 3% growth pa over five years results in a 15.9% rise while 4.5% pa for five years results in a 24.6% rise.

9 Four year, monthly average adjusted equity beta from Bloomberg as of 13/11/03.

- NATS (air traffic control), also regulated by the Civil Aviation Authority (CAA). NATS is unlisted but has some listed debt securities. CAA has previously set the asset beta for NATS (0.65) as slightly lower than that of BAA and Railtrack (0.7). BARA argues that this supports an asset beta slightly below that of Sydney Airports. It is also to be noted that IPART has previously used Railtrack as a guide in setting the asset betas for Rail Infrastructure Corp in NSW.

AsA benchmarks their costs and operations against NATS as well as:

- Airways Corp, NZ,
- NavCanada,
- ATNS (South Africa),
- EuroControl, and
- FAA, USA.

AsA has made the following points:

- Airways: A small listed organisation, serving a small country with considerable radar coverage. Airways NZ utilise a surprisingly low internal estimate of their equity beta of 0.2. AsA in periodic information exchanges with Airways has asked about the basis of this estimate, and responses have not provided any confidence in the reliability and accuracy of this estimate.
- NavCanada: Canada is similar to Australia in terms of geography and demography, but NavCanada is fully debt funded and run by a board of airlines. Consequently, its actual WACC is just its cost of debt and prices are set by the airlines to enable full recovery of operating costs including interest. As NavCanada is not a listed company, no empirical beta is available and no estimate of their beta has been identified.
- ATNS: Geographically similar, but is experiencing significant financial difficulties in line with the general South African economy. ATNS is unlisted; no empirical or internal estimate of beta is available.

In examining the reasonableness of AsA's costs and pricing in 2002, the ACCC compared AsA to Airways Corp, NavCanada and ATNS.

Consequently, whilst some similar ANSP operate around the world they are not providing reliable estimates of asset betas suitable for this analysis.

The Equity and Asset Beta of the Market as a Whole

The asset beta of the ASX 200 (excluding banks and insurance companies) has also been calculated. While the equity beta for the market is set to 1, the asset beta will depend on the overall gearing ratio which was calculated to be 0.2. This gives the asset beta as 0.8. Intuitively AsA would appear to be less risky than the market, given factors such as, the current absence of an alternative supplier of its services and the relatively stable demand for services. Hence we would expect the AsA regulatory asset beta to be below 0.8.

Empirical Share Market Estimates of Beta for Similar Companies

BARA have noted that the ACCC has previously used the average asset beta for listed infrastructure and utility companies as an appropriate proxy for airport companies that faced limited systematic risk. In 1998, the average asset beta was 0.46. In December 2001, the ACCC noted that Risk Management Service (a division of the AGSM) reported that the industry average asset beta for infrastructure and utility companies was 0.58. This outcome provided the ACCC with an 'anchor' for the suggested range of 0.55 to 0.70. BARA has suggested that the calculated equity betas could be biased upwards if recently listed infrastructure companies are more risky than previously listed entities. It is to be expected that change to using a net debt level will have increased the observed betas.

It is to be noted that in 2002, the ACCC argued that AsA' revenues are more susceptible to changes in discretionary income due to the business cycle than utilities and infrastructure firms, which have lower income elasticity of demand. AsA agrees and notes that it is provides a hybrid of services and infrastructure. On the other hand, the SARS outbreak had a significant impact on air traffic, but not on electricity demand. Such unexpected events reinforce the AsA view that the proposed change to a five year price path has the potential to significantly increases earnings volatility.

From Australia, a sample of 12 listed Utilities and 17 listed Transportation have been considered. A list of the entities is attached as an appendix. The Monkhouse formula was used to calculate the Asset betas; the gearing ratios were taken from Bloomberg and equity betas from the AGSM. The results are recorded in the table below. Over both sectors, the median asset beta was calculated to be 0.45, the simple average was 0.60 and the weighted average was 0.57. There was more variability in the measured asset betas of companies in the utilities sector than in the Transportation sector.[10]

For comparison purposes a sample of 9 international listed airport operators was also considered. The median asset betas for these airports was 0.47 with simple and weighted averages of 0.49 and 0.51 respectively.

[10] The effective tax rate was assumed to be 25% and the debt beta was assumed to be 0. The results are relatively insensitive to changes in these parameters.

Observed Asset Betas

Industry	Measure	Asset Beta
Utilities	Range	0.01 – 2.34
12 Companies	Median	0.37
	Simple Average	0.67
	Weighted Average	0.49
Transportation	Range	0.05 – 1.37
17 Companies	Median	0.45
	Simple Average	0.55
	Weighted Average	0.58
Transport and Utilities Combined	Range	0.01 – 2.34
29 Companies	Median	0.45
	Simple Average	0.60
	Weighted Average	**0.57**
International Airports	Range	0.08 – 0.75
9 Companies	Median	0.47
	Simple Average	0.49
	Weighted Average	**0.51**

BARA's final recommendation is for an Asset Beta of 0.46 if AsA does not follow a five year price path. This is based on the mid point of their analysis of the Transport and Utilities firms. As noted above, marketplace betas seem to have increased since BARA's analysis was conducted. BARA recommends a range of 0.55 to 0.60 if AsA begins to accept systematic risks.

Virgin Blue (represented by KPMG) have recommended an asset beta in the range of 0.45 to 0.55, based on a review of ANSP regulatory decisions from the UK and Australian transport regulatory decisions. Virgin Blue also believe that AsA should be compared to low-asset firms with stable revenue bases.

Debt Beta

Some CAPM practitioners support the use of the debt beta in WACC analysis. The debt beta is conventionally defined as the relationship between the default risk on a debt security and the default risk on the market. Where the default risk is not related to the market at all, the debt beta is set to zero. The debt beta is irrelevant where there is no default risk.

Any positive debt beta level has the impact of reducing the equity beta, reducing the cost of equity and in turn decreasing the WACC (all else equal). The ACCC's most recent approach has been to set a debt beta value at 0.0[11]. However, the ACCC has a track record for applying debt betas in other decisions at levels including 0.06, 0.12, 0.15 and 0.18.

[11] ACCC decision: Murraylink Transmission Company Application for Conversion and Maximum Allowed Revenue, October 2003.

Overall, this remains a parameter where setting levels are open to significant debate. In its submission AsA proposed a debt beta of 0.07 being calculated as the Debt Margin/MRP. BARA do not suggest a debt beta level.

Our role is to follow the ACCC approach, consequently a debt beta of zero has been assumed. However, there is some potential that the ACCC may reapply positive levels of debt beta in the future.

Beta Summary

Previously ACCC has said that it favours an asset beta at the low end of the range of 0.55 – 0.75 for AsA. This is slightly lower than the range of 0.6 and 0.8 awarded to Australian Airports. As noted by the ACCC and its British counterparts, companies such as AsA would be expected to have lower risks than an individual airport. BARA's analysis suggests that AsA's risks are comparable to those of Canberra and Sydney Airports which were awarded asset betas in the range of 0.6 to 0.65.

Overseas regulatory experience is relatively limited, however, it was noted that AsA's UK equivalent (NATS) was awarded an asset beta of 0.65 and the listed airport operator BAA was given a regulatory asset beta of between 0.6 to 0.75, compared to its actual asset beta of 0.49 taken from the stock market.

Empirical evidence from Australia shows that 29 listed infrastructure and utilities companies had, on average, asset betas of between 0.5 and 0.6. Overseas listed airport operators were noted to have asset betas of 0.5 on average.

Assuming no carry forward of under/over recoveries, PwC acknowledges that the proposed change to a five year price path provides a risk of slightly higher earnings volatility and our recommended asset beta range reflects this issue.

PwC view on the likely outcome of the ACCC review is an asset beta of between 0.55 and 0.65 for AsA assuming a five year price paths (with some scope for resets in the event of material deviation between actual and forecast volumes). This returns an equity beta of between 1 and 1.3, using the monkhouse formula and assuming a gearing ratio of between 0.4 and 0.5.

3.2.8 AsA's Cost of Equity

The cost of equity is measured as the risk free rate of return plus the equity beta multiplied by the market risk premium.

The views of the various stake holders are reproduced below, updated to reflect the current risk free rate. PwC's view is that the ACCC is likely to accept a range of between 11.3% and 13.7% for the cost of equity. The value of 13.7% is derived from an asset beta of 0.65 and a gearing ratio of 0.5. The midpoint of our expected range is 12.4%, which accords with ACCC's decision in June.

Measure	AsA's view	BARA view	ACCC view	PwC proposal
	March 2003	November 2003	June 2003	November 2003
Risk Free Rate	5.9%*	5.9%*	5.9%*	5.8%
Equity Beta	1.1	0.9	0.9-1.2	0.9-1.3
MRP	6%	6%	6%	6%
Cost of Equity	12.5%	11.3%	11.3%-13.1%	11.3%- 13.7%
Mid Point	**12.5%**	**11.3%**	**12.4%**	**12.4%**

*updated to reflect current rates.

3.2.9 AsA's Cost of Debt

This section builds on commentary contained in the debt margin section.

The cost of debt is the risk free rate plus the debt margin. AsA has previously suggested a debt margin the same as the spread on ASA notes. This ACCC and BARA accepted that this proposal was reasonable.

As noted above PwC has recommended a debt margin in the range of 0.6% to 0.8%, hence the estimated cost of debt for regulatory purposes is the risk free rate of 5.9% plus 0.6% or 0.8%. This results in a cost of debt of between 6.5% and 6.7% with a mid point of 6.6%.

3.2.10 AsA's Weighted Average Cost of Capital

Once the cost of equity is established, it is used in the following formula to determine the WACC:

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

where:

k_e = after tax cost of equity

k_d = nominal pre-tax debt rate

tc = corporate tax rate

D = market value of interest bearing debt

E = market value of equity

V = market value of entity

γ = franking credit utilisation (gamma)

3.2.11 Summary of Input values

The table below provides a summary of the various input parameters for WACC.

	AsA view	BARA view	ACCC decision	PwC calculations		
Inputs	Mar-03	Nov-03	Jun-03	**PwC measure**	**Low**	**High**
Nominal Risk Free Rate	5 yr bond				5.83%	5.83%
Inflation Rate	Market based				2.3%	2.3%
Debt Margin	Spread to treasury (0.42% at March)			Optimised	0.6%	0.8%
Nominal pre-tax cost of debt	Risk free rate plus debt margin				6.5%	6.7%
Market Risk Premium	6%	6%	6%		6.0%	6.0%
Gamma	50%	50%	>50%		50%	50%
Gearing Ratio	40%	50%	40%		40%	50%
Debt Beta	0.07	np	0.00		0.00	0.00
Asset Beta	0.70	0.46	0.55-0.75 (low end)		0.55	0.65

3.3 Summary of results

The table below summarises the preliminary views on reasonable low and high setting for the various WACC parameters and provides overall results expressed in different nominal, real, pre and post tax basis. Also provided is an indication of the importance of key parameters to the likely total regulatory revenue by providing the change in revenue likely from an incremental change in each parameter (holding other values constant). These sensitivity estimates should be taken as a guide only as they will alter following determination of the regulatory asset base.

Inputs	Low	High	Sensitivity of inputs for Net Indicative Revenue*
Nominal Risk Free Rate	5.83%	5.83%	+/-1% in Rf leads to +/-$3.7m
Real Risk Free Rate	3.39%	3.39%	
Inflation Rate	2.4%	2.4%	
Cost of Debt Margin over rf	0.6%	0.8%	+/-0.2% for debt margin leads to +/-$0.4m
Nominal pre-tax cost of debt	6.5%	6.7%	
Real pre-tax cost of debt	4.0%	4.2%	
Market Risk Premium	6.0%	6.0%	+1% for MRP leads to +$3.7m & -1% MRP is -$2.0m
Corporate Tax Rate	30.0%	30.0%	
Gamma	50.0%	50.0%	
Gearing Ratio	40.0%	50.0%	+/-10% for Rf leads to +/-$0.2m
Debt Beta	0.00	0.00	+0.05 for Debt beta leads to -$3.1m
Asset Beta	0.55	0.65	+/-0.05 for Rf leads to +/-$1.1m
Equity Beta	0.91	1.29	
WACC Analysis	**Low**	**High**	
Post-tax nom return on equity (pre-imp)	11.3%	13.6%	
Post-tax real return on equity (pre-imp)	8.7%	11.0%	
Nominal Vanilla WACC	**9%**	**10%**	+/-1% for leads to +/-$3.6m
Real Vanilla WACC	6.8%	7.6%	
Post-Tax Nominal WACC	7.6%	8.2%	
Post-Tax Real WACC	5.1%	5.6%	
Pre-Tax Nominal WACC	10.4%	11.1%	
Pre-Tax Real WACC	7.8%	8.5%	
Nominal Tax Allowance	0.84%	0.97%	
Real Tax Allowance	0.59%	0.95%	

Notes: *using ACCC June 2003 building block estimates, the Pwc WACC estimate, the AsA book value for regulated assets & holding all other WACC parameters constant

Based on the parameters above, the preliminary PricewaterhouseCoopers view is that a reasonable regulatory nominal vanilla WACC for AsA lies in the range of 9.4% to 10.1%. PwC's preliminary recommended nominal vanilla WACC is the simple midpoint of this range which is 9.75%.[12]

PwC notes that this suggested vanilla WACC is approximately 1.2% higher than the view expressed by the ACCC in June 2003, however, the difference is due mainly to:

- A rise of approximately 1.2% in the risk free rate over the period; and
- PwC suggesting a rise of approximately 0.3% in the debt margin from a base of 0.42% suggested by AsA and accepted by the ACCC. PwC views the early level as potentially understating the likely efficient borrowing margin of a similar entity.

The main drivers of the change in the suggested range of WACC are explored further in section 3.4.

3.4 Sensitivity Analysis of WACC calculations

Sensitivity analysis can be conducted by considering the effects of changes to parameters on the value for the WACC or the effect of changes on the value of Net Indicative Revenue (NIR) which is a key output of the ACCC's building block approach to regulating revenue.

Unlike the majority of utilities, return on capital is not the main source of AsA's regulatory revenue requirement. Operating expenditure is AsA's main revenue driver. The means that NIR is relatively less sensitive to changes in WACC.

It should also be noted that the ACCC is yet to extensively test the efficiency of AsA's operating expenditure for regulated activities. If such a review identified a reduction in allowable expenditure, that could result in a much greater effect on NIR than that produced by any modest change in WACC parameters.

This report does not assess the regulatory value of AsA's assets which is being completed as a separate project. In the interim, for sensitivities testing, as noted in section 1.2, the ACCC appears to have used a regulatory asset value of approximately $331 million in its revenue estimates whereas AsA suggest use of its June 30 2003 book asset value of $376 million is a more current valuation. The following analysis assumes that the values of AsA's assets and operating expenditure are fixed at the values used by the ACCC in its June decision, except where explicitly mentioned.

[12] Alternatively, if the mid-points are selected for individual parameters where a range is used (ie debt margin, gearing & asset beta) the nominal vanilla WACC is 9.73%.

3.4.1 Net Indicative Revenue

The estimated return on capital is calculated as the Nominal Vanilla WACC multiplied by the estimated value of regulatory asset base. Given PwC's suggests a Nominal Vanilla WACC for regulatory purposes in the range of 9.4% to 10.1%, and using AsA's 30 June 2003 Balance Sheet written down replacement cost value (for land & buildings plus infrastructure, plant and equipment) the expected range of values for regulated return on capital is $33.9m to $36.6m.

The PwC proposed low value is similar to the AsA March 2003 proposal, with PwC's higher proposed value Nominal Vanilla WACC (at the low setting) offset by because AsA's higher proposed value of assets.

The **mid-point of the PwC proposed return on capital ($35.2m)** is 25% higher than that determined by the ACCC in June 2003 ($28.3m) due to:

- PwC's interim use of an accounting value of assets (until the updated independent ODRC value is available) which is 9% above the asset value assumed by the ACCC.
- PwC's proposed vanilla WACC (midpoint) of 9.75% is above the ACCC's June 2003 (simple midpoint) level of 8.55% due mainly to the rise in the risk free rate.

Building Block Calculation of Indicative Revenue	AsA	ACCC	PwC Proposal		Low Asset Value		High Asset Value		Extreme Asset Beta Values	
	Mar 03	Jun 03	Low	High	Low	High	Low	High	0.50^	0.70^^
	$ million									
Asset Value**	376.0	331.0	360.7	360.7	324.6	324.6	396.8	396.8	360.7	360.7
Nominal Vanilla WACC	**9.0%**	**8.6%**	**9.4%**	**10.1%**	**9.4%**	**10.1%**	**9.4%**	**10.1%**	**9.1%**	**10.4%**
Return on Capital for Regulated Assets	**33.9**	**28.3**	**33.9**	**36.6**	**28.0**	**30.2**	**34.2**	**37.0**	**32.8**	**37.5**
Return of Capital for Regulated Assets*	58.9	53.6	53.6	53.6	53.6	53.6	53.6	53.6	53.6	53.6
O&M Regulated*	444.2	444.2	444.2	444.2	444.2	444.2	444.2	444.2	444.2	444.2
+Net taxation payable*	9.2	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
-Dividend Imputation Benefit*	(4.6)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)
=Net Indicative Revenue	**541.6**	**529.8**	**535.4**	**538.1**	**529.5**	**531.7**	**535.7**	**538.5**	**534.3**	**539.0**
% change from ACCC	**2.22%**	**0.00%**	**1.05%**	**1.57%**						
% change from PwC					**-1.10%**	**-1.18%**	**0.06%**	**0.06%**	**-0.20%**	**0.17%**

Notes: * revenue levels from ACCC June 2003 Decsion. ^ Asset Beta of 0.50, other parameters as per low proposal

^^ Asset Beta of 0.70, other parameters as per high proposal

**** AsA's 30 June 2003 Balance Sheet written down replacement cost value (for land & buildings plus infrastructure, plant & equipment)**

The low & high asset value sensitivity results are +/-10% change from the $360.7m book value.

The indicative dollar impact between the PwC proposed low (9.4%) and high value (10.1%) vanilla WACC estimates is +/-$2.7m or about 0.5% of total net indicative revenue.

3.4.2 Sensitivity to Changes in Asset Values

An indicative sensitivity analysis of the impact of a + or – 10% change in the asset value for the PwC suggested WACCs is estimated to result in a change in Net Indicative Revenue of approximately +/-0.6% or +/-$6.8m. This result again emphasises that operating costs are the key driver of NIR and sizable changes in both WACC and ODRC result in relatively smaller movements in maximum prices.

3.4.3 Effect of Interest Rate Changes

Since March the 5 year nominal interest rate has increased by 100 basis points to 5.83%. Over the same period the 5 year risk free rate has increased from 2.69% to 3.41%.

The entire change in the nominal interest rate has been passed through to the Nominal Vanilla WACC. Without the increase in interest rates the estimated range for the Nominal Vanilla WACC would have been 8.4% to 9.1% rather than 9.4% to 10.1%. Our estimated range for the Post-Tax Real WACC would have been 4.6% to 5.2%, rather than 5.2% to 5.7%. The range of values for NIR would have been 0.66% lower at between $531.8 million and $534.3 million.

A further 100 basis point increase in the nominal risk free rate and the real risk free rate would result in a estimated range of 10.4% to 11.1% for Nominal Vanilla WACC and a range of 6.0% to 6.5% for Post Tax Real WACC. This would raise the range of NIR by around 0.66%.

3.4.4 Effect of Debt Beta

As noted above, the ACCC has in the past set AsA's regulatory debt beta to zero and this approach was used again in decisions as recent as October 2003. However the ACCC has not always set the debt beta to zero and positive debt betas of up to 0.3 have been noted. A positive debt beta has the effect of reducing the estimated values of regulatory WACC.

Holding all else constant a debt beta of 0.3 would lower the estimated range of Nominal Vanilla WACC to 8.6% to 9.2%.

3.4.5 Effect of Changes to the Asset Beta

The low value for Nominal Vanilla WACC has been re-estimated using a value for the Asset Beta of 0.50 and the high value has been re-estimated using a value of 0.60. This has been done to demonstrate the effect of changing the value of the asset Beta.

The results are included in the table in section 3.4.1. Lowering the value of the asset beta by 0.05 to 0.50 has the effect of lowering the estimated Nominal Vanilla WACC from 9.4% to 9.1%. This lowers NIR by 0.22%. Increasing the value of the asset beta from 0.65 to 0.70 increases the estimated Nominal Vanilla WACC from 10.1% to 10.4% and NIR by 0.17%.

3.4.6 Effect of Debt Margin and Gearing Ratio

Virgin Blue has suggested that the debt margin should be no more than 0.6%. The values of Nominal Vanilla WACC and NIR have been re-estimated with a range of 0.4% to 0.6% for the debt margin. This results in a reduction in Nominal Vanilla WACC of 0.1% and a reduction in NIR of less than $0.4m.

A number of submissions have suggested a higher regulatory gearing ratio would be appropriate. The model has been re-estimated with a range of 50% to 60% for the gearing ratio. At most this increases Nominal Vanilla WACC by 0.1% and increases NIR by less than $0.3m.

	PwC Estimate		**Debt Margin**		**Gearing Ratio**	
	Low	**High**	**Low**	**High**	**Low**	**High**
Nominal Risk Free Rate	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%
Cost of Debt Margin over rf	0.60%	0.80%	**0.40%**	**0.60%**	0.60%	0.80%
Gearing Ratio	40.00%	50.00%	40.00%	50.00%	**50.00%**	**60.00%**
Asset Beta	0.55	0.65	0.55	0.65	0.55	0.65
Nominal Vanilla WACC	**9.4%**	**10.1%**	**9.3%**	**10.0%**	**9.4%**	**10.2%**
Asset Value	360.7	360.7	360.7	360.7	360.7	360.7
Return on Capital for Regulated Assets	**33.8**	**36.5**	**33.5**	**36.1**	**34.0**	**36.8**
Return of Capital for Regulated Assets	53.6	53.6	53.6	53.6	53.6	53.6
O&M Regulated	444.2	444.2	444.2	444.2	444.2	444.2
+Net taxation payable	7.4	7.4	7.4	7.4	7.4	7.4
-Dividend Imputation Benefit	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)
=Net Indicative Revenue	**535.3**	**538.0**	**535.0**	**537.6**	**535.5**	**538.3**
% change from PwC			**-0.1%**	**-0.1%**	**0.0%**	**0.1%**

3.4.7 Effect of Activity Forecast Bands

It has been suggested that any effects on AsA of the transition to a five year price could be mitigated if price discussions were to be reopened when activity in any one year differed significantly from the forecasts made at the time prices were first negotiated.

If a 10% activity forecast band was introduced then, in the event that in a single year activity was 10% below (or above) forecasts for that year, prices would be re-negotiated. There would be no automatic increase (or decrease) to prices. Instead the various parties would negotiate changes to the price path that could involve maintaining the status quo or some combination of modest price changes, adjustments to anticipated levels of capital expenditure and cost or service changes.

The reduction in uncertainty around AsA's actual revenue could have the effect of reducing the asset beta used in estimating WACC.

PwC considered the impact on asset beta of applying activity bands of 5%, 7.5% and 10% before prices are re-set. Overall, it is thought that these would have the effect of reducing the Asset Beta by modest amounts 0.05, 0.03 and 0.01 respectively. The minimal effect of a 10% activity band on the asset beta reflects the lower probability that a 10% discrepancy between actual and forecast activity would be observed. Furthermore, it reflects the view that even in the absence of a formal activity band, there would be pressure to re-examine AsA's prices and capital investments were activity to 10% above or below forecast.

A 5% activity band reduces the value of Nominal Vanilla WACC by 0.3%, but only reduces NIR by 0.2%. Activity bands set at 7.5% and 10% have smaller effects.

	PwC Estimate		**5% Activity Band**		**7.5% Activity Band**		**10% Activity Band**	
	Low	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**
Nominal Risk Free Rate	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%	5.83%
Cost of Debt Margin over rf	0.60%	0.80%	0.60%	0.80%	0.60%	0.80%	0.60%	0.80%
Gearing Ratio	40.00%	50.00%	40.00%	50.00%	40.00%	50.00%	40.00%	50.00%
Asset Beta	**0.55**	**0.65**	**0.50**	**0.60**	**0.52**	**0.62**	**0.54**	**0.64**
Nominal Vanilla WACC	**9.4%**	**10.1%**	**9.1%**	**9.8%**	**9.2%**	**9.9%**	**9.3%**	**10.1%**
Asset Value	360.7	360.7	360.7	360.7	360.7	360.7	360.7	360.7
Return on Capital for Regulated Assets	**33.8**	**36.5**	**32.7**	**35.4**	**33.1**	**35.8**	**33.5**	**36.3**
Return of Capital for Regulated Assets	53.6	53.6	53.6	53.6	53.6	53.6	53.6	53.6
O&M Regulated	444.2	444.2	444.2	444.2	444.2	444.2	444.2	444.2
+Net taxation payable	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
-Dividend Imputation Benefit	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)
=Net Indicative Revenue	**535.3**	**538.0**	**534.2**	**536.9**	**534.6**	**537.3**	**535.0**	**537.8**
% change from PwC			**-0.2%**	**-0.2%**	**-0.1%**	**-0.1%**	**0.0%**	**0.0%**

Although not having a large effect on the forecast value of NIR, activity bands would make it more likely that AsA would have lower variation between forecasted revenue and actual revenue.

3.4.8 Sensitivity Analysis Conclusions

As expected, the most important influence on the value of the WACC has been the change in the risk free rate of return. Changing the value of the asset beta or debt beta would also affect the value of the WACC but not to the same extent. Changes to other parameters and creating bands around forecast activity levels also appear to have a minor impact on WACC. It is also noted that changes to WACC parameters have only a minor impact on Net Indicative Revenue compared to changes to the regulatory value of assets or the regulatory level of operating expenditure.

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Appendix A Comparable Companies

Company	Observed Be	D/E	Ba
	AGSM	*Bloomberg*	*(calc.)*
Utilities			
Advanced Energy Systems Ltd	2.44	0.04	2.34
Alinta Ltd	0.29	0.30	0.22
Australian Energy Ltd	0.74	-0.01	0.75
Australian Pipeline Trust	0.39	1.17	0.18
Energy Developments Ltd	1.45	0.75	0.83
Energy World Corp Ltd	0.96	3.36	0.22
Envestra Ltd	0.39	2.87	0.10
EnviroMission Ltd	0.76	0.00	0.76
Horizon Energy Investment Group	0.07	-0.03	0.07
Pacific Energy Ltd	0.42	-1.66	0.01
Pacific Hydro Ltd	2.23	0.08	2.07
Solar Energy Systems Ltd	0.39	-0.26	0.53
Range			**0.01 – 2.34**
Median			**0.37**
Simple Average			**0.67**
Weighted Average			**0.49**
Transportation			
Adsteam Marine Ltd	1.07	0.94	0.56
Auckland International Airport Ltd	0.18	0.26	0.14
Australian Infrastructure Fund	0.80	-0.03	0.83
Chalmers Ltd	0.71	0.57	0.45
CTI Logistics Ltd	0.15	1.98	0.05
Heggies Bulkhaul Ltd	0.37	0.50	0.25
Hills Motorway Group	0.46	0.33	0.35
Huadu City Developments Ltd	0.41	-0.01	0.41
K&S Corp Ltd	1.39	0.38	1.01
Macquarie Infrastructure Group	0.31	0.32	0.23
Mermaid Marine Australia Ltd	0.96	0.70	0.57
Patrick Corp Ltd	1.36	0.10	1.24
Peninsular and Oriental Steam Navigation Co	1.35	0.66	0.82
Qantas Airways Ltd	0.86	0.76	0.49
Toll Holdings Ltd	1.50	0.10	1.37
Transurban Group	0.53	0.91	0.28
Wridgways Australia Ltd	0.31	0.02	0.31
Range			**0.05 – 1.37**
Median			**0.45**
Simple Average			**0.55**
Weighted Average			**0.58**
Infrastructure and Utilities Combined			
Range			**0.01 – 2.34**
Median			**0.45**
Simple Average			**0.60**
Weighted Average			**0.57**

Company	**Observed Be**	**D/E**	**Ba**
	AGSM	*Bloomberg*	*(calc.)*
International Airports			
BAA plc	0.46	0.59	0.29
Flughafen Wein AG	0.65	0.00	0.65
Japan Airport Terminal	1.01	0.35	0.75
Xiamen Airport Development	0.76	0.02	0.75
Shanghai International Airport	0.61	0.00	0.61
Unique Zurich Airport	0.96	10.76	0.08
TBI plc	0.75	0.60	0.47
Kobenhavns Lufthavne	0.67	0.79	0.38
Fraport AG Frankfurt Airport	0.66	0.68	0.40
Range			**0.08 – 0.75**
Median			**0.47**
Simple Average			**0.49**
Weighted Average			**0.51**