



**CAA's initial price control proposals for Heathrow, Gatwick
and Stansted airports**

December 2006

Supporting paper XII

Cost of capital – policy framework





**Policy Framework for Setting
Cost of Capital of BAA**

**A report by Europe Economics to the
Civil Aviation Authority**

**Europe Economics
Chancery House
53-64 Chancery Lane
London WC2A 1QU
Tel: (+44) (0) 20 7831 4717
Fax: (+44) (0) 20 7831 4515
www.europe-economics.com**

24 November 2006



TABLE OF CONTENTS

1	INTRODUCTION.....	1
2	GENERAL APPROACH.....	2
	Introduction to WACC and CAPM	2
	Approach to Risks	3
	Reasons for Using CAPM, and for Considering Alternatives	5
	Alternatives to CAPM.....	6
	Review of Consultation Responses.....	10
	Recommended Approach.....	10
3	TAXATION.....	12
	Three Options.....	12
	Regulatory Precedent	12
	Discussion	14
	Implementation Issues.....	15
	Review of Consultation Responses.....	15
	Recommended Approach to Taxation	15
4	GEARING.....	17
	Effects of gearing on the cost of capital.....	17
	Capital Structure and CAPM	18
	Further factors.....	21
	Options for Gearing.....	26
	Review of Consultation Responses.....	29
	Recommended approach to gearing	30
5	SEPARATE COSTS OF CAPITAL.....	31
	Reasons for separate cost of capital	31
	Approach to Separated Costs of Capital.....	32
	Separated Gearing and Taxation?	33
	Recommended framework to separate costs of capital.....	35
6	FURTHER ISSUES.....	37
	Split or Front - Loaded Cost of Capital	37
	Financeability	40
	Nature of Investment at Airports	42
	Indexation of Components of Cost of Capital	44
	Real Options.....	48
7	SUMMARY OF RECOMMENDED POLICY FRAMEWORK.....	56



1 INTRODUCTION

- 1.1 This paper discusses the approach to be taken to various issues in setting the cost of capital. It contains recommendations for the CAA on the approach to take in determining the cost of capital for the BAA regulated airports in the price review for the fifth quinquennium (Q5). The actual estimation and results are presented in a separate document the Supporting paper XIII: Cost of capital — estimating separate costs of capital for Heathrow and Gatwick (hereafter Empirical Paper).
- 1.2 The issues addressed here come from two main sources:
- (a) Section 9 of the consultation paper put out by CAA in December 2005, which was the Annex to the Specification of our terms of reference, and the policy update of May which took account of the implications of a possible takeover.
 - (b) Responses to the consultation paper.
- 1.3 These issues have been synthesised into the following key questions:
- (a) Should the general approach to setting the cost of capital be CAPM, as indicated by CAA in the consultation paper (the answer will be “yes”) ; and if so, what are the other methods that should be used to check/confirm the calculations made through the CAPM framework? This is the subject of Section 2 below.
 - (b) How should tax be treated in calculating the cost of capital, bearing in mind both regulatory precedent and the likely need to apply the cost of capital to separate airports whereas tax is paid at a group level? (Section 3).
 - (c) What effect might increased gearing have on cost of capital? In particular, does an increase in gearing reduce the cost of capital, and does it raise problems for economic regulation? (Section 4).
 - (d) Should there be separate calculations of the cost of capital used at Heathrow and at other regulated airports (again the answer will be “yes”) and if so how should the calculations be performed in the absence of separate shares? (Section 5)
 - (e) What other adjustments should be considered in determination or use of the cost of capital (Section 6). The issues considered are:
 - proposals for split or front-loaded cost of capital;
 - possible financeability adjustments;
 - potential effect of the nature of investment at airports;
 - proposals for indexing the cost of debt; and
 - real options adjustments.



2 GENERAL APPROACH

- 2.1 This section investigates whether the general approach to setting the cost of capital for the BAA regulated airports should be the CAPM-WACC framework, as indicated by the CAA in the December consultation paper, and if so, what other methods should be used to check/confirm the results of calculations made through the CAPM-WACC framework.

Introduction to WACC and CAPM

- 2.2 The cost of capital allowed by a regulator in setting price limits should reflect the opportunity cost of the funds invested in assets; it represents the rate of return that an investor would be likely to require in order to invest in a company, given its risk profile compared with other potential investments. It can also be thought of as the discount rate which an investor would use in evaluating the income stream to be expected from investing in the company.
- 2.3 Under the capital asset pricing model (CAPM) approach, the cost of capital is computed from (a) the average cost of debt for the various forms of debt held by the company, and (b) the cost of equity. This is the return that investors (shareholders and lenders of various types) require in order to invest in the company.
- 2.4 The weighted average cost of capital (WACC) is calculated using the following formula

$$WACC = r_E \cdot \frac{E}{D + E} + r_D \cdot \frac{D}{D + E} \quad [2.1]$$

where r_E is the cost of equity, r_D is the cost of debt and E and D are the total values of equity and debt respectively used to determine the level of gearing in the company, and so giving the relative weights between the cost of equity and debt finance.

Cost of debt

- 2.5 The cost of debt measures the combination of interest rates charged by banks to the company and the return paid by the company on any corporate bonds or other loan instruments issued. It can be conceived as being made up of a risk free component and a company - specific risk premium.

$$r_D = r_f + \text{debt premium} \quad [2.2]$$

- 2.6 Assuming reasonable efficiency in capital markets, the premium on debt from one source should be the same as that on debt from any other source involving the same risk. This principle should apply however complex the particular structure of finance adopted. Since payments on debt are generally fixed (in contrast to the variable returns on equity), "risk" in this context principally means the risk of non-payment. One potential measure of the risk of non-payment is the rating on the company's debt, provided by ratings agencies. Thus, one way to calculate a company's debt premium is to consider (or project) the



rating(s)¹ of its debt and then take the market average debt premium for debt of this rating.

Cost of Equity

2.7 The CAPM is used to determine the cost of equity, r_E , applying the following equation:

$$r_E = r_f + \beta_E * MRP \quad [2.3]$$

- r_f is the return on a risk free asset, usually proxied by a measure of the rate on medium to long-term government bonds.
- β_E is the correlation between the risk in company returns and those of the market as a whole, which can be estimated from primary market data.
- MRP is the market risk premium over the risk free rate, an economy-wide parameter.

2.8 Thus in the standard CAPM there are three determinants of the expected return on any asset: the return on a riskless asset; the market premium over that riskless rate that is earned by investors as a whole, reflecting systematic risk; and the particular company's exposure to systematic risk. Company specific risks do not enter the cost of capital, as they can, by definition, be diversified away by investors. We explore this further below.

Approach to Risks

2.9 Airport operating companies such as BAA face several sources of risk. Under CAPM these are divided into two major categories:

- Systematic risks; and
- Specific risks.

2.10 By definition, risks are either systematic or specific, meaning that they either can or cannot be avoided by an investor through diversifying his or her portfolio. The risks associated with some events are partly systematic and partly specific.

Systematic risks

2.11 The CAPM approach measures a company's exposure to systematic risk.

¹ Different ratings agencies may assess a company's debt differently. Thus there may be more than one rating to consider, even after allowing for differences in definition between different ratings agencies.



2.12 Since systematic risks are determined to varying extents by economy-wide factors, they cannot be diversified away by investors. Therefore the company has to compensate its investors for bearing the risk through the cost of capital. Examples of systematic risks that might be relevant to BAA include:

- Macroeconomic fluctuations, such as in the rate of growth of GDP — such fluctuations contribute to the rate of demand at particular airports being uncertain;
- Changes in interest rates;
- Changes in oil prices;
- Catastrophic events, such as terrorist attack, war, or a global pandemic, undermining demand in so far as they affect the market as a whole.

2.13 Various aspects of the company could affect its exposure to such systematic risks. Different exposure to systematic risks is also the reason for potentially different costs of capital at each regulated airport, as discussed in Section 5.

Specific risks

2.14 The specific risks affecting an individual firm are those risks that can be offset by investors diversifying their investments. As already indicated, these are not taken into account in CAPM because it is assumed that in an efficient capital market investors can protect themselves against such risks by holding a diversified portfolio – implying that specific risks do not affect the rate of return to investors that the company has to cover through its cost of capital.

2.15 Consider an industry in which there is no systematic risk, but each of the companies in the industry faces company-specific risk. CAPM predicts that the rate of return in this industry would be the risk-free rate. Since there is no systematic risk, an investment company with equal shares in all the companies in the industry would be guaranteed to receive the risk-free rate every period — the company-specific risks taken that turned out badly in some companies would exactly balance those that turned out well in others (that is precisely what it means to say that there is no systematic risk).

2.16 The key insight of CAPM is that company-specific risks are irrelevant to the cost of capital.

2.17 Examples of specific risks for BAA might include:

- Uncertainty regarding the cost and timing of airport expansions, due (for example) to planning decisions;
- Extent of substitutability between BAA airports and other airports or forms of transport by consumers; and



- Risks surrounding regulatory actions, when they are not related to market movements.

2.18 Such specific risks do not influence the cost of capital — since, as explained above, in an efficient capital market they can be diversified away by investors, the investors do not require a compensation for them. They would of course be assessed and taken into account in other parts of the regulatory inspection, for example in settling the projections for the cash flows relevant to regulation.²

Reasons for Using CAPM, and for Considering Alternatives

2.19 CAPM is widely used in UK economic regulation, and has been endorsed in a number of recent reviews. It has a persuasive theoretical basis which points to calculations and estimates that can often be made.

Previous regulatory practice

2.20 At the last review of BAA charges both the CAA and Competition Commission adopted a CAPM approach to the assessment of the cost of equity within the WACC. In the more recent NATS price control the CAA again used the CAPM approach in estimating the appropriate cost of capital allowance.

2.21 The joint regulators' "Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK" (Wright et al, 2003) concluded that whilst the CAPM approach had drawbacks it was the most robust methodology currently available.

2.22 However, the CAPM's empirical record as a predictor or model of firm performance is generally thought to be poor.³ Shortfalls identified in the literature include:

(a) The standard CAPM fails to account for several empirical observations about average stock returns. These include:

- Small firm effect. Small firms sometimes have higher expected returns than predicted by CAPM.
- Value effect. Firms with low ratios of book value to market value sometimes have higher expected returns than those predicted by CAPM.

(b) CAPM does not explicitly take into account the skewness of returns.

(c) CAPM does not explicitly allow for the possibility that investors may diversify into a wider range of assets than those quoted on stock exchanges.

² This has the advantage that specific risks can be more precisely described and managed than if they were to be treated as requiring an addition to the cost of capital.

³ See for example, Fama and French (2004) for many empirical examples illustrating its weakness.



- 2.23 For these and other reasons, other models have been put forward as potential alternatives to the standard CAPM.

Alternatives to CAPM

Arbitrage Pricing Theory

- 2.24 CAPM is a model of equilibrium. The “arbitrage pricing theory” of Ross (1976) focuses instead on how equilibrium is achieved. The starting point is the assumption that there should be no arbitrage opportunities in an economy. The APT assumes that for a risky asset, j , its payoff, r_j , is generated by K factors linearly:

$$r_j = \alpha_j + \sum_{k=1}^K (\beta_{jk} X_k) + u_j \quad [2.4]$$

Where X_k is the payoff from factor k , α_j and β_{jk} are factor-specific constants, and u_j is a random variable with zero mean and covariance with the factor returns, representing the specific risk.

- 2.25 Using the assumptions of no arbitrage and linearity of payoffs in the K factors, the APT derives a condition for the expected rates of return for risky assets, namely that when there are a sufficiently large number of risky assets:

$$|(E(r_j) - r_f) - \sum_{k=1}^K (\beta_{jk} X_k - r_f)| \leq \varepsilon, \text{ where } \varepsilon > 0 \text{ is small.} \quad [2.5]$$

- 2.26 Thus, when the number of risky assets is large and payoffs arise from K factors, there will be a linear relationship between the expected rates of return on risky assets and those factors. The linear relation in the APT is purely statistical with the APT offering no comment on what the multiple factors are or how many of them exist.

- 2.27 Aside from the Fama-French models (discussed below), the most important APT model is probably that of Chen, Roll & Ross (1986), which identifies a number of macroeconomic factors: the spread between long and short interest rates; expected and unexpected inflation; industrial production; and the spread between high and low grade bonds, as those that are significantly priced.

The Fama-French three factor model

- 2.28 Fama and French (1992, 1996) build a model in the APT tradition, incorporating firm size and ratio of book value to market value as explanatory factors. The empirical equation for the excess return on portfolio j , $Z_j \equiv r_j - r_f$, is given by

$$Z_j = \beta_j \cdot Z_m + s_j \cdot \text{SMB} + h_j \cdot \text{HML} + u_j \quad [2.6]$$

where SMB is the difference between returns on portfolios of small and large stocks, and HML is the difference between returns on portfolios of high and low book-to-market ratios.



- 2.29 For most regulated companies such as BAA the effect of using Fama-French instead of CAPM would be expected to be small. The reason for this is that for an average firm, β_j will be close to 1 (as for CAPM) while s_j and h_j will be close to zero (since such firms are identified only in relative terms, the average effect must be zero, with firms at the extremes having negative or positive values). The main impact of the additional factors will be for firms at extremes, or in cases where the effect is to change materially the estimate of β .
- 2.30 The Fama-French model has also been subject to considerable criticism. There is no clear theory as to why the factors included should deliver positive premia. Even if the assumed effects did once exist, given that they are now identified they should disappear (and indeed certain recent research suggests that they have done so). For example, a recent report to Ofgem, Smithers & Co (2006), found only very limited evidence for the existence of the value effect for UK utilities.⁴

Tobin's q

- 2.31 A promising ratio to investigate as alternative evidence is the ratio of BAA's market value to the regulatory asset value (RAV), the value set by the regulator for the regulatory asset base (RAB).
- 2.32 The principle underlying this approach is that in competitive market equilibrium the value of a company's shares should be approximately equal to the current or replacement cost value of the assets represented by those shares, since otherwise it would pay to invest in the assets or the shares until that equilibrium is reached. The ratio of the value of the shares to that of underlying assets is called Tobin's q (also referred to as the Market to Asset Ratio or MAR); and in equilibrium would be approximately equal to 1.
- 2.33 Regulated assets represent an expected income stream, the present value of which depends on the discount rate used. The cost of capital set by the regulator is an estimate of the rate of return the market would require to purchase the regulated assets at the RAV. Therefore, after deducting the value of non-regulated BAA activities, the market value of the company should be approximately equal to the RAB (Tobin's q = 1; or MAR = 1), if the regulator set the cost of capital correctly.
- 2.34 If such calculations were to show that the MAR was approximately equal to 1 at or shortly after the time of setting price caps, this would be confirmation that the cost of capital at that time was about the same as estimated by the regulator at the time. If the MAR were subsequently to become significantly different from 1 this would mean that one or more of the following factors must have changed:

⁴ "Report on the Cost of Capital", Smithers & Co (2006), provided to Ofgem.



- (a) The market cost of capital (the risk free rate, and/or the equity risk premium and/or the asset beta)..⁵
- (b) The income stream expected from the assets up to the end of Q4 (perhaps because of additional costs not anticipated at the time the cost of capital was set; or perhaps because the management is now expected to be more efficient in operating the assets).
- (c) The market may expect the regulator to make a mistake in setting the cost of capital or in predicting the income stream earned by the regulated assets in the next control period; or
- (d) the market may now price in a different possibility that some of the assets could eventually become unregulated, and so able to command a rate of return different from the cost of capital allowed on the regulated assets.

2.35 A MAR significantly in excess of 1 implies that shareholders expect to realize an above-normal return.

2.36 With information on the value of the RAB, estimates of the value of the BAA non-regulated assets and the total market asset valuation of BAA (debt plus equity), it is in principle possible to calculate an implied financial market valuation of the regulated assets. This allows calculation of the MAR (Tobin's q), and investigation of how it has changed since the time of setting the present price caps. We propose to use this approach in reviewing the estimates derived through a CAPM methodology.

2.37 The application and results are discussed further in the Empirical Paper.

Third moment CAPM

2.38 Third moment CAPM addresses the possibility that investors have preferences over the distribution of returns that go beyond mean and variance, i.e. the expected value and the uncertainty around that expected value.

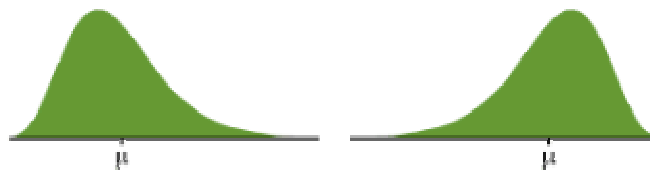
2.39 The "third moment" of a distribution of returns is the "skewness", and describes the asymmetry in a random variable's probability distribution. The probability density functions in Chart 2.1 have the same mean (μ) and same variance. However, the one on the left is positively skewed. The one on the right is negatively skewed.⁶

⁵ This effect is analogous to the effects of changes in market interest rate on the par values of fixed interest securities. For illustration, a £1,000 undated Consol yielding 5 per cent would be worth its par value if market interest rates were 5 per cent. If however market interest rates were to fall to 2.5 per cent, the price at which the Consol would sell would be £2,000. The change in the price of the security would provide information about the change in interest rates.

⁶ Perhaps counter-intuitively, when the right-hand tail is long, so that the distribution "leans" to the left, it is called "skewed to the right" or "right-skewed", while if it leans to the right, with a long left-hand tail, it is called "skewed to the left" or "left-skewed".



Chart 2.1: Distributions with the same mean and variance but differing skewness



- 2.40 It seems possible that some (risk-averse) investors might, for example, prefer distributions of returns of the form on the left with positive skewness (where downside risk is, in some sense, relatively lower) over those of the form on the right with negative skewness. Then distributions with systematic negative skew would have a higher cost of capital than predicted by standard CAPM, while distributions with systematic positive skew would have a lower cost of capital.
- 2.41 Third moment CAPM might therefore be a relevant alternative to the standard CAPM, if the skewness due to systematic risks is important.
- 2.42 Reasons for expecting that BAA returns may be skewed include:
- (a) Limited possibility of upside risks to returns due to commercial factors. The systematic variability of demand for airports in general might be greater than the systematic variability of demand for, say, water or energy, partly because of the significant earnings from retail sales at the airports. However, the capacity available to respond to exceptionally good demand circumstances is likely to vary by airport, so that for BAA a cyclical increase in demand for air travel might impact mainly at Stansted, rather than Heathrow.
 - (b) Possible higher prominence and incidence of large downside, particularly demand, risks. The airport sector may face the chance of larger cyclical downward swings than upward swings in demand. This could also vary by airports.
- 2.43 Kraus & Litzenberger (1976) devised an expansion of CAPM in which third moment risk is relevant. Conine and Tamarkin (1985) applied such a model to the US electricity industry. They studied 60 US utilities over a period of 5 years, finding that “third moment risk” added an additional 1.3 per cent to the cost of capital of a typical utility. It might be argued that asymmetries faced by an airport business are larger than those faced by pure utilities. There could therefore be some practical relevance to the concept.
- 2.44 However, though promising, the concept and models used are not yet fully developed for practical regulatory application. Doubts include:
- (a) Questions concerning the extent to which skewness can be diversified away in portfolios.



- (b) To solve and implement their model, Conine and Tamarkin assumed a constant coefficient of risk aversion across market participants. This assumption, not required for the standard CAPM, could in itself be more subject to challenge than the assumption that investors only care about expected value and standard deviation of returns.
- (c) Related to above, the Conine and Tamarkin data relate to US utilities subject to rate of return regulation, and presented in nominal terms. It is not clear that such a large effect would apply to UK utilities subject to a different form of regulation.
- (d) How material is the potential mistake of ignoring skewness in practice?

2.45 Addressing the above doubts would require substantial research effort. The concept does remain interesting as a possible alternative to, or an evolution from, traditional CAPM, and perhaps is something to which future regulatory economics research should be directed. However, we do not recommend its application in the present price determination.

Dividend Growth Model

- 2.46 According to the dividend growth model, the rate of return required to sustain the value of a share is its current yield plus the expected rate of growth in yield.
- 2.47 In order for this approach to be useful, a realistic estimate of market expectations of future growth of dividends would be needed. This is not available; the approach therefore is best thought of as a possible check on the plausibility of an estimate of the cost of capital reached in other ways. Little reliance has, however, apparently been placed by UK regulators on the DGM.

Review of Consultation Responses

- 2.48 Most of the consultation responses comment on the use of CAPM. These respondents generally support the use of CAPM as a practical and tested policy tool. Some of the respondents emphasise the need to be explicit as to exactly which risks are specific, and which are not. BA comments that the estimated beta should not reflect post bid volatility. Brattle Group asserts that use of alternative models would make comparisons more difficult.
- 2.49 We have taken account of these views in our analysis.

Recommended Approach

- 2.50 There are significant advantages in having a process for calculating the cost of capital that is founded on an economic model, such as CAPM, rather than on purely statistical relationships or informal impressions. Economic models are in general more accessible to practitioners than statistical methods. Such models are also more likely to allow for challenge, “reality checks”, and the application of judgement and intuition.



- 2.51 It is therefore our view that the use of models in the APT tradition (including Fama-French) is not appropriate for regulatory purposes and will not become appropriate unless and until either some structured version of APT becomes so widely accepted that it becomes possible to interpret the factors involved intuitively, or until the statistical advantages of the APT approach are seen to overwhelm the advantages in terms of process and understanding associated with CAPM.
- 2.52 We suggest that the most appropriate route for this price review period is to use the standard CAPM-WACC framework as the main analytical basis for the estimation of cost of capital, fortified and supplemented by other approaches as discussed throughout this report. Thus the CAPM estimate should be checked through consideration of evidence on market-asset ratios (Tobin's q) and through the implied rates of increase of dividends (although this could be problematic following the take-over).
- 2.53 The approach recommended here is consistent with the previous CAA (and Competition Commission) policy stance. It is in some respects a development of previous applications of CAPM, since development is necessary to address the particular current circumstances of BAA: notably, the substantial increase in gearing; and the desirability of estimating the cost of capital appropriate to different regulated airports exposed to different types of risk. For these reasons, greater emphasis will be placed on the estimation of the asset beta (as distinct from the equity beta, which in other regulatory contexts contains most of the information needed), and on the risks borne by lenders as well as shareholders.



3 TAXATION

- 3.1 This section discusses possible approaches to treatment of taxation in estimating the cost of capital.

Three Options

- 3.2 Estimating the cost of capital as described above without any tax adjustments gives the so-called plain vanilla WACC with a pre-tax cost of debt and a post-tax cost of equity. This is what the company has to recover, as it has to pay a pre-tax cost of debt to creditors, and a post-tax cost of equity to shareholders. This estimate can then be adjusted either to a fully pre-tax WACC by adding an allowance for tax to the cost of equity, or to a post-tax WACC by removing the tax component from the pre-tax cost of debt used in the vanilla WACC.

Pre-tax WACC	Plain vanilla WACC	Post-tax WACC
Debt: pre-tax	Debt: pre-tax	Debt: post tax
Equity: pre-tax	Equity: post-tax	Equity: post tax

- 3.3 The pre-tax return is the relevant number for setting price limits. An important regulatory decision is whether the uplift from the vanilla estimate should be at the statutory corporation tax rate or an estimate of the likely effective rate of tax (reflecting the actual amount of corporation tax expected to be paid in the forthcoming regulatory period, after taking into account capital allowances and other deductions). If the decision is taken to use the effective rate of tax, this can be either approximated by the regulator through the tax wedge used or modelled in detail.
- 3.4 In Q4, tax was treated as an underlying long-term cost, reflected in the statutory rate of corporation tax. This approach reflects the fact that any timing differences between regulatory and statutory allowances for capital expenditure and depreciation would be balanced out over time, and that a company's tax burden will be close to the statutory level in the long term. The alternative method aims to track the actual profile of taxation payments more closely over time.

Regulatory Precedent

- 3.5 There is regulatory precedent for using the pre-tax approach with the statutory tax rate as a wedge on the cost of equity. In more recent price determinations, however, some regulators have used effective rather than statutory tax rates.
- 3.6 In EDPCR04 Ofgem moved to this approach, using vanilla WACC in its financial modelling of the electricity distributors, and making an allowance for tax expected to be paid in the control period separately as a cost item. Three main reasons were given:



- (a) A change in Inland Revenue rules meant that electricity companies could no longer claim 100 per cent allowances on much of their capital expenditure. This had the effect that companies would face additional costs in the forthcoming control period, and Ofgem wanted to reflect these in the price determination;⁷
 - (b) Ofgem argued that it would improve consistency by treating tax as any other cost faced by the company, including eventually passing through cost savings to customers; and
 - (c) Ofgem wanted to reduce incentives that the companies had to increase gearing. The post-tax approach adopted accommodates a claw back of tax savings resulting from gearing above the level assumed in the prices (based on the difference between actual interest and interest charges included in the financial model).⁸
- 3.7 This change did not come without its criticism. In particular, some respondents to the Ofgem consultations argued that anything other than the pre-statutory corporation tax approach would encourage a “short term approach to tax efficiency” and introduce additional complexity and problems. EnergyWatch also commented that the new approach would make the price control more opaque, and compound uncertainties in the final prices.
- 3.8 Ofwat used a company specific effective rate of tax approach to cost of capital in both PR99 and PR04. Ofwat comments that the statutory corporation tax wedge approach has greater validity in industries where tax positions of companies are similar. However, in the water industry there were significant variations in the tax bills of different companies reflecting factors outside the influence of the current management, and Ofwat concluded that adopting a generic tax wedge would somewhat arbitrarily award or penalise different companies.
- 3.9 Some respondents to PR04 consultations argued that company-specific tax allowances undermine incentives for efficient finance.
- 3.10 ORR’s regulation of Network Rail is in many ways a special case due to circumstances surrounding the railway industry. However, we note that ORR used a statutory corporation tax wedge approach to cost of capital in ACR2003.
- 3.11 In the NATS price review, CAA used the pre-tax cost of capital calculated based on projected effective tax rates rather than the statutory marginal tax rate. This formed a part of the general approach of cost reflective price caps for the whole review, and also CAA’s

⁷ The Ofgem EDPCR04 Final Proposals document explains that the ending of the non-load agreement with the Inland Revenue meant that most of DNO’s would no longer be able to claim 100 per cent allowances on a significant proportion of their non-load related capital expenditure.

⁸ As we will discuss later, it would be possible to reduce the tax incentives for increased gearing while using the statutory rate of corporation tax to adjust from vanilla to pre-tax estimates of the cost of capital.



greater involvement in the financing arrangements in the review emanating from the post September 11th restructuring.

- 3.12 In the airports Q4 price review, CAA considered the argument that in a competitive market any tax advantages the firm possesses would be reflected in prices. CAA also acknowledged that effective and statutory tax rates can differ. However, in the end it decided that detailed calculation of effective tax rates would be more intrusive than was desirable given CAA's statutory duties. The cost of capital was therefore set on a pre-tax, statutory tax wedge basis, using the actual gearing level of the company. This approach was endorsed by the Competition Commission.
- 3.13 In summary, there is precedent for both approaches. Regulators that have adopted the approach of calculating expected effective rates of tax have done so for various reasons, including diversity of companies within the industry.

Discussion

- 3.14 Both approaches give the company an incentive to minimize tax costs once the price cap has been set.
- 3.15 Industry-specific factors were prominent in Ofgem's and Ofwat's list of reasons for using the effective rate of tax approach — the change in the Inland Revenue rules affecting the electricity companies, and the fact that different companies in the water industry faced significantly different tax bills. These issues are not present in the same way for the CAA, although BAA's levels of capital expenditure will have a significant effect, as might the recent change in ownership.
- 3.16 The closer the effective tax rate facing the company is to the statutory tax rate, the closer in practice are the two approaches. The CAA December consultation paper noted that the Competition Commission has stated that in its view the difference between actual and standard tax rates was unlikely to be significant in the long-term.
- 3.17 An approach based on expected effective rates of tax would remove any incentive to investment that the government intends to provide through capital allowances, whereas using the statutory tax rate as the wedge would retain these incentives. If an effective rate of tax computation were used to estimate the tax wedge, the company would have a lower total regulatory allowance at a time of a significant investment programme, and more once that programme has been completed. Particularly in view of the Aviation White Paper recommendations and CAA's statutory duty to encourage efficient investment, that would seem a perverse effect.
- 3.18 Another issue relates to the possibility of regulators reducing or removing any incentive in the tax system for a company to increase its levels of gearing. As we have seen, this was one of the factors Ofgem had in mind in determining its treatment of taxation. Using an effective rate of tax approach might allow the use of tax more accurately for this purpose. However, a similar effect could be achieved using the statutory corporation tax adjustment, and this is discussed in Section 4 below.



- 3.19 Another argument in favour of continuing the previous system in the case of BAA is regulatory precedent and consistency. As the Competition Commission pointed out, if there were to be a change to a system based on effective tax rates it would be reasonable to ensure that customers did not pay too much taking the regulatory periods together (e.g. that customers would not pay for tax twice).

Implementation Issues

- 3.20 A WACC for which actual tax liabilities have to be estimated would be more difficult to implement than the current system in which the statutory corporation tax rate is the tax wedge. Particularly in the context of the recent takeover and ongoing financial restructuring, it would be complex and perhaps difficult for CAA to validate the company's tax projections, or to make its own detailed estimates.
- 3.21 In moving to a post-tax approach, if that approach were to be adopted, account would also have to be taken of the point made by the Competition Commission that "over-recovery" of tax costs from customers in one control period should be offset by "under-recovery" in subsequent years. Changing the method used would carry this risk. It could, in principle, be avoided by taking into account past benefits in modelling the tax costs under an effective tax rate approach, although the calculation would be complex.

Review of Consultation Responses

- 3.22 The respondents so far support the use of an effective tax rate. BA in particular argues that BAA's effective tax rate is "far below" the statutory tax rate and that it will remain so for "at least ten years".

Previous CAA policy stance

- 3.23 For airports, as we have already noted, the CAA has in the past used the statutory corporation tax rate in calculating the pre-tax cost of capital.

Recommended Approach to Taxation

- 3.24 We recommend that CAA keeps to the use of the statutory corporation tax rate in estimating pre-tax WACC approach for airports. Both the statutory and effective tax rate approaches provide incentives for tax efficiency; but the advantages of continuing to use the statutory tax rate include:
- (a) This would be consistent with preserving the incentives to investment that result from the system of capital allowances.
 - (b) Practical computation of the actual tax liabilities in the context of the Ferrovial takeover could well suffer from complications due to financial restructuring issues and interaction of the Spanish and UK tax systems. Thus, calculating an effective tax rate could involve intrusive involvement in the details of the company's finances.



- (c) If changing to a system based on forecasts of effective tax rates it would be difficult to ensure and demonstrate that the customers did not pay too much, taking regulatory periods together.
 - (d) A pre-tax approach would be consistent with past CAA and Competition Commission conclusions.
- 3.25 We also note that either approach would be consistent with limiting incentives for excessive gearing by the airport operator, (see Section 4).
- 3.26 It could still be relevant for CAA to investigate the overall present value of the benefit BAA would enjoy due to the pre-tax approach with the statutory tax rate used.



4 GEARING

- 4.1 BAA's financial gearing, defined as the ratio of debt to debt plus equity, increased from 24 per cent at the beginning of Q4 to about 38 per cent in January this year, and it has since experienced a further hefty increase. Regulators are naturally concerned with what effect increased levels of gearing might have on the cost of capital and on companies' ability to finance future investment. These issues are particularly relevant for the present review.

Effects of gearing on the cost of capital

- 4.2 The value of a project (or a company) is equal to the present value of the future discounted cash flows it is expected to generate:

$$V = CF1 + \frac{CF2}{(1+r)} + \frac{CF3}{(1+r)^2} + \frac{CF4}{(1+r)^3} + \dots \quad [4.1]$$

- 4.3 Hence, if a factor is to affect the value of the company, it has either to change the amount of expected cash flows, or the discount rate r , which is the cost of capital. The value of a project or company may change over time for a number of reasons. The expected cash flows of the company might change, for example due to new management taking over that is thought able to use the existing assets more efficiently, or for any of a wide range of other possible reasons.
- 4.4 Like the expected cash flows, the cost of capital may also change for a range of possible reasons, not necessarily related to a change in the level of gearing. A fall in the cost of capital increases the value of the company, compared to that which had been estimated previously, because the future income stream is discounted less heavily. In the CAPM-WACC framework the cost of capital can be expressed as:

$$r = r_f + \beta_A MRP \quad [4.2]$$

where r_f is the risk free rate of return in the economy, MRP is the market risk premium, and β_A is the asset beta that measures the company's riskiness relative to the market.

- 4.5 Therefore, if an observed increase in the value of a company has arisen because of a fall in the cost of capital, that could be due to a fall in the asset beta of the company, a fall in the risk free rate, or a fall in the market risk premium. In the case of the last two, this should be reflected in the values of all companies in the economy.
- 4.6 The asset beta is a weighted average of the debt beta and equity beta, where the weights are the relative values of debt and equity the company has:

$$\beta_A = \beta_E \frac{E}{D+E} + \beta_D \frac{D}{D+E} \quad [4.3]$$



- 4.7 This illustrates that the asset beta may fall, lowering the cost of capital and thus increasing the value of the company, if the equity beta and/or the debt beta fall. The above equation is, however, slightly misleading in implying that equity and debt betas determine asset beta. In fact the causality runs the other way under the usual assumptions, from the asset beta (relative risk associated with the future cash flows) to the equity and debt betas, which are only an expression of the chosen level of gearing.⁹
- 4.8 So far we have said hardly anything about gearing. This has been deliberate, in that now we have briefly recapitulated the main ways in which a company's cost of capital, or its stock market valuation, might change due to various other factors that might be behind the apparent increase in BAA's valuation since the previous price review.

Capital Structure and CAPM

- 4.9 The starting point in thinking about the effect of gearing has to be the Modigliani-Miller insight (MM) that in a world without taxes, incentive or information issues, the way a project or firm is financed does not matter. Or, expressed another way, the market value of any firm is independent of its capital structure. Briefly, this is because the overall risk on the company's asset base (some combination of equity and debt), the asset beta, does not change with the capital structure.

Understanding MM

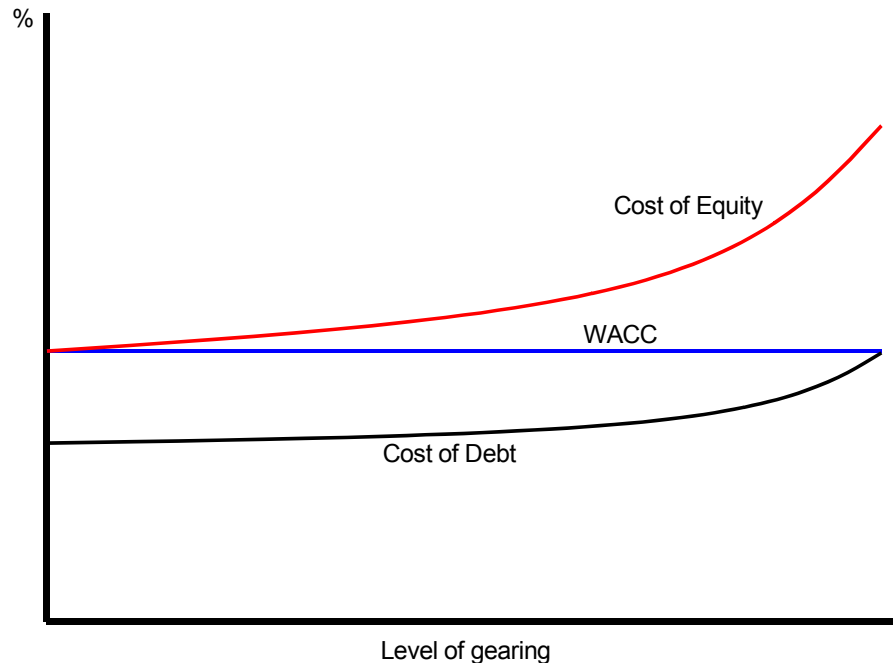
- 4.10 MM is easiest to explain in terms of raising finance to undertake a project. Future revenues from a project are equivalent to some amount of cash today; the exact amount being obtained by discounting by the cost of capital. Adding the discounted future stream of revenues together gives the total value of the project, project V , say.
- 4.11 Suppose the project costs an initial amount C . This brings us back to the MM proposition as follows. The financiers of the project — who put up the C — have to expect to get their C back. They can get it back in a variety of ways: they could be given a share s of future revenues, where $sV = C$, or they could get some debt (riskless or risky) that has a present value equal to C . Regardless of the method, they must get at least C , and the entrepreneur who sets up the project may get the remainder $V - C$. That is, from the entrepreneur's point of view (and from the financiers') within a wide range of possibilities the method of financing does not matter. (It does not matter how the C is divided.)¹⁰
- 4.12 The proposition is illustrated in Figure 4.1 below. At zero level of gearing the weighted average cost of capital is equal to the cost of equity. As gearing increases, the weight on the (lower) cost of debt increases. However, cost of equity and debt both adjust such that the combined WACC remains unaltered, until, at 100 per cent gearing, WACC simply

⁹ However, later on we shall look at more complicated circumstances in which the causality may run the other way, for example from the level of gearing to the asset beta.



equals the cost of debt (the weight on the higher cost of equity is zero).

Figure 4.1: Modigliani-Miller proposition 1



- 4.13 It is crucial to note that according to the theory *both* the cost of equity and debt adjust as gearing increases. In applications observers sometimes assume that the cost of debt is either zero or constant while gearing increases. This assumption is neither in line with the MM framework nor realistic. As gearing increases, the debt providers become more exposed to systematic risk due to a lower equity buffer to soak up the effects of shocks. Gearing is also one of the determinants of credit ratings of companies, which in turn have a large effect on the cost of debt for the company. Indeed, the credit rating of BAA fell during Q4 concurrently with increased gearing, though in general the response in cost of debt might not be large until very high levels of gearing.
- 4.14 Table 4.1 below illustrates the potential scale of the error made by ignoring adjustment in cost of debt. The starting assumption here is a company with an asset beta of 0.6 at 38 per cent gearing ratio, with equity beta of 0.8 and a debt beta of 0.27.¹¹

¹⁰ Miller used to illustrate MM proposition 1 with one of Yogi Berra's famous (mis-)sayings: "You better cut the pizza in four pieces because I'm not hungry enough to eat six."

¹¹ These figures are used for illustration only; we discuss the estimation of debt, equity and asset betas in the Estimation Paper.

**Table 4.1: Effects of different treatment of the debt beta**

Gearing	Zero debt beta		Constant debt beta		Flexible debt beta	
	Equity beta	Debt beta	Equity beta	Debt beta	Equity beta	Debt beta
0.38	0.80	0	0.80	0.27	0.80	0.27
0.5	1.00	0	0.93	0.27	0.88	0.32
0.6	1.25	0	1.10	0.27	0.95	0.37
0.7	1.67	0	1.38	0.27	1.04	0.41
0.8	2.50	0	1.93	0.27	1.18	0.46
0.9	5.00	0	3.60	0.27	1.50	0.50

- 4.15 The first two columns show the response in equity beta to gearing under the assumption that debt beta is zero. The equity beta responds strongly to gearing and begins to change significantly at a quite low level of gearing. The next two columns recognise the existence of the debt beta, but hold it constant, therefore assuming that there is no change in the cost of debt of the company as a result of gearing. This adjustment, taking us half way towards consistent application of the MM framework, significantly reduces the adjustment needed in the equity beta, especially at the very high levels of gearing.
- 4.16 Taking into account the possibility that the cost of debt changes with significant increases in gearing further reduces the impact of gearing on the equity beta and the cost of equity, as seen in the last two columns. This follows directly from the equation 4.3. Both equity and debt betas rise as gearing increases, since this increases the exposure of both debt and equity holders to variations in income due to systematic risk. Subject to the qualifications discussed below, the implied increase in the cost of both equity and debt offsets savings that would otherwise result from the substitution of debt for equity.
- 4.17 These illustrative figures (Table 4.1) have been calculated using a linear response in the cost of debt. Any non-linearity in the cost of debt response, as may be expected for very highly geared structures, would limit the cost of equity response further at high gearing levels (though the effect in the ranges of less extreme gearing might be limited).

Implications of Gearing within the CAPM-WACC Framework

- 4.18 In order for the financiers of a project to be willing to provide the required capital, they must determine what level of risk they are taking on, and therefore, what level of return they require for their investment. To do this in a CAPM framework, they have to estimate the systematic risk on all of the company's cash flow, the asset beta.
- 4.19 The asset beta is relevant to the total WACC of the company, not just the cost of equity:

$$WACC = r_E \cdot \frac{E}{D+E} + r_D \cdot \frac{D}{D+E} ; \beta_A = \beta_E \cdot \frac{E}{D+E} + \beta_D \cdot \frac{D}{D+E} \quad [4.4]$$

- 4.20 If the firm uses no leverage, then the shareholders receive all the project revenues, and



$\beta_A = \beta_E$. However, when the firm uses debt as well as equity, β_E overstates the risk of the company, and the equity beta must be “unlevered” to measure the asset beta. This is straightforward in the well functioning capital markets we are still assuming — we can utilise the above formula.

- 4.21 Equity beta estimation is routine to both financial markets and regulatory applications. The concept of debt beta might not be as familiar as the equity beta, as debt betas are not referred to as commonly. The return on debt in WACC formulae is most usually expressed as the risk free rate plus a company specific debt premium. This can be thought of as composed of the debt beta and the same general market risk premium as used in the CAPM for cost of equity

$$r_D = r_f + \text{debtpremium}, \quad r_D = r_f + \beta_D \text{MRP}$$

$$\text{this implies: } \beta_D = \text{debtpremium} / \text{MRP} \quad [4.5]$$

- 4.22 However, the debt premium observed in spreads is likely to include an element of insurance against default on the debt, regardless of whether the default occurs for systematic or idiosyncratic factors. Therefore it might not be appropriate to think of all of the debt premium, or spread, as an indicator of market covariant risk covered by the debt beta. We investigate the effect this has in the Empirical Paper, which estimates the debt beta for BAA. We conclude that the required correction to Equation 4.5 is likely to be small for investment grade bonds.
- 4.23 As mentioned above, it is sometimes incorrectly assumed that debt beta is zero when unlevering the equity beta. This approximation could be valid for companies with low gearing as debt is perhaps exposed to little risk and its share in the asset beta is small as well (Equation 4.4). However, at high levels of gearing ignoring the debt beta will lead to a higher than required adjustment in the equity beta, and hence in the cost of equity.
- 4.24 We have now demonstrated MM in the CAPM-WACC framework. The fact that a company gears up within a realistic range does not matter because the rises in cost of debt and equity adjust, leaving the asset beta, and therefore the company WACC, unaffected. The overall risk on the asset base is what matters, the cost of equity and debt only adjust to reflect this depending on their relative amounts and the specific terms of different classes of loan.

Further factors

- 4.25 Since capital structure is irrelevant according to the principles of MM, should we expect to see completely random capital structures of companies? Of course this is not the case — and one value of the MM theory is that it points us to the reasons why capital structures



might matter for a company. The proposition abstracts from:¹²

- (a) Taxes — differences in tax treatment of income to financiers from equity and debt finance may imply that increasing gearing will increase company value, depending on the value of the debt tax shield. One expression of this idea is that the value of a company is equal to its value if financed wholly by equity plus the value of any tax saved through the use of debt finance.
- (b) Incentive issues — financial structure may affect incentives that for example the managers have to maximise the net present value of the company.
- (c) Costs of financial distress — in the absence of other distortions, the expected costs of financial distress to all parties will rise with the level of gearing.
- (d) Information issues — the information that different market participants have access to at different times might vary; and
- (e) transaction costs — for example, in changing the level of gearing.

4.26 These and other effects will trade off against each other such that an optimal level or range of gearing arises, specific for a particular company.

Value of Tax shield in CAPM

4.27 It is possible that a company's value is affected by its capital structure due to a possible tax advantage enjoyed by debt finance — interest payments are tax deductible, whereas dividends and capital gains are not. The assumption usually made is that debt has a significant tax advantage compared to equity finance. The tax shield of interest payments, however, is to an extent a function of the point at which it is measured. Full assessment of the value of the tax shield would have to take into account taxes that are paid by debt financiers on their interest income and by shareholders on income from equity investment.

4.28 The starting point in thinking about the tax picture beyond the company level is that investors (whether equity or debt holders) care about the returns they receive after all taxes — money in their pockets. That is what the returns on investment (debt or equity) have to provide. We leave the question of what the rates actually are to one side for now, proceeding with the following conventions:

- (a) T_I — the tax on interest income, assumed to be the same for all debt providers;
- (b) T_E — the tax on equity income, assumed to be the same for all equity holders; and

¹² MM proposition 1 also assumes efficient well functioning capital markets, but that is an assumption we will keep for most of this paper.



(c) T_C — the marginal rate of corporation tax for the company.

- 4.29 If only the corporation tax existed, the company's objective would be to optimise gearing to minimise the corporation tax burden (assuming away the other factors in paragraph 4.25). Indeed, ignoring taxes other than corporation tax leads to the usual expression of the tax adjustment of debt in the WACC formula:

$$PosttaxWACC = R_E \cdot \frac{E}{D+E} + R_D(1-T_C) \frac{D}{D+E} \quad [4.6]$$

- 4.30 However, when personal taxes are taken into account, the company's objective may be assumed to be to maximise income in the hands of its investors after all taxes have been paid.
- 4.31 Table 4.1 illustrates the flow of the complete after tax returns of £1 of income, depending on whether that income is paid to equity or debt.

Table 4.1: After tax return to debt and equity of £1

	Operating income of £1	
	Paid out as interest	Paid out as equity income
Corporate tax	None	T_C
Income after corporate tax	1	$1-T_C$
Personal tax	T_I	$T_E(1-T_C)$
Income after all taxes	$1-T_I$	$1-T_C-T_E(1-T_C) = (1-T_E)(1-T_C)$

Adopted from Brealey, Myers and Allen: "Corporate Finance", 2006.

Note that the tax rates used in the calculation of the value of the tax shield should refer to the rates faced by the marginal investor.

- 4.32 It is evident from Table 4.1 that borrowing is better if $1-T_I$ is less than $(1-T_E)(1-T_C)$. The relative tax advantage of debt is therefore:

$$\text{Relative tax advantage of debt} = \frac{(1-T_I)}{(1-T_E)(1-T_C)}$$

- 4.33 This formulation enables us to investigate some illuminating special cases. First, if the personal tax on interest income is equal to the personal tax on equity income ($T_I = T_E$), the relative advantage of debt depends on the marginal rate of the corporation tax, T_C , as in Equation 4.6 above. Second, if the personal and corporation taxes were to cancel each other out completely, $1-T_I = (1-T_E)(1-T_C)$, there would be no tax advantage to debt, and so tax would be irrelevant to debt policy.



- 4.34 Determining the value of the debt tax shield at the level of individual lenders and investors, however, is difficult. The issues to consider include:
- Some investors (e.g. pension funds, a very important class of investors, and perhaps some based overseas) are tax exempt;¹³
 - The company might not make a profit, in which case any value of tax shield becomes redundant;
 - Different legal persons are liable for different tax rates, or are better at planning their own tax and avoiding the full rates;
 - Taxation of profits differs depending on whether it is paid out in dividends or retained in the hope for generating capital gains, so that a company's dividend policy has an effect on tax shield value;
 - The marginal rate of corporation tax might be different from the statutory rate due to non-debt tax effects; and
 - There might be significant differences between nominal and real tax costs due to inflation.
- 4.35 The task is reduced somewhat by the recognition that it is the marginal tax rates that we are interested in. It is sometimes assumed that pension funds are the dominant creditors, in which case it may be argued that T_I is approximately equal to zero. Further assuming that marginal equity holders do not have to pay tax on equity income takes us back to $T_I = T_E$, and therefore the tax advantage would be equal to the corporation tax rate (before inflation effects).¹⁴ Otherwise, the advantage is likely to be smaller.
- 4.36 The conclusion is that tax shield value to investors and lenders is not, except under certain special assumptions, simply equal to the amount of corporation tax saved due to tax deductibility of interest payments but depends on the particular tax positions of the investors in and lenders to each company. As a practical matter, however, it might be appropriate to adopt a simplifying assumption, and to base calculations on the corporation tax saved.

Other possible effects of gearing

- 4.37 Differences in incentive structures of the new proposed management contracts, differences in information between the old and current ownership and differences in monitoring or other arrangements might in theory all be factors which affect the cost of

¹³ One "easy" way to correctly value the tax shield at the marginal corporation tax level would be to argue that pension funds are the most likely class of investors to represent the marginal investor in gilt and equity markets.

¹⁴ This seems consistent with Ofwat's and Ofgem's treatment of interest savings due to gearing above the notional level, where all corporation tax saved is clawed back.



capital or the optimal level of gearing. Also, it could be argued that possible (positive) skewness in the distribution of equity returns caused by increased gearing would affect the response in the cost of equity to gearing.

Management incentives

4.38 The higher the incentives from management contracts and pay packages, the less important the incentives provided by equity become. In effect, management would be taking on some of the risk-bearing functions of equity.

Differences in information

4.39 There may be differences in information held by the different market participants that manifest themselves in different valuations of the same assets (projected future cash flows). Two possibilities are particularly interesting:

- (a) New information about the applicable levels of the cost of capital parameters; and
- (b) Different expectations about the relationship and balance of power between the operator and the regulator.

4.40 It could be the case that financial markets overall have moved towards a higher preference for debt finance. The identified change could for example involve a lower debt beta than assumed previously. There might also have been an increase in the relative attractiveness to investors of income streams that are likely to vary with the rate of inflation.

4.41 Different views about the response of the cost of capital to an increase in gearing might also arise from different assessments of the possibility of regulatory bail outs in case of financial distress.

Skewness

4.42 It possible that increasing gearing will lead to a skew in the distributions of returns to equity holders, such that downside risk is limited relative to upside risk. However, it could be that any positive skewness in equity returns due to increased gearing is countered by negative skewness in expected debt returns. It would be difficult to estimate how these two might balance.

4.43 Further, the general reservations about the practicality of investigating the effects of skewness, discussed in Section 2, apply here also. We have therefore not considered the possible skewness resulting from increasing gearing further at this stage.



Options for Gearing

- 4.44 Considering the approach and incentives to gearing might seem like a moot point, as the takeover has been completed with an associated significant rise in gearing. However, the questions do remain appropriate, because incentives matter continuously.
- 4.45 The above discussion covers factors that could influence the cost of capital due to gearing or the takeover. Should these aspects be of concern to the CAA?

Valid concerns about gearing

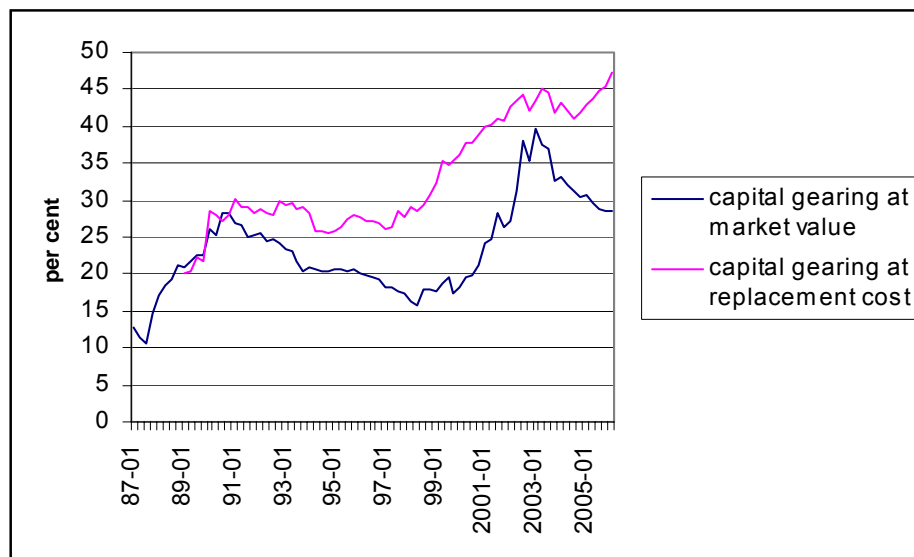
- 4.46 In an incentive regulation framework, it might be argued that CAA should not be concerned about the level of gearing a company chooses to have, unless there are some imperfections that move the incentives of the airport operator to gear at a level it would not choose in a competitive market. Distortions of incentives could arise if:
- (a) The airport operator expects that the risks and costs of financial distress will be alleviated by regulatory intervention;
 - (b) The airport operator expects to be able to hold CAA (and customers) to ransom over proposed investment plans more easily with a high level of gearing;
 - (c) It is possible for the airport operator to cross-subsidise its non-regulated businesses by debt finance raised on the regulated business; or
 - (d) There are excessive claw-backs or adjustments to operational and capital efficiency gains. (The less shareholders are allowed to benefit from efficiency gains, the less incentive there is for the company to hold equity.)
- 4.47 Clearly there would be undesirable potential consequences if regulated companies have incentives to over-gear. For example:
- (a) There could be conflict with the regulator and disturbance to the business as the company attempted to implement a “hold the regulator to ransom” strategy, for example over investment plans;
 - (b) Over-gearing could dilute the effect of regulatory incentives for operating efficiency, for example by reducing monitoring of management by shareholders, with managers preferring to comply with lender covenants;
 - (c) Over-gearing could increase the risk of financial distress, to the disadvantage of customers as well as investors; or
 - (d) There could be some shifting of other risk to airport customers, perhaps not compensated for it.
- 4.48 On the other hand, CAA is clearly not concerned with the specific financial arrangements made by the regulated company, beyond the point at which these might infringe on its



statutory duties. The CAA might therefore wish to correct for distorted or non-market incentives, for that could lead to unduly high gearing, but not imply any view on the decisions which the company then takes within the regulatory framework.

- 4.49 An increase in BAA's gearing may be a reflection of underlying changes in the view of the market. It may be that the market has developed more of an appetite for leverage, helped by changes in the market levels of interest rates and share values. The following chart of the level of gearing in the UK corporate sector offers some support for this notion.

Figure 4.2: Aggregate capital gearing of UK companies



Source: Europe Economics calculations based on ONS data, following a chart by the Bank of England¹⁵

Different possibilities

- 4.50 The main regulatory choices for the treatment of gearing in setting the cost of capital are:
- Using the actual level of gearing that the company employs;
 - Forecasting what the levels of gearing will be during the control period;
 - Forming a view about the efficient level of gearing; or
 - Adopting a notional level of gearing, broadly in line with current market practice for regulated companies but not taken from the actual level, nor put forward as a specific efficient level.

¹⁵ Source: National Statistics website: www.statistics.gov.uk Crown copyright material is reproduced with the permission of the Controller of HMSO



4.51 Ofwat and Ofgem have used a notional level of gearing in the recent price determinations. These regulators also aim to limit the companies' incentives to increase gearing through taking account of (clawing back) the corporate tax savings from gearing above the level used in modelling. Moreover, electricity and water utilities' licence conditions also include ring fencing provisions and requirements to maintain investment grade credit rating. Other things being equal, in the absence of corresponding regulatory powers CAA has greater reason to be concerned about the possibility of an unduly high level of gearing.

Discussion of the possibilities

4.52 The following observations can be made about the different approaches listed in paragraph 4.50:

- (a) using the actual or forecast level of gearing might be taken to imply the regulator under-writing a particular capital structure, which would not be appropriate;
- (b) estimating an optimal level of gearing for a company from the regulatory viewpoint is not practical. CAA has acknowledged that there is neither evidence nor a normative model that unequivocally predicts the optimal capital structure;
- (c) if the notional level of gearing used were higher than the current level, it could be seen as an encouragement to gear up until reaching that level.

4.53 It appears to us prudent to assume that the perceived threat of financial distress is not as strong as it would be in an unregulated sector, and that higher gearing could have a material effect on negotiations over capital expenditure plans (the company might expect to be able to hold the regulator to ransom to some degree). CAA's duties could then lead it to be interested in limiting the incentives that the company has to maintain high levels of gearing.

4.54 Part of the solution would be to address the reasons for the expectations of bailouts or of the hold-up benefits directly, as far as possible eliminating them. CAA has made a number of clear statements on this matter. Other options for reducing incentives for excessive gearing could be through the treatment of differences in the actual materialised level of gearing and the level used in the financial modelling. The possibilities include:

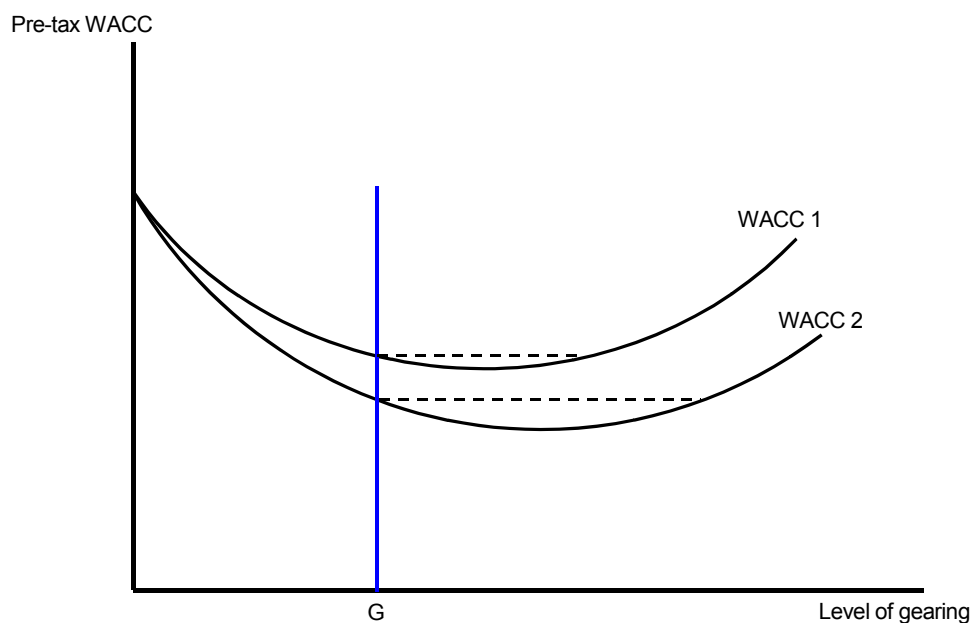
- (a) laying out stringent rules about the regulatory response in any *force majeure* circumstances if the company is geared more highly than modelled; and
- (b) removing any tax savings related to interest payments resulting from increases in gearing.

4.55 Tax measures alone would not remove all potential incentives to gear higher than under a scenario free from distortions. For example, the tax measures do not address the expectations of bailouts. The profile of cost of capital at different gearing levels might be wholly different from the one that would be in place were the bailouts not expected. Figure 4.4 shows the bluntness of the tax instrument in a pre-tax framework. The only



two effects assumed to be at play on top of the MM assumptions are the (assumed significant) tax effects and costs of financial distress.

Figure 4.4: Exploring effects of tax advantage claw back



- 4.56 If there were no expectations of bailouts, the costs of financial distress would begin to outweigh tax benefits earlier (WACC1). If, however, such expectations exist, the trade-off is weaker (WACC2). Clawing back tax advantages beyond gearing level G at best creates a plateau of outturn (pre-tax) cost of capital. If the market expects bailouts, the company has much more scope to increase gearing without a detrimental effect on cost of capital, even in the presence of a tax claw back.

Review of Consultation Responses

- 4.57 The respondents to the consultation so far all recommend the use of an assessed optimal gearing level in some form. Brattle group suggests that the level of gearing has to still be realistic, and notes that the value of the interest tax shield might in practice be relatively low, as well as recalling the need to potentially adjust cost of debt upwards with gearing. bmi explicitly calls for a forecast (rather than current) level of gearing to be used. The respondents are divided on whether gearing should be considered at group level, or individually by different airports.



Recommended approach to gearing

Previous CAA policy

- 4.58 In the Q4 review, the CAA approach in determining the price caps was based on actual gearing rather than notional or “optimal” gearing.
- 4.59 CAA has consistently emphasised that financial arrangements are the responsibility of the company, and that it will not endorse or seek to provide incentives for the company to adopt any particular arrangements. Its statutory duty is to provide efficient incentives, not to intervene in areas for which BAA’s management has responsibility. However, it is possible that regulated businesses may consider that in the event of the company encountering financial difficulties, the regulator would be under pressure to take steps designed to alleviate matters; and this in combination with the tax advantages of higher gearing may lead to unduly strong incentives for the company to gear up. We have already noted that other regulators employ financial ring fencing, as a mechanism to ensure that the regulated business is not starved of financial resource; and that Ofwat and Ofcom have both taken steps to recover from companies the tax savings resulting from high levels of gearing. Measures of this sort do not involve endorsing any particular levels of gearing.

Recommendations

- 4.60 It might seem ideal if the regulator could have the company reveal the optimal level of gearing. However, we have seen that there may be gaming incentives leading a regulated company to adopt higher gearing than would be optimal in other circumstances; and there are tax incentives which may also induce companies to adopt higher gearing than they would otherwise adopt. CAA has acknowledged that it is not possible to calculate a theoretically optimal efficient level of gearing, and in its May Policy Update document made clear that it would decide on the assumption to make on the basis of regulatory fundamentals and not in order to accommodate any particular financing arrangement adopted. We therefore believe that the approach in setting price limits for Q5 should be to adopt a notional gearing level, broadly in line with market evidence for regulated businesses and taking into account the characteristics of aviation. This might be in the range of 60 to 75 per cent (defined as the ratio of debt to debt plus equity).
- 4.61 To further reinforce its stance that there will be no regulatory bail outs, CAA could determine a system for recovering at a future determination the tax benefits associated with gearing above the level used in modelling for Q5.
- 4.62 We believe that this approach would be consistent with the existing CAA policy stance that financial arrangements are the management’ and shareholders’ decision, and that it is their responsibility to bear any risks arising from these arrangements.



5 SEPARATE COSTS OF CAPITAL

5.1 This section first briefly comments on whether separate costs of capital should be calculated, and the aspects of the cost of capital formula that should be considered at group and airport levels. We then explore how they can be calculated within the CAPM-WACC framework in the absence of separate shares for each airport. The detailed description of our calculations is provided in the Empirical Paper.

Reasons for separate cost of capital

5.2 In the December 2005 consultation document CAA stated that it considers that allowing separate costs of capital is more likely to provide appropriate incentives to invest. The underlying parameter reflecting the risk differential between the different airports in the CAPM-WACC framework is the asset beta.

5.3 If systematic risk exposure varies significantly between the regulated airports, but the company WACC and expected cash flows are used as the basis of regulation, there is a possibility that suboptimal decisions will be made. Other things being equal:¹⁶

(a) Some investments at the airport with the higher individual cost of capital will be rejected, due to a falsely low allowed return, that otherwise would have gone ahead; and

(b) The customers of the airport with the lower individual cost of capital may effectively subsidise the customers of the airport with the higher individual cost of capital.

5.4 The conclusion is that if the systematic risk of investments in the different airports is significantly different, then using disaggregated WACC estimates would be beneficial. This does not of course imply that the airports should be treated as completely separate companies. The reality is that the airports are owned and operated as a group, so that the relevant question is whether in this context the CAA should allow different rates of return to investment in the different airports.

Sources of different systematic risk exposure

5.5 The most obvious potential sources of differences between the exposure of investments in Heathrow, Gatwick, and Stansted airports to systematic risk are differences in aggregate demand; in traffic mix, and in investment programmes. The situation of Stansted in particular is significantly different from those of Gatwick and Heathrow.

¹⁶ The interaction between actual investment decisions and regulatory allowance may in practice be much more complicated, but this demonstrates the principles involved. Other relevant factors would include the treatment of new capex, treatment of capex variances and the total cash flow implications of the investment.



- 5.6 Heathrow appears to be relatively insulated from demand side systematic risk compared to Gatwick and Stansted. Our understanding is that Heathrow is generally the first choice airport for airlines, and as such faces significant excess demand for its limited capacity. This could limit the effect that pure demand shocks have on Heathrow as compared to the other two airports. Indeed BAA, in its response to the December consultation, states that nearly all South East demand side risk is borne by Stansted and Luton.¹⁷
- 5.7 Systematic shocks to the costs of inputs to the airports, however, might be expected to affect all airports' operating expenses to a similar extent. With regard to capital expenditure, the position may be more complex and depend partly on the flexibility of the programmes.
- 5.8 The extent of the differentiation is investigated in the Empirical Paper, which reaches the conclusion that the difference could indeed be significant. We therefore turn to the question of implementation of separate costs of capital in the BAA London airports, and in particular to the differences between Heathrow and Gatwick.

Approach to Separated Costs of Capital

- 5.9 Implementing different costs of capital at the different airports requires:
- (a) Investigation of the differences in systematic risk exposure by the different airports, i.e. the asset beta applicable to each airport;
 - (b) Identifiable assets and revenues for each airport that the different returns are estimated for; and
 - (c) Confirmation that disaggregation did not lead to double counting of returns.
- 5.10 The latter two tests are relatively straightforward to pass. The costs and revenues associated with each of the three regulated airports are already largely accounted for separately. Also, if the approach adopted involves estimating the group cost of capital and making adjustments for each airport, it is straightforward to ensure overall revenue neutrality. The first requirement is, however, more problematic. Even with strong grounds for expectation that the cost of capital might in principle be materially different at different airports, the extent of the differences will have to be estimated with a reasonable degree of confidence for the approach to be desirable.
- 5.11 With common ownership of the airports, and hence in the absence of traded shares for individual airports, we begin with the group level estimate for the cost of capital, making adjustments for each airport. Different possible bases for the adjustments (similar to

¹⁷ BAA response to the CAA December consultation on the Policy Framework, page 47.



those considered by Ofcom in its 2005 consultation of the feasibility of estimating different costs of capital for different parts of BT) include:

- (a) Identifying and using “pure-play” traded comparators with similar risks to BAA airports to estimate the disaggregated betas, or to infer the airport betas from their betas and BAA group beta.
 - (b) Identifying traded companies that have operations with similar systematic risk exposure to one or many BAA airports. The use of comparator or sectoral betas (used because of the similarity in systematic risk exposure) is a standard component of the regulatory toolkit.
 - (c) Use of accounting data to estimate either the absolute or relative systematic risk exposure of the different airports.
 - (d) Estimating betas or adjusting BAA group level betas based on theoretical arguments and fundamental analysis of the business.
- 5.12 Some respondents to Ofcom were particularly pessimistic about the possibility of achieving sufficiently robust estimates of the differences between the risks of different parts of BT, therefore arguing for abandonment of the idea. Recognising the difficulties, Ofcom, however, remained of the view that it is appropriate to apply disaggregated betas to parts of BT’s business (copper access and the rest), gained via adjustments to BT group equity beta through a combination of the above approaches.¹⁸

Separated Gearing and Taxation?

- 5.13 Within the CAPM framework, exposure to systematic risk is taken into account in the asset beta estimates for each airport. Additionally, separating and allocating hypothetical taxation and gearing between the airports is therefore not necessary or indeed relevant for disaggregated WACC to be applied to the different airports. The considerations are discussed below.

Taxation

- 5.14 The cost of capital is a return that financiers require for investment in the company as a whole, implying that the group level tax position should be the one taken into account.
- 5.15 If an effective rate of tax approach to cost of capital were adopted, with taxation modelled as a separate cost item, it could be relevant to disaggregate the group income, cost and

¹⁸ “Ofcom’s approach to risk in the assessment of the cost of capital”, Final Statement, Ofcom, 18 August 2005.



investment data so as to derive hypothetical effective tax estimates for each airport.¹⁹ If on the other hand CAA applies the statutory tax rate as in the past, and as recommended above, then there is no requirement for such disaggregation.

Gearing

- 5.16 As explained earlier, the cost of capital reflects the underlying asset risk regardless of whether that asset is in the form of debt or equity. Therefore, starting from a group level estimate for that asset risk, the level of gearing is a second order issue in disaggregating the cost of capital.
- 5.17 Since debt is not held at airport level, any attribution of debt to different airports would be artificial and arbitrary. One possible view is that the low risk airport should hold more of the company debt than a high risk airport. This general thought is supported by an empirical observation that companies with low exposure to systematic risk (low asset betas) are generally financed more through debt than companies with high asset betas. However, there is no established relationship between the two that could be used to say e.g. how much of BAA group's debt should be attributed to Heathrow — systematic risk may only be one factor in determining a gearing level.
- 5.18 We also observe that taking a view on a question such as “how much of the BAA group's debt is actually supported by Heathrow, or should be allocated to it” might deviate from the CAA stated principle that a financial structure of BAA is a matter for the company to decide.

Review of consultation responses

- 5.19 All the respondents so far recommend using separate costs of capital at the three airports, though several express concern about how this can be achieved in practice. Views expressed differ, however, on the benefits of separate taxation and gearing of the airports, some identifying a trade-off between further separation of the airports and the possibility of obtaining cheaper finance through group holding. If any group financing benefits were relevant, the group cost of capital would include them. Allocating the group cost of capital to different components of the group by analysis of relative systematic risk exposure would carry any such benefits through directly to those components. In the setting in which BAA is assumed to continue to be financed as a group, this is appropriate.

¹⁹ On the other hand, there might be some costs of separate tax treatment of the airports to the extent that group holding company is able to balance returns and taxes among components better than would be possible for stand alone operators. Separate tax costs, if estimated, would then reflect an upper bound of the tax costs to which BAA is subject.



Recommended framework to separate costs of capital

Existing CAA policy stance

- 5.20 Having consulted on the topic at the Q4 review, CAA decided that a stand-alone approach to cost of capital is best suited to meet its statutory objectives, due to the different degree of risk faced by the different airports. CAA stated that in order to modify its current view it would expect compelling evidence to demonstrate that users in aggregate would be genuinely better off as a result, and that the impact was not likely to be unduly distortionary or discriminatory as regards other airports in the South - East.
- 5.21 The Competition Commission thought that employing a system approach made negligible difference to the price caps in Q4. The Competition Commission's recommendations were to allow BAA not only to earn its regulatory cost of capital on a system basis but also on an airport by airport basis.

Recommended approach

- 5.22 It could indeed be beneficial to use disaggregated costs of capital at different airports. This entails investigation of:
- (a) The extent to which the systematic risk exposure actually differs at the different airports, particularly compared to the uncertainty in the estimates of the BAA group beta, and from the point of view of materialised detriment to users and investment programs; and
 - (b) The possibilities of robustly estimating separate asset betas for the different airports, as discussed above.
- 5.23 On the latter point, since it would be impossible to measure directly the correlations between investor returns deriving from the separate airports and those from the market portfolio, we will consider differences in systematic risk exposure of each airport at the asset level.
- 5.24 Therefore, the starting point for the disaggregation should be a robust estimate of the group weighted average cost of capital from primary market data using conventional methods, giving the (range for) the group vanilla WACC. This is analogous to the rate of return in equation 4.2 above, expressing the WACC in terms of the risk free rate, the asset beta and the market risk premium for corporate assets. The group WACC is divided into components for the different airports. This allocation will be based on the relative exposure of the different airports to systematic risk. Using the group WACC as the starting point also recognises the fact that the airports are indeed held jointly. The Empirical Paper gives details of the calculations.
- 5.25 It is possible that in the course of Q5 BAA may be further restructured, for example following the current OFT investigation, and in this case the question of the impact of possible separate ownership of the airports on the cost of capital might become relevant.



At this stage, we would observe that the smallest of the three would be a substantial company in its own right, so that the question of a possible small company premium, allowed by some regulators, would be unlikely to arise. Further, if separate companies were established, investors would be able to diversify any non-systematic risks, so that the overall weighted cost of capital might not be expected to be very different.



6 FURTHER ISSUES

- 6.1 This section discusses the recommended approach to some further issues that have been raised in relation to estimation and use of the cost of capital.

Split or Front - Loaded Cost of Capital

- 6.2 This section complements Sections 2 and 4 by commenting on suggestions for a split cost of capital or for a front loaded return, discussed in a recent consultation paper from Ofwat and Ofgem.²⁰ The question is whether the CAA should do anything along these lines with the objective of encouraging equity investment, assuming that the overall level of the cost of capital has been determined and applied at the correct level.

Particular issues about financing incremental investment

- 6.3 There are a number of issues that could be considered with regard to financing incremental investment, including:
- (a) Commitments about future calculations of the cost of capital, extending over the expected life of the asset rather than over the next regulatory control period. In our view, there exists a clear understanding that at every regulatory review BAA will be allowed its appropriate cost of capital based on the best estimates at the time of price setting, taking into account the cost of capital elsewhere in the economy. Further reiteration of this principle does not appear to be necessary; it is a fundamental feature of the UK's system of incentive regulation that price limits are aligned to costs including the cost of capital in the (in this case quinquennial) periodic reviews.
 - (b) Commitments about the use of financial ratios and regulatory depreciation to structure the profile of allowed revenues to facilitate financing where necessary. These issues are addressed in the section on financeability.
 - (c) Commitments about regulatory behaviour in the event of financial distress. There is a clear CAA position that there will be no bailouts. This is also consistent with the principles set out in paragraph 69 of Ofwat/Ofgem Financing Networks paper, February 2006.
 - (d) Commitments about the treatment of over/under spends on pre-specified investment projects, or about the treatment of outturn differences in the specification of investment projects (e.g. deferred/accelerated projects, project specification changes in response to changes in demand conditions, evolving investment strategies). The same principles apply as in paragraph (d) above.

²⁰ "Financing Networks: a discussion paper" February 2006



Split cost of capital

- 6.4 The proposal for a split cost of capital is based on an argument that once new investment is contained within the RAB, the risk on it is substantially reduced and it will earn an almost certain index-linked income. Hence, it is argued, investment that is included in the RAB is suitable for debt finance with a low required return, whilst the capital required for new investment would be more appropriately raised from equity.
- 6.5 One proposal is to split the cost of capital allowing RAB to be ring fenced and securitised earning the cost of debt, but any new investment earning a return consistent with cost of equity. The result would still be highly geared companies. However, it is argued that equity funding would be provided for where it would be appropriate and its incentive properties would be best utilised in managing operation and construction risks of investments.

Discussion

- 6.6 A key assumption underlying the proposal is that there is substantial risk that investment would not be allowed into the RAB. However, this situation seems to us unlikely to materialise in the airport sector, particularly in the airports in which the process of constructive dialogue between the airport and airlines is satisfactory.
- 6.7 A split cost of capital with only the cost of debt allowed on RAB would appear to represent a departure from the CAA's principle of BAA being responsible for its own financial structure.
- 6.8 The approach would suggest a mechanistic approach to financial structure, with debt financed RAB and equity financed CAPEX. However, there is no reason to assume that 100 per cent equity finance is the most efficient financing solution for all investment, nor that the operation of existing assets is necessarily a low risk activity.
- 6.9 Further, unless the result were to be very inefficient levels of gearing, the overall cost of capital would not be affected. In general, if the weighted average cost of capital is set at the right level, the company should be able to finance investment through equity or debt, as it chooses.
- 6.10 In addition to the above concerns, Ofwat and Ofgem have commented on the proposal as it might apply in water or energy sectors as follows:
 - (a) There would need to be more clarity on the treatment of new CAPEX and its incorporation into the RAB, and further reassurances on including investment into the RAB might undermine some incentives for efficient investment; and
 - (b) It might not be sound in practice to assume that equity provided by financiers could immediately (and without costs) be turned into debt once the CAPEX becomes sunk (entered into RAB).



- 6.11 It is perhaps unfair to consider the proposal for split cost of capital in isolation from other possible CAPEX and OPEX treatment reforms. However, for the present purposes, we believe that the proposal for a split cost of capital would introduce many more problems and uncertainties than benefits.

Front-loaded cost of capital

- 6.12 Mayer (2003) observes that water companies responded to the challenges from the tightened price caps and continued required investment in PR99 by gearing up for two reasons: first, to gain financing efficiencies and a lower cost of capital, and second, to reduce the scope available to the regulator to demand further efficiency improvements. Therefore, he argues, pre-tax cost of capital has fallen to between 3.5 and 4 per cent as a result of reductions in asset risk achieved through corporate restructuring, or through strategic use of debt to reduce regulatory exposure.
- 6.13 The argument for a front loaded cost of capital arises from an alleged mismatch between the commitment to a long-term return required by investment and the commitment that the regulator can provide given the five-year price review.
- 6.14 Mayer's proposal to overcome the commitment problem is to front-load returns on new investment, offering higher returns in the short run to offset the long-term commitment problem. He suggests implementing a rolling 5 to 10 year period of higher returns, after which investment would be included in the RAB. In this way, the regulator would tie his hands to provide "adequate" returns to justify the equity model throughout the life of the investment.

Discussion

- 6.15 Mayer has interpreted the increased gearing as a response to tightened price controls in water PR99 to bring the operation and financing in line with the lower allowed rate of return. An alternative interpretation of the move to higher gearing, put forward by Ofwat and Ofgem, is that PR99 increased regulatory transparency and certainty, so providing a trigger for companies to take advantages of tax efficiencies of debt finance.
- 6.16 It is also not clear that there is evidence of a lack of regulatory commitment to equity funding. The latest price reviews in the water and energy sectors transparently aimed to limit the amount of gearing, the regulators arguing strongly for the benefits of equity finance that they wished to preserve.
- 6.17 In the airport sector the CAA has an explicit duty to ensure that the allowed return is such that efficient investment can be financed. Further, the 2003 White Paper comments on airport capacity, and the subsequent investment plans since, could be seen as increasing the importance for the CAA to allow the return that those large investment programmes require, provided this is compatible with CAA's other statutory duties.
- 6.18 The cash flow implications of front-loading cost of capital would be similar in kind to accelerated depreciation that has been employed by Ofgem.



- 6.19 A company can be assumed to take its planned future investment into account when deciding the level of gearing. If the company decided to increase gearing, then that gearing level should be consistent with delivering the desired investment programme.
- 6.20 Further, we would once again identify risk of regulatory commitment — in so far as it is relevant in the airport sector — as a specific risk, and therefore something that should not be include in the WACC estimate.

Review of consultation responses

- 6.21 EasyJet and Stanstead LACC (through which Ryanair responded) have made comments about these proposals.
- 6.22 EasyJet is against any form of front-loading or split cost of capital. It argues that these proposals allow an airport operator to recover investment early and so encourage expenditure where standard economic indicators would not do so — EasyJet argues that this would be inconsistent with CAA's statutory duties.
- 6.23 Stansted LACC argues that the CAA should not place more emphasis on incentives to invest at the expense of users' other interests. This would require a judgement by the CAA to balance the long term interests against the interests of current users.

Recommended approach

- 6.24 Both of the proposals discussed above arose at least in part from the gearing up in the water sector after PR99. They seem to have a limited applicability in the case of airports.
- 6.25 We recommend that the CAA should not reflect these proposals in its cost of capital determination for Q5.

Financeability²¹

- 6.26 It is possible that after the takeover and (the coming) refinancing, BAA's gearing would have increased to a point at which stressed financial ratios might be anticipated — and even the practical difficulty of raising finance — if there were significant adverse developments.

²¹ We distinguish two senses of the term "financeability" as reflected in the following questions:

"Is the current appetite in the financial markets for providing funds for BAA (from whatever sources and of whatever type) such that BAA is likely to face practical problems in raising money for capital expenditure (or anything else)?"

"Would any of the financial ratios used by the three leading rating agencies be such, when calculated from BAA or BAA's new parent company, as to imply that new capital would be particularly hard or expensive to raise (e.g. because the company would be below investment grade)?"



- 6.27 We have already noted CAA's clear policy that responsibility for the company's finances rests with the regulated business. However, the question whether the allowance for the cost of capital should include an additional allowance for financeability has been raised, and this section briefly addresses the questions:
- (a) In determining the cost of capital to be allowed in Q5, should the CAA make explicit allowance for the financeability of the existing business or of incremental investments; or should it take the view that this issue is adequately covered by the cost of capital as estimated through CAPM?
 - (b) What steps (if any) might CAA take to make sure that there is no undue risk of BAA facing a problem of financeability?

Should a financeability allowance be made in the cost of capital estimate?

- 6.28 We do not believe that that the calculation of cost of capital for BAA's London airports should make any allowance for possible problems of financeability. Doing so would mean that the costs of dealing with any such problem would have been passed at least in part to customers, rather than remaining with management and shareholders.
- 6.29 CAA's existing policy on the airports speaks against such an adjustment. When deciding on the price caps for Q4, the CAA did not make a separate financeability allowance as it said that the cost of capital had been set so as to reflect the risks faced by each of the BAA regulated airports. The CAA took the view that given the price cap decision and the set of regulatory policies, the adoption of particular financing arrangements was the responsibility of BAA and users should not be expected to carry any risks.²² The CAA also said that price caps should be set on the basis of regulatory fundamentals and not to accommodate particular financing arrangements. It did not accept BAA's view that it should be given regulatory protection if it was to approach critical levels of interest cover through no definite fault of its own.
- 6.30 We conclude that there would be no justification for adding a "financeability allowance" to the cost of capital allowed in Q5. CAA has, we believe, ensured that investors in BAA should be under no misapprehensions that there would be regulatory bail-outs if the company came under financial stress as a result of its chosen method of financing (e.g. a high level of gearing leaving little scope to adjust to a possible downturn in profitability by reducing dividends).
- 6.31 However, as discussed elsewhere, we do recommend that CAA takes steps to ensure also that BAA has no undue incentives to increase gearing.

²² Economic regulation of BAA London airports (Heathrow, Gatwick and Stansted) 2003-2008, CAA Decision, February 2003 p65.



Nature of Investment at Airports

- 6.32 It is sometimes argued that the large and lumpy nature of investment at airports might have an influence on the overall cost of capital - typically the argument is for upwards adjustment. This section breaks the question into two separate components:
- (a) The financial implications of having a large CAPEX programme relative to the existing RAB; and
 - (b) The effect of this CAPEX being focused on a small number of large scale projects rather than many smaller ones, as may be the case in other sectors.

Impact of large CAPEX program

- 6.33 It can be argued that a large CAPEX programme will tend to increase the cost of capital due to what is known as “operational gearing”.
- 6.34 Operational gearing is distinct from financial gearing, and relates to the level of fixed costs (e.g. depreciation on assets) as a proportion of total costs. When operational gearing is high, the company is more exposed to systematic risk from changes in demand caused by economy-wide factors. This is because the variability of net cash flows (i.e. after deduction of the large fixed cost) is greater than it would be if these costs were also varying in line with volumes. So long as the fluctuations in revenue are caused by economy-wide factors, this additional risk is systematic and would therefore be expected to affect the cost of capital within the CAPM framework.
- 6.35 It should be noted, however, that:
- (a) Not all fluctuations in demand and revenue will be due to economy-wide factors.
 - (b) CAPEX is not necessarily a good proxy for fixed costs. Indeed, a large current CAPEX programme provides some opportunities for an airport to reduce its exposure to systematic risk, because it can adjust the scale of its CAPEX programme in the light of new information about likely future demand.
 - (c) The market expectation of the future operational gearing due to CAPEX programme might be reflected in the expectations of future cash flows from the shares, and so be included in the cost of equity estimated from historical data (assuming there have been no major changes in the expected operational gearing during the relevant time period). The expected level of operational gearing might also be priced into any debt premium required today over the risk free rate. Additional adjustments would, in those cases, double - count the effect. It seems reasonable to assume that the effect on operational gearing of major airport CAPEX (stemming from the White Paper) would be included in expectations of the future cash flows.
- 6.36 Some stakeholders may also argue that a large CAPEX programme raises greater financeability issues, or affects gearing. However, it would be wrong to assume that new



CAPEX has to be funded entirely through debt finance. There is no reason why a large CAPEX programme should lead inevitably to an increase in gearing.

- 6.37 More generally, our arguments regarding the inappropriateness of making adjustments for financeability apply in this context.
- 6.38 We would not expect to make adjustments to our market based estimates of the cost of capital due to the size of current or expected CAPEX programmes.

Impact of number of projects within CAPEX programme

- 6.39 A perspective from a corporate finance theory is that a firm is a bundle of “projects”, or investment opportunities, with its own particular risk-reward profile. Since each project (potentially) carries its own risk, each one also carries its own cost of capital (though of course they could be the same). The question, therefore, is whether it matters that there is one large project rather than several small ones.
- 6.40 A natural response could be: “Yes, surely larger projects carry larger risks even when expected returns are the same”. However, the project is likely to be large only from the point of view of the company. As long as the project is not large relative to the market for investments with such risk profiles (or there are enough investment opportunities for any given risk - return profile), (specific) risks around the project are diversifiable by investors.
- 6.41 Some stakeholders might further argue that, even if the cost of capital is unaffected by the fact that CAPEX is focused on a few large-scale projects, this property of CAPEX in the airports sector raises greater financeability concerns. The argument would be that the probability of bankruptcy is greater with a single, large project than with many small-scale projects, and that this will affect the availability and terms of debt finance.
- 6.42 However, our previous analysis of financeability applies. We suggest that it is for the company to choose a financial structure which best suits the risk characteristics of its business. It could be argued, for instance, that equity finance may be more appropriate than debt finance for businesses which face large specific risks of the type discussed above. We have argued that it would not be appropriate for airport users to pay more if the company faces financeability problems due to its chosen financial structure.

Conclusions

- 6.43 We conclude that:
- (a) A large increase in a company’s CAPEX programme could in theory affect the cost of capital due to higher operational gearing, by increasing exposure to systematic risk. The effect of CAPEX in particular could also work the other way, reducing exposure to systematic risk. With regard to BAA airports, however, the effects of the capital expenditure plans might reasonably be expected to be included in current market valuations of the future cash flows, hence no further adjustment would be needed.



- (b) The fact that CAPEX is focused on a few large-scale projects (rather than many small-scale ones, as in the water sector) should not affect the cost of capital, because any additional risks associated with this are diversifiable by investors;

6.44 Neither the size nor the nature of the CAPEX programme affect our earlier conclusions regarding the inappropriateness of making adjustments for financeability.

Indexation of Components of Cost of Capital

6.45 Though not one of the issues highlighted in the CAA consultation, the idea of indexing (some components of) the cost of capital has since been raised by respondents. This section briefly comments on the proposals, particularly on indexing the risk free rate used.²³

6.46 In its May policy update, the CAA commented as follows on a proposal by BA and its advisers CEPA that the allowed cost of capital should be linked to market information:²⁴

“The CAA acknowledges BA’s proposal that the cost of capital should be set low to reflect the current market levels with automatic adjustments in the event that the allowed cost of capital turns out to be too low. However, the CAA considers that there are likely to be a number of factors that would work against its adoption, including the introduction of greater uncertainty over returns to investment, the risk of undermining the properties of incentive based regulation, implications for efficient financial structure and the existence of embedded debt costs. However, the CAA will consider further with its advisers the possibility that such an approach could enhance the regulatory framework.”

6.47 In a subsequent paper CEPA responded to some of these points, suggesting that:

- (a) A mechanism that in effect hedges for debt providers’ interest rate risk is likely to reduce uncertainty about returns, because there would be a better match between the cost of debt and allowed revenues to service the debt.
- (b) The risk-free rate is outside the control of the company and therefore passing it through should not undermine the properties of incentive-based regulation.
- (c) Any implications for efficient financial structure and embedded debt would depend on the exact design of the trigger, and CEPA asserts that mechanisms can be developed that address any concerns in this area.
- (d) The following argument was put forward:

²³ We assume throughout that the regulator is setting a real cost of capital and hence the market information we are interested in relates to real interest rates.

²⁴ CAA, “Airports review – policy update”, 15 May 2006



Transparent non-controllable indicators of the cost of rated debt are readily available. This sort of transparent, automatic adjustment mechanism would keep user charges lower than they would otherwise be, for so long as the low cost of debt available in the markets continued. However, should debt markets tighten, debt providers would know that there would be a compensating adjustment to BAA's allowed revenues and so BAA would still be able to raise the additional debt it needed to finance its investment programmes, potentially at lower cost because of the partial interest rate hedge.”²⁵

- 6.48 CEPA stresses the potential benefits of setting the allowed cost of debt closer to the actual cost of debt in terms of lower charges for airport users. It suggests that the cost of debt at the start of Q5 should be set at 2 per cent with an indexation mechanism, but at 3.375 per cent without such a mechanism. On CEPA's calculations, this would represent a 0.2 per cent difference in BAA's WACC (on its “most likely” scenario, a pre-tax WACC of 5.4 per cent compared to 5.6 per cent.)

Discussion

- 6.49 By definition, in a reasonably efficient capital market prevailing yields for bonds of any given maturity factor in the market's “best guess” about future interest rate movements over the relevant time period. Since it is implausible to suggest that the regulator has better information about future interest rate movements than the market, there is logically no reason why the regulator's assumptions about future interest rates should be based on anything other than observed current market yields for bonds of appropriate maturity.
- 6.50 However, regulators that have used rates higher than that of the market could have been influenced by a perception that the consequences of a change in interest rates are asymmetric: if rates remain low the worst outcome is that companies make a windfall profit, whereas if rates increase unexpectedly companies may find themselves unable or unwilling to finance their investment programmes without a re-opening of their price control.
- 6.51 Hence, it can be argued that some form of indexation would allow customers to benefit from the current low level of interest rates, while ensuring that BAA can continue to finance its investment if interest rates were to increase.
- 6.52 We agree that, *in principle*, an indexation mechanism could reduce uncertainty in returns, and that it need not undermine incentive based regulation.
- 6.53 Only certain components of the cost of capital could be indexed. If the CAA wished to introduce some indexation into the cost of capital, there would appear to be five main options:

²⁵ CEPA, “Setting the Weighted Average Cost of Capital for BAA in Q5”, July 2006, p42



- (a) Indexation of the risk-free rate in the cost of debt (to government gilts or LIBOR), with all other components of the allowed cost of capital fixed at the price review;
 - (b) Indexation of the risk-free rate in the cost of debt alongside indexation of the risk-free rate used in computing the cost of equity;
 - (c) Indexation of the overall cost of debt (to corporate bond yields for a specified credit rating), with all other components of the allowed cost of capital fixed at the price review;
 - (d) Indexation of the overall cost of debt, alongside indexation of the risk-free rate used in computing the cost of equity;
 - (e) Indexation of the risk-free rate for both the cost of equity and cost of debt, alongside indexation of the debt premium (to an index of the corporate debt premium for a specified credit rating). This would be equivalent to option (d) provided that the corporate debt premium were calculated using the same corporate bonds and government gilts.
- 6.54 Indexing (part of) the cost of capital would mean that some systematic risk related to general real interest rises would be transferred to consumers. As a result the consumer should in theory benefit from a lower cost of capital, but face correspondingly increased risk. Within the CAPM framework, this reduction in systematic risk exposure resulting from an interest rate cost pass through would be reflected in a lower equity beta and possibly a lower debt premium for BAA (the two aspects of the WACC which reflect a company's exposure to systematic risk).
- 6.55 Practical issues would include:
- (a) How would one calculate the reduction to the cost of capital that would reasonably compensate customers for taking on the interest rate element of systematic risk? If this were not done, indexation would be equivalent to a subsidy from customers to (the debt component of) BAA's financing costs even if this were more attractive to them than paying a premium over the market cost of debt..
 - (b) How would one ensure that there was no unintended increase in the attractiveness of debt relative to equity finance?
 - (c) If an indexation scheme were to be put in place, which components of the cost of capital should be indexed, and to which type of bonds?

Conclusions

- 6.56 The case for indexation depends partly on whether it is to be compared with a system in which the cost of debt is assessed as accurately as possible, reflecting current interest rates, or with one in which CAA adds a significant margin to this in view of the possibility that interest rates may rise during Q5.



- 6.57 Against the counterfactual of using a significant margin on top of market rates, the option of indexation does have some attractions. However, it would not be straightforward to design, and it would give only partial cover to BAA against interest rate increases (since BAA's borrowings would be unlikely to mirror exactly the interest rates used in the indexation mechanism). Appropriate treatment of embedded debt would not be straightforward.
- 6.58 It would be important to avoid an unintended consequence of making debt seem relatively more attractive than equity finance.
- 6.59 There are alternative mechanisms with which CAA could reduce the risk that an increase in the cost of capital during the course of Q5 left BAA with inadequate ability or incentive to raise capital for investment purposes. One possibility would be to allow the company to recover the cost of locking in current interest rates, as a specific cost item. Another would be to add any desired safety margin to the Equity Risk Premium, or to the aggregate WACC.
- 6.60 If despite the difficulties CAA decides to pursue the interest rate indexation proposal, further analysis will be needed of:
- (a) the detailed design of an indexation mechanism;
 - (b) the reduction that should be made to BAA's estimated beta and possibly debt premium to take account of the transfer of systematic risk from shareholders to customers; and
 - (c) ways of ensuring that debt is not made unduly attractive relative to equity.²⁶
- 6.61 Our recommendation at this stage would be not to introduce an indexation measure, but to decide on a cost of debt that quite closely reflects current interest rates, making any desired "safety margin" allowance at another point in the estimation. If, however, CAA does wish to pursue the possibility, the next steps should be to explore possible designs for an indexation mechanism to see whether the practical difficulties can be resolved and to set out some possible mechanisms in the next stakeholder consultation.

²⁶ It could be argued that this would in theory not be an issue if indexation took the form of indexing the risk-free rate for both the cost of debt and the cost of equity. The issue could potentially arise if indexation were applied only to the cost of debt. In this case, a possible mechanism to address the concern would be to implement the reduction in the cost of capital arising from the transfer of systematic risk entirely through a downwards adjustment to the cost of debt, leaving the cost of equity unchanged (i.e. to use a lower debt premium but an unchanged equity beta)



Real Options

- 6.62 A “real option” is the name given to a management decision over an operational or investment matter — thus the decision is “real”, as opposed to the “financial options” traded in financial markets, which relate to purely financial decisions (e.g. whether or not to buy 100 units of stock ABC at £1 each). Nonetheless, the mathematics of financial options applies, also, to real options.
- 6.63 Among the most important real options in the regulatory context is the “option to wait” before investing. The option to wait will have value when investment decisions are irreversible and net returns are uncertain. If decisions were reversible, then we could undo tomorrow any (ex post misguided) decisions we made today, and so there would be no incentive to wait. Similarly, if there is no uncertainty, then either it is better to invest or it isn’t — there is nothing to wait to find out about.
- 6.64 To understand why the presence of such an option-to-wait affects required returns for investment, consider the following example produced by Robert Pindyck of MIT, in his paper “Mandatory Unbundling and Irreversible Investment in Telecom Networks.”²⁷ Suppose that:
- (a) a firm is considering whether or not to make an irreversible investment that can only be used to support a new application. There is a significant amount of uncertainty regarding demand for the new application by end users.
 - (b) if the firm decides to make the investment now, the (expected) NPV is £10m. This NPV is based on:
 - a 50 per cent chance that there will be no demand for the new application, meaning that the investment will be wasted, and the project’s NPV will be -£20m; and
 - a 50 per cent chance that there will be a significant demand for the new application, meaning that the investment is successful and that the project’s NPV will be £40m.
 - (c) if, as an alternative, the firm is able to wait and see whether there will be a demand for the new application, then the expected NPV will be £20m, higher than the £10m in the example above, since the firm is able to ensure that it invests only in the second scenario and is therefore able to avoid the losses associated with the first, i.e.:

²⁷ As reported in “Ofcom’s approach to risk in the assessment of the cost of capital — First Consultation”, 02/02/05.



- if there is no demand for the new application (which will be the case with probability 50 per cent), the firm will not make the investment, yielding an NPV of zero; and
 - If there is a significant demand for the new application, the investment will be made, yielding an NPV of £40m (although in practice this figure might be lower than the NPV in a “invest immediately and be successful” state of nature figure of £40m quoted above due to the delay in implementation).
- 6.65 In this situation the wait and see option has a value, equal to the difference between the return that the firm would expect on the investment if it invests now compared with the expected NPV if it delays — i.e. £10m in this example.
- 6.66 A key lesson to draw from this example is that the option-to-wait affects the *expected cash flows*. This means that whether risk is specific or systematic is not relevant — there is no equivalent of “diversifying away risk” for the case of effects on expected cash flows.
- 6.67 This example assumes that the firm concerned is a monopolist — it is possible for this firm to secure a positive NPV on investments. When firms operate in a competitive or contestable environment, positive NPVs will not be available — if they were, then entry would bid down prices.²⁸ However, prices will still be affected, as illustrated by the following example.
- 6.68 The example is based on a case where there are many firms, in a competitive environment, each considering supplying one unit per period of a product for which sales will continue forever. Firms face a choice between investing either at the start of today or the start of tomorrow. Investing means that a firm pays a fee (£1m) to buy a licence to sell the product. Firms cannot sell on their licences, so that the fee is sunk, and the investment expenditure is irreversible.
- 6.69 First consider a scenario in which there is no uncertainty. Any firm investing receives a constant net return (R) in every period. In a competitive market just a sufficient number of firms would invest such that the level of supply would push prices to a level that would give the marginal investing firm an NPV of zero from investing. In other words, net returns would be just sufficient to cover the sunk cost of entry, whilst delivering a normal rate of return (given by the cost of capital, assumed to be 10 per cent in this example). Table 6.1 below illustrates this first scenario, “Certainty over future returns”.

²⁸ ...assuming certain technical conditions apply that will not concern us here...



Table 6.1: An Illustrative Example I

Scenario		Net returns, today	Net returns, tomorrow
Certainty over future returns	Returns	R	R/0.1
	NPV	11R - £1m	
No firm has an option to wait	High	X_H	$X_H / 0.1 = 10X_H$
	Low	0	0
	Expected, as of today	$0.5X_H$	$0.5(10X_H) = 5X_H$
	NPV	$5.5X_H - £1m$	
One firm can wait and see, and invests tomorrow only if demand high	High	-	$10X_H$
	Low	-	-
	Expected as of today	-	$5X_H$
	Expected return from waiting (discounted value at start of today)	$0.5(10X_H - £1m / 1.1)$	

Notes:

Investors are assumed risk-neutral;

The discount rate is 10 per cent = 0.1;

The probability of high demand is assumed to be 50 per cent = 0.5;

Net returns are net of production costs; and

The (sunk) investment cost is £1m.

- 6.70 In competitive equilibrium this suggests that R must be £0.09m per period, receiving a constant payment of £0.09m per period, starting from today, is financially equivalent to receiving £1m today given an interest rate of 10 per cent p.a.
- 6.71 In the “certainty” scenario, firms are indifferent between investing today and investing tomorrow i.e. there is no real option value. This is because firms have no incentive to wait to invest, since waiting until tomorrow to purchase a licence just means missing one day of sales, but also delaying the payment of the £1m investment cost.
- 6.72 The second and third scenarios in Table 6.1 consider situations in which there is uncertainty over how much demand there will be. Demand could be “high” or “low”, with probability $p (=0.5)$ in each case. For simplicity, “low” demand means zero demand in this example.
- 6.73 Assume that firms find out today how much demand there will be in each period for the rest of time (and therefore what the net returns each period will be in the high demand scenario, denoted X_H). Importantly, they do not know this at the start of today.
- 6.74 Since there is uncertainty, firms have to make their decisions on the basis of expected outcomes. If there were no option to wait, i.e. if today were the only day on which a licence could be bought, then (as in the certainty case) firms would purchase licences if



the net present value of the expected stream of profits from the investment were zero. This is the second scenario in Table 2.1 “No firm has an option to wait”.

- 6.75 In competitive equilibrium, exactly a sufficient number of firms would purchase licences such that, given the supply of product from those firms, the expected NPV of the marginal investing firm would be zero. In Table 6.1 this means supply is sufficient that prices deliver returns net of production costs of $X_H = £0.18\text{m}$ per unit. If demand turned out to be low, then on average firms with licences would make losses (or less-than-normal profits), while if demand turned out high, then on average firms with licences would make (greater-than-normal) profits. But expected profits, at the time of the investment decision (i.e. at the start of today), would be just normal profits for a competitive industry.
- 6.76 Now consider the third scenario, titled, “One firm can wait and see, and invests tomorrow only if demand is high”. Suppose that there is just one firm with a genuine option to wait (e.g. only one firm could buy a licence tomorrow), and that once all other firms have made their investment decisions the NPV to this firm from investing today (given the prices that are implied by the supply from all other firms) is £0. Alternatively, it could be imagined that this firm, with the option to wait, is a regulated monopoly, with the regulator having set prices constant in each period (i.e. at $X_H = £0.18\text{m}$ above production costs), at a level at which the NPV from investing today is £0.
- 6.77 Should such a firm invest today? The answer is no: waiting leads to greater-than-normal profits if demand is high whilst avoiding the losses if demand is low. So the expected profits from waiting are strictly higher than those from investing today. There is an expected return from investing today of £0, while investing later delivers $0.5(10X_H - £1\text{m} / 1.1) \approx £0.45\text{m} > £0$. The option to wait leaves such a firm with above-normal expected profits.
- 6.78 Next consider Table 6.2. In a competitive scenario, if all firms had an option to wait, then some would choose to wait. Because some firms wait before investing, today’s supply will be lower and hence today’s prices (delivering net returns of $Y_H = £1.09\text{m}$) higher than in the absence of options to wait. Higher prices today make investing early more attractive, so while some firms wait, others invest. To understand the point being made, note that if no firms chose to wait, then any one firm waiting would be in the position of the firm in third scenario in Table 6.1, i.e. waiting would be better than investing for this firm.
- 6.79 However, if demand turns out to be high, sufficient firms will enter tomorrow to compete down prices (delivering net returns of Z_H per period from tomorrow onwards) at a level that will eliminate later excess profits. They invest under conditions of certainty, so the prices in later periods of high demand are the same as those in the certainty scenario (therefore $Z_H = £0.09\text{m}$). Sufficient firms will wait so that today’s supply will be low enough (and so the prices paid to early investors today high enough) to make waiting and



not waiting equally attractive — so some firms invest early and others will wait. This means that in equilibrium, under the competitive conditions in this example, the real option value of waiting is zero.²⁹

6.80 However, the option to wait, whilst not affecting the total return of firms, has had an effect on the path of prices relative to a counterfactual under which there had been no option to wait. They are higher in the short-term than if there had been no option to wait, but lower in positive outcomes of long-term futures. In the example in Table 6.2, short-term prices (over and above production costs) rise from the £0.18m per unit of Table 9.1 to £1.09m per unit in the short-term, but fall to £0.09m per unit in the longer-term if demand is high.

Table 6.2: An Illustrative Example II

Scenario		Net returns, today	Net returns, tomorrow
Many firms can wait — returns to those investing today	High	Y_H	$Z_H / 0.1 = 10Z_H$
	Low	0	-
	Expected as of today	$0.5Y_H$	$0.5(10Z_H) = 5Z_H$
	Expected return from investing today (discounted value at start of today)	$0.5Y_H + 5Z_H - £1m$	
Many firms can wait — returns to those investing tomorrow if demand is high	High	-	$10Z_H$
	Low	-	-
	Expected, as of today	-	$5Z_H$
	Expected return from waiting (discounted value at start of today)	$0.5(Z_H - £1m / 1.1)$	

Notes:

In competitive equilibrium when all firms have an option to wait,

$$0.5Y_H + 5Z_H - £1m = £0 = 0.5(10Z_H - £1m / 1.1) \Rightarrow Y_H \approx £1.09m > X_H \approx £0.18m \text{ and } Z_H \approx £0.09m < X_H \approx £0.18m$$

(Note that $£1.09m + £0.09m/1.1 + £0.09m/1.12 + \dots = £2m$. So once again it is worth £1m to have a 50 per cent chance of getting the stream of payments when demand is "high".)

6.81 The implication of this is that, under uncertainty, short-term prices are high enough for the successful outcomes to be sufficiently profitable for them to compensate the early investor for the unsuccessful outcomes, whilst investors that wait until uncertainty is resolved still

²⁹ Note that we are assuming that prices can rise high enough in the short-term to induce some firms to invest early (i.e. in the limited case, we are assuming that the monopoly price is sufficiently high to make it worthwhile to be the sole provider). Otherwise the NPV of investing early is negative and the real option value of waiting is positive. However, this no-early-investment case is uninteresting since the point of the exercise is to consider what adjustment to the cost of capital might be required to induce a regulated firm to invest early—the possibility of inducing early investment is therefore assumed.



make only normal profits — prices fall as uncertainty is eliminated (even when, as is assumed in this example, investors are risk-neutral).³⁰

- 6.82 If the purchase of the licence were not irreversible (e.g. if it could be sold back to the licensing authority for £1m) then, even if there were an option to wait, firms would invest up to the point at which the marginal investor had an NPV of zero. In this scenario, if demand turned out to be low some investors would “exit” by selling back their licenses.

Settings in which to make real options adjustments

6.83 The implications of this discussion are as follows:

(a) Real options adjustments can be appropriate, if the necessary conditions are present ; and specifically if

- There is an option to wait and see (investments are not “now-or-never”).
- Net returns are uncertain.
- Investments are irreversible
- There are not corresponding “positive” options that offset the wait-and-see option effects, such as the option to do follow-on investment.

(b) When there are real options adjustments, they should be made so as to affect the time profile of returns, rather than the overall NPV. Specifically, returns in early periods, after the investment but before the resolution of all uncertainty, should be higher than the cost of capital adjusted for a “fair bet”, but lower than this “fair bet” cost of capital in later periods.

(c) Thus, if an investor has, as a result of being compensated by the regulator for loss of a wait-and-see option, received a return above the “fair bet” cost of capital in an earlier period, and if uncertainty has now been resolved, then that investor should now receive a rate of return below the “fair bet” cost of capital.

6.84 However, it should be noted that real options adjustments should be restricted to cases of particular significant investments, rather than applied to all degrees of investment at the level of an industry. This was, the approach offered by Ofcom at the time of its August 2005 Final Statement on its approach to risk.³¹ Paragraph 9.57 stated:

³⁰ Note that in this case the “fair bet” requirement (higher-than-“normal” returns in high demand cases to compensate for lower-than-“normal” returns in low demand cases) is still achieved, but this time is done via front-loading of the higher returns.

³¹ Ofcom was the first regulator to confirm that it would consider the use of real options adjustments in its assessment of the cost of capital.



“Ofcom’s view is therefore that, for the foreseeable future, it will not be appropriate for it to attempt to develop a model with which to value real options, such as the one developed by Robert Pindyck and included in the Analysis Group response. Some stakeholders have argued that a simple approach such as decision tree modelling might yield potentially powerful insights, a view that may be closer to the most appropriate means by which to take this analysis forward.”

- 6.85 (To understand the significance of this paragraph, it should be noted that the approach favoured by Pindyck is set out in the well-known Dixit and Pindyck textbook, *Investment Under Uncertainty*, and involves a continuous model. In contrast, a decision tree approach intrinsically involves discrete choices.) Ofcom also said that it took the view that real options adjustments were to be made on a “case-by-case” basis³², where the tenor appeared to be that the “cases” concerned were particular investments (or, perhaps, particular products³³), rather than particular industries.

Real Options in Q5

- 6.86 In its ruling on BAA’s cost of capital in Q4, the Competition Commission quoted the possibility of waiting as one of four key factors justifying an increment to the cost of capital in respect of T5. It is not clear from the argumentation how much of the uplift related to real option issues, therefore we do not consider the issue further for T5. However, we do believe that real options adjustments are relevant in the case of an additional new runway at Stansted.
- 6.87 As mentioned above, the basic requirements are that
- There is an option to wait and see (investments are not “now-or-never”).
 - Net returns are uncertain.
 - Investments are irreversible
 - There are not corresponding “positive” options that offset the wait-and-see option effects, such as the option to do follow-on investment.
- 6.88 For practical purposes, these requirements might be broken down into a set of questions, such as follows:
1. Is there a practical possibility of waiting before investing?
 2. Is there a significant amount of demand uncertainty (e.g. do returns on investment depend on significant-and-uncertain demand growth)?

³² See paragraph 9.50 of the Final Statement.

³³ At 9.51 of the Final Statement, it is stated: “the onus will in most cases be on stakeholders to persuade Ofcom of the relevance of real options theory to particular wholesale products.”



3. Can the uncertainty for the firm be resolved without the firm itself committing to the investment?
 4. Can the investment be staged, reversed, or piloted (thereby reducing materially the extent to which it is really “irreversible”)?
 5. Are there other alternative investment strategies available (e.g. some way to address the upside possibilities without facing the same downside exposure — e.g. perhaps increasing the intensity of use of an existing runway)?
 6. Could the wait-and-see option be mitigated by gaining a first-mover advantage?
- 6.89 In the case of an additional runway at Stansted, it seems that the answer to (1) is probably Yes; to (2) is clearly Yes; to (3) is unclear; to (4) is clearly No; to (5) is probably No; and to (6) is No.
- 6.90 Consequently we conclude that the application of a real option adjustment to the permitted regulated price path for Stansted may be appropriate if the answer to (3) is Yes.
- 6.91 The calculation of the appropriate adjustment would require:
- (a) Data on the contribution of the runway to total Stansted RAB;
 - (b) Data on uncertainty in demand for use of the runway, and on how such uncertainty might evolve in the future;
 - (c) Data on uncertainty in costs of building the runway, and how such uncertainty might evolve in the future;
 - (d) Discussion/Data on any available investment strategies.
- 6.92 With the data above, it should be possible to calculate the path of regulated prices that would induce early investment whilst leaving the NPV at zero.

These issues merit further consideration. As discussed elsewhere, the circumstances at Stansted are materially different from those in the other two airports, and this may be a context in which development of real option principles is relevant. The implication might be to allow a higher rate of return to be earned in early years (if the market would bear this) balanced by lower rates of return later.



7 SUMMARY OF RECOMMENDED POLICY FRAMEWORK

- 7.1 This paper has addressed the following questions, drawing recommendations when relevant.

In Section 2:

- 7.2 **Should the general approach to setting the cost of capital be CAPM, as indicated by CAA in the consultation paper; and if so, what are the other methods that should be used to check/ confirm the calculations made through the CAPM framework?**
- 7.3 We recommend that the CAPM-WACC framework should remain the main analytical basis for setting the cost of capital. The estimates should be reviewed in the light of calculations of the Market to Asset Ratio (or Tobin's q) for the RAB, and of the dividend growth model.
- 7.4 We do not recommend the use of arbitrage pricing theory models for this regulatory purpose. However, there could be merit in investigating extensions to the CAPM-WACC framework in the future, perhaps by the method of third moment CAPM.

In Section 3:

- 7.5 **How should tax be treated in calculating the cost of capital, bearing in mind both regulatory precedent and the need to apply the cost of capital to separate airports whereas tax is paid at a group level?**

Although some other regulators have moved towards using estimates of the effective rate of corporation tax in calculating the pre-tax cost of capital, regulatory precedent for BAA suggests a continued reliance on the use of the statutory rate of tax. This leaves intact the incentives provided by the system of capital allowances. It will also simplify the exposition of the separate costs of capital for each regulated airport and avoid the need for complex and potentially intrusive assessments of the tax position of BAA within the Ferrovial group.

In Section 4:

- 7.6 **Does an increase in gearing reduce the cost of capital, and does it raise problems for economic regulation?**
- 7.7 An increase in gearing can affect the cost of capital as discussed in Section 4. In so far as these changes arise from undistorted market behaviour and incentives, they should not be of concern to regulators; there has been a general market move to increase gearing. However, it is prudent to assume that the presence of regulation may cause some distortion (e.g. an expectation of bail outs, or gaming).



- 7.8 With regard to gearing, the CAA should base its calculations of the cost of capital on a notional level of gearing, broadly in line with market evidence of what might currently be regarded as a normal level for a regulated airport. The pre-tax cost of capital should be calculated using this notional rate of gearing.

In Section 5:

- 7.9 Should there be separate calculations of the cost of capital used at the different regulated airports and if so how should they be calculated in the absence of separate shares?**

Separate calculations should be made of the cost of capital at the different regulated airports. These would take account of differences in the nature of revenues at each and the extent to which these are subject to systematic risk; and similarly for the operating and capital costs at each airport. The relevant form of control at Stansted should take account of the particular circumstances there, and the possible relevance of the value of options concerning the investment programme.

- 7.10 The calculation should proceed from an estimate of the group WACC, allocating this to the regulated airports and rest of the BAA group by analysing the relative asset risk of each.

In Section 6:

- 7.11 Should there be a split or front-loaded cost of capital allowance for investment in BAA's regulated airports?**

We do not suggest action on these proposals.

- 7.12 Should CAA be concerned about the "financeability" of BAA or of its investment programme, if it has allowed an appropriate cost of capital?**

With regard to financeability, no addition should be required to the revenues calculated under the CAPM framework. CAA has emphasised that the owners and management of the regulated airports must bear responsibility for the financing methods adopted.

- 7.13 Does the large and lumpy nature of airport capital programmes affect the risk exposure such that a correction upwards of a market based cost of capital estimate is warranted?**

A large increase in a CAPEX programme could in theory affect the cost of capital due to higher operational gearing, by increasing exposure to systematic risk. However, these effects might reasonably be expected to be included in current market valuations of the future cash flows, hence no further adjustment would be needed.

The fact that CAPEX is focused on a few large-scale projects should not affect the cost of capital, because any additional risks associated with this are diversifiable by investors.



7.14 Should CAA introduce a system whereby the cost of borrowing for BAA is linked to an appropriate indicator of interest rates, allowing a lower allowance for interest costs in the cost of capital compensated by allowing possible increases in interest rates during Q5 to be passed through in airport charges?

We do not recommend this, since it would be complex and should not be necessary if the allowance for interest charges is set at a realistic level. However, if CAA wishes to pursue the suggestion, a scheme should be developed for consultation in which there is no inappropriate inducement for BAA to use debt rather than equity finance.

7.15 Should an allowance be made in the rate of return estimated for each airport to reflect the value of real options to defer investments?

This approach is only relevant in circumstances where:

- There is an option to wait and see (investments are not “now-or-never”).
- Net returns are uncertain.
- Investments are irreversible
- There are not corresponding “positive” options that offset the wait-and-see option effects, such as the option to do follow-on investment.

However, these circumstances appear to apply to investment at Stansted, and the application should be explored.