

# **ALLOWED PROFIT I: COST OF CAPITAL – FOR THE UK INLAND MAILS BUSINESS OF CONSIGNIA**

## **Paper 3 of a series of papers prepared by Consignia in June 2002 for Postcomm’s review of the price control for 2003**

### **Summary**

This paper considers the evaluation of the pre-tax, real Weighted Average Cost of Capital (WACC) for the UK inland mails business which, when applied to the regulatory asset base (RAB), can be used to estimate the allowed profit for the price control.

The WACC is evaluated from estimates of generic and company-specific parameters that include the risk-free rate, equity risk premium, debt premium, gearing, equity beta and tax adjustment. In general, Consignia considers that the generic parameters have been extensively reviewed by, amongst others, the Competition Commission and that the valuation of the generic parameters should be based on the Competition Commission’s most recent cases. At present, this would result in a risk free rate of 3 per cent and equity risk premium of 4 per cent. These figures may need to be revised following further reports from the Competition Commission later this year.

The WACC approach was not used in setting the present, and first, price control within Consignia’s Licence. Consequently, the company-specific parameters have not been reviewed previously for a price control of the UK inland mails business. Consignia estimates the debt premium to be 0.3 per cent; the actual gearing to be about 0.2; and tax adjustment to be about 1.43.

The remaining company-specific parameter is the beta value that reflects the equity risks associated with the company. Consignia is a publicly owned company for which there is no share price and thereby no direct means of assessing the beta value through the standard capital asset pricing modelling approach. However, there is regulatory precedent and statistical support for the asset beta selected by regulators increasing with increases in OPEX:profit ratio and, since profit is a function of the RAB, increases the OPEX:RAB ratio of the regulated industries. For a RAB value of between £3bn and £5bn, Consignia estimates, from the asset betas selected by other regulators and OPEX:RAB ratios of the regulated companies, the asset beta for the UK inland mails business to be in the range of 0.93 to 1.31 for OPEX:RAB ratios of 1.05 to 1.75. The estimates of the generic and company-specific parameters yield a range of the pre-tax, real WACC of 9.4 to 11.6 per cent, depending on the level of the OPEX:RAB ratio assuming a RAB in the range of £3bn to £5bn. This range of WACC on the RAB is consistent with a pre-tax return on turnover of about 6 to 9 per cent. The WACC estimate depends on the OPEX:RAB ratio which, in turn, depends primarily on the coverage of the control and the estimation of the RAB-value.

This paper sets out the general principles for deriving the WACC estimate of the UK mails business of Consignia. The RAB-value and estimation of the allowed profit is the subject of Consignia’s paper entitled “Allowed profit II: regulatory asset base - for the UK inland mails business of Consignia” (May 2002).

## 1. Introduction

This paper sets out the case for use of the Weighted Average Cost of Capital (WACC) as a means of assessing the allowed profit for the price control. It has been prepared with the assistance of OXERA Consulting Ltd, an experienced economic and regulatory consultant.

The WACC approach has been used in periodic price control reviews in other regulated industries over many years. It combines evaluations of the financial costs of equity and debt of a company to form a Weighted Average Cost of Capital (WACC). The WACC is then applied to the RAB to derive the allowed level of annual profits. The RAB value is discussed in a separate, but related, paper<sup>1</sup>.

The general rationale for use of the WACC to estimate the cost of capital is discussed in section 2. The WACC is evaluated from estimates of generic and company-specific parameters that include the risk-free rate, equity risk premium, debt premium, gearing, equity beta and tax adjustment. The WACC calculation is based on the following:

- i. Cost of debt = Risk free rate + debt premium
- ii. Asset beta = (Equity beta) . ( 1 – Gearing)
- iii. Post tax cost of Equity = Risk free rate + Equity beta (Equity risk premium).
- iv. Pre-tax cost of Equity = Post-tax cost of Equity (Tax wedge).
- v. WACC = Gearing.(Cost of Debt) + (1- Gearing).(Pre-tax cost of Equity)

The generic parameter estimates are discussed in section 3. In general, Consignia considers that the generic parameters have been extensively reviewed by, amongst others, the Competition Commission and that the valuation of the generic parameters should be based on the Competition Commission's most recent cases. In contrast, some of the company-specific parameters have not been reviewed previously within the context of a price control for Consignia.

The company specific parameter estimates are discussed in section 4. This section discusses, in some detail, factors that need to be considered in assessing the company-specific beta value.

The conclusion, in terms of estimates of the pre-tax, real WACC for the UK inland mails business of Consignia, are set out in section 5. These estimates depend primarily on the OPEX:RAB ratio.

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<sup>1</sup> "Allowed profit II: the regulatory asset base for the UK inland mails business of Consignia", Consignia, May 2002

## **2. Weighted Average Cost of Capital approach**

The capital asset pricing model (CAPM) is a means of measuring the risk and appropriate return on assets. It has been used in periodic price control reviews in other regulated industries over many years to evaluate the beta-value for the WACC. According to the assumptions underpinning CAPM, it is only those risks that are correlated with overall market risk that should be of concern to investors. These risks, which are primarily the sensitivity of demand to the macroeconomic business cycle, are ones that investors cannot normally diversify away or avoid within a well-balanced portfolio of assets. However, those factors which influence demand but which operate at a firm- or industry-specific level, can normally be avoided through diversification and do not form part of CAPM analysis. CAPM analysis is used to assess the beta value that measures the correlation between returns to a company's investors and movements in the market as a whole and thereby the level of risk that investors cannot avoid with a well-balanced portfolio.

Consignia is a publicly owned company for which there is no share price and thereby no direct means of assessing the beta value through the standard CAPM approach. In practice, the CAPM approach has been used to estimate the cost of equity used in the WACC calculation in the setting of the price controls of other regulated businesses without such information. An assessment of the beta value can be made from, amongst other factors, consideration of regulatory precedent, the characteristics of the company and the environment in which the company operates that affect the correlation between company risk and overall market risk.

Consignia considers that the cost of capital for its UK inland mails business can be reasonably assessed from this approach. Furthermore, this approach is used by other UK regulators and creates a familiar framework for evaluating risk. It is preferred by Consignia over alternative approaches, including, for example, a general assessment of the return on turnover may yield. Consignia notes that once the level of allowed profit has been evaluated in this manner, it may be converted into an allowed return on turnover as a further check on the reasonableness of the level of allowed profit.

### 3. Generic Parameters

#### 3.1 *Risk free rate*

The risk-free rate is normally set with reference to the yields on government-issued index-linked gilts. In the regulatory environment there has been considerable debate over the extent to which *current* yields on index-linked bonds are the most appropriate measure of the risk-free rate.

Consignia considers that:

- i. given the variability of real interest rates over time, a reasonable range for the risk-free rate should take account of longer-term historical evidence, as well as most recent data; and
- ii. short-term imbalances between supply and demand in the market for index-linked bonds mean that current yields are artificially depressed and therefore an unreliable indicator of future interest rates.

Consignia also considers that, since there is, as yet, no general consensus for the appropriate value of the risk-free rate, the valuation of the risk free-rate should be based on the recent position expressed by the Competition Commission. The Competition Commission last investigated this subject in summer 2000<sup>2</sup>, and concluded that a risk-free rate of 3 per cent should be used in cost of capital calculations.

Consignia notes that the Competition Commission is scheduled to report on two further cases—BAA and Manchester Airport’s price-control review, and the four calls to mobiles cases—before Postcomm publishes its final conclusions. Consignia considers that the risk free rates used in these decisions should be factored in for assessment of the final risk-free value used in setting the cost of capital for Consignia’s price control.

#### 3.2 *Equity risk premium*

As with the debate on the risk-free rate, there is, as yet, no general consensus for the appropriate value of the equity risk premium. Since this is the case the valuation of the equity risk premium should be based on the recent position expressed by the Competition Commission. In this regard, Consignia notes that in 1998 the Monopoly and Mergers Commission used a range of 3.5 to 5.0 per cent<sup>3</sup> and in 2000 the Competition Commission used a figure of 4 per cent in its reports on Mid Kent Water and Sutton & East Surrey Water. Consignia considers that the equity risk premium used in the forthcoming Competition Commission reports

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<sup>2</sup> ‘Mid Kent Water plc: A Report on the References under Sections 12 and 14 of the Water Industry Act 1991’, September; and ‘Sutton and East Surrey Water plc: A Report on the References under Sections 12 and 14 of the Water Industry Act 1991’, Competition Commission, September 2000.

<sup>3</sup> See, for example, ‘British Telecommunications plc: A report on a reference under section 13 of the Telecommunications Act 1984 on the charges made by BT for calls from its subscribers to phones connected to the networks of Cellnet and Vodafone’, MMC, 1998.

(discussed in subsection 3.1) should be factored in for assessment of the final equity risk premium used in setting cost of capital for Consignia's price control.

## **4. Company-specific Parameters**

### **4.1 Debt premium**

The debt premium is perhaps the most straightforward of all parameters to estimate using objectively verifiable data. At the time of writing, Consignia was borrowing from the National Loans Fund at various rates equal to AA-rated corporate bonds. The average *nominal* cost of debt is about 5.8 per cent. For expected inflation of 2.5 per cent, the real effective interest rate is about 3.3 per cent. Assuming a forward-looking return on debt of the risk-free rate of 3.0 per cent (as discussed in subsection 3.1), the debt premium for Consignia is about 0.3 per cent.

### **4.2 Gearing**

Some regulators have calculated the WACC using the actual gearing while others have used estimates of an efficient gearing level. Those regulators that have used the approach of an efficient gearing level have done so and concluded a low out-turn cost of capital by balancing the tax advantages of increasing levels of debt against the additional risk of financial distress as gearing levels increase.

Consignia considers that the actual gearing level, and not an estimate of an efficient gearing level, is appropriate for Consignia. Firstly, the concept of an optimal efficient level of gearing is fairly subjective, given the complex relationship between capital structure and the cost of capital and no adequate mechanism readily available to model it. Secondly, Consignia's gearing level cannot be adjusted to an optimal efficient level because of borrowing constraints under public ownership. Consignia considers it appropriate to take its present gearing level when calculating the cost of capital which, when defined as debt/(debt + equity), is approximately 0.2.

### **4.3 Beta value**

#### **4.3.1 Introduction**

The equity beta reflects the equity risks associated with the company and is a factor applied to the equity risk premium to estimate the cost of equity in the WACC calculation. An assessment of the asset beta value can be made from, amongst other factors, consideration of regulatory precedent, the characteristics of the company and the environment in which the company operates that affect the correlation between company risk and overall market risk. The asset beta figure can then be converted into an equity beta by taking into account the effects of gearing levels to derive an equity beta. For this, other regulators have used the 'Miller' transformation, whereby  $\text{equity beta} = (\text{asset beta}) \times (1 + \text{debt/equity})$ . Consignia considers that the same transformation is appropriate for its UK inland mails business.

Estimates of the asset and equity betas for the UK inland mails business of Consignia are discussed in some detail in the subsections 4.3.2 to 4.3.6. In this text reference is made to:

- the fact that the beta value can be affected by the market environment in which a company operates. The subsequent estimation in this paper does not include any adjustment for the impact of, for example, liberalisation. This is on the assumption that it is fully dealt with elsewhere in the control (e.g. through the structure of the control<sup>4</sup>);
- the theoretical relationship between the beta value and the OPEX:RAB ratio;
- the rail regulator's use of such a relationship in selecting the asset beta for use in its last price control;
- the statistical relationship between the asset beta selected by regulators and the OPEX:RAB ratio of the regulated industries. This enables a range of asset beta estimates to be made for the UK inland mails business.

### 4.3.2 Key assumptions

Academic evidence indicates that, at the onset of liberalisation, companies' betas increase.<sup>5</sup> In a regulated environment, following either a positive or adverse cost or demand shock, there may be some justification for regulatory intervention to limit the effect on the company, either to limit the upside gains or to avoid the problems of the existing provider going bankrupt. By contrast, the justification for regulatory intervention in a market that is increasingly subject to competitive pressure is much reduced: the problems associated with the existing provider facing bankruptcy are reduced when established alternative providers are available, while any intervention in the event of upside gains seems unjustifiable where competition is supposed to have replaced regulation. Consequently, profit volatility is greater in a competitive environment, feeding through into a higher beta figure.

Some regulators have adjusted the cost of capital, effectively via the beta value, to reflect the impact of liberalisation. For example, in 1999 OFFER stated:

*“Distribution is a monopoly business with little scope for the development of competition in the operation of the network, the demand for electricity is also stable. Supply and metering businesses are increasingly subject to competitive pressures and could be expected to be more risky than the distribution business alone. The proposal to separate out these activities from the distribution business may reduce the level of beta for a standalone distribution business in the future.”*<sup>6</sup>

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<sup>4</sup> See “Volume risk I: forecasting errors – for the UK inland mails business of Consignia” and “Volume risk II: cream skimming entry – for the UK inland mails business of Consignia”, Consignia, May 2002.

<sup>5</sup> See, for instance, ‘An Analysis of the Impact of Regulatory Change: The Case of Natural Gas Deregulation’, Economic Review 20(1),pg 36-54,Chen, A. and Sanger, February 1985; ‘Deregulation and Risk: Evidence from Earnings Forecasts and Stock Prices’, Risk Management, Fraser, D.R. and Kannan S. winter 1990; ‘Risk and Regulation: An Empirical Test of the Relationship’, Economics Letters, 6, Hogan, W.P., Sharpe, I.G., and Volker, P.A. 1980; and ‘Regulation, Profit Variability and Beta’, Journal of Regulatory Economics, 15:3, Binder, J.J. and Norton, S. May 1999.

<sup>6</sup> ‘Reviews of Public Electricity Suppliers 1998 to 2000 Distribution Price Control Review: Consultation Paper’ OFFER, 1999.

In addition, in 1995 Hydro-Electric Monopoly and Mergers Commission case<sup>7</sup>, the appropriate return on turnover for the electricity supply business was taken to be 0.5 per cent, which equated to a 7 per cent return on capital employed. However, during the consultation process for the 1998–2000 supply price control, the appropriate return on turnover was increased to 1.5 per cent (which equated to a 21 per cent return on capital employed) to compensate the risk of a greater liberalisation with a significantly greater reward.

The evaluation presented in this paper assumes a price control period of up to five years<sup>8</sup> and the application of the optimal hybrid price control structure and adjustment to the level of allowed revenue associated with cream-skimming entry discussed in separate papers<sup>9</sup>. Those papers set out measures to address the subject of risks associated with deviations in the outturn volume from the forecast volume used in setting the control. To the extent that those risks, which also relate to the impact of liberalisation, are not addressed through the structure of the control, then the estimate of the beta value that is presented in this paper would need to be increased.

#### **4.3.3 Theoretical relationship between the asset beta and the opex/RAB ratio**

One of the key factors that affect the relative risks of the regulated industries is the ratio of operating cost (OPEX) to profit or, alternatively, the ratio of OPEX to RAB - since allowed profit is a function of the RAB. Profits are, in effect, a 'residual claimant' after costs have been covered. For 'high capital intensity' industries there is a low OPEX:RAB ratio such that a small change to costs or revenues has a relatively small impact on profit levels. However, for 'low capital intensity' industries there is a high OPEX:RAB ratio such that it takes only a relatively small change to costs or revenues to feed through into a significant proportionate impact on profit levels.

This is illustrated by a comparison of the returns of a low and high-capital intensive industry in Tables 1 and 2 respectively. The low capital intensive industry has an allowed OPEX of 90 and RAB of 50 in Table 1; the high capital intensive industry has an allowed OPEX of 50 and RAB of 250 in Table 2. In each case a period of 5 years is taken over which the allowed total revenue of 100 is the same each year; the allowed profit is taken as 10 per cent of the respective RAB values; and out-turn OPEX varies from the allowed OPEX by the same percentage over a 5-year period. For simplicity, capital expenditure is assumed to equal depreciation – where depreciation is taken to be 10 per cent of the RAB value.

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<sup>7</sup> 'Scottish Hydro-Electric plc: a report on a reference under section 12 of the Electricity Act 1989', MMC, 1995.

<sup>8</sup> As explained in "Andersen's Assessment of the Financial Impact of Competition on Consignia: A Response by Consignia", April 2002, the beta value would increase for a price control period beyond 5 years.

<sup>9</sup> "Volume risk I: forecasting errors- for the UK inland mails business of Consignia" and "Volume risk II: cream skimming entry - for the UK inland mails business of Consignia", Consignia, May 2002.

Table 1: The effect of changes of out-turn operating costs on the rate of return for a low capital intensive industry with high ratio of OPEX to RAB, (i.e. OPEX of 90 and RAB of 50).

	Year 1	Year 2	Year 3	Year 4	Year 5
RAB	50	50	50	50	50
Revenue requirement	100	100	100	100	100
Assumed OPEX	90	90	90	90	90
Assumed depreciation	5	5	5	5	5
Assumed profit (i.e. allowed rate of return = 10%)	5	5	5	5	5
Actual OPEX	99	81	99	81	90
Actual profit	-4	14	-4	14	5
Actual rate of return %	-8	28	-8	28	10

Table 2: The effect of changes of out-turn operating costs on the rate of return for a high capital intensive industry with low ratio of OPEX to RAB, (i.e. OPEX of 50 and RAB of 250).

	Year 1	Year 2	Year 3	Year 4	Year 5
RAB	250	250	250	250	250
Revenue requirement	100	100	100	100	100
Assumed OPEX	50	50	50	50	50
Assumed depreciation	25	25	25	25	25
Assumed profit (i.e. allowed rate of return = 10%)	25	25	25	25	25
Actual OPEX	55	45	55	45	50
Actual profit	20	30	20	30	25
Actual rate of return %	8	12	8	12	10

For each of the 5 years shown in Tables 1 and 2, the actual return on the RAB is calculated taking account of the change in actual operating cost from allowed operating cost. The average actual rate of return over the 5 years is the same for both cases at 10 per cent. However, because of the much greater proportion of the revenue requirement being driven by operating costs in Table 1, the same proportionate change in OPEX leads to a much greater volatility in the actual rate-of-return figures. In the low capital intensity case, the standard deviation of the rate of return is 18, while in the high capital intensity case the standard deviation is 2. This difference leads a much higher beta value for the low capital-intensive industry relative to the high capital-intensive industry.

#### 4.3.4 Evidence of the relationship between the asset beta and the opex/RAB ratio

##### (i) Asset beta values for other regulated industries

Figure 1 shows the range of asset beta values used in recent periodic price reviews of UK regulated industries. The asset beta ranges from 0.3 to 0.5 for electricity, gas and water networks, 0.5 to 0.7 for rail and airports and 0.9 for BT (telecommunications). The different asset betas reflect the different risks of the companies. However, since the asset beta is less than unity in each case, the risks of the company are considered to be less than the average in the UK market as a whole.

Figure 1: Asset beta values used in recent periodic price reviews of regulated industries

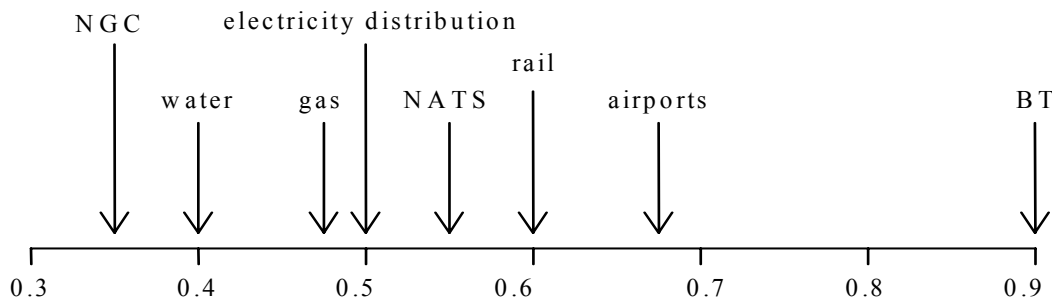


Table 3 shows the OPEX to RAB ratios and most recent asset betas used by regulators for a range of regulated companies. The table shows that, in general, the asset beta increases with increases in the OPEX:RAB ratio. The main exception is that of BAA which has a high asset beta for the OPEX:RAB ratio that reflects, amongst other factors, the dominance of a single project, Heathrow's Terminal 5, in the investment plans of BAA<sup>10</sup>. The correlation between the asset beta and OPEX:RAB ratio is 0.72 for the whole data set and 0.86 with the exclusion of BAA.

<sup>10</sup> See also "Allowed profit II: regulatory asset base – for the UK inland mails business of Consignia", Consignia May 2002.

Table 3: The most recent asset betas selected by regulators and the OPEX:RAB ratios of the regulated companies.

Company/sector	Date	OPEX:RAB ratio	Asset beta
NGC	September 2001	0.07	0.35
Transco	September 2001	0.11	0.475
Water companies	September 2000	0.13	0.40
Electricity distribution	March 2001	0.13	0.50
NATS	September 2001	0.56	0.55
Railtrack	September 2001	0.59	0.60
BAA	December 2001	0.12	0.675
BT	September 2001	0.74 <sup>11</sup>	0.90

**(ii) Regulatory precedence**

A relationship between the asset beta used by the regulators and the OPEX:RAB ratio was recognised explicitly by the rail regulator in its most recent periodic review. The rail regulator stated:

*“Railtrack argues that a given change in revenues or costs will have a relatively large effect on profitability since profits represent a smaller proportion of costs and revenues than in other utilities ... this difference arises because the RAB is low relative to the company’s expenditure requirements ... In the longer term, this difference will tend to decline since Railtrack’s RAB is also expected to grow much faster than other utilities. At present, however, the Regulator considers that Railtrack’s operational leverage [sic]<sup>12</sup> is significantly higher than other utilities and that this should be reflected in the assumed cost of capital.”<sup>13</sup>*

The rail regulator retained this standpoint in its final proposal and concluded from this that the asset beta value of Railtrack should be 0.1 to 0.3 percentage points greater than that of water and electricity distribution companies – in effect, a higher OPEX:RAB ratio leads to a higher asset beta value. In practice, the rail regulator’s choice of asset beta was consistent with an increase of about 0.15 on the asset beta from a 0.46 increase in the OPEX:RAB ratio or:

$$\Delta \text{ Asset beta} = 0.33 (\Delta \text{ OPEX:RAB ratio}) \quad \text{Equation (1)}$$

<sup>11</sup> For BT the WACC is applied to the total fixed assets which thereby acts as the RAB equivalent for BT. The operating cost-to-total fixed asset ratio of its network business was 0.74, taking figures from BT’s regulatory accounts for 2001.

<sup>12</sup> The use of the term ‘operational leverage’ in this context is slightly misleading, as this tends to refer to the ratio of fixed-to-variable costs. This paper continues to refer to OPEX-to-RAB ratios.

<sup>13</sup> ‘The Periodic Review of Railtrack’s Access Charges: Provisional Conclusions on Revenue Requirements’, ORR, December 1999.

**(iii) Statistical inference**

Consignia has assessed the statistical relationship between the asset beta used by the regulators and the OPEX:RAB ratio of the regulated companies. This indicates whether, having selected the optimal structure for its controls<sup>14</sup>, UK regulators' choice of the asset betas is consistent with that choice being made, albeit implicitly, around a relationship between the asset beta and OPEX:RAB ratio. The analysis is limited by the number of UK regulated industries, but still provides insight into the selection of the asset beta by those regulators.

The best-fit line for the relationship between the asset beta and OPEX:RAB ratio for the whole of the data set in Table 3 is as follows:

$$\text{Asset beta} = 0.42 + 0.46 (\text{OPEX:RAB ratio}) \quad \text{Equation (2).}$$

Equation (2) satisfies the F-test for and individual estimates satisfy the t-test at the significance level of 5 per cent. These results indicate a statistically significant relationship between the asset beta used by the regulators and the OPEX:RAB ratio of the regulated companies.

The analysis was repeated with a dummy variable (taking the value of 1 for BAA and 0 otherwise) to reflect the fact that the regulator's choice of a high asset beta for that case was influenced primarily by a factor significantly different from the OPEX:RAB ratio (see (i) above). For this data set, the best-fit line for the relationship between the asset beta and OPEX:RAB ratio is as follows:

$$\text{Asset beta} = 0.36 + 0.55 (\text{OPEX:RAB ratio}) + 0.25 (\text{Dummy}) \quad \text{Equation (3).}$$

Equation (3) satisfies the F-test for and individual estimates satisfy the t-test at the significance level of 5 per cent. These results indicate a stronger statistical relationship exists between the asset beta used by the regulators and the OPEX:RAB ratio of the regulated companies in Equation (3) relative to Equation (2). Consequently, Consignia considers that asset beta estimates from Equation (3) have greater validity than those from Equation (2).

The result of Equation (3) indicates that:

$$\Delta \text{ Asset beta} = 0.55 (\Delta \text{ OPEX:RAB ratio}) \quad \text{Equation (4).}$$

Equation (4), as derived from Equation (3), shows that a change in the OPEX:RAB ratio has a greater impact on the asset beta than in Equation (1) – the equation effectively used to adjust the asset beta by the rail regulator.

**(iv) Application for Consignia**

Consignia has used Equations (2) and (3) to estimate a range for the asset beta value for the UK inland mails business of Consignia. To do so requires evaluations of the level of operating cost and RAB. These evaluations require other aspects of the price review to be defined, including the coverage of the

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<sup>14</sup> See “Volume risk I: forecasting errors- for the UK inland mails business of Consignia” and “Volume risk II: cream-skimming entry – for the UK inland mails business of Consignia”, Consignia, May 2002

control, the Efficiency Review Study and the market valuation of the assets. The RAB value is the subject of a separate, but related, paper prepared by Consignia<sup>15</sup>.

For illustration in this paper, the estimation of the asset beta for the UK inland mails business of Consignia in this paper is based on estimates of the OPEX:RAB for the USO area. The OPEX:RAB ratio is estimated using an OPEX figure of £5.2bn and range of RAB values of between £3bn to £5bn<sup>16</sup>. The OPEX:RAB ratio ranges from 1.75 to 1.05<sup>17</sup> as the RAB value increases from £3bn to £5bn. For the UK inland mails business of Consignia, the OPEX:RAB ratios are – closest to those of BT which has an OPEX:RAB ratio of 0.74.

Table 4 shows the estimates of the asset beta value from application of Equations (2) and (3) for OPEX:RAB ratios in the range of 1.05 to 1.75. The table shows that the asset beta estimates of Equation (3) are similar to, but marginally higher than, those of Equation (2) for the range of OPEX:RAB ratios. It also shows that, when compared to other regulated industries in Figure 1, the asset beta estimates are closest to the asset beta of BT of 0.9.

Table 4 also shows that the asset beta increases as the OPEX:RAB ratio increases. The asset beta is estimated, from Equations (2) and (3) to be: 0.90 to 0.93 for an OPEX:RAB ratio of 1.05; 1.01 to 1.07 for an OPEX:RAB ratio of 1.30; and 1.22 to 1.31 for an OPEX:RAB ratio of 1.75. However, as discussed above, Consignia considers that asset beta estimates from Equation (3), which generally yield the marginally higher value for each OPEX:RAB ratio case, have greater validity than those from Equation (2).

Table 4: The estimates of the asset beta value from application of Equations (2) and (3) to RAB and OPEX values

RAB	Opex:RAB ratio	Asset beta estimate	
		Equation 2	Equation 3
3.0	1.75	1.22	1.31
4.0	1.30	1.01	1.07
5.0	1.05	0.90	0.93

<sup>15</sup> “Allowed profit II: allowed profits - for the UK inland mails business of Consignia”, Consignia, May 2002

<sup>16</sup> In “Allowed profit II: the regulatory asset base - for the UK inland mails business of Consignia”, Consignia, May 2002, the RAB value for the Total USO area is estimated to be at least £3.7bn. This estimate lies within the range of £3bn to £5bn presented in this paper. However, the principles set out in this paper can be applied to RAB values above this range.

<sup>17</sup> Rounded to the nearest 0.05.

### 4.3.5 Conclusion

Consignia considers that in theory the asset beta for the regulated industries should be higher, the greater is the OPEX:RAB ratio of the industry. This approach was given regulatory confirmation and precedent when the rail regulator selected the asset beta for its last price control proposals. Statistical analysis further supports a relationship between the asset beta used by regulators and the OPEX: RAB ratio of the regulated industry. This indicates that, having selected the optimal structure of the control, UK regulators' choice of the asset betas is consistent with that choice being made, albeit implicitly, around a relationship between the asset beta and OPEX:RAB ratio. This statistical relationship, together with estimates of the OPEX:RAB of the Consignia's inland mails business, are used to provide the main estimates of the asset beta for the UK inland mails business of Consignia.

The two approaches to the estimation of the asset value provide a range for the asset beta of the UK inland mails business depending on the OPEX:RAB ratio. These ranges are shown in Table 6. For completeness, the table also shows the equity beta values corresponding with the asset betas using the Miller transformation (see subsection 4.3.1).

Table 6: A range of estimates of the asset beta<sup>18</sup> for the UK inland mails business

OPEX:RAB Ratio <sup>19</sup>	Range of asset beta	Range of equity beta
1.75	1.22 - 1.31	1.52 – 1.63
1.30	1.01 - 1.07	1.26 – 1.34
1.05	0.90 – 0.93	1.12 – 1.16

## 4.4 Taxation

The cost of capital includes an allowance for tax so that the total revenue entitlement is sufficient to leave a profit equivalent to the business's post-tax cost of capital. For the cost of capital calculation, there are two possible approaches to the treatment of taxation:

- set a post-tax cost of capital—to assess the cost of capital on a post-tax basis and to treat tax payments as a separate cash-flow item in the overall revenue requirement;
- set a pre-tax cost of capital—to set the allowed rate of return on a pre-tax basis in order to deliver a pre-tax profit that is sufficient to produce the required post-tax return to investors.

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<sup>18</sup> Rounded to nearest 0.05.

<sup>19</sup> Rounded to nearest 0.05.

These two approaches should yield the same result. Most regulators have used the pre-tax cost of capital, with the alternative approach only applied when there are special tax issues to consider.

Consignia considers that the pre-tax cost of capital is the appropriate approach in its case. It also considers that the most appropriate tax adjustment is as follows:

$$x = \frac{1}{1 - tc}$$

where  $tc$  = the marginal rate of corporation tax, and  $x$  is the size of the tax-wedge adjustment applied to the post-tax cost of equity. This is the approach adopted in the telecommunications, electricity, gas, and airports sectors, as well as that adopted by the Competition Commission when it last looked at the issue. This formula assumes that companies pay tax at the statutory marginal corporation tax rate. At the current corporation tax rate of 30 per cent, this formula generates a tax adjustment (or tax wedge) of 1.43.

## 5. Estimates of the Weighted Average Cost of Capital

Table 7 shows estimates of the pre-tax, real WACC for the UK inland mails business of Consignia using the estimates of the generic and company specific parameters presented in this paper. The company specific parameter of the asset beta value and thereby the WACC estimate depends, amongst other factors but primarily, on the OPEX:RAB ratio. The table refers to three cases:

- for Case A, with an OPEX:RAB ratio of 1.05, the asset beta is estimated to be in the range of 0.90 to 0.93;
- for Case B, with an OPEX:RAB ratio of 1.30, the asset beta is estimated to be in the range of 1.01 to 1.07; and
- for Case C, with an OPEX:RAB ratio of 1.75, the asset beta is estimated to be in the range of 1.22 to 1.31.

Table 7 shows the overall range for the pre-tax, real WACC to be 9.2 to 11.6 per cent, depending on the level of the OPEX:RAB ratio. The pre-tax real WACC estimate increases with increases in the OPEX:RAB ratio. The range of WACC estimates is consistent with an expected return on turnover of about 6 to 9 per cent. In each case of Table 7, Consignia considers the derivation of the asset beta at the top of the range in each case to be most appropriate, since the alternative and least asset beta estimate in the range is derived from a statistical analysis that includes the outlier of BAA.

Table 7: The pre- tax, real WACC estimates for the UK inland mails business

Parameters	Case A OPEX:RAB = 1.05	Case B OPEX:RAB = 1.30	Case C OPEX:RAB = 1.75
Risk free rate	3.00	3.00	3.00
Debt premium	0.30	0.30	0.30
Cost of debt	3.30	3.30	3.30
Equity risk premium	4.00	4.00	4.00
Asset beta	0.90 – 0.93	1.01 - 1.07	1.22 – 1.31
Equity beta	1.12 – 1.16	1.26 – 1.34	1.52 – 1.63
Post-tax cost of equity	7.5 - 7.6	8.1 – 8.3	9.1 – 9.5
Tax Wedge	1.43	1.43	1.43
Pre-tax cost of equity	10.7 - 10.9	11.5 - 11.9	13.0 - 13.6
Gearing	0.2	0.2	0.2
Pre-tax, real WACC	9.2 - 9.4	9.9 - 10.2	11.1 - 11.6