



# **Economic Regulation of Heathrow and Gatwick Airports**

**2008 – 2013 - CAA Decision**

**March 2008**

**Supporting paper I**

**Advice to CAA on Aspects of Cost of Capital for the Final  
Price Control Decisions**

**Advice to CAA  
on Aspects of Cost of Capital  
for the Final Q5 Price Control Decisions**

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## 1 INTRODUCTION

1.1 This supporting paper to CAA's final Q5 price control decisions for Heathrow and Gatwick addresses several aspects of the cost of capital determination. In particular, we provide comments on:

(a) Three papers submitted to CAA on behalf of BAA; and

(b) Issues related to determining the cost of debt, including:

- A high level review of the Competition Commission's analysis and comments on the cost of debt;
- Comparison of the evidence presented by the Competition Commission, Credit Suisse and previous analysis of Europe Economics, to provide a view on how the cost of debt assumptions at different points in the review have compared with then current market evidence; and
- Drawing a recommended approach and benchmarks to cost of debt.

1.2 We consider each of the points in turn.

## 2 HIGH-LEVEL REVIEW OF RECENT BAA SUBMISSIONS

2.1 This section provides a high level review of three papers commenting on the Competition Commission's recommendations submitted on behalf of BAA and other advice commissioned by BAA:

- (a) "Impact of the Financial Crises on BAA's Cost of Capital" by Oxera;
- (b) "Cost of Capital for Heathrow and Gatwick" by Professor Stuart Myers of the Brattle Group (also an earlier version of this paper, titled "Recommendations regarding BAA's Cost of Capital"); and
- (c) "The Cost of Capital for Gatwick and Heathrow" by Professor Stephen Schaefer of the London Business School (also an earlier version of this paper, titled "BAA Quinquennial Review: A Review of the CC's Recommendations Regarding BAA's Cost of Capital").

### Comments on the Oxera paper

2.2 Oxera has produced a paper arguing that the impact of the recent and ongoing financial crises is likely to be an increase in both the cost of equity and debt that CAA should use in the Q5 price control determination for Heathrow and Gatwick.<sup>1</sup> In particular, Oxera argues that:

- (a) The market wide risk, or price of the market risk as measured by the equity market risk premium (EMRP), is likely to have risen during the crises;
- (b) Debt spreads and the cost of debt have risen during the crises; and
- (c) That, on an individual company basis, it is likely that equity betas of individual firms have been affected during the crises.

2.3 This section provides high level comments on the Oxera analysis, as well as comments about particular assertions and assumptions made by Oxera in arriving at the above conclusions.

### General comments on the relevance of the analysis

2.4 Much of the evidence and discussion presented by Oxera does not seem relevant to CAA's price control decision. This is because the analysis focuses on market data during the financial crises. It seems reasonable to assume that an efficient company would seek to avoid raising finance (or refinancing) during credit crises (a crises being, by definition, temporary).

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<sup>1</sup> Oxera: "Impact of the financial crisis on BAA's cost of capital", report for CAA, 21 January 2008.

- 2.5 The market's equilibrium assessment of risk could have risen materially during the credit crises. However, at the peak of the credit crises, when the market becomes thin, the observed prices may only very imperfectly reflect the underlying longer-term willingness to buy and sell different assets. Prices are determined by marginal players among current market participants, but there is little reason to suppose that these would also be the marginal players when market activity returns to more normal levels. It is the observations at the normal levels of market activity that CAA should reflect in the price control determination.
- 2.6 Oxera acknowledges evidence that large spikes in their preferred projected volatility measure (based on call options of short maturity) are typically short-term, and that cost of capital might be unaffected in the long run, but nevertheless argues that even relatively short term continuation of the market turbulence during the price control period would be relevant for the CAA. Much of the (alleged) relevance of Oxera's analysis relies on the thought that the relatively short term volatility measured by their preferred volatility measure is relevant throughout the price control. Oxera argues:<sup>2</sup>
- “However, while equity investments are often regarded as long-term and the cost of equity might be analysed over the lifetime of the assets, regulatory determinations are set for five years only — i.e. they are set for 2.5 years on average. In other words, the duration of the allowed returns (the average time for investors to receive the allowed revenues) is approximately 2.5 years. Therefore, it is much more likely that the impact of IV [the preferred volatility measure] on the required rate of return will be significant over the regulatory period than over the lifetime of the assets. Put differently, while the impact of high levels of IV on the cost of capital might not be permanent, it is reasonable to expect that it might last for two years, for example.”
- 2.7 The argument seems to be that, if one invests in a regulated entity at years 1, 2, 3, 4, or 5 of the price control, on average the investment would have been for 2.5 years, and therefore, expected volatility for just two years of the price control period is particularly significant. We have some concerns about the argument. First, there is no reason why the length of the price control period should determine the length of an investment in a regulated company. Thus, the above does not imply that investors only have 2.5 years on average to earn the allowed revenues. Second, if one invests in a company sequentially in each year, as the argument requires, investments made in years 2, 3, 4 and 5 would not be subject to *any* of the volatility in year one, if the volatility is known to be temporary. Following the thought experiment of sequential investment might therefore reduce the impact of temporary financial turmoil. Finally, assets with relatively secure income streams, such as those from a RAB based regulatory price control, might be preferred by investors during temporary financial turmoil. As such, the impact of increased expected market volatility might be to reduce the required return of the regulated airports.

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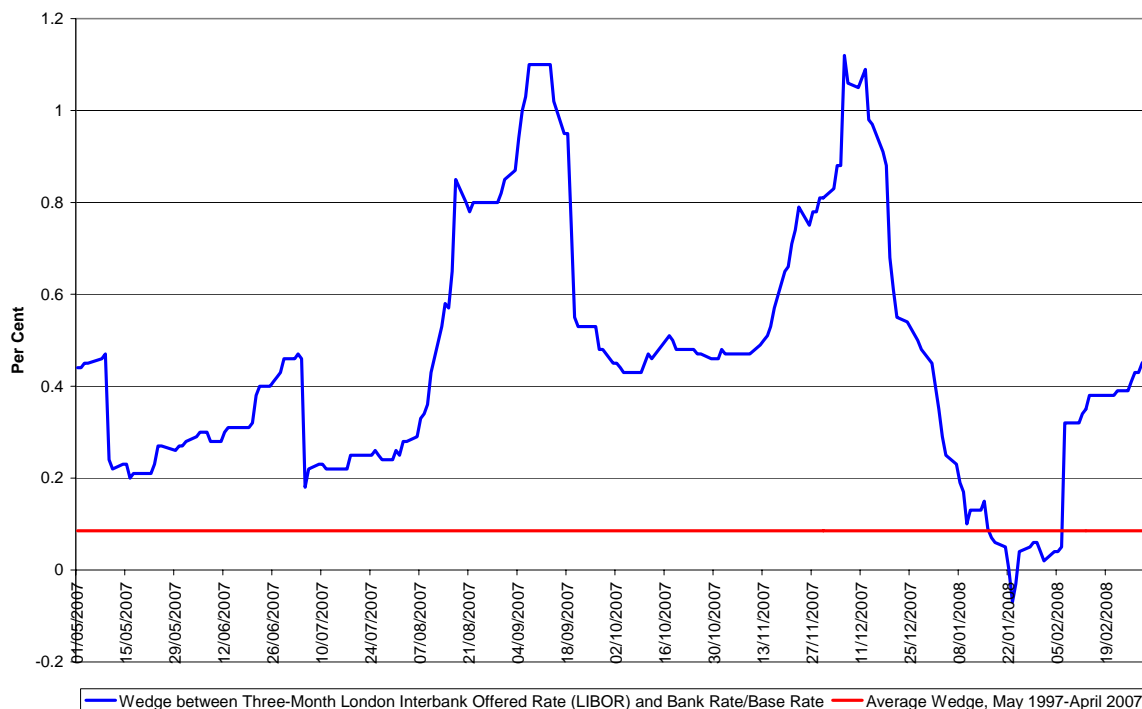
<sup>2</sup> Page 8, Oxera: “Impact of the financial crisis on BAA;s cost of capital”, report for CAA, 21 January 2008

- 2.8 Therefore, we consider that Oxera does not offer convincing arguments why the beginning of a price control period should be somehow weighted more heavily than the following years, or why a regulated income stream from assets commanding significant market power should become relatively more expensive to finance as a result of the five year regulatory period. Again, much of the (alleged) relevance of Oxera's analysis seems to rely on the first of these points, which is never actually established.
- 2.9 Another argument used by Oxera to establish the relevance of the analysis to CAA's price control decision is that:<sup>3</sup>
- "There is no evidence these crisis conditions, including significant market volatility, re-pricing of risk and funding problems in the banking sector, are diminishing or have diminished since the CC recommendation to the CAA or CAA proposals published in November."
- 2.10 Higher levels of market volatility and issues with reassessment and re-pricing of risk in the financial markets might indeed continue for some time. However, data from late December 2007 and early 2008 indicates that at least the funding problems in the banking sector related to availability of liquidity seem to have abated, as shown in Chart 2.1 below.
- 2.11 The red line in the chart gives the average "wedge" between 3-month interbank interest rates and the rate set by the Bank of England (now, the Bank Rate), for the period May 1997 to April 2007. The difference between these two data points should reflect a combination of risk perceptions and expected interest rate movements over the three-month period. So, for example, we see that in May and June 2007, interest rates were thought likely to rise over the next few months, so the wedge was a little above its trend of the previous ten years. But then in the summer there was a sudden significant hump in this wedge, even though interest rates were expected to be fairly near their peak. Interest rates were falling in November 2007, and were expected to fall further, so under normal circumstances one might even expect that the wedge should have been negative. The fact that, far from being negative, it was close to the extremes of the previous summer is a measure of how significant recent money market issues have been.
- 2.12 Since December 2007, however, the wedge has fallen to more normal levels, helped by massive injections of liquidity to the market by various central banks, which seemed to resolve at least the market liquidity aspect of the "credit crises" (at least for now). The increase in the wedge following the reduction the Bank rate to 5.25 per cent on 7 February 2008 could indicate that markets are expecting the reduction to be reversed in the next three months.

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<sup>3</sup> Page 3, Oxera: "Impact of the financial crisis on BAA's cost of capital", report for CAA, 21 January 2008

**Chart 2.1: Scale of the credit crises**



### Specific comments on Oxera's cost of equity analysis

- 2.13 We have further concerns about the implied volatility (IV) measure used by Oxera as the basis of much of the analysis, particularly on the effects of the crises on cost of equity.
- 2.14 First, the IV used is based on variation in prices of options during particular financial market turbulence. As discussed below, the marginal participants in the market during crises are likely not to be the marginal participants during more usual market conditions.
- 2.15 Second, the longest IV measure used by Oxera relates to 12 month call options. However, when considering whether the IV measures have been accurate predictors of realised returns, Oxera uses 30 day and 90 day historical volatilities of the FTSE 100 index to draw an inference that "volatility implied by derivatives prices is a generally reliable indicator of future, actual exposure to risk of the market portfolio and of the individual stocks".<sup>4</sup> On the evidence presented by Oxera, there seems to be a missing link in the logic of drawing, first, the conclusion that the 12 month IV is an accurate predictor of actual volatility over next 12 months, and second, that the volatility of individual stocks (as opposed to the market index) would be similarly affected.

<sup>4</sup> Page 6, Oxera: "Impact of the financial crisis on BAA's cost of capital", report for CAA, 21 January 2008

- 2.16 Further, the data presented on this point, from May 2005 to January 2008, does not contain financial crises that have been subsequently fully resolved. Oxera appears to draw the conclusion that its data suggests that “investors are on average correct in their expectations of future risks stemming from the financial crisis”. However, that investors are on average correct in their expectations, *at all times*, is an axiom of the analysis and interpretation of stock market data — the rational expectations axiom. So what Oxera’s data really shows us, that during the period from May 2005 to late 2007, IV is a reasonable proxy for the (fairly short term) expectations of the market. It in no way follows from this that IV, during financial crises, is a good proxy for the rational market expectations of longer term returns.
- 2.17 These concerns about the establishment of the IV measure as the basis of Oxera’s analysis, particularly on the cost of equity, add to our doubts about the relevance of the arguments presented for CAA’s price control decision.

*Impact on equity risk premium and equity beta?*

- 2.18 On the equity risk premium, Oxera recounts some of the arguments made by Professors Myers and Schaefer, which are addressed in the following sections of this note. Oxera also draws a link from the volatility of the equity market during the financial crises to the equity risk premium. However, again, the argument by Oxera is based on current volatility during the peak of the financial crises.
- 2.19 We consider the EMRP to be a fundamental taste parameter. The measurement of EMRP is uncertain, and is usually based on long runs of historical data. It is possible that financial crises lead to reassessment and re-pricing of risk. However, that does not mean that CAA should adjust the EMRP based on data drawn during the financial crises.
- 2.20 For their analysis of the effect on equity beta, Oxera has assumed that the IV measure during financial crises accurately reflects the average volatility during the Q5 price control period. As discussed above, neither the validity nor the relevance of this assumption is established in the paper. Also, the correlation coefficients used in the analysis are based on historical correlations of company and market returns, which is at odds with the use of forward looking volatility measures, as Oxera indeed acknowledges.
- 2.21 It is possible that the financial crises has led to or will lead to reassessment and/or re-pricing of risks. However, we do not consider that the Oxera arguments provide a relevant basis for such adjustments, for reasons discussed above.

**Specific comments on Oxera’s cost of debt analysis**

- 2.22 Our overall comments about the relevance of Oxera’s arguments based on data during the credit crises apply also to their estimation of the impact of the crises on cost of debt relevant for Heathrow and Gatwick airports.
- 2.23 Much of Oxera’s analysis on the impact of cost of debt focuses on movements in spreads and yields on bonds up to 22 December 2007. We note this is in contrast with the dates

used by Oxera in the cost of equity assessment above, when data up to 15 January 2008 was utilised. If the credit crises, or aspects of it, have eased since 22 December 2007, the analysis could present a misleading picture of the more recent developments in the bond markets.

2.24 Indeed, Oxera cites the London Interbank Offer Rate (LIBOR) as an important measure of the price of credit:<sup>5</sup>

“Another important measure of the price of credit in capital markets is LIBOR. LIBOR, as a measure of the price of funds in the inter-bank market, could be seen as the price of liquidity. It is also used as the primary benchmark for floating-rate corporate debt. Thus, an increase in LIBOR has a direct impact on the cost of borrowing for companies.”

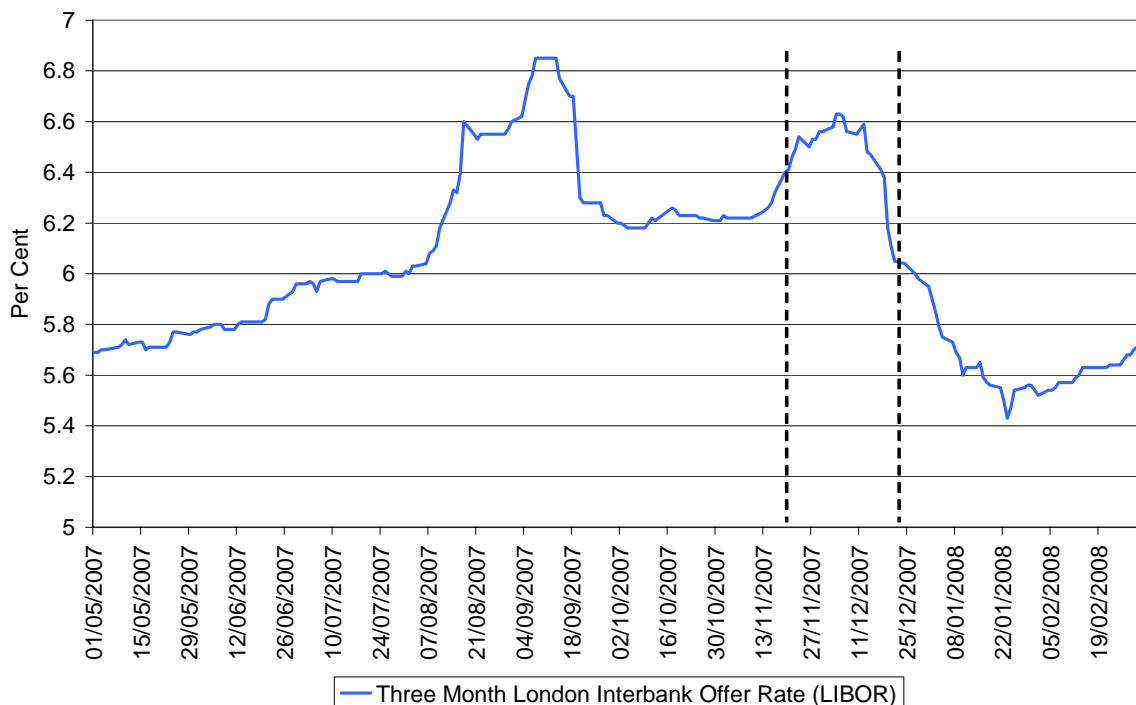
2.25 Oxera goes on to discuss the increase in the three month LIBOR during 2007 from the average value in Q4 and 2006, and particularly between 20 November and 22 December 2007. During that period, which coincided with the core of the credit crises, the LIBOR was 167 basis points above the 2007 average.

2.26 Chart 2.2 below shows the evolution of the three month LIBOR from May 2007 to 4 March 2008. The period of 22 November to 22 December 2007 is highlighted (approximately) between the dashed lines. Clearly the LIBOR has fallen significantly since the date range presented by Oxera, currently being near the value in May 2007. Taking Oxera’s argument quoted above at face value, this movement in the LIBOR implies that any increases in the financing cost between November and December 2007, presented by Oxera, would now have been expected to reverse, and more.

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<sup>5</sup> Page 27, Oxera: “Impact of the financial crisis on BAA;s cost of capital”, report for CAA, 21 January 2008

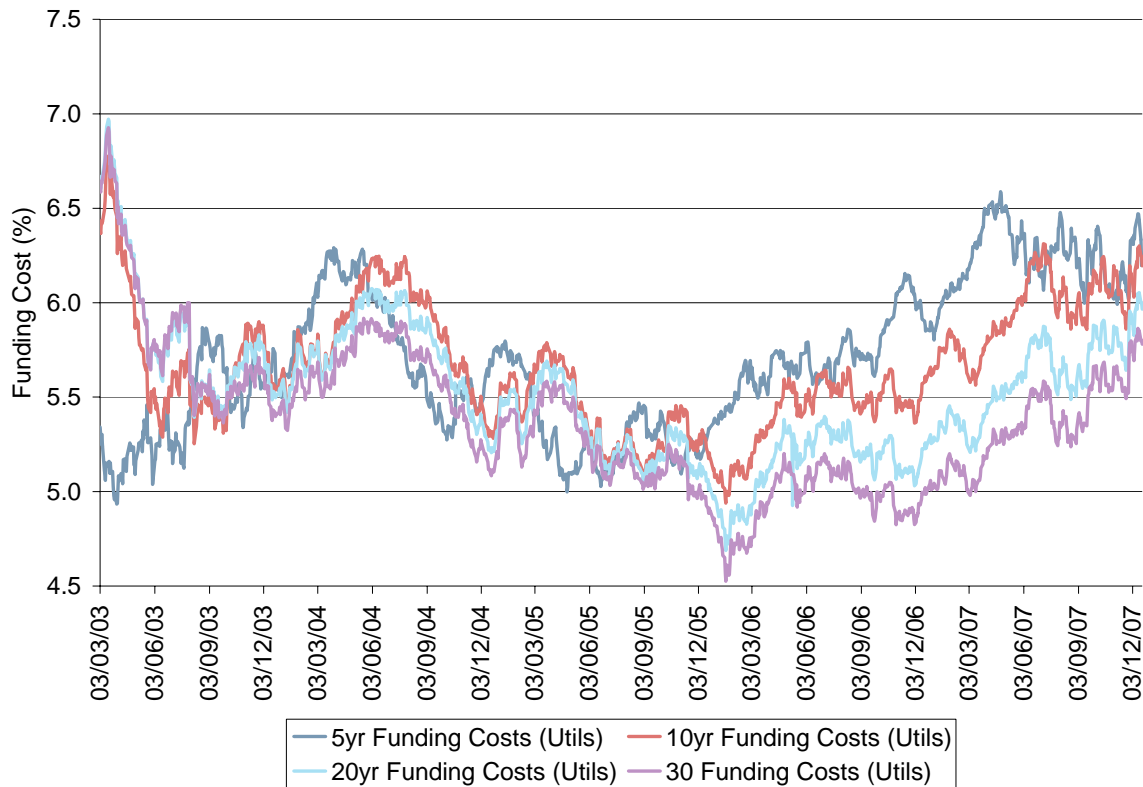
**Chart 2.2: Three month LIBOR: May 2007 – March 2008**



- 2.27 Further, movements in credit spreads during credit crises might not be as reliable of an indicator of the cost of debt of companies as during more normal market conditions. As credit spreads are measured against current yields on government bonds (or other relatively default risk free instruments), a fall in the government bond yields would lead to an observed increase in the debt premium of corporate bonds, even if the actual required return of those corporate has not changed. Inspection of the movements in the UK government bond yields and the corporate bond yields during the credit crises would tend to support this view. As discussed below, the government yields have fallen substantially during the credit crises, perhaps due to investor “flight to safety”.
- 2.28 However, we can directly observe the cost of borrowing by corporations and utilities at BBB+ rating, leaving no need to speculate how the changes in the government (nominal) gilt yields and bond spreads, potentially measured against different benchmarks, have moved during the recent months. The evidence provided by Credit Suisse to the CAA, reproduced in Chart 2.3 and Chart 2.4 below, shows that the sterling funding costs for benchmark “corporates” and “utilities” in secondary markets have not increased

substantially during the last six months. Funding costs for BBB+ rated corporates have actually been on a falling trend since July 2007.<sup>6</sup>

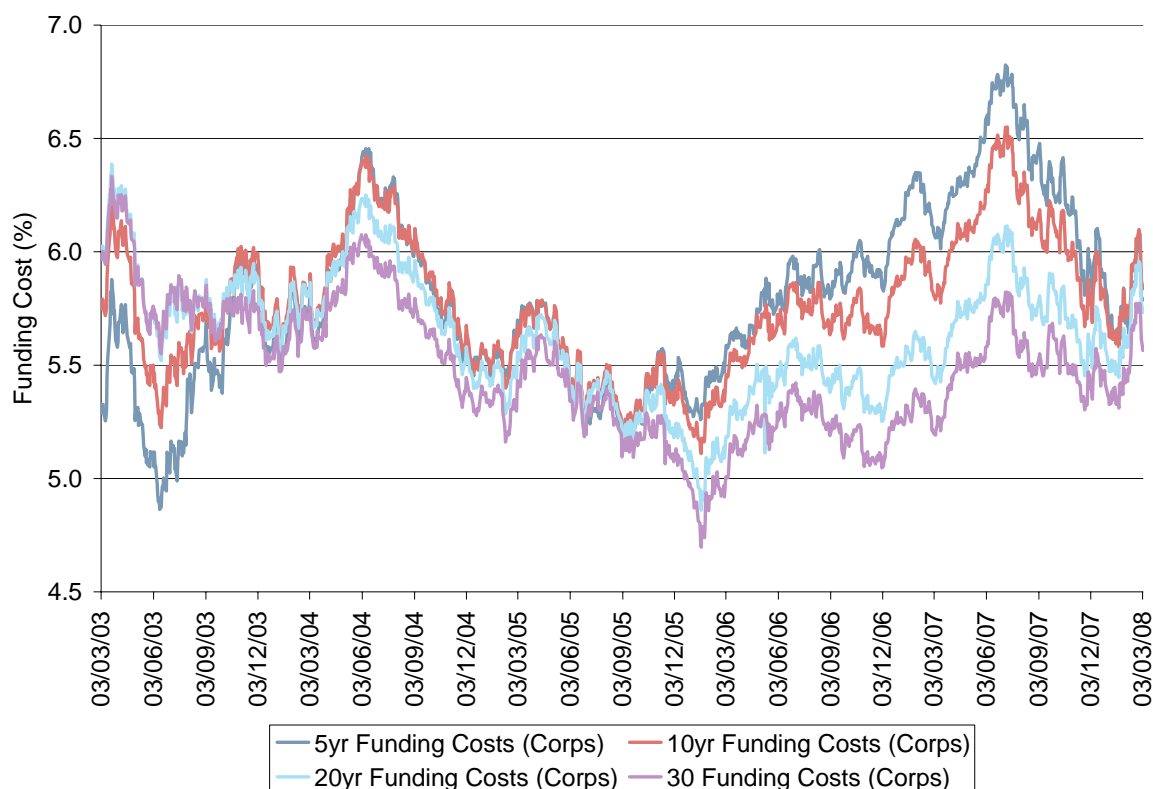
**Chart 2.3: Sterling BBB+ Funding Cost Last Five Years (Utilities)**



Source: Credit Suisse via CAA

<sup>6</sup> Credit Suisse, however, also notes an emergence of a “new issue premium” relative to the benchmark measure, which might offset some of the benefit of the decrease for a new issuer.

**Chart 2.4: Sterling BBB+ Funding Cost Last Five Years (Corporates)**



Source: Credit Suisse via CAA

- 2.29 Oxera further points out that the CAA's estimate of the cost of debt does not sufficiently reflect the uncertainty in the cost of debt, or the differences between particular issuers from the overall benchmarks used. However, as shown by the above data and discussed further below, the required benchmark yields on the market yields have rarely reached the level of 6.3 per cent nominal cost of debt included in the CAA's WACC estimate. Further, Oxera shows that the average nominal cost of debt for European airports has not risen above 6 per cent during the financial crises (Oxera Figure 3.10).
- 2.30 Again, it is possible that the recent financial turmoil has led to or will lead to a reassessment and/or re-pricing of risks. However, we do not consider that the Oxera provides convincing arguments or evidence to increase the cost of debt beyond the level implied in the November price control proposals.

## Comments by Professor Myers

- 2.31 Professor Myers' analysis considered the equity market risk premium (EMRP) proposed by the Competition Commission. Prof Myers finds the Commission's recommended range to be too low, and the arguments used to arrive at the range inconclusive. He suggests that the top of the range should be 6 per cent, based on arithmetic average of equity returns over short term bills. He argues that the bottom end of the range put

forward by the Commission (2.5 per cent) lies beyond the bottom end of a range of reasonable estimates.

- 2.32 Following the preference for arithmetic average, he quotes a historical equity return figure for the UK of 5.4 per cent. This is also shown in the Commission's cost of capital annex Table 3, as is the corresponding estimate of 4.2 per cent based on geometric averages. Similarly for the measures against the short term interest rates.
- 2.33 The above figures are sourced from the Dimson, Marsh and Staunton (DMS) study, widely acknowledged as an authoritative analysis of historical equity returns. We note that DMS suggested adjusting historical equity returns downward by 0.7 to 1.2 per cent to gain forward looking estimates of the EMRP. Using these adjustments on the arithmetically averaged historical UK returns for would lead to a forward looking EMRP estimate from 4.2 to 4.7 per cent. Using the estimate of historical global returns (5.2 per cent) as the basis of the adjustment would lead to a forward looking EMRP estimate from 4.0 to 4.5 per cent. Further, we note that in a more recent working paper, the same authors infer that investors expect a premium of 3.0-3.5 per cent on geometric basis, or 4.0-4.5 per cent on arithmetic basis.<sup>7</sup> Prof Myers quotes DMS recommendation in the 2007 yearbook to be 4.5-5.0 per cent versus short term bills.
- 2.34 However, we would agree with Prof Myers that the basis of the earlier DMS adjustments, particularly of the larger one regarding changes in dividend yields, should be investigated more thoroughly before they are substantially relied upon. Also, different methods of adjustment could indeed give different answers. These comments could also be applied to the forward looking studies the Commission used to derive the lower end of the EMRP range. However, there could be other developments, such as financial market innovations, that could in principle imply that the forward looking EMRP is lower than the historical average.
- 2.35 We also would tend to agree that the cost of capital in the context of five year price cap regulation should be based on arithmetic mean returns, rather than geometric mean returns. Arithmetic mean returns give a measure relevant to the opportunity cost of capital. If there is serial correlation — by this we assume the Commission means mean reversion — then using geometric means can become better, because doing so captures the underlying process behind the historical returns, as opposed to the annual observations of return captured by arithmetic mean. However, in our view it is too much to suggest that there is powerful evidence of mean reversion in stock markets. Indeed, our understanding is that the considerable bulk of academic evidence suggests that markets are weakly efficient over any significant timescale, and thus that, say, annual returns certainly do *not* exhibit mean reversion.

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<sup>7</sup> Dimson, Marsh, Staunton (2006): "The Worldwide Equity Premium: A Smaller Puzzle", Working Paper, London Business School

- 2.36 Therefore, Myers' criticisms of the Commission's justification of using the geometric mean returns as the basis of EMRP estimate seem reasonable. Nevertheless, there could be other reasons, not explored in the Commission report, to move away from using arithmetic means of historical returns.
- 2.37 However, it might not be correct simply to use arithmetic means of actual observed returns, but, rather, arithmetic means of *logarithms* of the returns. This issue was considered in the Joint Regulators study by Smither's & Co (2003). Smither's & Co point out that it is very commonly assumed that investment returns follow a lognormal distribution. The lognormal distribution accounts for the truncated nature of the possible equity return distribution — the downside risk is limited to 100 per cent of investment, whereas upside risk is not. In other words, the distribution of returns is skewed, and assuming that is lognormal is a way to represent this skewness. Indeed, Prof Myers himself has assumed as much in past.<sup>8</sup> As well as being a common assumption, there is empirical evidence that realised returns follow a lognormal distribution. For example, Andersen et al (2001) find that distributions of realised daily variances of returns are highly non-normal and skewed to the right, but the logarithms of realised returns are approximately normal.<sup>9</sup>
- 2.38 Smither's & Co (2003) show that the geometric mean of returns corresponds quite closely to the arithmetic mean of logarithms of returns. They show using the DMS data set that geometric mean over-estimates the arithmetic mean of log returns by 0.2 percentage points. Therefore, if the arithmetic mean of log returns is the preferred measure, the geometric mean used by the Commission could be a close approximation to it.
- 2.39 Unfortunately, however, there is no clear cut answer or agreement on the issue. Again, the clear aim should be to derive an estimate of the arithmetic mean return. The ambiguity relates to whether the arithmetic mean of normal returns or lognormal returns should be preferred. As discussed by Smither's & Co (2003), unless volatility of returns is constant *and* returns are unpredictable, assuming that the arithmetic mean return is stable over time must mean that geometric mean return is not, and vice versa. The above conditions do not hold together on the DMS sample. However, given the variability in historical averages, there is no clear cut empirical answer to whether the arithmetic or geometric mean (as an approximation to the arithmetic mean of logarithms of returns) is the one that should be assumed stable.
- 2.40 The choice then, Smither's & Co (2003) argue, comes down to preference about which measure is assumed to be stable. They did not find consensus in the literature on the

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<sup>8</sup> Myers and Reid (2001): "Capital allocation for insurance companies", *Brattle Group*, page 18: "To derive a formula for marginal default values we need to specify the form of the probability distribution of future losses and asset values. The standard assumption in the option pricing literature is the lognormal distribution. The lognormal is a natural choice because it implies that asset values are bounded from below at zero (negative values are ruled out) and are unbounded from above — that is, the probability distribution of future values is positively skewed."

<sup>9</sup> Andersen, Bollerslev, Diebold and Ebens (2001): "The distribution of realised stock return volatility", *Journal of Financial Economics*, Vol. 61, No. 1, pp. 43-76

point. However, they did express a slight preference for assuming that returns follow a lognormal distribution, i.e. that the geometric mean return is stable, due to its ability to better describe the features of financial returns (as discussed above). They recommended that the relevant arithmetic mean returns are “best built up from a more data consistent framework in which returns are lognormally distributed, so means should be estimated with reference to mean log returns, or (virtually identically, geometric (compound) averages).”

- 2.41 Therefore, the Commission’s assumption (based on the use of the geometric mean) would be in line with both a common assumption about the distribution of the equity returns, and the (tentative) recommendation of the Joint Regulators study. However, there no definitive consensus on the point. Further, justifying the use of geometric mean from the lognormality angle could leave the CAA open to questions of how skewness of returns (driving the lognormal characterisation of the distribution) is taken into account elsewhere in the determination. Previously we discussed using models based on skew, though this was rejected at an early stage (for reasons that remain valid). As we discussed at that time, once we begin to model skewness, we might have to take into account that investors could care about it. If investors do care about the skewness of returns, it should be taken into account in more comprehensive way than using it just as a basis of an argument when it seems convenient.
- 2.42 We would also note in passing that although the use of DMS averages would not justify a lower end estimate of 2.5 per cent, this is of limited relevance since the Commission derived the lower end using evidence from other studies.
- 2.43 We do have some sympathy with the observation (made also by Prof Schaefer) that the range proposed by the Commission is narrow compared to the range of available estimates as well as the statistical uncertainty that surrounds those estimates. However, one has to be mindful of the basis of the ranges and the purpose of drawing them — the EMRP range has to be useful in regulation, and adherence to the statistical confidence bounds in quoting a range of estimates could be counter productive in a regulatory setting where the purpose is to find the best estimate. Indeed, the range proposed by the Commission is clearly a range of best estimates from different sources, and as such it seems more relevant for regulatory purpose. The issue here might be partially about presentation — the EMRP range of 2.5 - 4.5 per cent should not be presented as a range of possible figures of EMRP, but instead as a range within which specific regulators might choose a rather narrower sub-range.
- 2.44 Indeed, in our view, a range of 2 per cent is too wide a range for a regulatory purpose, although at the same time being too narrow to properly reflect the inherent statistical, uncertainty in estimating such a variable. For a regulatory purpose, we would consider it more appropriate to adopt a range of perhaps a half or one per cent, or perhaps at a stretch 1.5 per cent, within which one exercises a regulatory judgement, e.g. about such matters whether one should aim high. For example, the argument for asymmetry of outcomes for aiming towards higher end of the range would have little force if the range were 0 to 8 per cent.

- 2.45 This point is connected to the function of the “aiming up” notion. We believe it is appropriate to aim up within a given range because of a mild asymmetry of costs to consumer welfare between outcomes in which prices are too high, and hence consumer surplus is lost in the short term, and those in which investment is too low, and hence consumer surplus is lost in the longer term. We don’t believe that the function of aiming up is to eliminate all reasonable possibility of a cost of capital that is “too low” — e.g. by making the probability of “too low” be less than 5 per cent. In this sense, perhaps, we disagree with both the Commission and Professor Schaefer (see below) of how it is appropriate to construct and interpret ranges of regulatory judgement.
- 2.46 Nonetheless, we have sympathy with the thought that the 4.5 per cent higher end estimate is a rather low “top of the range”, if the range is conceived as expressing the full set of statistically plausible possibilities. For example, the error bounds exhibited by Smither’s & Co suggest that, statistically speaking, the range of plausible values might extend higher as well as lower than 4.5.
- 2.47 Professor Myers suggests that the EMRP should lie between 4 and 6 per cent, based on his preferred definitions. Professor Schaefer suggests the range should be between 2.5 and 6.5 per cent, with 4.5 as his preferred central estimate. We were not tasked with providing a detailed investigation of the equity risk premium targeted at producing a detailed or firm recommendation of our own. However, from the discussions referred to above and from our understanding of the general evidence as well as previous regulatory determinations, our tentative opinion is that an equity market risk premium in the region of 4.5 per cent would seem reasonable, particularly given the choice of a risk-free rate of 2.5, leading to the sum of ERP and risk-free rate of 7 per cent — and hence, an average market cost of equity of 7 per cent.
- 2.48 Professor Myers also comments upon the debt beta used in calculating equity betas for Heathrow and Gatwick. Our comments on this issue are provided in the following section.

### **Comments by Professor Schaefer**

- 2.49 Professor Schaefer comments on various aspects of the Commission’s analysis, providing his own alternative estimation of the cost of capital for Heathrow and Gatwick. Appealing to uncertainty in estimation, Professor Schaefer provides higher upper bound estimates on particularly on cost of debt and the equity risk premium than those used by the Competition Commission. He also uses a lower debt beta value in deriving the cost of equity at 60 per cent gearing. Further, he draws a preferred estimate of the WACC picking the value at the higher bound of the 90 per cent confidence interval of his final (wider) WACC range. These changes combine to increase his preferred WACC estimates substantially above those of CAA and CC previously. Finally, Prof Schaefer uses market evidence up to end of November 2007 to adjust his cost of debt estimate, further increasing the final WACC estimates.

2.50 In these high level comments we have focused on the above aspects of Professor Schaefer’s analysis, apart from the EMRP, which were dealt with within the discussion on Prof Myers comments.

## Betas

2.51 Prof Schaefer puts forward an alternative methodology to estimate the debt beta, which involves a two-step procedure; first to estimate the co-variation of a company’s bond and equity returns, and then multiplying the estimated coefficient by the company equity beta to obtain an estimate of the debt beta. We have some doubts about this method. First, the theoretical and practical shortcomings of estimation discussed previously, and accepted by the Commission, would hold here also.<sup>10</sup> Indeed, we note that BAA’s other advisers Oxera expressed preference for the derivation method.<sup>11</sup>

2.52 Second, Prof Schaefer states:<sup>12</sup>

“It is important to note that the debt betas estimated using the regression shown in Equation (8) are betas against the underlying equity of the firm rather than the market portfolio. However, all that is required to convert these betas to conventional betas (against the market) is to multiply them by the firm equity beta.”

2.53 The above statement implies that the following relationship holds:

$$\frac{\text{cov}(D, E)}{\text{var}(E)} \times \frac{\text{cov}(E, M)}{\text{var}(M)} = \frac{\text{cov}(D, M)}{\text{var}(M)} \quad [2.1]$$

2.54 Where D represents the return on company’s debt, E represents the return on company’s equity and M represents the market return. Therefore, the first term of the left hand side is the beta of debt against equity, the second term is the equity beta against the market, and the term on the right hand side is the debt beta with respect to the market. Using lower case letters to represent mean returns, then writing out the operators in terms of the expectations operator gives:

$$\frac{E[(D - d)(E - e)]}{E[(E - e)(E - e)]} \times \frac{E[(E - e)(M - m)]}{E[(M - m)(M - m)]} = \frac{E[(D - d)(M - m)]}{E[(M - m)(M - m)]} \quad [2.2]$$

2.55 Therefore, in order for [2.2] to hold, we would have to eliminate all terms containing *E* from the left hand side. However, because *E*, *D* and *M* by definition are not independent, the expectations operator is not multiplicative (i.e.  $E(X*Y)$  is not equal to  $E(X)*E(Y)$ ), this is not allowed. This raises doubts about the validity of Prof Schaefer’s statement above — it

<sup>10</sup> Europe Economics (July 2007) report to the Competition Commission

<sup>11</sup> Page 2, Oxera (May 2007) “Debt Beta”, report prepared on behalf of BAA as submission to the Competition Commission.

<sup>12</sup> Paragraph 55, Schaefer, S. (2008): “The Cost of Capital for Heathrow and Gatwick”, BAA/Q5/612, Appendix Two

seems that one cannot obtain the debt beta with respect to the market by first calculating the beta of debt with respect to equity, and multiplying the result by the equity beta.<sup>13</sup>

2.56 Nevertheless the procedure employed by Prof Schaefer might produce a close approximation to the relevant CAPM debt beta.

2.57 However, the method also runs the risk that the variation in debt returns that is not explained by the regression is actually the part that is correlated with the market return. Variations in equity return are not perfectly correlated with variations in market returns. Variations in bond returns are not perfectly correlated in variations in equity returns. If the part of the bond returns that is not correlated with equity is actually correlated with the market, then Schaefer's method appears to underestimate the debt beta. We would argue that is likely to be the case, for reasons including:

(a) Most of the states of world that contribute to equity beta will be censored in the estimates of the debt beta (as there should be no variance in debt return except in so far as default risk is changed). All the states of world in which upside risk increases but downside risk is unchanged increases equity volatility but leaves bond volatility unaffected.

(b) In contrast, many of the states of world that generate the variance in bond returns are the worlds in which equity returns are invariant (there is little variance in the amount lost by equity holders in most cases of default as default means equity holders lose everything, however, there is significant variance in the amount lost by the bond holder — in some cases he will lose everything, but in some he may get most of his money back).

(c) Different systematic risks could affect the equity and bond markets differently. For example, bond prices and returns could be more sensitive to changes in expected interest rates than equity prices, in the sense that bonds could react more rapidly and strongly to interest rate changes. Alternatively, there could be a market event which drove investors from equities to bonds. In this case, bond returns would rise exactly as the returns on equity markets were falling.

(d) The residual unexplained variation in the regressions may be the part of bond return that is correlated with the market return.

2.58 The paper referred to is pending publication, and there may be some adjustments made for the above that Schaefer did not discuss in the paper submitted to CAA. However, earlier working paper version of the publication does not contain such adjustments, or indeed arguments on why the above quote should be expected to hold.<sup>14</sup>

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<sup>13</sup> Of course, showing that assuming independence would produce the desired result is not the same as showing that one *has to* assume independence for the result to arise. There could be a more subtle proof of either the possibility or the impossibility of the statement in [2.1] to hold in this circumstance. However, we were unable to explore this fully in the time available for this note.

<sup>14</sup> Schaefer, S. M., Strebulev (November 2003): "Structural models of credit risk are useful: evidence from hedge ratios on corporate bonds", Working Paper, London Business School

- 2.59 Indeed, the paper is focused on testing whether structural models of credit risk can be used to explain the sensitivity of debt returns to equity, rather than the sensitivity of debt returns to the market. In doing so, the authors investigate the question of how much of the debt return can be explained by credit risk. This part of the analysis is akin to the critiques of CAPM as a model of expected returns — it has been well established that risk aversion alone cannot account for empirically observed returns. However, as discussed above, this is the assumption CAPM makes and therefore it is an assumption we must make in order to apply it consistently through a change in gearing: the expected return on debt observed on the market (i.e. debt premium minus default premium) reflects compensation for systematic risk. In moving away from this assumption, the paper referred to by Schaefer also seems to move away from the debt beta as relevant for application of CAPM. This, of course, is inconsequential for the robustness of the arguments or the conclusions of the paper itself. It is, however, crucial for the relevance of the results to CAA's price determination.
- 2.60 Hence, it seems that Schaefer offers a somewhat imperfect thought experiment to produce the CAPM debt beta, and it seems very plausible that the approach produces downward biased estimates, particularly in the cases where seriousness of default correlates with the market (for example, if in recession defaults tend to lead to greater losses, which seems plausible).
- 2.61 In addition to suggesting an alternative method to estimate the debt beta, Prof Schaefer (in an earlier unpublished paper commenting directly on the Competition Commissions debt beta analysis) dismisses the derivation method to obtain debt beta estimates employed by the Commission. We agree with the comment that the Commission's use of the liquidity premium in the derivation of the debt beta lacks theoretical foundation, and that liquidity premium is little more than an empirical residual. The use of the liquidity premium by the Commission is slightly unfortunate, and we would be interested in the Commission's response to our arguments of its irrelevance *in principle*, summarised below.
- 2.62 We emphasise, however, that the derivation method as employed by Europe Economics is soundly based on corporate finance theory, and could be considered a direct application of it.
- 2.63 The key to understanding Europe Economics approach to the derivation of the debt beta is that we have aimed to produce estimates of BAA's cost of capital using CAPM.<sup>15</sup> This may seem obvious, but it is a point that previous critiques of our derivation method do not acknowledge. In fact, consideration of liquidity premia abandons the strict CAPM

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<sup>15</sup> We have then produced alternative approaches to estimating BAA's cost of capital (e.g. the Fama-French model), and compared the results, combining the results of our models and our own analysis into a judgement which we have recommended to the CAA, and which the CAA has used as one input into its own regulatory judgement.

framework. Hence such an estimate of “debt beta” is manifestly not an estimate of the CAPM debt beta, but of some other concept.

- 2.64 In CAPM the cost of capital is composed of a risk-free rate, a market risk premium, and one factor, interpreted as reflecting the systematic risk of the asset in question. In our view, the correct methodological approach when employing CAPM is to use it consistently to produce a CAPM result, then to compare that result with the results obtained from the consistent application of alternative models.
- 2.65 One cannot simply incorporate into the CAPM framework additional alleged explanatory factors, such as liquidity premia, without ceasing to use CAPM. Rather, analysis suggesting that there are liquidity premia in debt premia represents a *critique* of the CAPM. In our earlier working papers to CAA we produced many critiques of CAPM, and there is no doubt that many others can be found. However, pointing out a model's limitations is not sufficient in the absence of an alternative, superior model. We are not aware of any compelling evidence that a “CAPM with merely bond-based liquidity premium” approach might prove to be systematically superior, either overall or in a regulatory setting, to plain CAPM. In our view, the use of liquidity premia adjustments in this way is simply *ad hoc*.
- 2.66 For the avoidance of doubt, we emphasise that the adjustment to the debt premium made in our analysis is not of this nature — it works *within* CAPM rather than outside of it. Since CAPM is a model of *expected* returns, not promised returns — the expected return is, at a first iteration, the amount we are promised multiplied by the probability that we get paid. Thus, the default risk adjustment is necessary for a consistent application of CAPM. The liquidity premium adjustment is not.
- 2.67 Finally, in the context of the asset beta and debt beta, we note that Prof Schaefer employs CAPM as a model of expected returns. This is correct. However, this argument is made particularly in connection of the default premium in bond yields, where he argues that the adjustment made by the Commission overstates the default probability and the loss given default (LGD). We would agree that it is important to use an up-to-date estimate of the probability of default and LGD. We note, however, that this would tend to increase the debt beta estimate obtained via the derivation method.<sup>16</sup> We also note that Professor Schaefer's estimate of the BAA asset beta is below that estimated by the CAA or the Commission.

### **Use of swap rates as basis of risk free rate**

- 2.68 Prof Schaefer has argued for the use of swap rates, rather than government bond rates, as the basis of the risk free rate. The use of swap rates was also proposed by NERA (on

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<sup>16</sup> Schaefer (2007): “BAA Quinquennial Review: The Cost of Capital for Heathrow and Gatwick”, paragraph 117, makes the same point and provides estimates for the expected loss rate.

behalf of EdF) earlier in the review process.<sup>17</sup> We note that the Competition Commission were presented these arguments and rejected them.

- 2.69 Prof Schaefer argues that the difference due to default risk of the banking sector is minimal, instead explaining it in terms of better liquidity of government bonds. He attributes only 5 basis points of the swap rates to default risk of the banking sector. It remains an open question of whether or not this is an appropriate amount in the market circumstances since the summer 2007 and in the future. The overall effect of the swap rate adjustment on Prof Schaefer's cost of capital estimates is to increase his cost of equity estimates by 23 basis points for Heathrow and 19 basis points for Gatwick.
- 2.70 We have not been tasked with detailed analysis of the risk free rate, or the possible alternative basis on which to make that determination. However, since arguments for the use of swap rates were presented to the Competition Commission during the review, we assume the Commission considered the use of swap rates as the basis of the risk free rate estimate. Nevertheless, the Commission based its recommendation on analysis of government bond yields. On the other hand, the adjustment employed by Prof Schaefer is subjective and based on assumed increases in the swap spread, as he acknowledges.
- 2.71 Therefore, we do not recommend the CAA includes such adjustment in its assessment of the risk free rate.

### **Cost of debt**

- 2.72 Prof Schaefer also estimates updated cost of debt estimates based on bond spreads up to 30 November 2007. He investigates the increase in spreads rather than actual required yields on bonds, while holding the risk free rate constant at 2.5 per cent. As discussed above, the increase in the spreads could be driven by falling government bond yields, while the required yields on corporate bonds remain relatively unaffected. Prof Schaefer discusses this effect also, showing a fall in the BBB nominal yield during a rise in the spread measured against nominal government bond yields. However, combining this higher debt premium estimate with the constant 2.5 per cent risk free rate estimate risks over estimating the actual return on debt required from a BBB+ rated company.
- 2.73 Indeed, the real cost of debt range proposed by Prof Schaefer is from 3.44 to 4.64 per cent. This implies a nominal cost of debt range from 6.3 to 7.6 per cent (assuming expected inflation of 2.8 per cent). The proposed range therefore lies wholly above the current required yields on BBB+ bonds, as presented above.
- 2.74 Further, we note that Prof Schaefer measures the spread against the nominal treasury yield, not the swap rate he argues is the correct measure of the risk free rate, and is the measure he uses (after the adjustment) for cost of equity. This inconsistency would tend

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<sup>17</sup> NERA Economic Consulting (April 2007): "A Review of the CAA;s Assessment of the Risk Free Rate for the 2007 Airport Price

to bias the estimated debt premium upwards, relative to a consistent treatment of the risk free rate.

- 2.75 We agree with Prof Schaefer that the use of the debt premium by the Commission in parts of the advice to the CAA, and determination of the cost of debt in elsewhere from bond yields, is not fully consistent. We address this point further in Section 3, where we set out our recommended approach to cost of debt estimation in the current circumstances.

### **Combination of ranges into preferred estimates**

- 2.76 Prof Schaefer argues that, on one hand, the Competition Commission suggests ranges that are too narrow to use for the estimates of the different components of the final WACC figure, but then combined the components to form a final range in a manner which would tend to increase the final WACC range. Instead, Prof Schaefer estimates standard deviations for all component estimates, and simulates the lower and higher bounds of the WACC range. The overall effect is that the WACC range used by Prof Schaefer is considerably wider than that reported by the Commission. Finally, he chooses the value at the upper bound of the 90 per cent confidence interval from his central estimate of the WACC as his preferred estimate.
- 2.77 Schaefer, therefore, treats the establishment of ranges of the estimates, as well as the drawing of the preferred estimate, as a statistical exercise. Statistical uncertainty bounds, in our view, are not the basis on which the range of estimates used as the basis of regulatory judgement should be drawn. Ranges of reasonable estimates within which a regulatory judgement might be drawn (i.e. as suggested by the Commission) can be both too narrow to fully capture the statistical uncertainty in estimation, and at the same time too wide for a specific regulatory purpose.
- 2.78 In our view, the purpose of drawing ranges for regulatory decisions to be based on is connected to the function of the “aiming up” notion. We believe it is appropriate to aim up within a given range because of a mild asymmetry of detriments to consumer welfare between outcomes in which prices are too high, and hence consumer surplus is lost in the short term, and those in which investment is too low, and hence consumer surplus is lost in the longer term. Estimating the statistical higher and lower bounds, and selecting a figure at 90<sup>th</sup> percentile, as suggested by Prof Schaefer, would imply that the function of the aiming up is to eliminate all reasonable possibility of setting a cost of capital that is “too low”. We do not believe that is appropriate.
- 2.79 Further, in our view, there could be two main reasons for “aiming up”. First, it could be done to acknowledge uncertainty or possible errors in estimation. Second motivation could be to allow for the possibility that the market cost of capital might evolve during the

price control period. However, taking an extreme case, once one is in the worst possible state of the world, one is in *the worst possible* state of the world. It would be a mistake to think that it was appropriate, having realised an unexpectedly bad outcome, one should then aim off further, as if things could get even worse than the worst possible case. Clearly, the current state of the world is not *the worst possible*, but nonetheless, the lesson to be drawn from the above is that the degree of aiming up, if any, should be less in acknowledged bad states of the world than in “normal market conditions”.

- 2.80 At the risk of labouring the point, and to put it one more time, there is an element of double counting if we find ourselves in the bad state of the world against which we insured by aiming up from measurements conducted in more normal times, and then, on the basis of measurements conducted in the bad state of the world, aim up again.

### 3 COST OF DEBT

#### Comments on Competition Commission's Analysis

- 3.1 This section makes observations about two aspects of the Commission's analysis of cost of debt:
- (a) The Commission's general approach to cost of debt and the evidence used behind their preferred estimate; and
  - (b) Comments made regarding (possible) allowances for embedded debt and fees and costs of refinancing.

#### General approach

- 3.2 The Commission's approach to cost of debt is straightforward — directly observing the current yields of benchmark bonds (or possible benchmark indexes of bonds) at the relevant credit ratings, and removing the expected RPI inflation from the current value to gain the real cost of debt. Due to the recent and continuing market volatility, the Commission also reasonably recommends caution in drawing inference from the recent data. The range gained from the above was further discussed with and checked with an investment bank, though the Commission does not quote the exact figures recommended to them via that route. Nevertheless, using the City as a sense check seems reasonable.
- 3.3 The approach adopted by the Commission is clearly forward looking, which we would tend to agree with. The current yields are used as the basis of the cost of debt estimate, and were it not for the particularly volatile period in the debt markets, these would be the markets best estimate of the nominal cost of debt from BBB and A rated bonds. We also agree with the approach of using a general benchmark as the basis of the regulatory cost of debt estimate, rather than concentrating on information about the regulated company itself. Though the report did not disclose it, we have subsequently learned that the bond index used by the Commission relates to BBB and A rated FTSE Sterling bond index, with average lives of approximately 9 years for the bonds in the BBB index and 12 years for the bonds in the A index. These seem fairly reasonable benchmarks to use.
- 3.4 We consider there to be one minor shortcoming to the general approach, relating to the overall approach to cost of capital. The Commission's approach to cost of debt as a single estimate, rather than estimating it via risk free rate and a debt premium, might not be entirely consistent with other aspects of the cost of capital analysis. Particularly, the Commission uses a debt premium in the derivation of the debt beta. This approach leaves open the possibility that the compensation for risk allowed in the cost of debt estimate is not the same as that used in deriving the debt beta.

#### Other comments

- 3.5 In addressing BAA's concern that the CAA recommended cost of debt lay below the interest paid by BAA on fixed-rate debt taken on in the past, the Commission only remarked that its cost of debt estimate was in line with BAA's embedded debt cost, and

therefore it did not have to consider the issue further. Our concern is that the Commission's comments regarding the issue may be taken to imply that embedded debt costs are a relevant consideration. This interpretation would be somewhat in contradiction with the Commission's use of the latest market data in drawing the cost of debt estimate.

- 3.6 In our view, cost of capital as utilised in regulation should take no account of embedded debt costs. The function of cost of capital is to provide efficient investment incentives at the margin for the five year price review period. Financing decisions made in the past by the regulated companies should not enter the consideration, whether they have resulted in higher or lower interest payments (except perhaps as a sense check of the relevance of the evidence base used to draw the forward looking estimate).
- 3.7 The Commission also added 15 basis points uplift to the forward looking cost of debt estimate, to "make allowance for the ongoing commitment, agency and arrangement fees paid respectively to lenders, rating agencies and arrangers of finance". These clearly are costs reasonably incurred in operating a business. However, including them in the rate of return has two possible downsides. First, it should be ensured that inclusion of them in the rate of return does not double count any costs, such as costs allowed elsewhere for treasury management functions of the company. Second, as these are not part of the return to investors, it could be better to allow for such costs as explicitly in operating cost projections, rather than cloud them as a part of the overall return. This could have the benefit of providing clearer signals to managers responsible for minimising such costs.

### **Comparison of CC, Europe Economics and Credit Suisse Evidence**

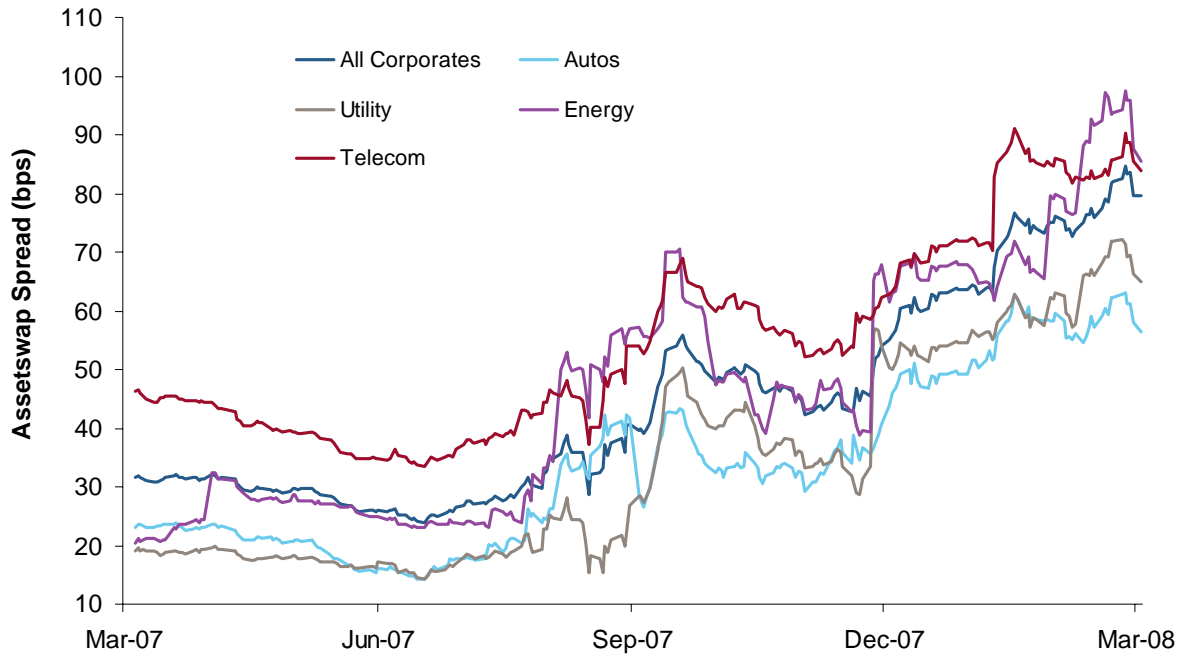
- 3.8 The purpose of this section is to briefly compare the cost of debt evidence produced by the Commission and Credit Suisse to the analysis previously provided by Europe Economics, particularly to investigate how cost of debt assumptions by CAA/EE compare to market data at different times of the review.

#### **Comparison of evidence bases**

- 3.9 As discussed above, the Commission presented data on benchmark yields of BBB and A rated bonds.
- 3.10 Credit Suisse has provided data (via the CAA) on Sterling BBB funding costs (which we have taken to mean nominal cost of debt), and Sterling BBB spreads measured against asset swap rates. The data on Sterling BBB funding costs is presented above in Charts 2.3 and 2.4. The measurement of the spreads against asset swap rates is not entirely consistent with the notion of the debt premium. The asset swap rate includes compensation of the default risk of the banking sector, and is therefore not a representation of a default risk free rate in the same way that government bond rates would be. This means that the spreads measured against it would tend to be lower than the spreads measured against truly default risk free measures. As can be seen from Chart 3.1 below, the implied spreads have indeed lower than those observed from the

Reuter's spreads. For example, the Reuter's average spread for investment grade Utilities bonds in September 2007 was 117 basis points, whereas the spread in Chart 3.1 peaks at around 50 basis points during that period.

**Chart 3.1: Secondary spreads by sector against asset swap rates**

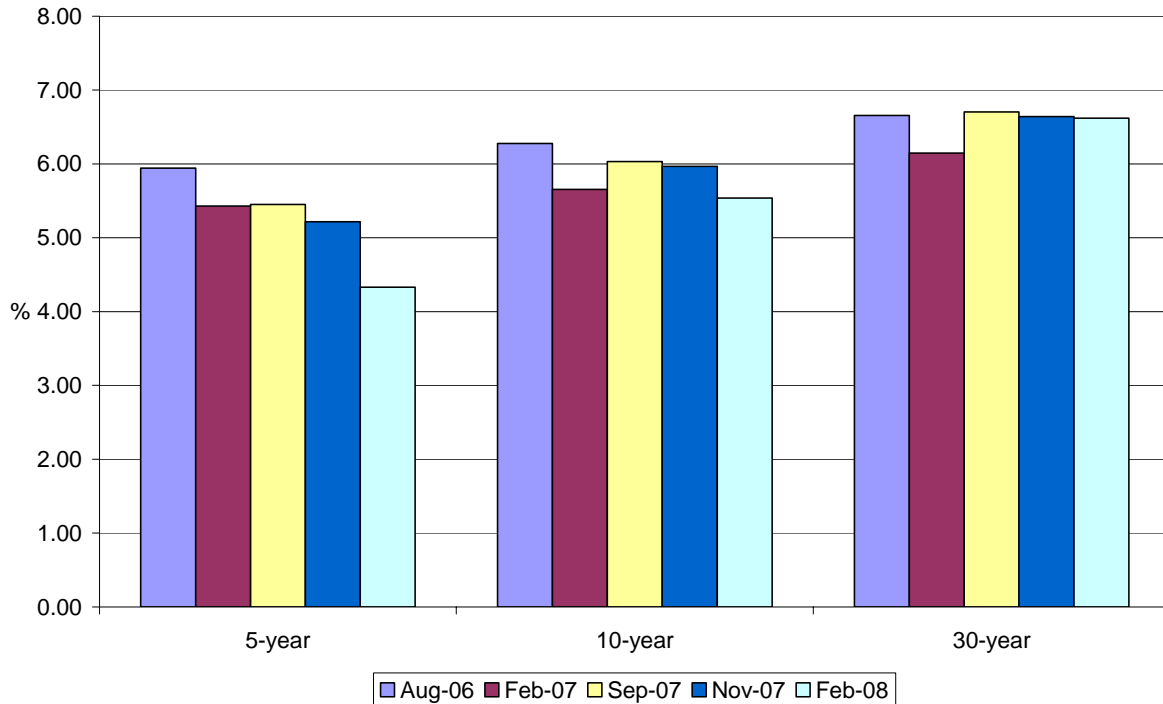


Source: Credit Suisse via the CAA

- 3.11 The movement in the yields or sterling funding costs of BBB bonds presented by the Commission and Credit Suisse are quite consistent with one another.<sup>18</sup> In particular, both show an increase in the yields of BBB bonds from around 6 per cent earlier in the year to around 6.5 per cent (and below) since August.
- 3.12 The chart below shows the implied yields for BBB+ rated bonds, based on the Reuters Utilities spreads and the yields of US Treasuries. The implied yields dipped from August 2006 to February 2007 on all maturities. The 10-year and 30-year measures were higher again in September and November 2007, roughly coinciding with the credit market “humps”, whereas the 5-year measure fell slightly. The implied 5-year yields have fallen further since the CAA’s price control proposals in November 2007, whereas the 10-year measure is currently near the level of February 2007, and the 30-year measure is near the level of August 2006.

<sup>18</sup> Charts 2.3 and 2.4 above, and Competition Commission (2007): “BAA Ltd - A report on the economic regulation of the London airports companies (Heathrow Airport Ltd and Gatwick Airport Ltd)”, Annex F, Figure 1

**Chart 3.2: Implied yields of BBB+ bonds from Reuters: Utilities**



3.13 The evidence in the above chart is slightly at odds with the evidence presented by both the Commission and Credit Suisse on benchmark yields. One possible reason for the difference could be movements in the US Treasury rate used to construct the implied yields (as those are also the benchmark used by Reuter’s in calculation of spreads). Indeed, the yield on 30-year US Treasuries fell from around 4.8 per cent in February 2007 to 4.5 per cent in November 2007, and the 5-year US Treasuries yield fell from around 4.7 per cent to around 3.7 per cent in the same period. The shorter term US Treasury rates have continued to fall further: the 5-year rate averaged 2.72 per cent in February 2008 and the 10-year rate averaged 3.74 per cent. As speculated previously, these movements could be the result of “flight to safety” by investors during the current market uncertainty. Recently, they could also reflect both actual and expected movements in the US base rate.

3.14 To investigate the issue further, Table 3.1 below shows the composition of the above implied yields, as they divide into the underlying US Treasury benchmark nominal bond yield, and the Reuters’ benchmark spread for BBB+ bonds. The table shows the results on 5-year and 10-year basis. On 5-year basis, the fall in the implied yields seems indeed to have been driven largely by falling underlying US Treasury yields, consistent with “flight to safety” hypothesis. The 10-year US Treasury yields have not fallen as much as the 5-year yields, though the fall in the implied yield from November 2007 seems to have been driven by the fall in the US Treasury yields.

**Table 3.1: Composition of implied Utilities yields**

	US Treasury (%)	BBB+ spread (%)	Implied Yield (%)	UK Government (%)
<i>5-year basis</i>				
August 2006	4.82	1.12	5.94	4.64
February 2007	4.69	0.74	5.43	4.97
September 2007	4.20	1.19	5.45	4.98
November 2007	3.67	1.55	5.22	4.64
February 2008	2.78	1.55	4.33	4.33
<i>10-year basis</i>				
August 2006	4.88	1.40	6.28	4.44
February 2007	4.71	0.95	5.66	4.68
September 2007	4.52	1.51	6.03	4.95
November 2007	4.15	1.82	5.97	4.67
February 2008	3.74	1.80	5.54	4.61

- 3.15 These movements in the US Treasury yields, particularly with a view to the effects of the recent turbulence in the credit markets, could diverge significantly from the UK Government bond yields. Such divergence, if leading to movements in the Reuters spread measure, could make the Reuters spreads less desirable benchmarks for the price of risk relevant in the UK, compared to using the spreads in usual market circumstances. The final column of Table 3.1 above investigates this issue. Indeed, both on 5-year and 10-year basis, the US Treasury yield has been below the UK government bond yield since February 2007. US Treasuries have also fallen more rapidly during the credit crises than the UK government bond yield and seem to continue to do so.
- 3.16 In summary, current spreads may be distorted by the effect of the credit crises due to “flight to safety” effects on the underlying government bond yields. The recent relative movements in US Treasuries and UK Government bond yields could further affect the reliability of spreads estimated against US data. We would therefore not recommend using the recent Reuters benchmark spreads to inform the CAA’s debt premium estimate. In particular, simply combining these higher spreads with the assumed stable risk free rate of 2.5 per cent would be a mistake.

#### **Assumed cost of debt and market cost of debt**

- 3.17 It is also informative to investigate how the cost of debt assumptions at various points in the review have compared to the then prevailing market conditions and evidence presented by other parties. Here we take the yields presented by the Commission and

Credit Suisse as evidence of the historical levels of market yields. We also compare the cost of debt assumption to evidence presented by UBS on behalf of BAA. Table 3.2 below shows the results.<sup>19</sup>

**Table 3.2: Comparison of CAA Assumptions to other evidence**

Timing of Publication	CAA nominal cost of debt (%)	UBS/BAA <sup>1,2</sup> Utilities (%)	Competition Commission <sup>1</sup> BBB (%)	Credit Suisse BBB+ (%)
<i>5-year basis</i>				
December 2006 Initial proposals	5.88	5.1	5.7	5.9
March 2007 recommendation to Commission	5.88	5.4	5.9	6.1
September 2007 Commission publication	N/A	5.8	6.4	6.4
November 2007 Price control proposals	6.3	5.8	N/A	6.1
February 2008	6.3	6.1	N/A	5.8
<i>10-year basis</i>				
December 2006 Initial proposals	5.88	5.1	5.7	5.7
March 2007 recommendation to Commission	5.88	5.4	5.9	5.9
September 2007 Commission publication	N/A	5.8	6.4	6.1
November 2007 Price control proposals	6.3	5.8	N/A	5.9
February 2008	6.3	6.1	N/A	5.9

1) The UBS/ BAA and Competition Commission figures did not distinguish spreads by maturity; hence they are the same for the 5-year and 10-year cases in this table.

2) The constituents of the utilities index used are rated from AA to BBB, so the figure is could underestimate yield required on BBB+ bond

Source: Europe Economics analysis of Bank of England, UBS, Competition Commission and Credit Suisse data

3.18 The results show that the assumed cost of debt was slightly above the market rates at the time of the Initial Proposals and the recommendations to Competition Commission. In addition, the Commission's recommendation (and the CAA's subsequent proposals) continue to be above current market yields. However, without the increase in the regulatory assumption, the assumed cost of debt would have fallen below the evidence on market rates, and as such, some rise in the cost of debt seems justified (albeit not necessarily to 6.3). Evidence from Credit Suisse suggests that the relevant corporate BBB+ yields observed in secondary markets in February 2008 were between 5.8 and 5.9

<sup>19</sup> Converting the Europe Economics / CAA cost of debt assumption to a comparable figure to the nominal yields requires an inflation adjustment to be made. Here we have used the same expected inflation figure of 2.8 per cent as the Competition Commission assumed in its analysis.

per cent on average. Using a cost of debt of 6.3 per cent would therefore seem to incorporate substantial headroom compared to current required yields on the market.

- 3.19 Further, the difference between the nominal cost of debt implied by CAA's price control proposals and the observed UK Government bond yields fell between the initial proposals and the March 2007 update of them. However, it rose to roughly 1.4 per cent at the time of the price control proposals, reflecting the combined effect of the risk free rate and the debt premium used. Maintaining the cost of debt assumption at 6.3 per cent would imply roughly 200 basis points premium compared to the levels of nominal UK Government bond yields in February 2008, based on a five year measure.

### **Recommended Approach**

- 3.20 This section revisits the basis of the cost of debt measurement, discussing our preferred approach to it, practical benchmarks to achieve it, as well as the implications of the current market circumstances to measurement.
- 3.21 The options to cost of debt measurement introduced above are:
- (a) Direct derivation of the cost of debt from yields (current or otherwise); and
  - (b) Utilising the concept of the debt premium (however measured).
- 3.22 The purpose of the cost of debt estimate is to provide a part of the forward looking cost of capital estimate for a five year price review period. The above options can in theory produce exactly equivalent answers and are both in a sense correct. However, we consider that utilising the concept of the debt premium can better ensure consistency throughout the cost of capital determination, as well as allowing more and different types of evidence being brought to bear on the decision.
- 3.23 We also remain of the view that the debt premium represents compensation for the risk taken on by providers of debt finance to a company, and that it should be estimated against yields on suitable government benchmark bonds. Ideally, the government bond used in deriving the debt premium would be of same maturity as the benchmark (nominal) BBB+ yield, and from the same geographic region such that the resulting real debt premium does not include components of residual inflation or inflation risk. Further, the yields used as the basis of the debt premium estimate should be wide benchmarks, rather than company specific cost of debt estimates.
- 3.24 In normal market circumstances our recommended approach would therefore be to obtain reliable current benchmark yields of the desired maturity and credit rating, and removing the relevant government bond yields from them to obtain the estimate of the debt premium that would reflect the compensation for risk associated with that rating of bond. This premium would then be added to the risk free rate estimate to obtain the relevant cost of debt.
- 3.25 As discussed previously (see also below), the current market circumstances are such that current spreads may be distorted by short term influences in both the underlying

government bond yields, as well as short term effects in observations of the corporate yields. To help insulate the decision from the movements in the government bond rates, while continuing to ensure consistency across the WACC determination, one could take the following approach:

- (a) Observe yields on BBB+ rated benchmarks;
- (b) Subtract the risk free rate estimate used in the determination to obtain the debt premium estimate, which is then used in determination of the cost of debt and the analysis of debt beta, thus ensuring consistency of application.

3.26 This approach would be very similar to the approach adopted by the Commission, but it would ensure internal consistency in application of the cost of debt figure in the price review.

### **Effect of the credit crises**

3.27 Typically the approach we have sketched for both the cost of debt and the risk-free rate involves using the latest data, including the approach set out above.<sup>20</sup> Recent events in money markets, however, have been quite unprecedented. Does it remain the case that we should still take the latest observation?

3.28 The exact causes of recent turbulence are ill-understood and remain the subject of extensive speculation. However, at a high level, the following story seems a relatively safe interpretation of events:

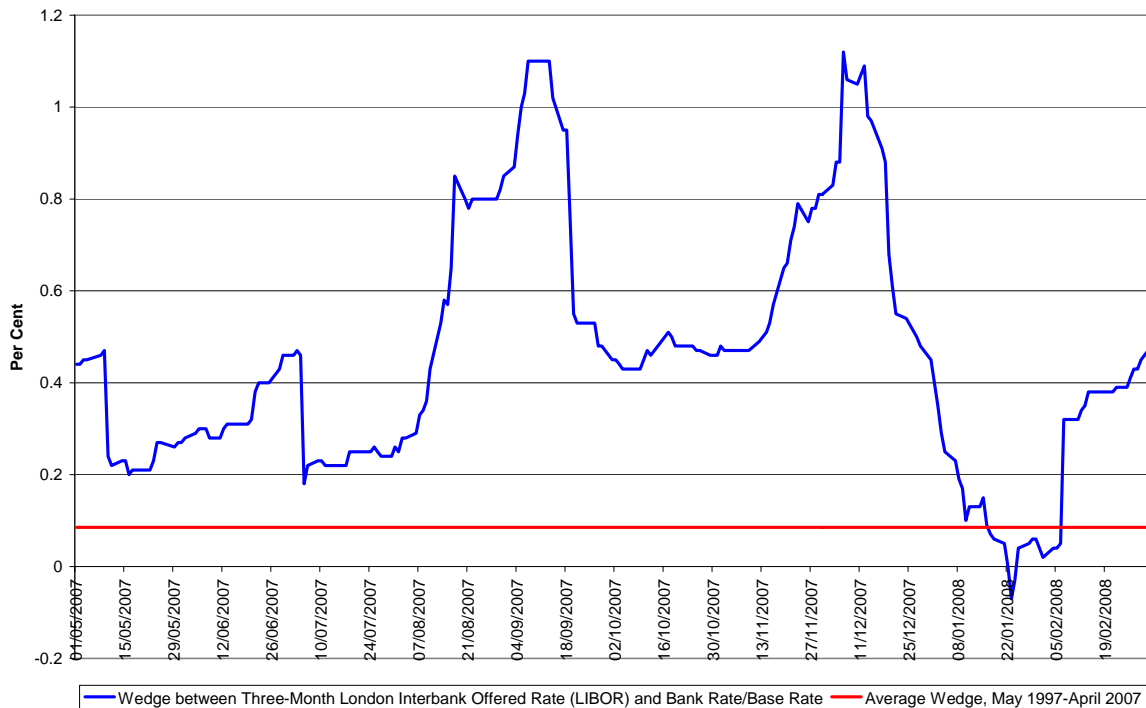
- (a) Markets have materially re-assessed the risk of lending cash;
- (b) The new equilibrium is sufficiently distant from the old that the transition is not smooth;
- (c) Because of (b), it is unclear where the new equilibrium will be;
- (d) Because of (c), and because most market participants have some flexibility over precisely when they borrow and lend money, some borrowers have been reluctant to issue debt (since there is the possibility that the interest rates the market currently requires may represent over-shooting of the new equilibrium risk-adjusted rates), and lenders have been unwilling to offer money (since rates have risen rapidly, lending today carries the opportunity cost of not lending tomorrow at potentially higher rates, and the risks to one's own balance sheet have changed sufficiently that it is difficult to estimate how much cash one might require for one's own purposes — and it would be expensive to buy it later in the marketplace);
- (e) The result of (d) has been that, in the short-term at least, money market activity and bonds issuance has declined very materially — the market has become "thin".

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<sup>20</sup> As discussed previously, we acknowledge that there is some tension between this, the use of long-run estimates of the Market Risk Premium, and our partial endorsement of the Smithers & Co claim that the sum of the MRP and the risk-free rate will be more stable than estimates of each component alone.

3.29 The chart below reproduces Chart 2.1 above illustrating the scale of the current issue. As discussed in paragraph 2.11, the fact that, far from being negative, in November 2007 the wedge was close to the extremes of the previous summer is a measure of how significant recent money market issues have been. The fall in the wedge since December 2007 might be an indication that the credit markets have begun to settle and that worst of the credit crunch is over (at least for now).

**Chart 3.2: Scale of the credit crises<sup>21</sup>**



3.30 However, any issues about revaluation and assessment of risk that were present in the crises could take time to resolve, and caution should still be exercised in applying current market rates. At the peak of the credit crises, when the market becomes thin, the observed prices may only very imperfectly reflect the underlying longer-term willingness to buy and sell debt. Prices are determined by marginal players among current market participants, but there is little reason to suppose that these would also be the marginal players when market activity returns to more normal levels.

3.31 Thus our view is that the market assessment of risk could have risen quite materially, but that market prices during the credit humps are a very poor indicator of by how much, and the CAA would be unwise to rely on just taking the latest data point in this environment.

<sup>21</sup> Note: this is the same as Chart 2.1 above, but it is duplicated here as part of a slightly different discussion.

- 3.32 We note, however, that the approach adopted by CAA so far would be relatively unaffected by the recent market turbulence, compared to some possible alternative approaches. The approach has been quite conservative, in that many of the “new economy” financial market innovations that might have been given a higher weight were not. Instead, such effects were thought to potentially affect the forward looking market risk premium, which remains our preferred interpretation. First, the approach to estimate the allowed cost of debt did not rely on the continued availability of very cheap index linked “wrapped” debt.<sup>22</sup> Second, the approach did not overly emphasise the effect and possibilities of private equity or other innovative financial arrangements. Third, the CAA was not tempted to redefine the measurement of the risk free rate in terms of asset and credit default swap rates. Had any of the above been incorporated substantially to the analysis, the impact of the market volatility on the regulatory settlement might have been substantially larger.
- 3.33 Under our methodology established in the previous papers, the notional gearing used the WACC was set such that bonds carry an assumed appropriate credit rating. If events such as the credit crises would have the consequence of changing the expected credit rating, at a given gearing level, of bonds, and if this were expected to continue over the period of the price control, then the appropriate response within our methodology would be to change the notional gearing assumption, reducing it until the appropriate credit rating is reached.

#### **Time horizon of the cost of debt estimate**

- 3.34 The final open question about the cost of debt benchmark is to what maturity structure the benchmark yields used as the basis of the cost of debt estimate should relate to. Previously in the process we have used an assumed “reasonable and realistic” maturity structure in compiling a debt premium estimate from the Reuters spreads data. In doing so, we used the BAA 2006 actual debt structure as an example of a reasonable and realistic mix of maturities, leading roughly to an average 7-year maturity used. Other options include making reference explicitly to a 5-year maturity, corresponding to the length of the price control period, or to a longer, perhaps 10-year or 20 year maturity, corresponding to the length of the investment plans.
- 3.35 There are some benefits of either of the above approaches. However, in the context of the rest of the cost of capital, the notional approach adopted, and price review determination, we consider maintaining the current approach of seeking to reflect a reasonable and realistic maturity structure appropriate. The example reasonable realistic maturity structure used previously implied an average maturity between 5 and 10 years. This implies that CAA should focus on the yields on bonds with a maturity between 5 and 10 years in drawing its final cost of debt estimate.

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<sup>22</sup> However, consideration of index linked debt might be relevant to assessment of the robustness of the financing arrangements, as discussed in CAA’s November 2007 price control proposals, paragraph 13.36.

### Relevance of data from BAA banking advisers

3.36 Little of the data presented by BAA banking advisers speak directly to the determination of the debt premium or the cost of debt allowance. For example, the credit spread data is often presented as spreads against asset swap rates. Also, as discussed above, the spreads presented against government gilt yields could be influenced by volatility in the gilt yields themselves, rather than the underlying yield. The data presented does not focus on what we would consider to be the relevant benchmark measure in the current circumstances: yields on BBB+ rated utilities.

### Summary of the recommended approach

3.37 In summary, we recommend the following approach to inform the final cost of debt estimate:

(a) Observe or construct yields on BBB+ rated benchmarks:

- Covering the most recent yields as well as the period prior to the recent credit crunch;
- Relating to the non-financial corporations in general and utilities specifically; and
- Corresponding to a range of maturities between 5 and 10 years;

(b) Subtract the risk free rate estimate used in the determination to obtain the debt premium estimate;

(c) Sense check the above cost of debt and debt premium estimates against the cost of recent airport bond issues at BBB+ rating (if available), as done for the Initial Proposals and the March recommendations; and

(d) Use the above debt premium in determination of the cost of debt and the analysis of debt beta, thus ensuring consistency of application.

3.38 This approach would be very similar to the approach adopted by the Commission, but it would ensure internal consistency in application of the cost of debt figure in the price review.