



A Review of the Risk Assessment in the CAA's Initial Proposals for Q6

A Report for London Heathrow

10 June 2013

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Executive Summary

Heathrow Airport Ltd (HAL) has asked NERA to provide a high level review of the risk assessment in the CAA's Initial Proposals for Heathrow for Q6.

In response to our January 2013 report, which addressed a number of risks faced by HAL including beta risks, asymmetric risks and regulatory risks (measured by free cash flows) the CAA's Initial Proposals contained a number of comments on why it thought our January 2013 report overstated the relative risk of HAL.

This report first responds to the comments made by the CAA in response to NERA's January 2013 relative risk report¹ before reviewing the plausibility of the CAA's own relative risk assessment.

What Risks Matter for the Cost of Capital

The CAA's main concern (para 9.94) appears to be that "*only systematic risks matter for the CAPM*" and it uses this argument to largely dismiss our relative risk analysis presented in our January 2013 report due to the fact that "*many of the risk factors we raised appear non-systematic in nature*."

Whilst it is true that the CAPM *assumes* only systematic risks matter for beta, we believe the CAA should have taken a greater account of the analysis we presented on sector relative risks for the following reasons:

- Our analysis placed a strong emphasis on analysis of beta risks, especially "demand risk" which we identified as the most relevant beta risk factor.² Based on this analysis, it is clear that airports face a significantly higher exposure to beta risks than the other regulated UK companies that are regulated through a revenue cap mechanism and do not face volume risk. The importance of beta risks was captured by assigning a 50% weight to systematic risks in our overall relative risk assessment.
- In addition to beta risks, we considered the effect of *some* non-systematic risks which are relevant to the cost of capital (asymmetric risks and regulatory risks). We were clear to explain why these risks might matter for investors required returns and should not just be dismissed, since finance literature provides empirical evidence which shows that these risks are relevant for investors. It is widely acknowledged in the regulatory and financial literature that CAPM is not a perfect model for explaining asymmetric and/or regulatory risks.

The CAA rejected the evidence provided by our stylised relative risk model, on the basis that it considered both systematic and non systematic risk factors. For the reasons discussed above, there is empirical evidence that the non-systematic risk factors we consider are relevant for investors. Our stylised relative risk model was not intended for the purposes of beta estimation but rather represented an assessment of relative risk exposure to business

¹ NERA (31 Jan 2013): Relative Risk of London Heathrow

² Which the CAA does not seem to dispute.

risks due to differences in the regulatory frameworks. This warrants the inclusion of all risk factors (including non-systematic) investors require compensation for.

However, it is worth noting that even if we take out the non-systematic risk factors for HAL, that the general conclusion of our analysis does not change, namely that HAL's regulatory framework exposes it to significantly more risk than the other utilities.

In addition the CAA provided a number of items of supporting evidence for its position that Heathrow is not significantly riskier than traditional utilities, to which we respond in Appendix D.

The CAA appears to have misunderstood some of our arguments on systematic risk

It further appears to us the CAA has misunderstood a number of the arguments in our January 2013 report relating to HAL's exposure to *systematic risks*. In particular, the CAA state that HAL's demand risk is "*dampened by airlines responding to weakening demand conditions by cutting yields in the short run to maintain load factors and by the CAA re-setting the price cap every five years.*" (Para 9.94). However, these factors were taken into account in our relative risk analysis and we note that other regulated companies also enjoy the benefits of five year price reviews.

We also note that retail revenues, which are particularly important at Heathrow relative to other airports are not subject to demand mitigation by airlines. Even if passenger numbers are held up by airline mitigation measures, spending per passenger will be impacted by economic conditions.

A very important issue is HAL's underperformance over the past two control periods on traffic risk. This has been a major contributor to HAL's overall low profitability. However, whilst the CAA notes this, it appears to make no allowance for this in the cost of capital on the basis that "... *merely reviewing HAL's actual performance compared to forecast for the past two control periods conflates forecasting accuracy issues with systematic traffic risk.*" (Para 9.94)

However, it seems simply implausible that investors would not take account of traffic volume risk in their assessment of HAL's cost of capital. We also note that forecasting error is likely to contain a strong cyclical component because any unexpected changes to the macroeconomic climate will lead to a difference between outturn and forecast demand (forecasting error) in the same direction as the change in the economy. The length and depth of the recession has been a major factor in HAL's traffic volume performance, and this must be a beta risk.

We note that the CAA's representation of the treatment of systematic risk in our January 2013 appears incomplete. The CAA appears not to have addressed other cyclical risks, which also have the potential of making HAL riskier than conventional utilities. These include HAL's exposure to pension costs, the treatment of which is as yet unclear and high operating leverage, which may have contributed to HAL's underperformance on opex over Q5. We discuss these two aspects in more detail in Appendix A and Appendix B.

We also review academic literature on risk differences between price cap and revenue cap regulatory systems and their impact on beta. We find that both cross-country and time series approaches provide support for higher beta risks faced by utilities regulated under price caps

relative to utilities regulated under revenue cap as long as regulators are independent, as is the case in the UK. The evidence in academic literature supports our conclusion of the higher systematic risk of price cap regulated companies relative to revenue cap regulated companies, which is mostly caused by increased demand risk.

The CAA appears to understate the importance of asymmetric risk

With regard to the CAA's assertion that a number of the risks we considered are non-systematic we note the following. The risk factors we considered in our January 2013 report were either correlated with the business cycle (systematic) or they were asymmetric with the main asymmetry for HAL being the existence of a capacity constraint and susceptibility to asymmetric (downside) shocks that means the distribution of traffic is skewed to the downside.

A key assumption underlying the CAPM is that expected returns are symmetrically and normally distributed. However, the fact that the CAPM assumes away asymmetric risks represents a potential shortcoming of the CAA methodology of relying solely on the CAPM rather than a reason for concluding that asymmetric risks do not exist or that investors do not require compensation for being exposed to such risks.

The academic literature shows that asymmetric risks (both systematic and non-systematic) will have an impact on investor's required rate of return more generally. The importance of asymmetric risk has also been recognised by UK regulators in the past including Ofgem³, Ofwat⁴ and the CC, which concluded with regard to Heathrow T5:

“In the course of the construction of T5 the scope for BAA to outperform the price control set for Q4 is limited, but there is real scope for the expectations incorporated in the price control not to be met and for BAA thereby to be financially disadvantaged. (...) In our view the factors in paragraph 4.71 [including the above] can best be recognised by way of a further T5-related uplift to the WACC of some 0.25 per cent.”⁵

The CAA ignores this wealth of evidence when relying on the CAPM only.

Empirical review of the cyclicity of outturn returns for HAL and other regulated companies contradicts the CAA's risk ordering

In addition to responding to the CAA comments we undertake a review of regulatory statements on relative risk as well as an empirical review of differences in outturn volatility between the different regulated sectors as a plausibility check of the CAA's relative risk ordering. As shown in Figure 1 the CAA's own ordering of risk places Heathrow's beta in line with Network Rail and significantly below NERL; two other companies regulated under

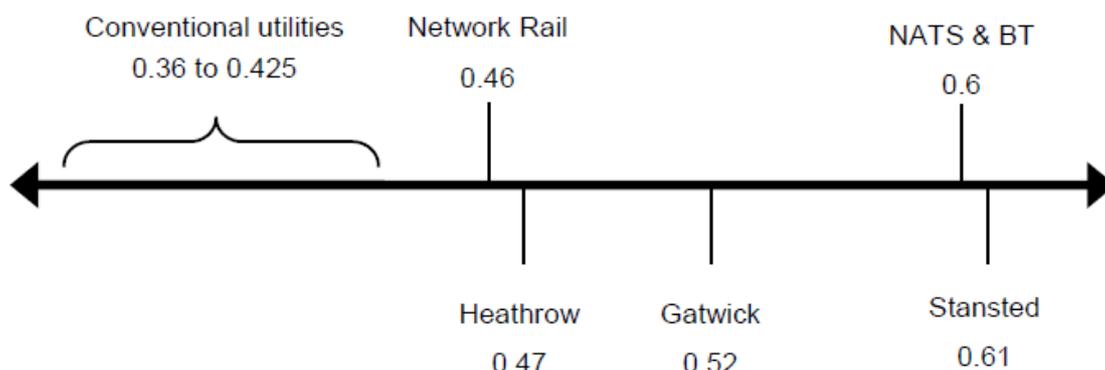
³ Ofwat (2013): Setting price controls for 2015-2020 – framework and approach: a consultation p.126

⁴ Ofwat (2013): Setting price controls for 2015-2020 – framework and approach: a consultation p.126

⁵ CC (2002): BAA plc: a report on the economic regulation of the London airports companies (Heathrow Airport Ltd, Gatwick Airport Ltd and Stansted Airport Ltd) p. 179

a price cap regime but enjoying significant protection from demand risk compared to Heathrow.

Figure 1
CAA's Diagrammatic Representation of recent Beta Assessments



Source: CAA – Economic regulation at Heathrow from April 2014: Initial Proposals; Figure 9.4, p.144.

With regard to the positioning of Heathrow on the above continuum we note that it appears implausible that the beta for HAL is closer to the top end of the range of conventional utilities than it is to Gatwick or NERL despite the fact that conventional utilities do not face material volume risk, due to revenue correction mechanisms within their regulatory frameworks. Volume risk at airports is clearly a systematic risk factor and (arguably) the most significant beta risk factor faced by HAL since lower than predicted volumes because of the recession have been the main factor that has been responsible for HAL's low achieved rates of return over Q5.

When last assessing NERL's beta the CAA explicitly took account of the impact of demand risk on NERL's profits and considered it significant despite the fact that NERL's regulatory framework affords it more protection from demand risk than Heathrow's:

“volume-sharing arrangements, have been explicitly factored into the CAA's analysis. Generally, this shows that changes in GDP growth have the potential to impact on NERL's profits much more than a conventional regulated utility. It is for this reason that the CAA has tended in previous decisions to allow NERL a commensurately higher rate of return.”⁶

The negative impact of traffic risk on hub airports is recognised by rating agency S&P when assessing “Aéroports de Paris”:

“The SACP on ADP reflects our view that the company will retain its excellent business risk profile, thanks to Paris-Charles de Gaulle's strong competitive position and core hub status for the largest European airline, Air France-KLM. (...) These strengths are partially offset by the company's exposure to traffic risk, ...”⁷

⁶ CAA: NATS Formal proposals CP3; October 2010; p. 152

⁷ S & P (28 Oct 2011): Summary: Aéroports de Paris

Similarly, the advisers to the ORR mention that a UK investor survey highlighted the importance of demand risk as a prime risk for airport investments:

“respondents [to the investor survey] did, however, rank airports as more risky than traditional utility companies, generally highlighting airports exposure to demand risk in support of this position.”⁸

Also we note that the CC concluded that the risk of HAL and GAL was not materially different.⁹ It also appears implausible that HAL is ranked as essentially identical in risk to Network Rail despite Network Rail’s regulator (the ORR) concluding that there is “*strong evidence that Network Rail’s risk profile is below that of the airports.*”¹⁰ Instead an investor survey found that “*The two regulated sectors in which permanently higher risk is said to exist are telecoms and aviation*”¹¹ suggesting airport betas should be more comparable to BT’s beta (0.6) than Network Rail (0.46).

Finally HAL’s position a long way below NATS does not appear consistent with the CAA’s own previous positioning that the beta for NERL should fall “*within the margin of accuracy*” for Gatwick’s beta¹² and the CAA’s acceptance of the CC’s Q5 position that the risk of HAL and GAL was not materially different.

While there is no guarantee that individual regulatory decisions provide an unbiased indicator of true beta it appears that the CAA’s estimate of HAL’s beta is out of line with *almost all* regulatory decisions for UK industries as shown above.

This conclusion is confirmed by our empirical analysis of realised outturn returns since 2006. For the period for which we have data available (2006-2012) we find that HAL’s returns have been significantly more cyclical than Network Rail’s and National Grid Electricity Transmission’s returns and roughly comparable to NATS’ and GAL’s. This finding provides further evidence that HAL’s risk profile is more comparable to NATS and GAL than it is to Network Rail and the more conventional utilities.¹³

The CAA’s current beta estimate for HAL does not reflect the above findings, which strongly suggests that a logical ordering of risk would place HAL further to the right of the continuum presented in Figure 1. The CAA should adjust its beta estimate accordingly at final proposals stage in order to account for the evidence presented above.

⁸ Water UK investor survey, quoted in First Economics (2008): “The Riskiness of Network Rail Relative to Other Regulated Industries”

⁹ CC (Sep 07): BAA Ltd - A report on the economic regulation of the London airports companies (Heathrow Airport Ltd and Gatwick Airport Ltd), Appendix F, para 117.

¹⁰ ORR (2008): Determination of Network Rail’s outputs & funding for 2009-14, p.230 [Emphasis added]

¹¹ First Economics (2008): “The Riskiness of Network Rail Relative to Other Regulated Industries” – A Report for ORR. [Emphasis added]

¹² CAA (2010): NATS (En Route) plc price control: CAA formal proposals for control period 3 (2011-2014): under Section 11 of Transport Act 2000, p.153. At the time the CAA claimed that Gatwick’s beta was 0.58, the top end of the beta range the CAA used at Q5.

¹³ We acknowledge that outturn returns reflect both systematic and non-systematic risk. However, by its very nature non-systematic risk is as likely to bias up the observed beta as it is to bias down the beta depending on whether it happens to materialise in a boom or a downturn.

In summary, we review regulatory statements from the UK as well as the academic literature on the relative risk of price cap and revenue cap regimes as well as undertaking an empirical review of the cyclical nature of outturn returns for HAL and other regulated companies. All three lines of enquiry support the conclusion that the CAA's Initial Proposals understate the risk of HAL relative to other regulated industries and that the CAA should adjust upward its estimate of HAL's beta.

1. Introduction

Heathrow Airport Ltd (HAL) has asked NERA to provide a high level review of the risk assessment in the CAA's Initial Proposals for Heathrow for Q6.

In response to our January 2013 report, which addressed a number of risks faced by HAL including beta risks, asymmetric risks and regulatory risks (measured by free cash flows) the CAA's Initial Proposals contained a number of comments on why it thought our January 2013 report overstated the relative risk of HAL.

This report first responds to the comments made by the CAA in response to NERA's January 2013 relative risk report¹⁴ before empirically reviewing the plausibility of the CAA's own relative risk assessment. The remainder of the report is structured as follows:

- Chapter 2 provides our response to CAA comments on our arguments related to systematic risk considered in our January 2013 report;
- Chapter 3 provides our response to CAA comments on our arguments related to non-systematic risk considered in our January 2013 report;
- Chapter 4 provides an empirical review of the CAA's proposed relative risk ordering including a review of the cyclical volatility of outturn returns for different regulated companies; and
- Chapter 5 concludes.

The appendix provides supporting information including an updated assessment of whether Heathrow's exposure to the risk factors analysed in our January 2013 report has changed given the CAA's Initial Proposals for Q6.

¹⁴ NERA (31 Jan 2013): Relative Risk of London Heathrow

2. Response to the CAA's Comments on Systematic Risk

2.1. The Risks presented in our January 2013 report

In response to our January 2013 report, the CAA's Initial Proposals for HAL for Q6 contain a number of comments on why it thought our January 2013 report overstated the relative risk of HAL.

The CAA's main concern appears to be that our analysis considered both systematic and non-systematic factors. In the CAA's view

“Only systematic risk should be considered in a CAPM framework and non-systematic risk can be taken into account in the gearing and cost of debt assumptions. Many of the risks that NERA raised would appear to be non-systematic in nature.” (Para 9.94 & 9.98)

The CAA argues that only systematic risk should be considered in a CAPM framework and uses this argument to dismiss the evidence presented in our January 2013 report. However, the fact that the CAPM assumes away asymmetric risks represents a potential shortcoming of the CAA methodology of relying solely on the CAPM rather than a reason for concluding that asymmetric risks do not exist or that investors do not require compensation for being exposed to such risks.

In our report we have only considered risks that are relevant to the cost of capital. These risks include:

- Systematic risks: we placed a strong emphasis on the analysis of beta risks, especially “demand risk” which we identified as the most relevant beta risk factor¹⁵. Based on our analysis, we concluded that HAL faces a significantly higher exposure to beta risks than other regulated utilities which are regulated through a revenue cap mechanism and do not face volume risk. The importance of beta risks was captured by assigning a 50% weight to systematic risks in our overall relative risk assessment.
- Non-systematic risks: represented by asymmetric risks and regulatory risks (measured by free cash flows), which are both relevant to the cost of capital. In our January 2013 report we were clear to explain why these risks might matter for investors required returns and should not just be dismissed as irrelevant. (We provide more detailed explanation of relevance of non-systematic risk in Section 3) It is widely acknowledged in the regulatory and financial literature that CAPM is not a perfect model for capturing asymmetric and/or regulatory risks.

When commenting on our “relative risk model”, which analyses HAL's cash flow variability relative to other regulated sectors, the CAA dismisses our evidence on the basis that it combines both systematic and non-systematic risks:

¹⁵ The CAA does not seem to dispute this point – see below.

“Furthermore, NERA’s analysis of the variability of HAL’s cash flows will give an indication of combined systematic and non-systematic risk, but not an indication of the relative magnitude of each.” (Para 9.93)

Our stylised relative risk model was not intended for the purposes of beta estimation but rather represented an assessment of relative risk exposure to business risks due to differences in the regulatory frameworks. For the above stated reasons, the non-systematic factors we consider are relevant for investors due to their asymmetry and therefore we included them in our risk modelling. The results of our stylised risk model confirm our conclusions on the relative risk of different sectors, which include all risks relevant to the cost of capital, including relevant non-systematic risks.

Below we discuss in more detail our responses to CAA statements regarding our analysis of systematic risks in our January 2013 report. The next chapter responds to CAA’s statements regarding our analysis of non-systematic risks.

2.2. The CAA provides an incomplete account of systematic risk presented in our January report

As part of our January 2013 report we argued that underlying demand risk, together with the form of the price control mechanism, represents the main driver of cyclical risk faced by HAL. We concluded that HAL was more exposed than other utilities due to higher correlation between demand for air transport services and the business cycle when compared to conventional utility services. In addition, the form of the price control (price-cap) provides no protection from demand risk for HAL unlike for other major European airports.¹⁶

The CAA seems to agree with our conclusion that demand risk represents the most important systematic risk factor for HAL. However, in response to our January 2013 report the CAA stated that demand risk was mitigated by airline behaviour and the fact that traffic forecasts are re-set every five years:

“CAA concurs that demand risk is one of the main systematic risks facing HAL, although this effect is in part dampened by airlines responding to weakening demand conditions by cutting yields in the short run to maintain load factors and by the CAA re-setting the price cap every five years.” (Para 9.94)

In response to the first point we note that our January 2013 report already accounted for mitigation of demand risk through airline behaviour by looking at HAL’s actual returns, which inevitably account for any measures taken by airlines to stabilise passenger numbers.

¹⁶ E.g. of the two main comparators used by Europe Economics i) Fraport has a limited risk sharing mechanism that allows it to pass through part of the difference between expected and outturn volumes in the form of higher charges and ii) Aeroports de Paris shares 50% of the risk beyond small changes in volume for which there is a deadband.

With regard to the second point it is not clear why the CAA is referring to the five-year regulatory period as a risk-mitigating mechanism given that the main comparators that we use, NATS in particular, also face a five-year regulatory period after which demand forecasts are re-set while it enjoys significant within-period protection from demand risk due to the volume risk sharing mechanism. In addition:

- We do not argue that airports are as risky as airlines, which bear demand risk in full. This difference is confirmed by investigating beta estimates for some of the major listed airlines operating from Heathrow, e.g. we estimate IAG's beta to be 0.67 over the last 2 years, a full 40% higher than the CAA's proposed beta estimate for HAL¹⁷; and
- We also note that retail revenues, which are particularly important at Heathrow relative to other airports are not subject to demand mitigation by airlines. Even if passenger numbers are held up by airline mitigation measures, spending per passenger is affected by economic conditions. Heathrow's econometric models of commercial revenues indicate an elasticity of around 0.4 for spending per passenger with respect to EU economic growth

We note that the CAA's representation of the treatment of systematic risk in our January 2013 appears incomplete. The CAA appears not to have addressed other cyclical risks, which also have the potential of making HAL riskier than conventional utilities. These include HAL's exposure to pension costs, the treatment of which is as yet unclear and high operating leverage, which may have contributed to HAL's underperformance on opex over Q5. We discuss these two aspects in more detail in Appendix A and Appendix B.

2.3. Forecasting Error is itself likely to be cyclical

The CAA ignores the effect of traffic forecasting, which is required for setting the price caps, on HAL's exposure to systematic risk. The CAA argues that:

"The CAA, however, also notes that merely reviewing HAL's actual performance compared to forecast for the past two control periods conflates forecasting accuracy issues with systematic traffic risk." (Para 9.94)

We note that traffic forecasting error is likely to have a strong cyclical component itself, even if the base forecast includes expected shocks (both positive and negative in nature) as it does in CAA's Initial Proposals for HAL for Q6. Forecasting error itself is likely to be strongly pro-cyclical for the following reasons:

- Inevitably the CAA has to take a view on the macroeconomy and forecast passengers accordingly in developing its base forecast. Given the high income elasticity of demand of air travel, any unexpected change to the macro climate is likely to lead to a difference between actual passenger numbers and the CAA forecast (i.e. forecasting error) that goes

¹⁷ We used the same approach to debt beta and leverage adjustment as the Competition Commission to ensure the beta estimates are on a comparable basis.

in the same direction as the unexpected shock to the macroeconomy and the stock market and hence forecast error is cyclical;

- Truly unsystematic forecasting error is as likely to overstate as it is to understate the correlation between HAL's returns and the macro economy as it is just as likely to act in the opposite direction to the macroeconomy (and thus dampen volatility) as it is to enhance volatility.
- Where unsystematic forecasting error consistently leads to under-recovery of cost (as the CAA seems to imply) the distribution of risk may not be symmetric, in which case the CAA's preferred model (the CAPM) is not suited to determining the appropriate rate of return and instead the CAA should be considering models that take account of asymmetric risk.

Our above findings suggest that from a theoretical perspective demand risk is more material than the CAA's initial findings appear to suggest as traffic forecasting error is likely to be strongly pro-cyclical even when accounting for asymmetric shocks.¹⁸ This cyclical risk is specific to companies regulated under a price cap regime as companies regulated under a revenue cap do not face any return risk from forecasting error. Moreover, the cyclicity of this risk is amplified the stronger is the correlation between the business cycle and the demand for the underlying good. Consequently, HAL's exposure to demand risk is likely to be viewed as a significant risk by investors when comparing HAL's profile to other utilities. Chapter 4 provides an empirical confirmation that such higher risk has indeed made HAL's returns more cyclically volatile than those of other UK regulated companies.

2.4. Higher Beta Risks of Price Caps in the Literature

Our conclusion of the higher systematic risk of price cap regulated companies relative to revenue cap regulated companies, which is mostly caused by increased demand risk, is well documented in the academic and regulatory literature. E.g. a recent Queensland Competition Authority (QCA) paper discusses the difference between price caps and revenue caps as follows:

“(under price cap regulation) the regulated firm, in principle, bears demand (i.e. volume) risk. This difference from the revenue cap is fundamental,…”

Appendix C provides a full review of academic studies assessing the impact of the regulatory system on beta risk. Academic studies find that regulatory regimes with high powered incentives (such as price cap regulation, as opposed to revenue cap or rate of return regulation) are associated with higher betas of the regulated companies, provided there is an independent regulator.

¹⁸ The CAA's move to incorporating asymmetric shocks into the base forecast is likely to improve cost recovery but does not reduce risk.

Relative Risk of London Heathrow

The impact of higher demand risk on investor risk perception was also a feature of a UK investor survey, commissioned by Water UK that highlighted the impact of the price control on the allocation of demand risk to airports:

“respondents [to the investor survey] did, however, rank airports as more risky than traditional utility companies, generally highlighting airports exposure to demand risk in support of this position.”¹⁹

This risk differential needs to be reflected in the cost of equity and more specifically the beta estimate. E.g. the CAR, the Irish aviation regulator has taken account of this link when setting charges for the air traffic controller, the IAA arguing that *“provid[ing] for a sharing of risk between the IAA and its users with respect to uncertainty in projections of traffic volumes, thereby permitting a lower cost of capital than would otherwise have been necessary.”²⁰* Conversely, any system that does not allow for risk sharing with users needs to provide higher returns.

¹⁹ Water UK investor survey, quoted in First Economics (2008): “The Riskiness of Network Rail Relative to Other Regulated Industries”

²⁰ CAR (2007): Determination and Report on the Maximum Level of Aviation Terminal Service Charges that may be imposed by the Irish Aviation Authority, p.9.

3. Response to the CAA's Comments on Non-Systematic Risk

As discussed in Section 2, the CAA argues that

Only systematic risk should be considered in a CAPM framework and non-systematic risk can be taken into account in the gearing and cost of debt assumptions. Many of the risks that NERA raised would appear to be non-systematic in nature.

The risk factors we considered in our January 2013 report were either correlated with the business cycle (systematic) or they were asymmetric with the main asymmetry for HAL being the existence of a capacity constraint that means the distribution of traffic is skewed to the downside as there is no corresponding upside to offset the risk of downside shocks to traffic forecasts as the CAA has now recognised as part of its traffic forecasting assumptions, which now include a specific adjustment for downside shocks.²¹

A key assumption underlying the CAPM is that expected returns are symmetrically and normally distributed. Hence, as the CAA states, the CAPM in its basic form cannot take account of skewed risks such as downside asymmetric risk caused by demand shocks. However, the fact that the CAPM assumes away asymmetric risks represents a potential shortcoming of the CAA methodology of solely relying on the CAPM rather than a reason for concluding that asymmetric risks do not exist or that investors do not require compensation for being exposed to such risks.

Where downside asymmetric risks are significant²² the basic CAPM is prone to underestimating the true cost of equity. For a regulated utility the presence of unmitigated downside asymmetric risk, e.g. to traffic, decreases the expected outturn return on equity/WACC below the regulatory allowance because over the longer term the company will not expect to earn the regulatory allowed revenue. Regulatory practice has been to account for these by way of a WACC uplift where they have been significant.

Moreover, the academic literature shows that asymmetric risks (both systematic and non-systematic) will have an impact on investor's required rate of return more generally. Intuitively, a share with significant downside risk with no offsetting upside potential (negatively skewed returns) will be less attractive from an investors' perspective than a share with the opposite property. Investors will therefore be willing to pay less for a share with negatively skewed returns, or conversely they will require a higher return to compensate for this undesirable property, a feature not captured in the basic CAPM.

²¹ CAA (April, 2013): Economic regulation at Heathrow from April 2014: initial proposals, p.46, para 3.18. We understand that the capacity constraint per se is accounted for in the actual modelling but the novelty in the Q6 approach is that the central forecast is now adjusted downward for the asymmetric distribution of potential shocks.

²² As the CAA implicitly acknowledges by adopting a traffic forecast below the central path to account for shocks.

Kraus and Litzenberger (1976)²³ were the first to analyse the effect of skewness on the cost of equity. They extend the standard CAPM framework to allow for the presence of asymmetric risk in returns (so called third-moment CAPM). They find that systematic skewness is priced²⁴, suggesting that investors require a premium for holding portfolios with systematically negatively skewed returns. The existence of a systematic skewness premium is further confirmed by Harvey and Siddique (2000).²⁵

In addition, Barberis and Huang (2008)²⁶ show that even an individual security's (such as HAL) skewness can be priced:

“Earlier papers have shown that a security’s coskewness with the market portfolio can be priced (Kraus and Litzenberger, 1976). We show that it is not just coskewness with the market that can be priced, but also a security’s own skewness.”²⁷

Following on from the above the effect of return asymmetry on a regulated utilities’ cost of capital has been recognised by various UK regulators including Ofgem, Ofwat and the CC.

“In the course of the construction of T5 the scope for BAA to outperform the price control set for Q4 is limited, but there is real scope for the expectations incorporated in the price control not to be met and for BAA thereby to be financially disadvantaged. (...) In our view the factors in paragraph 4.71 [including the above] can best be recognised by way of a further T5-related uplift to the WACC of some 0.25 per cent.”²⁸

“(...) incentives that give rise to a significant asymmetry in overall risk to RORE – particularly where impacts are skewed towards the downside. In these cases, the actual future cost of equity may be different to the level derived from historic information, such as that reflected in the capital asset pricing model (CAPM) ...”²⁹

“(...) TO’s face asymmetric risk which is not captured by the CAPM methodology they have used in deriving their estimates. In the past, Ofgem has implicitly allowed for such risks in its allowed rates of return to equity”³⁰

²³ Kraus, A., and Litzenberger, R.H., 1976, “Skewness preference and the valuation of risk assets”, Journal of Finance 31, 1085-1100.

²⁴ due to the existence of a significant co-skewness premium

²⁵ Harvey, C. R. and Siddique, A., 2000, “Conditional skewness in asset pricing tests”, Journal of Finance 40., 1263-1295.

²⁶ Barberis, N., and M. Huang. 2008. “Stocks as Lotteries: The Implications of Probability Weighting for Security Prices” American Economic Review 98, 2066–2100.

²⁷ Barberis, N., and M. Huang. 2008. “Stocks as Lotteries: The Implications of Probability Weighting for Security Prices” American Economic Review 98, 2066–2100. p.3

²⁸ CC (Nov 2002): BAA plc: a report on the economic regulation of the London airports companies (Heathrow Airport Ltd, Gatwick Airport Ltd and Stansted Airport Ltd) p. 179

²⁹ Ofwat (2013): Setting price controls for 2015-2020 – framework and approach: a consultation p.126

³⁰ Ofgem (2006): Transmission price Control Review: Updated Proposals, p. 41

Relative Risk of London Heathrow

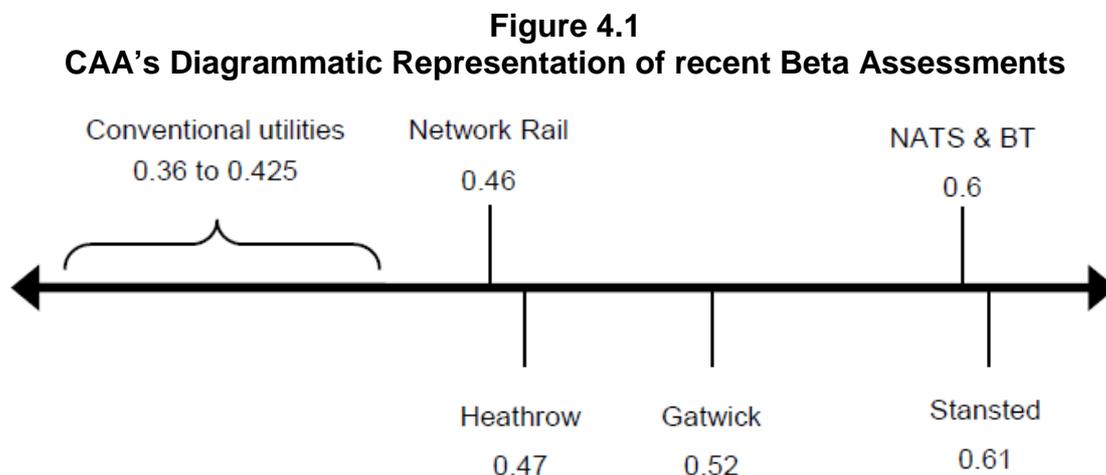
The above evidence shows that, based on academic literature and regulatory precedent, there is reason to believe that investors require a compensation for holding securities with negatively skewed returns such as HAL and that the CAA has to take these into account when determining an appropriate risk-return package. Using the CAPM, which by nature cannot capture asymmetry in returns, will therefore lead to underestimating the true cost of equity.

Our January 2013 report considers both beta risks and asymmetric risks in order to assess the overall relative riskiness of the different UK regulated sectors. Appendix E provides an update on how HAL's exposure to different risk factors has changed following CAA's Initial Proposals for Q6. The main conclusion is that our relative ranking from the January 2013 report remains unchanged.

This is in stark contrast with the CAA's proposed "a logical hierarchy of risk" presented in its Initial Proposals for Heathrow for Q6, which places Heathrow in line with Network Rail and well below NERL and BT, the other "utilities" regulated under a price cap regime rather than revenue cap regime. In the following chapter we discuss evidence which shows that the CAA understates the risk of HAL relative to other regulated companies while in Appendix D we respond to a number of items of supporting evidence that the CAA presents for its position that Heathrow is not significantly riskier than traditional utilities.

4. Empirical Review of the CAA’s Relative Risk Ordering

As part of its Initial Proposals for Heathrow for Q6 the CAA presents the following diagrammatic representation of recent regulatory beta decisions.



Source: CAA – Economic regulation at Heathrow from April 2014: Initial Proposals; Figure 9.4, p.144

The CAA concludes that the above represents “a logical hierarchy of risk”. Based on the above the CAA uses a beta estimate for HAL that is just above Network Rail (0.46) and well below NERL (0.6) and BT (0.6), the other “utilities” regulated under a price cap regime rather than revenue cap regime.

However, Network Rail bears almost no demand risk (because the vast majority of its revenues come in the form of fixed charges)³¹ and NERL is also partly protected from demand risk due to its volume risk sharing mechanism. Conversely, HAL has no explicit volume risk sharing arrangements and is therefore fully exposed to demand risk, which has rendered its return profile more cyclical than that of the other companies considered here, as we show below. From this point of view the CAA’s relative risk does not appear plausible.

Our concern appears to be supported by statements and regulatory decisions made by a large number of UK regulators. In fact, below we show that the CAA’s conclusion that the above represents “a logical hierarchy of risk” is not shared by any of the other UK regulators and that instead it appears the CAA significantly understates the beta risk faced by HAL.

In particular HAL’s beta appears to be misrepresented relative to all of:

- Conventional utilities;
- Network Rail; and

³¹ ORR (2008): Determination of Network Rail’s outputs & funding for 2009-14, p.231.
“We are providing Network Rail with some very significant protections against risk, particularly related to its capital investment Programme. It also faces very little volatility in revenues. The majority of its income is fixed for the five year control period.”

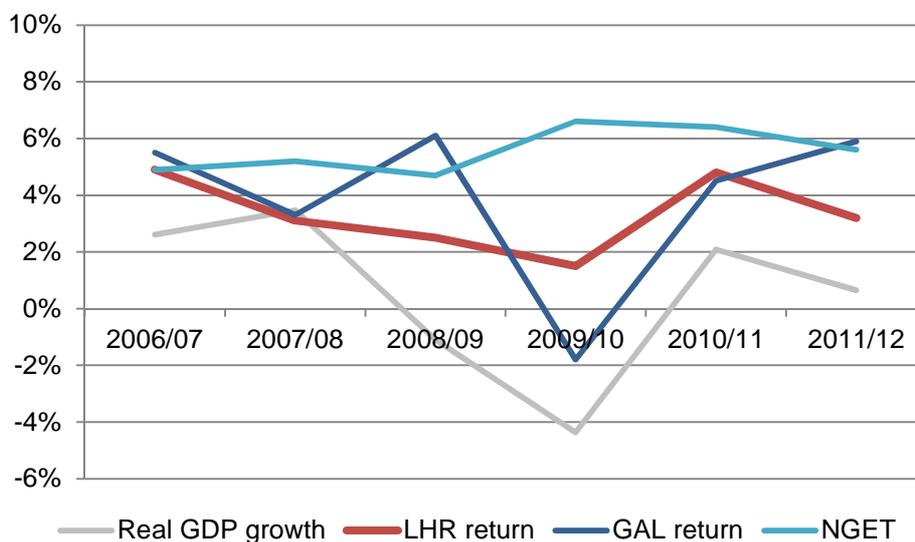
- NATS.

We deal with each of these comparisons in turn. Below we provide empirical and theoretical evidence on the relative exposure to demand risk for HAL relative to Gatwick, NERL, Network Rail which are all regulated under a price-cap regime and conventional utilities. We review both the regulatory arrangements in place which mitigate demand risks as well as their actual performance. We note that reviewing actual performance contains both systematic and unsystematic effects. However, in line with our comments in chapter 3 we note that unsystematic risk is as likely to increase as it is to decrease the observed cyclicality of returns for all sectors we review. Hence the empirical analysis will provide an a priori unbiased view.

Comparison between GAL, HAL and Conventional Utilities

First of all we note that the CAA’s Initial Proposals place HAL’s beta (0.47) closer to the top end of the conventional utilities regulated under a revenue cap (0.425 allowed as part of Ofgem’s 2012 decision for fast-tracked electricity transmission companies) than Gatwick (0.52). Given the CC’s previous statements about relative risk between Heathrow and Gatwick³² this positioning does not appear robust. Our empirical analysis of the cyclicality of returns provides further evidence that strongly contradicts the CAA’s relative positioning of HAL, GAL and conventional utilities.

Figure 4.2
Cyclicalities of realised returns for HAL, GAL and conventional utilities



Source: NERA analysis

Figure 4.2 shows the returns of both HAL and GAL move broadly in line with GDP while the returns on NGET, a conventional utility regulated under revenue cap are broadly flat and unaffected by the business cycle. If anything it appears that HAL’s returns have even been

³² Competition Commission report (Sep 07): BAA Ltd - A report on the economic regulation of the London airports companies (Heathrow Airport Ltd and Gatwick Airport Ltd), Appendix F, para 117.

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slightly more pro-cyclical than Gatwick's although this may be due to the specific circumstances surrounding the sale of Gatwick. The above figure confirms that it is highly implausible to assume that HAL's beta is closer to a conventional utility facing *no* volume risk than the closest comparable airport in the UK.

Comparison between HAL and Network Rail

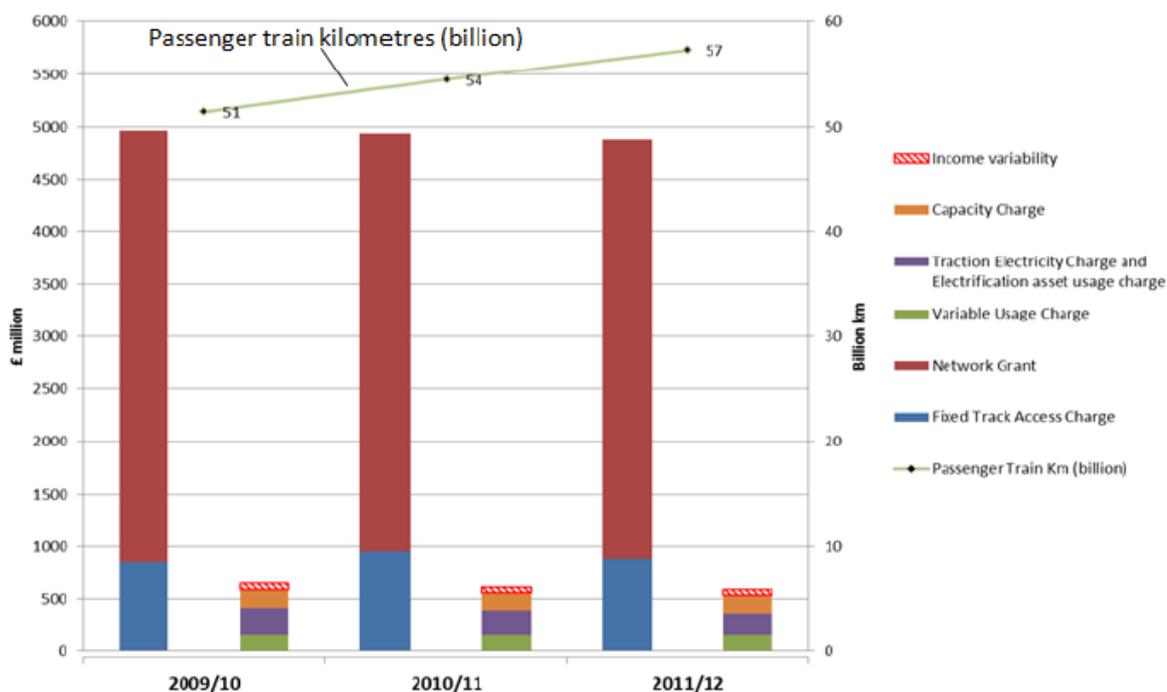
In addition it seems implausible that the CAA classifies HAL as about the same risk as Network Rail, which bears almost no demand risk (because the vast majority of revenues come in the form of fixed charges).³³ In principle Network Rail is regulated under a price-cap mechanism like HAL. However, Network Rail derives the vast majority of its income from fixed charges (either via grant income from the government or via fixed charges received from the train operating companies). This arrangement effectively shields Network Rail's revenue from the impact of the underlying demand volatility, despite the price-cap regulatory regime.

This finding is confirmed by the CEO of ORR who, in a recent lecture, stated that "almost nothing" happens to Network Rail's volumes when passenger traffic increases (see Figure 4.3 which replicates his analysis).

³³ ORR (2008): Determination of Network Rail's outputs & funding for 2009-14, p.231.
"We are providing Network Rail with some very significant protections against risk, particularly related to its capital investment Programme. It also faces very little volatility in revenues. The majority of its income is fixed for the five year control period."

Figure 4.3
The Impact of Volume Risk on Network Rail

Chart 11: What happens to Network Rail’s income as volume increases?
(Answer: almost nothing). Network Rail’s income in respect of passenger trains, 2009-10 to 2011-12, at 2011-12 prices.



Source: *Towards a more efficient railway The Beesley Lecture by Richard Price, CEO of the ORR, November 2012 p. 29*

Taking account of the above Network Rail’s own regulator, the ORR and its advisers quoting evidence from an investor survey argue that there needs to be a significant risk differential between Network Rail and HAL.

“The two regulated sectors in which permanently higher risk is said to exist are telecoms and aviation.”³⁴

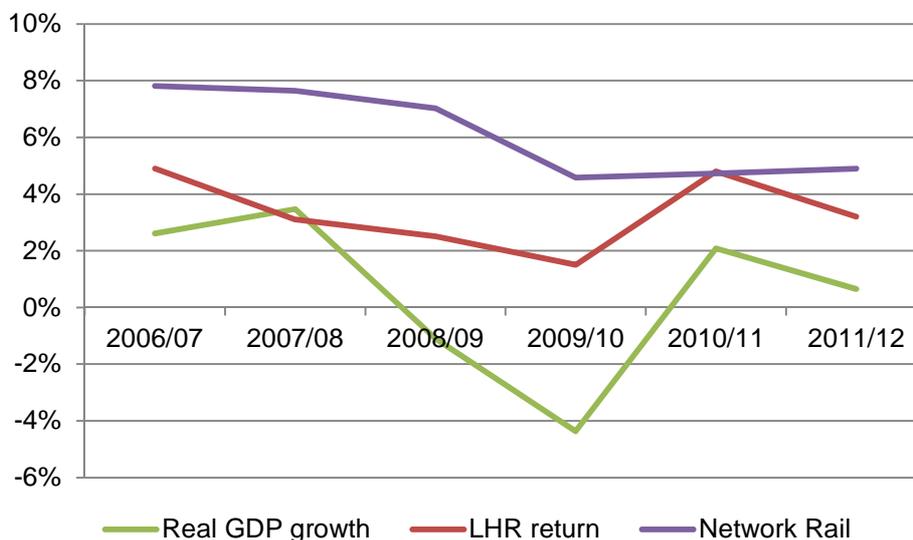
“In addition, we commissioned a study from First Economics on the underlying risk that Network Rail faces compared to other UK regulated network industries. This, in our view, provides strong evidence that Network Rail’s risk profile is below that of the airports.”³⁵

This view is supported by the empirical evidence that we undertake with regard to the cyclicity of returns at HAL and Network Rail, which is presented in Figure 4.4.

³⁴ First Economics (2008): “The Riskiness of Network Rail Relative to Other Regulated Industries” – A Report for ORR.

³⁵ ORR (2008): Determination of Network Rail’s outputs & funding for 2009-14, p.230

Figure 4.4
Cyclicality of Returns for Network Rail and HAL



Source: NERA analysis of HAL’s and Network rail’s regulatory accounts

Figure 4.4 shows that HAL’s returns have moved very closely with real GDP throughout Q5 while Network Rail’s returns have shown significantly lower correlation with the business cycle³⁶, which is in line with the different exposure to volume risk.

The above statements and actions by other UK regulators suggest that the beta for HAL and other airports should be closer to the 0.6 allowed for BT than the 0.40s allowed for some of the traditional utilities and Network Rail.

Comparison between HAL and NERL

Finally, in using the hierarchy of risk shown in Figure 4.1 the CAA appears to contradict its own line of argument from when it last set a beta estimate for NERL as well as the empirical evidence on the relative risk exposure of HAL and NERL. When last setting an allowed beta for NERL the CAA did not dispute that NERL’s risk profile was “broadly comparable” to that of an airport and selected an asset beta of 0.6 arguing that this was within the “margin of accuracy” of its estimate for Gatwick.³⁷ However, the above ordering places Heathrow closer to the bottom end of the classical utilities than the CAA’s final NATS estimate.

This very significant difference between the assumed beta values for NERL and HAL is not plausible when taking into account theoretical and empirical observations about the relative

³⁶ In fact, Network Rail’s revenues were significantly affected by a deferral of government grant income from the period of 2004-06 to the period of 2006/09, explaining the slightly higher returns in 2006/07 relative to 2011/12 but even during the years unaffected by this deferral the correlation with the business cycle is much weaker than for HAL.

³⁷ CAA (2010): NATS (En Route) plc price control: CAA formal proposals for control period 3 (2011-2014): under Section 11 of Transport Act 2000, p.153. At the time the CAA claimed that Gatwick’s beta was 0.58, the top end of the beta range the CAA used at Q5.

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exposure to demand risk: From a theoretical point of view HAL is regulated under a price-cap, which fully exposes it to demand risk. Conversely, NERL is regulated under a price-cap which includes an explicit risk sharing mechanism which offers NERL a significant protection from volume risk. Specifically, NERL bears:

- Full volume risk for deviations of CSUs from forecasts up to +/- 2%;
- 30% volume risk for deviations of CSUs from forecasts up to +/- 10%; and
- Zero volume risk for deviations of CSUs from forecasts above +/-10%.

At CP3 the CAA itself recognised that volume risk represented a significant source of beta risk for NERL which differentiates NERL from a conventional utility:

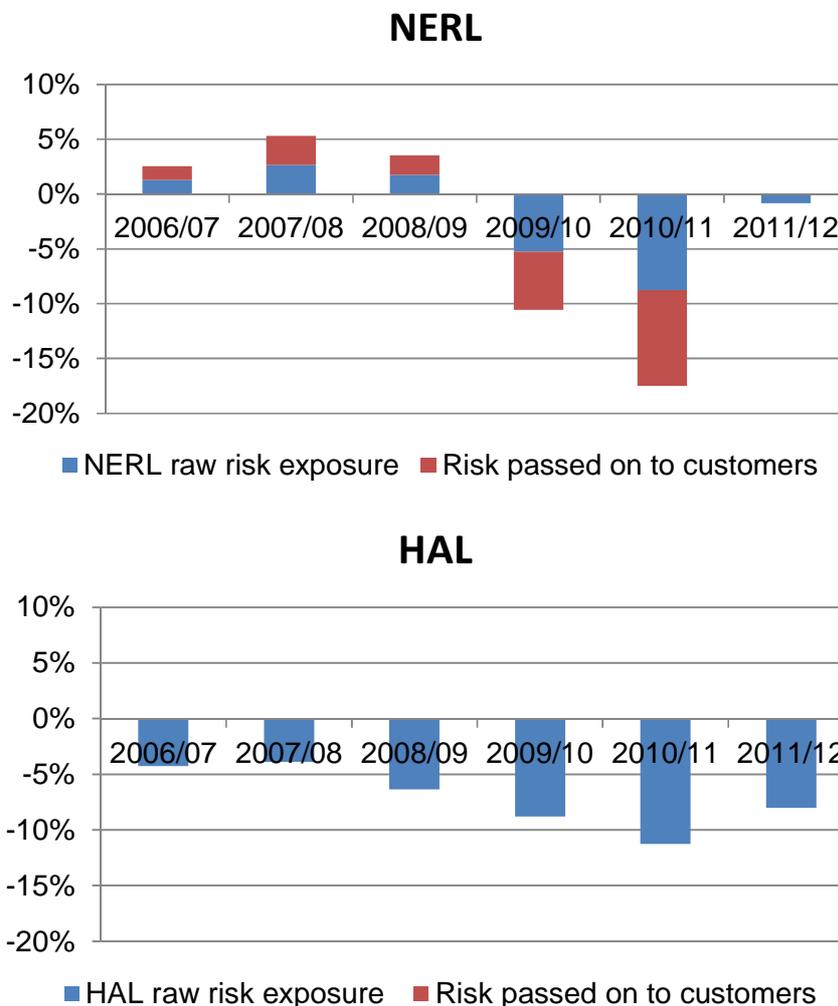
“volume-sharing arrangements, have been explicitly factored into the CAA’s analysis. Generally, this shows that changes in GDP growth have the potential to impact on NERL’s profits much more than a conventional regulated utility. It is for this reason that the CAA has tended in previous decisions to allow NERL a commensurately higher rate of return.”³⁸

Based on the regulatory regime itself, HAL is exposed to significantly more volume risk than NERL *by definition*. However, it can be argued that the volatility of underlying demand for HAL is lower than for NERL due to HAL being exposed to more “premium” travel which exhibits lower sensitivity to GDP than the overall traffic mix which NERL is exposed to. In addition, the capacity constraints at HAL somewhat dampen its exposure to demand risk.

Figure 4.5 shows the demand out/underperformance relative to forecasts between 2006/07 and 2011/12. The explicit volume risk sharing arrangements in place have shielded NERL revenues from the full impact of demand deviations from forecast, thus reducing revenue volatility. For companies regulated under a price cap, the observed demand volatility directly translates into volatility of revenues. This is in stark contrast to companies regulated under a revenue cap, whose returns are fixed for the regulatory year and do not vary with underlying demand volatility. For example, WASC as a group have underperformed on revenues over 2005/06-2009/10 (PR04) only by 0.7% relative to the allowance.

³⁸ CAA: NATS Formal proposals CP3; October 2010; p. 152

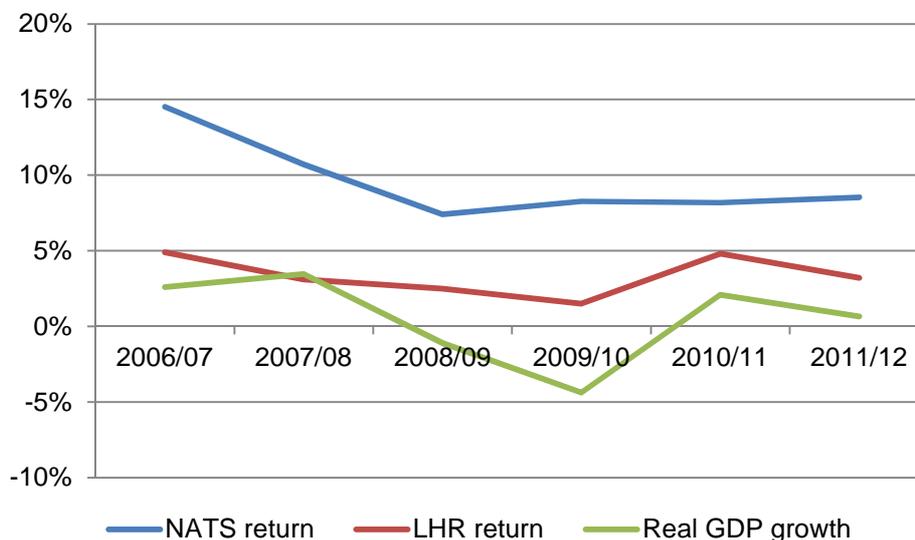
Figure 4.5
HAL and NERL Demand: Performance Relative to Forecasts



Source: NERA analysis of HAL and NERL regulatory accounts

While we recognise that demand volatility is not the only beta risk, it is certainly an important driver of risk. We verify the impact of demand risk on overall return cyclicality by assessing outturn returns for NERL and HAL relative to GDP growth for the period for which we have data for both. This empirical analysis of outturn returns does not support the significant risk differential between NERL and HAL that the CAA’s Initial Proposals for Heathrow for Q6 imply. Instead Figure 4.6 shows that if anything HAL’s returns have been more cyclical than NATS’ returns over the period for which data has been available.

**Figure 4.6
Cyclicality of Returns for NATS and HAL**



Source: NERA analysis of HAL’s and NERL’s regulatory accounts

The above figures do not support a significant difference in beta risk between NERL and HAL. Instead a beta allowance for HAL that is more in line with the beta allowance for NERL appears warranted.

Summary of the relative risk analysis

We have reviewed the cyclicality of HAL’s returns relative to GAL, NERL, Network Rail and conventional utilities. We find that for the period since 2006 HAL’s returns have been significantly more volatile than Network Rail’s and those of conventional utilities, such as NGET. The volatility of HAL’s returns has been broadly comparable to NERL and GAL over that period with observed volatility even slightly higher for HAL than the other comparators.

Based on the above, the CAA’s ordering of risk, which places HAL as more in line with traditional utilities (regulated under a revenue cap regime) than Gatwick and other aviation sector players including NERL (regulated under price cap regimes), does not appear to be supported by either other UK regulators including the CAA’s position during the NERL decision or the empirics of return volatility.

5. Conclusions

We have reviewed the CAA's comments on our January 2013 relative risk report and the CAA's own view of the relative risk of different regulated entities in the UK, as shown in Figure 9.4 of the CAA's Initial Proposals for Heathrow's Q6 price control.

The CAA's two main concerns with our January 2013 report appear to be that the CAA believes our report i) overstates demand risk exposure and ii) considers non-systematic risks which are not relevant in a CAPM framework. .

In our January 2013 report, we identified demand risk as the main source of beta risk for HAL. The CAA does not seem to dispute this point. We concluded that HAL was more exposed to demand risk than other utilities due to higher correlation between demand for air transport services and the business cycle when compared to conventional utility services. In addition, the form of the price control (price-cap) provides HAL with no protection from demand risk. We have shown in this report that our January 2013 report already accounted for the demand risk-mitigating factors mentioned by the CAA while forecasting error is either cyclical in itself or neutral in its impact on expected volatility (because it is as likely to act in a risk-increasing manner as it is to act in a risk-decreasing manner).

With regard to non-systematic risk we note that the risks we considered were either systematic or asymmetric and the fact that the CAA's model (CAPM) cannot account for asymmetric risk does not mean that the risk does not matter per se. We review the academic literature and find that asymmetric risks (both systematic and unsystematic ones) affect an investor's return expectation. In addition we show a number of past occasions where UK regulators including the CC's Q4 proposals for HAL have allowed for an uplift for asymmetric risk.

We also reviewed the plausibility of the CAA's own ordering, which places Heathrow's beta in line with Network Rail and significantly below NERL; two other companies regulated under a price cap regime but enjoying significant protection from demand risk compared to Heathrow. The CAA's view of "logical ordering of risk" does not appear to be supported neither by other UK regulators including the CAA's own position during the NERL decision nor by an empirical analysis of the cyclicity of outturn returns. UK regulatory decisions and the empirical analysis suggest that investors and other regulators view airport betas as more in line with BT and NERL rather than Network Rail and electricity transmission networks. The regulatory precedent is supported by academic literature on relative riskiness of price-caps versus revenue caps. There are two general approaches to estimating the impact of the regulatory systems on beta, cross country estimates and time series estimates. We find that both approaches provide support for higher beta risks faced by utilities regulated under price caps as long as regulators are independent, as is the case in the UK.

The CAA's current beta estimate for HAL does not reflect the above findings, which strongly suggest that a logical ordering of risk would place HAL further to the right of the continuum presented in Figure 1. The CAA should adjust its beta estimate accordingly at final proposals stage in order to account for the evidence presented above.

Appendix A. Accounting for Pension Costs

In addition to demand risk HAL currently faces another cyclical risk that other utilities are shielded from, namely its exposure to the cost of plugging the deficit of its defined benefit pension scheme. The CAA has previously recognised the potentially risk-enhancing nature of an unprotected pension scheme:

“The CAA considers that the risks faced by NERL have marginally reduced since CP2 because:

- (...);
- *the pension pass through mechanism now addresses all the cost risk of the defined benefit pension scheme (in CP2 it addressed the cost risk associated with members at 1 April 2006); and (...)*³⁹

although it eventually concluded that the changes introduced for NERL for CP3 were unlikely to have a significant effect on beta because NERL was already enjoying significant protection during CP2 and the CC was not able to conclude that the link between pensions and beta was straightforward.⁴⁰

Unlike other regulated utilities (including NERL) HAL does not yet have a mechanism in place that allows it to pass on part of its pension costs, which are highly cyclical in nature as the pension scheme is likely to be invested at least partly into assets, which display a high correlation with the stock market.

So far, the CAA only states that it will consider the issue but does not provide conclusions on what it will do and/or what protection it will offer. Unless it puts in place a mechanism that provides comparable protection to the system used in other sectors, HAL will likely face higher cyclical risk not just because of the more cyclical nature of its revenue base but also because its regulatory framework does not allow the same protection from cyclical cost risks.

³⁹ CAA (May 2010): NERL Initial Proposals

⁴⁰ CAA (Oct 2010): NERL formal proposals, p.152.

Appendix B. Operating Leverage and Input Price Risks as further Cyclical Risks

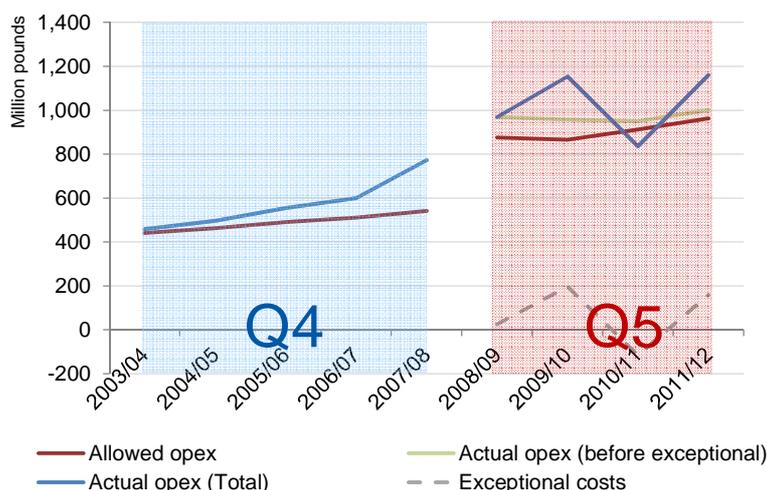
B.1. Operating Leverage

Our January 2013 report discussed operating leverage as another potential driver of beta risk. Operational leverage measures the degree of “commitment to fixed production charges” in a company’s cost base, and is typically measured as the ratio of fixed costs to variable costs. Financial theory indicates that high operating leverage will raise the beta of a company. This is because companies with a higher proportion of fixed costs relative to total costs will face more volatile margins for operating earnings in respect of market fluctuations, since such fluctuations will cause turnover to vary, while costs will be fixed.

A price cap regulated company with high operating leverage is exposed to higher risk than a revenue cap regulated company. A price cap regulated company with high operating leverage will not be able to significantly change its cost base in the face of a demand shock while its revenues will fall under its price cap. Revenues of a revenue cap regulated company will remain unchanged for a company regulated under a revenue cap, irrespective of its cost base.

Empirically, high operating leverage may have contributed to HAL’s significant underperformance relative to its opex targets during the height of the 2008-2010 recession as costs could not be adjusted in line with the falling economy.

Figure B.1
Actual versus allowed opex in Q4 and Q5 for LHR



Source: London Heathrow regulatory accounts (2004/05 – 2011/12)

Relative Risk of London Heathrow

We do not observe the same pattern for other regulated companies suggesting HAL faced higher operating leverage than its comparators.⁴¹

B.2. Input Price Risks

Our January 2013 report identified exposure to input price changes as another potential beta risk. We measured companies' exposure to real changes in capital prices using capex to turnover ratio and to labour and materials prices using the opex to turnover ratio.

Our analysis showed that airports and NERL have a higher exposure to risks associated with labour and material unit costs over the analysed period as (forecast) opex typically represents a larger proportion of turnover albeit HAL having the lowest of the four companies in that group. With regard to capex to turnover ratios and thus the exposure to capital input prices HAL was found riskier than all but the energy transmission networks. An update of the opex and capex to turnover ratios and hence the relative risk exposure may be warranted (in light of CAA's Initial Proposals for Q6).

⁴¹ See the appendices of our Jan 2013 report for more detail on individual company performance.

Appendix C. Literature review of link between regulatory regime and beta risk

The academic literature assesses the impact of the regulatory system on beta in two ways: either through a cross-country study or an in-country case study. The former has the advantage of being able to draw on a larger data set but cannot control for country-specific effects, while the latter can insulate the effect of the proposed change in framework by keeping country effects constant.

The seminal cross-country study is Alexander et al (1996) who investigate the effect of different regulatory regimes on the riskiness of a regulated company (measured by beta) for a large sample of countries and regulatory regimes. They find that regimes with low power of incentives (rate of return regulation) are associated with lower asset betas than regimes with high-powered incentives (price-cap regulation).⁴²

A more recent study by Gaggero (2012) finds more mixed results.⁴³ Gaggero uses a vector of eight indicators of strength of regulation (including price cap vs. revenue cap) and finds different results depending on whether he uses a fixed (significant of strength of regulation on beta) or random effects specification (no discernible impact). Gaggero notes that one explanation of his inconclusive finding may be poor institutions with regulators.

“The conclusion of this paper is that, ... , there might be an active behaviour by the firms to lessen the restrictions imposed by the system of regulation, so that regulatory regimes different in theory become similar in practice.”⁴⁴

Rothballer (2012) confirms that there is only a discernible difference between revenue cap and price regimes where the system is well-established and the regulator is independent⁴⁵; like it is the case in the UK.

A more general problem with cross-country studies is that they cannot distinguish between country effects and actual effects of the regulatory framework unless fixed effects estimators are used. Another way of circumventing the issue of country-specific risk factors confounding the impact of the regulatory system is to look at single country time series estimates. Using this technique Francis and Grout (2000) analyse the effect of the expected

⁴² Alexander, I., Mayer, C. & Weeds, H. (1996) “Regulatory Structure and Risk and Infrastructure Firms: An International Comparison”, Policy Research Working Paper 1698, World Bank.

⁴³ Gaggero, A. (2012): Regulation and risk: a cross-country survey of regulated companies, *The Bulletin of Economic Research*, 64:2, p.226-238

⁴⁴ Gaggero, A. (2012): Regulation and risk: a cross-country survey of regulated companies, *The Bulletin of Economic Research*, 64:2, p.226-238.

⁴⁵ Rothballer, C. (2012): Infrastructure Investment Characteristics: Risk, Regulation, and Inflation Hedging - An Empirical Analysis of Listed Infrastructure Firms

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change from price-cap regulation to profit sharing regulation in 1998-1999 on UK regulated companies' risk (measured by beta).⁴⁶

Francis and Grout (2000) show that the betas of utilities fall whereas they remain unchanged for the non-regulated control group in the period of regulatory uncertainty about the potential change of the regime. A more recent study by Grout & Zalewska (2006) confirms the link between proposed changes to the incentive properties of regulation and beta.⁴⁷

While these studies are relatively dated by now they have the advantage of insulating the impact of a regime change from cross-country effects and they refer to a regulatory and institutional framework that is most closely comparable to the one faced by HAL.

⁴⁶ Francis, N. & Grout, P. (2000): The impact of policy uncertainty on regulated companies, working paper, available at: <http://www.bristol.ac.uk/cmpo/publications/papers/2000/wp24.pdf>

⁴⁷ Grout, P. & Zalewska, A., 2006, The impact of regulation on market risk, *Journal of Financial Economics*, 80:1, p. 149-184.

Appendix D. Response to further CAA comments

In this appendix we provide comments on the remainder of the CAA's comments on our report and the subject of risk more generally.

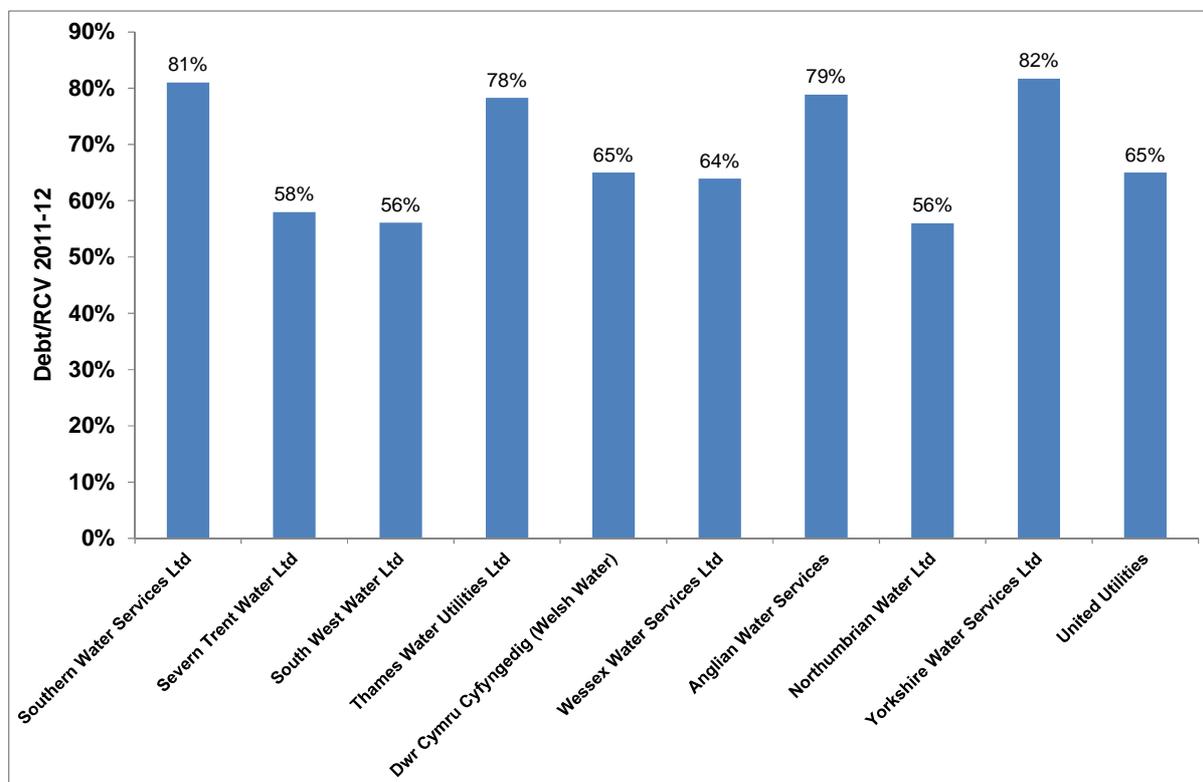
9.95 The CAA acknowledges that free cash flow metrics are an important measure for credit rating agencies. The CAA has met with the three main agencies and has, in chapter 10, undertaken a financeability assessment. The CAA has adopted an approach to the cost of debt that considers the appropriate gearing level for the risks (systematic and non-systematic) and is consistent with the credit rating assumption used in the estimation of the cost of debt. The CAA therefore considers that it has in place a mechanism for incorporating the appropriate non-systematic risks in the WACC through the credit rating assumption (which is reflected in the gearing and cost of debt assumptions).

We note that the CAA's financeability test assumes that dividends can be cut indefinitely in order to resolve any financeability constraint. It is clear that there are limits to investors' willingness to accept such cuts before demanding a higher cost of equity and it appears that the CAA's financeability test does not consider the potential for such increases. Neither does the CAA report the actual realised return on equity under its financeability test scenarios that would allow outsiders to assess whether the scenario that is considered financeable by the CAA would likely be considered acceptable to equity investors.

9.96 The CAA notes that, if business risk were as high as suggested by NERA and EE, a company would be likely to choose a relatively low level of gearing, so that financial risk would not exacerbate the high business risk. However, since the Ferrovial takeover, HAL has maintained a high level of gearing: most recently 82% (September 2012). One possible explanation is that this does not appear to be the action of a company that regards itself as facing high business risk.

We note that the decision on capital structure is a matter for companies to decide. In our view, there appears to be no apparent link between business risk and capital structure. This can be seen when looking at the current gearing levels of the ten largest regulated companies in the water sector which are shown in Figure D.1.

Figure D.1
Gearing of ten largest water companies in 2011-12



Source: Companies' annual reports

Figure D.1 shows that the gearing levels of the ten largest water companies differ by as much as 26 percentage points. This is despite the fact that the companies operate in the same sector and are therefore exposed to comparable business risks.

Based on the above evidence, we conclude that there appears to be no apparent link between observed gearing levels and companies' business risk exposure.

9.99 The CAA notes the credit rating agencies' assessments of the business risk of Heathrow. For example, S&P stated:
"As a result of our analysis, we still consider the business risk score as "excellent". We now consider this independent from any further asset sale. Our business risk score is mainly driven by the competitive position of Heathrow as one of the biggest hubs in the world, by both traffic and retail revenue. Revenues have proved relatively resilient in the midst of a major period of economic stress. Heathrow also demonstrates a high and increasing EBITDA margin and tested regulatory framework."

9.100 Similarly, Fitch considered Heathrow to fit the profile of "larger or more essential assets [that] have in most cases demonstrated stronger resistance to economic downturns". The CAA draws two conclusions from this analysis. First, that HAL's exposure to systematic risk does not appear to have changed materially during Q5. Second, that HAL appears to be resilient to the systematic and non-systemic risks that its business has faced over Q5, despite the financial risks created by its actual gearing. As noted above, HAL and its owners have been able to raise a significant amount of debt and sell two minority equity stakes which value HAL at more than its RAB.

The fact that the rating agencies consider the business risk profile of HAL as excellent does not provide any evidence that HAL's beta should be materially lower than that of say NERL, which rating agency S&P also rates as having an "excellent" business risk profile and which the CAA associates with an asset beta of 0.6, i.e. materially higher than the CAA's current estimate for HAL. In December 2012 S&P wrote:

NERL's SACP also reflects our assessment of the company's "excellent" business risk profile. Our assessment points to the predictable regulatory regime under which NERL operates and which, in our view, will continue to support stable earnings and cash flows. The regime includes partial risk-sharing for variations in traffic, and a pass-through of certain costs to customers. NERL has a track record of executing large and complex investments on time and within budget, which we see as a supportive factor.⁴⁸

Furthermore, our analysis in section 4 shows that HAL's returns have been about as cyclical, if not more so than NERL's suggesting the CAA is significantly overstating the difference in beta between HAL and the value of 0.6 it chose for NERL in 2010.

⁴⁸ S&P (17 Dec 2012): &P revises NAT (En Route) PLC outlook to negative

Appendix E. Review of the continued Applicability of NERA's Risk Assessment of HAL as per Dec 2012

Our January 2013 report was based on the existing framework. We have now also assessed potential changes to our risk assessment arising from recent changes to the framework. Our preliminary assessment is shown in Table E.1.

**Table E.1
Key Risk Factors facing the UK Regulated Air Transport Industry**

Risk Factor	NERL	Designated Airports	NERA Risk Factor Rating	Comments Based on April 2013 Proposals
BETA RISK FACTORS				
<p>1. Revenue Risk Affects the cost of capital through beta coefficient due to correlation with business cycle.</p>	<p>NERL is regulated under a hybrid five years revenue cap. Under the current price control formula, the level of revenues NERL is allowed to recover depends on the extent to which actual revenues differ from the forecast adopted by the CAA during the price control review. In particular:</p> <ul style="list-style-type: none"> ■ All revenue risk if outturn traffic varies by less than 2% from the forecast; ■ In the event that revenues are less than (or greater than) 2% of the forecast (but within 10%), NERL is able to recover 70% of the revenue shortfall from (or shares 70% of the revenue surplus with) its customers; and ■ If revenues are more than 10% lower (or higher) than the forecast, the full extent of the shortfall (or surplus) is passed on to the customers. <p>These provisions are the result of a common EU framework for regulating air traffic operations: the Single European Sky I (SES I). Previously, NERL shared 50% of its revenue risk with customers, NERL is exposed to changes in aviation demand in any part of the UK. Moreover, nearly one third of NERL's revenues come from overflights that do not arrive in or depart from the UK.</p>	<p>For designated Airports price caps are fixed for five years and are based on an RPI-X control and a revenue yield approach. The price caps set limits on the airport charge revenue per passenger that the airport can earn in each year. Volume risk between reviews is attributed to the airport: if passenger volumes are greater than expected the airport gains, and if they are lower it loses. There is a correction factor: in the event that in one year the airport earns more or less than the allowed average revenue per passenger, the price cap two years hence is adjusted to compensate for this.</p> <p>In the case of Heathrow, capacity risk is asymmetric: positive shocks yield limited growth in passenger numbers. Different passenger segments are characterised by different elasticities with respect to factors such as income or price levels. Thus, the underlying revenue risk varies across designated airports. Regulation of these charges has been based on a single till approach, meaning that most airport activities are included in the till, with the exception of hotels.</p>	<p>Medium for NERL and High for designated airports.</p> <p>The traffic mix at Stansted means that passengers are more sensitive to changes in income or prices than Heathrow or Gatwick. However, Heathrow faces asymmetric revenue risk due to capacity being constrained.</p> <p>In comparison to other regulated sectors, demand for air transport services is also relatively more sensitive to changes in income. This leaves air transport industries more vulnerable to unforeseen macroeconomic changes, which result in larger deviations from the forecasts adopted by the regulator for the control period. This risk is particularly important for airports, which bear the full extent of volume risk.</p>	<p>The main change in the April 2013 proposals is an explicit adjustment to the traffic forecast to account for the impacts of unforeseen shocks (note, this is not the same as unforeseen macroeconomic developments). The allowance for shocks was estimated by HAL to be 1.4% of passenger on average, but this was lowered by the CAA.</p> <p>This change helps mitigate expected under-recovery that would otherwise arise from the asymmetry of the distribution around the central pax forecast. However, the focus on asymmetric shocks means the mechanism can only address asymmetric risk, which the CAA does not recognise anyway, not beta.</p>

<p>2. Bad Debt Affects the cost of capital through beta coefficient due to correlation with business cycle.</p>	<p>Relatively low historical levels of Bad Debt. The CAA makes an allowance for bad debt during regulatory reviews. Until the implementation of SES I, NERL was allowed to pass through bad debt costs provided that they apply credit management and recovery best practices.</p>	<p>Airport customers tend to be other companies, allowing airports to employ credit management tools (such as commercial guarantees).</p>	<p>Low</p>	<p>No new developments to our knowledge</p>
<p>3. Operating Leverage Usually expressed as the ratio of fixed costs to total cost. Impacts on beta since companies with higher proportions of fixed costs will face more volatile margins for operating earnings in respect of market fluctuations. The volatility of operating earnings in response to demand fluctuations is exacerbated/mitigated by the regulatory mechanism.</p>	<p>NERL's risk sharing mechanism partially protects NERL's revenues from demand fluctuations, thus mitigating the impact of demand fluctuation on NERL's profits. NERL's volume drivers protect it from deviations in demand in excess of +-10%, whereas it bears 30% of volume risk when demand deviations lie between +-2% and 10% and full volume risk in case of deviations smaller than +- 2%.</p>	<p>The regulatory mechanism fully exposes CAA designated airports' revenues to demand fluctuations. Therefore, the extent to which their costs are variable/fixed is an important risk factor. Further quantitative analysis would be necessary to determine the extent to which airports adjust costs in response to demand fluctuations.</p>	<p>Low/Medium impact</p>	<p>No new developments to our knowledge</p>
<p>4. Input Price Allowance Regulated companies face the risk of not being able to recover an adequate return if actual input costs diverge from allowed costs as they cannot pass through an increase in input costs customers. Impacts on beta as input prices correlated with business cycle. Asymmetric if the CAA fails to make appropriate allowance for central input price risks.</p>	<p>For the current control period (CP3; 2011-14), NERL's average opex to turnover and capex to turnover ratios are 61% and 23% respectively. NERL's lower capex commitments than Heathrow and Gatwick imply less exposure to construction prices growing above the RPI. NERL is, however more exposed to changes in operating costs prices above the RPI. NERL can pass through 100% of its capex costs: at the end of the period, the over/underspend is incorporated in the opening RAB for the next period, thus completely mitigating the risk from capital input price increases.</p>	<p>Prior to the opening of Terminal 5, capex at Heathrow had been greater than turnover. Continued investment in Terminal 2 during Q5 has meant that Heathrow continues to have the highest capex to turnover ratio (52%). A limited capital expenditure programme at Stansted during Q5 is reflected in a low capex to turnover ratio of 9%. For Heathrow and Gatwick, the CAA included an input price allowance of RPI+2% during Q5 (the allowance at Stansted was set to RPI+0.75%).</p>	<p>Low/Medium</p>	<p>There are no references to input price risk allowances for Q6. Not clear if this is because these have been removed altogether. There have been some changes the treatment of capex but at first glance these do not appear to have changed risk exposure.</p>

<p>5. Setting Allowed Operating Costs at Review</p> <p>Likely to be an asymmetric risk with greater prospect of downside impact on allowed returns (relative to average efficient company).</p> <p>Unlikely to impact on beta as not obviously correlated with macro-economic cycle</p> <p>May also increase incentives to delay investment if benchmarking process expected to become more transparent over time.</p>	<p>For both NERL and designated airports, the CAA's starting point is a forecast of opex requirements submitted by the company. The CAA then conducts efficiency studies, bottom up reviews to check the reasonableness of estimates and robustness of assumptions, and top down assessments. Subsequently, the baseline opex (excluding atypical costs) is rolled forward using efficiency and volume growth forecasts, and then the atypical costs are added back in.</p> <p>In the forthcoming review of airports, the CAA has decided to include opex within the scope of constructive engagement (CE). The CAA will continue to conduct work on efficiency with a view to providing information to the CE opex working group, and it will be left to the airports to agree their opex allowances with customers. In the event that agreement is not reach, the CAA has the responsibility for setting opex allowances.</p> <p>Opex is over 60% of turnover, making the CAA's assumptions about opex a significant source of risk for NERL.</p>	<p>Opex to turnover ratios vary across airports, with Heathrow having the lowest (46%) and Gatwick the highest (58%).</p>	<p>Low/ Medium</p>	<p>No departures from the approach described. The efficiency target set by the CAA draws on a large number of assessments.</p> <p>The issue of HAL's pension deficit is briefly discussed. The CAA has not made a decision on this yet. A number of other regulators have explicit provisions for the treatment of pension deficits. If the CAA does not install a comparable protection mechanism HAL is exposed to significantly higher cyclical cost risk than protected sectors</p>
<p>6. Unexpected Costs</p>	<p>Condition 25 of NERL's Licence allows the company to apply for a re-determination of charge limits if changes in circumstances beyond company control lead to significant negative impact on NERL ability to meet its current or future obligations. The outcome of the application depends to a large extent on the discretion of the regulator. Following the 9/11 terrorist attacks, NERL successfully applied for a re-determination as a result of large falls in its income.</p>	<p>Designated airports can apply to the CAA for an interim review. However it is at the CAA's discretion to undertake one.</p> <p>The CAA also has power to extend the control period by up to 12 months at the same terms as the on-going control period.</p> <p>The regulatory framework also includes provisions for changes to capex triggers during the control period "to cater for significant external events". Changes can occur following agreement between the airport and airlines. In the event that the airport makes an application to revise a capex trigger without the agreement of airlines, the CAA may still make revisions if it felt that this would be consistent with its duties.</p> <p>The framework does not include provisions for pension cost deficits.</p>	<p>Medium</p>	<p>Several comments:</p> <ol style="list-style-type: none"> 1) The CAA is currently consulting on the form of the re-opener provision 2) Nothing to suggest that the CAA can extend the price for 12 months. 3) The framework for capex triggers does not seem to have changed.

<p>7. Quality of Service Schemes Unlikely to impact on beta since performance not obviously correlated with macro-economic cycle Could impact on required regulatory rates of return if impact was asymmetric (i.e. greater probability of +ve or -ve adjustments).</p>	<p>Service quality incentives are provided through a "delay term" included in the price cap formula. This term, which can be positive or negative, depends on the average annual delay per flight. The actual maximum would depend on the outturn level of traffic. The incentive scheme also includes a mechanism that provides greater financial incentive in relation to delays early in the morning and to longer delays over 15 minutes. The targets were tightened by the CAA after NERL's outperformance during CP2.</p> <p>The revenue risks derived from the financial incentives on service quality for NERL are capped to a maximum penalty of £24 million a year (approximately 4% of NERL' 2006 revenues) in the event that average annual delay exceeds 45 seconds per flight.</p>	<p>Under the Scheme of Standards and Rebates each airport must pay rebates to airlines when service levels fall below certain defined standards in a particular terminal. The scheme currently covers two subsets of standards:</p> <p>(i) an airline rebate, consisting of: the availability and serviceability of certain equipment, pier service levels and security queues; and</p> <p>(ii) a customer rebate, based on passenger perceptions of performance, as measured by the Quality of Service Monitor (QSM), consisting of: cleanliness, departure lounge seat availability, way-finding and flight information systems.</p> <p>The cap on the total annual level of rebates is 7 % of airport charges at all three designated airports. The Scheme of Standards and Rebates is asymmetric: bonuses for outperformance at Heathrow and Gatwick are capped at 3%, and no bonuses are available at Stansted.</p>	<p>Medium (Possible -ve asymmetric impact on airport's expected returns)</p>	<p>Some changes in the details of what is included in the quality of service scheme, but not clear if these are very major.</p> <p>Some discussion of moving from "knife-edge" approach to a "sliding scale" – so penalties will kick-in more gradually, rather than large penalties linked to thresholds.</p> <p>CAA plans to retain cap of 7% on annual rebates.</p> <p>CAA has reduced bonus pool to 1.44% (from 2.24%) – but is contemplating: (i) allocating the reduction to other categories to maintain a bonus pool of 2.24%; (ii) allocating the difference to a flexible bonus pool that can be negotiated during the control period; or (iii) removing it altogether.</p> <p>Linked to (ii), the CAA is thinking of allowing a more flexible approach to quality of service schemes by making provisions for renegotiation during the control period.</p>
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<p>8. Capex Incentives</p> <p>The capex incentive rate represents a measure of the revenue risk companies face for under/overspends as they are allowed to retain (or must bear) the incentive rate on cost savings and additional costs incurred</p> <p>Asymmetric if the CAA incentives do not reward companies that are more than averagely efficient and penalise companies that are less than averagely efficient.</p>	<p>Opex rolling incentive mechanism allows NERL to keep (or bear) operating cost savings (overspends) for a full five year period.</p> <p>Under the current regulatory framework there are no direct financial capex incentives for NERL.</p>	<p>Investment incentives at designated airports take the form of “capital expenditure triggers.” These triggers reduce the maximum allowed level of charges if particular projects or milestones in projects are not met by specified dates. The current capex triggers scheme reduces the allowable yield by a percentage depending on the number of months by which the performance of a trigger is delayed. With the exception of Heathrow Terminal East triggers, during Q5, the scale of each trigger is “based on one twelfth of the return on the completed value of the asset as projected in the capital investment plan.”⁴⁹</p> <p>For Q4 there were 5 triggers for Heathrow, each representing 2% of airport charges per annum spread over the quinquennium. During the Q5 review, the CAA expanded the number of capex triggers at both Heathrow and Gatwick. The CAA also relied on CE to determine the final list of capex projects that would be subject to a trigger. The final determinations for Q5 included 23 triggers at Heathrow and 10 triggers at Gatwick, each associated with different trigger payments.</p>	<p>Medium to High for Heathrow and Gatwick, reflecting more than half of capex being exposed to asymmetric triggers.</p>	<p>There appear to be no changes to the capex incentives scheme. At this stage, there is no information on exactly how many capex triggers there will be.</p> <p>There is a general change to the way capex allowances are set. Based on suggestions by HAL and airlines, the CAA is thinking of distinguishing between “core” and “development” capex. The CAA will make an “indicative” allowance for development capex based on P80 estimates (rather than P50 for core capex). Some differences in level of consultation during the control period required for development capex. Doesn't appear to materially alter the risk associated with capex.</p>
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⁴⁹ CAA – *Economic Regulation of Heathrow and Gatwick Airports 2008-2013*, CAA Decision, March 2008

Relative Risk of London Heathrow

<p>9. Revenue Risk from Competition May affect beta coefficient (entry prospects correlated with business cycle). Asymmetric risks with greater prospect of downside impact on revenues.</p>	<p>NERL's en-route activities do not face any risks from competition in the short term.</p>	<p>Airports can face competition along a number of dimensions, including: competition from other airports in their vicinity; in the case of hub airports, competition from other hubs; and on some market segments, competition from other modes.</p> <p>The extent of competition faced by airports varies according to characteristics such as: location; surface access infrastructure; runway infrastructure; aircraft facilities; and the nature of the airlines that operate from them.</p> <p>The extent of competition faced by each of the three designated airports is reflected in the CAA's recent market power assessments. The CAA regards Heathrow to have the greatest level of market power, and Stansted to have significant market power only during the morning peak. However, unlike Gatwick and Stansted, Heathrow faces hub-competition from various airports.</p>	<p>Low for NERL and Medium to High for designated airports.</p>	<p>No changes.</p>
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NON-SYSTEMATIC REGULATORY RISK FACTORS	NERL	Designated Airports	Risk Factor Rating
<p>10. General Regulatory Risks to RAB recovery</p> <p>Recovery of the RAB is exposed to regulatory risk in many different ways through disallowance of costs at price reviews, under-estimates of the allowed WACC, changes to regulatory methodology etc.</p> <p>Large investment programmes commit the company to short term cash outflows. Low levels of Free Cash Flows delay the return of funds to the investors, increasing exposure of these cash flows to general regulatory risks.</p> <p>Unlikely to be captured in beta coefficient – more likely to be increase the hurdle rate to invest.</p> <p>We measure relative regulatory risks as the ratio of operating profit minus forecast investment costs to turnover, known as Free Cash Flows (FCF).</p>	<p>For 2007-09, on average NERL had positive cash flows of 16% of its turnover. FCFs were forecast to remain at 16% over CP3 (i.e. 2011-14).</p>	<p>FCFs vary significantly across airports and at different points in time. This typically reflects the nature of capital expenditure programmes at the designated airports.</p> <p>Between 2007 and 2009, FCFs for Heathrow were -24%. FCFs at Stansted were also negative during this period (-5%), and Gatwick had FCFs of 12%. The negative cash flows at Heathrow reflect the completion of Terminal 5 and other large capital expenditure programmes.</p> <p>According the regulatory determinations for Q5, FCFs were forecast to be: 2% at Heathrow; 4% at Gatwick; and 39% for Stansted.</p>	<p>Highest for Heathrow airport, followed by Gatwick. Medium for NERL.</p> <p>N/A</p>

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