Response to comments on the Kearney and Hutson (2005) estimate of Dublin Airport Authority's cost of capital

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1. Introduction

In this report, we comment on the responses of the Aer Lingus (2005a,b), the Dublin Airport Authority (2005) and NERA (2005) to the Hutson and Kearney (2005) estimate of Dublin Airport Authority's cost of capital. In doing so, we recognise that there is agreement on a number of the constituent components of the estimate of the Dublin Airport Authority's (henceforth, DAA) cost of capital, and we focus our attention on the aspects of the estimate upon which there is most difference of opinion.

Before getting into the detail, it is appropriate to make a general point that concerns all issues related to measuring the cost of capital for a regulated utility. The point is that all estimates of the cost of capital are subject to error, and it is well known in the literature that in estimating the cost of capital for regulated utilities necessitates making subjective judgements. This arises because many of the concepts and variables that are defined precisely in theory are not readily measurable in practice, and have to be estimated in some way. Examples of these include the real risk free rate of interest and the equity risk premium, both of which are integral to calculating the cost of capital. As mentioned in Hutson and Kearney (2001), these practical difficulties in estimating the cost of capital imply that the 'true' cost of capital cannot be known precisely, and uncertainty will be attached to the estimate. The CAA (2001) observes in its position paper on the cost of capital for the UK's regulated airports:

> *This is not a precise science and judgement will be needed in coming to a view…"*
> *[CAA (2001), page 4].*

In a more recent overview of estimating the cost of capital for regulated utilities in the UK, Wright, Mason and Miles (2003) point to the practical difficulties in estimating the constituent components of the cost of capital:

> *Typically, … all elements are estimated with error; that is, any point estimate is accompanied by a range of uncertainty (or 'confidence interval') which can be large…*
> *There are two extremes that the regulator will try to avoid. The first is setting the price cap too high, and so allowing the regulated firm to over-price. The second is setting the price cap too low, and so discouraging the regulated firm from undertaking efficient levels of investment, for example.*
> *[Wright, Mason and Miles (2003), page 8].*

In Hutson and Kearney (2005), we argued that it is important for the long-term development of DAA that it is able to earn a reasonable rate of return on its assets, sufficient to attract the necessary funds to maintain and develop its infrastructure. Given the uncertainty that attaches to any estimate of the DAA's 'true' cost of capital, it is preferable that the regulator sets a rate that is more likely to err on the high side rather than the low side. This is particularly relevant to the DAA to the extent that existing capacity constraints will require substantial infrastructure investment. As mentioned by Wright, Mason and Miles (2003), however, it is also prudent not to set the rate too high because this would reduce incentives for the DAA to improve efficiency over time.

Given that all estimates of the components of the cost of capital have an element of uncertainty and that a degree of judgment is necessary, in Hutson and Kearney (2005) we exercised a careful degree of judgment, recognising the broad literature on estimating the cost of capital for regulated utilities, along with previous and recent regulatory determinations. In making the case for the DAA, NERA (2005) tends to advocate estimates of the components of the cost of capital that are on the high side. By way of contrast, Aer Lingus, in its submissions tends to favour estimates on the low side. As can be seen in Table 1, Aer Lingus's estimate of the pre-tax weighted average cost of capital (WACC) is 6.1 percent, NERA's estimate is 8.5 percent, while the Hutson and Kearney estimate is 7.4 percent. Given a range of 2.4 percent between the lower and upper estimates, our estimate in Hutson and Kearney (2005) can be seen to be very close to the mid-point of the range. This illustrates the extent to which all estimates of the cost of capital are measured with error, and the regulator should exercise a degree of discretion and judgment.

Looking now at the details of the estimates provided by Aer Lingus and by NERA, Table 1 shows that the main areas of disagreement are in the risk-free rate, the beta, the market risk premium, and the debt premium. The remainder of this report focuses on these components, and provides our responses to the points made by Aer Lingus (2005b), the DAA (2005), and NERA (2005). In summary, our responses to the main discrepancies in the estimates of the components of the cost of capital are as follows.

1. The risk-free rate. We agree with the Aer Lingus estimate of 2.6 percent, and we disagree with NERA's estimate of 3.0 percent. We conclude that the appropriate risk-free rate is 2.6 percent. Our justification for this conclusion is provided below in section 2.
2. The equity premium. We agree with the NERA estimate of 6.0 percent, and we disagree with Aer Lingus's estimate of 5 percent. Our justification for this conclusion is provided below in section 3.
3. The asset beta. Our estimate of 0.61 is almost mid-way between NERA's estimate of 0.70 and Aer Lingus's preferred estimate of 0.51. We are confident that our estimate is reasonable, given the considerable uncertainties that surround beta estimation. Our justification is provided below in section 4.
4. The equity beta. Our equity beta of 1.1 also lies between the preferred Aer Lingus figure of 0.89 and the NERA's figure of 1.4. Again, we are confident that our estimate is reasonable, and our justification for this is also provided in section 4.

In section 5, we consider the issue of financing incremental investment, and in section 6, we consider the relation between the cost of capital, FFO-debt ratios and credit ratings.

2. The risk-free rate

The main issue of contention is that our estimate of 2.6 percent is lower than NERA's estimate of 3.0. In commenting upon our report, NERA (2005) states on page 1 that "K&H present a wide range of evidence on the real risk-free rate. Conclusions on this evidence are not clearly drawn by K&H……" We disagree with this. Our report presented a wide range of evidence using both short-term and long-term bonds, index-

linked gilts, as well as evidence from prior regulatory determinations, and arrived at an estimate of 2.6 percent, which was also used in our prior determination on the cost of capital for Aer Rianta. We note that NERA's (2005) preferred risk-free rate of 3.0 percent is based on a very selective use of the evidence they provide. Overall, we find that NERA's analysis of the risk-free rate tends to focus on their chosen issues to a great level of detail, while missing the main point of the bias in their sample selection, and not responding to our pointing this out. By way of contrast, we have attempted to provide a well-balanced and broad overview of the evidence on short bonds, long bonds, gilts and regulatory determinations, using both shorter and longer runs of data to arrive at a balanced estimate of the risk-free rate. We are not aware of any reason why the real risk-free rate might have risen from 2.6 percent in recent years, and our estimate is very close to that suggested by Wright, Mason and Miles (2003) of 2.5 percent (see page 5).

We disagree with NERA's claim that our deduction of an inflation risk premium is incorrect because the DAA can only raise nominal finance. We reiterate that this reflects a mistaken understanding of the required calculation for the cost of capital, which is a real cost, not a nominal cost. The regulated firm earns nominal revenue from which it covers its nominal operation costs and finances its nominal debt. The cost of capital, however, remains a real variable.

NERA also argue that our inflation risk premium estimate is incorrect and lacks robustness because it is based on data over a different time period to the various time periods we used in compiling the range of evidence provided in our estimate. It is true that our estimate of the inflation risk premium of 40 percent is based on the Breedon and Chadha (1997) estimate using their data. It is also true that inflation is likely to be lower during the regulatory period than the period in which the inflation risk premium was estimated. However, we noted that the figure of 40 percent is very close to the DMS figure of 39 percent over a much longer period. NERA argue in their fifth dot point on page 9 that the DMS estimate is not supportive of the original estimate because it is based on an entirely different time period and on bonds of different maturity. We believe on the contrary that this similar estimate of the inflation risk premium from different researchers using different maturity bonds over different time periods is supportive of our estimate because it demonstrates robustness.

NERA seem not to recognise in their fourth dot point on page 9 that the inflation risk premium does vary with the level of inflation, and will tend to be higher (lower) when the inflation rate is higher (lower).

3. The equity risk premium

Our estimate of the equity risk premium of 6.0 percent coincides with the estimate provided by NERA, but Aer Lingus (2005) believes that an estimate of 5 percent is more appropriate. Aer Lingus quotes the analysis of Dimson, Marsh and Staunton (2002) (henceforth DMS) in showing that the average equity risk premium for a world index of 16 countries over the period 1900-2000 is 4.6 percent using a geometric average and 5.6 percent using annual arithmetic averages. Aer Lingus (2005) also points out that the DMS data shows an average arithmetic risk premium on the world

index over rolling 10-year periods of 4.7 percent. In response to this, we argue that the DMS analysis is of recent vintage and has not been thoroughly investigated and/or replicated by other researchers, and neither has it been accepted in other regulatory determinations. The main difference between DMS's estimates of the risk-free rates and prior studies is that the data they use goes back to 1900, whereas data widely used before the DMS study begins in 1926. The differences in estimate illustrates that estimating the components of the cost of capital is difficult, and by definition associated with error. Estimates will be widely different depending on the data period as well as the data interval and the techniques and assumptions made in the calculations.

One study that does use the DMS data, in addition to other date, is by Wright, Mason and Miles (2003) who estimate the equity risk premium and the overall market return (which is the equity risk premium plus the risk-free rate). They point to the difficulty in separately estimating the risk-free rate and the equity risk premium, and they argue that there are considerable advantages in aggregating the two to arrive at a measure of the overall market return. Using the data of DMS, they find that for the countries covered, all but 3 exhibited arithmetic average returns in the range of 6 to 10 percent. On further examination of long time series of US evidence, together with the DMS international evidence, they advocate a central estimate of the arithmetic average of the cost of equity at 7 percent, and suggest that this be decomposed into a risk-free rate of 2½ percent and an implied equity risk premium of 4½ percent. Importantly, however, they find that the 95 percent confidence interval for their estimates are, at a conservative estimate, up to 2 percentage points on either side of their point estimates. Overall, the range of DMS average returns in many countries coupled with Wright, Mason and Miles' (2003) 95 percent confidence interval for their estimate of the return on equity encompass our estimate of 6 percent for the equity risk premium.

In commenting upon our estimate of the equity risk premium, Aer Lingus (2005a) refer to DMS in arguing that there is mean reversion in equity returns that suggests a risk premium of around 5 percent. We do not agree that this implication follows, and we refer to the more detailed discussion in Wright, Mason and Miles' (2003). Essentially, the relation between arithmetic and geometric returns is constant over time only if return volatility is constant, and it is constant over different horizons only if returns are unpredictable. The literature is divided on both of these issues, and the authors conclude that:

> *'…given the absence of a clear consensus on the best way to model the underlying properties of returns, the only clear-cut recommendation must be to to deal consistently with the difference between the two averaging methods, to be precise in noting which is being used in any context, and to be aware of the potentially significant differences between the two'.*
> [Wright, Mason and Miles' (2003), p27].

We have followed this approach in consistently using the arithmetic mean approach in our various estimates.

4. Beta

NERA (2005) claim that the Hutson and Kearney (2005) approach to estimating beta is 'arbitrary, lacks robustness, and contains a calculation error'. We do not agree with this. NERA claim that our derivation of BAA's asset beta contains a fundamental error because we use the most recent 2004 gearing numbers for BAA to derive the asset beta, while the equity beta of 0.74 is estimated using stock price data over the full period from September 1988 to December 2004. NERA's main argument is that BAA's gearing level was significantly higher in 2004 than it was over the whole period from 1988 to 2004. In short, NERA asserts that we should have used the average of BAA's gearing rather than its most recently available gearing in calculating the company's asset beta.

We know of no theoretical argument that the time period used to estimate an equity beta must coincide with the time period used to average the gearing rates that are used to de-gear the equity beta into its corresponding asset beta. As we stated in our report, we used the full data period average estimate rather than the more recent rolling estimates because in our judgment the latter provided an estimate that was too low. It is possible to argue, as NERA (2005) have done, that it might well be appropriate to have used an average measure of BAA's gearing over the same period as we used to estimate BAA's equity beta. In particular, if there was a big change in leverage over the beta estimation period, some sort of average of the gearing ratio might have been appropriate. There is no certainty here, however. It is also possible that over the estimation period, there might have been big changes in BAA's estimated beta, or in the covariance of the return to BAA's stock with the return on the market portfolio that brought about changes in the estimates of BAA's equity beta. As it turns out, there have indeed been big changes in BAA's gearing and in its equity beta over the time period under consideration. It follows that the relation between the two variables will differ depending upon what time period is analysed. It should be recalled that NERA themselves advocate not using parts of the sample in their calculation of BAA's equity beta due to once-off effects. This demonstrates the extent to which judgment is required in these matters. Within regulatory practice, the only reference we have found to averaging the gearing ratio over the same time period as the calculation of the equity beta in order to derive the asset beta of a regulated utility is Lally (2004), who suggests doing this for US electrical utilities.

Applying the averaging process to BAA's gearing from August 1988 to May 2005, NERA obtain their preferred estimate of the asset beta for BAA of 0.67, and extrapolates from this an asset beta for DAA of 0.70, which converts to their preferred equity beta for DAA of 1.4. In our view, this estimate of 1.4 for DAA's equity beta is excessive. It would place DAA in the realm of very high-risk firms, and in stock market parlance a highly 'aggressive' stock. On balance, we believe that our approach, which explicitly recognises that the DAA is likely to be 20 percent more risky than BAA, and which estimates an equity beta for DAA at 1.1, is a much more reasonable estimate of the utility's true systematic risk.

Concerning Hutson and Kearney (2005) raising BAA's asset beta of 0.5 by 20 percent in order to adjust for the probable greater uncertainty facing DAA relative to BAA, we note that NERA regards the uplift as arbitrary, but does not disagree with it, but that Aer Lingus disagrees with our upward adjustment. It is well understood in corporate finance theory and practice that the time series regression phase of beta estimation is simply a first step. This is because, whether beta is being estimated for

use in regulatory determinations or for any other purpose (such as in corporate finance or in the markets), it is an attempt to estimate the future systematic risk of a firm. Estimation using regression is by definition historical, and it is standard practice that adjustments to the regression estimate are based on subjective judgments about likely changes in systematic risk in the future. In our paper, we argued that a number of factors would justify this, including the expectation that DAA would be inherently more risky because it operates in a riskier economy, that it is considerably smaller than BAA, and smaller than Aer Rianta and therefore less diversified, and due to uncertainty about future investment projects. Aer Lingus (2005) argues that equity investors are increasingly internationally diversified and thus the higher risk of the Irish economy and lower diversification in DAA should not matter.

Aer Lingus also argues that our mention of the possibility of downside risk is not appropriate because other parts of our analysis show that airports are not subject to significant asymmetric risk. Overall, it is possible to argue about the relative strengths of the factors mentioned, but it is our judgment that regardless of the strength of the individual factors, it is highly probable that the considerably smaller DAA will be associated with a higher level of risk than BAA, and that in estimating DAA's asset beta from BAA's asset beta, an uplift of 20 percent is a reasonable judgment to make. As with other components of the cost of capital, our assessment of the asset beta of 0.61 lies very close to the mid-range between Aer Lingus's preferred figure of 0.51 and NERA's preferred figure of 0.70.

5. The 'funding of incremental investment'

We agree with DAA (2005) that the use of limited recourse debt would not reduce DAA's overall cost of capital. DAA provides a long, detailed section refuting Aer Lingus's claims that cheaper debt is available through limited recourse financing, which can also be known as project financing. Such financing, as Aer Lingus explains, '…involves the lender taking on some of the project risk.' Whether or not such alternative financing arrangements are available to DAA, finance theory would suggest that such shifting of risk should not alter a firm's cost of capital. As DAA (2005) says: "A real reduction in the cost of capital for a particular entity can only be attained if an actual reduction in risk or elimination of market inefficiency can be attained via securitisation." They suggest how this reduction might in theory occur, including the exploitation of incomplete markets, reduced agency costs and reduced costs of financial distress. However, DAA goes on to argue that the significance of these factors is unclear, and that Aer Lingus's argument that limited recourse financing does not affect the cost of equity is incorrect. We agree with DAA's (2005) arguments on alternative financing arrangements.

6. The cost of capital, FFO-debt ratios and credit ratings

On pages 5 and 6 of DAA (2005), the Dublin Airport Authority discusses the issue of credit ratings, the ratio of funds from operations (FFO) to debt, and the cost of capital. While welcoming the Commission for Aviation Regulation's stress testing the financial robustness of the regulatory proposals under the heading 'financial viability', the DAA (2005) argues that the S3 model 'demonstrates that the cost of capital applied (7.4%) is inadequate', and that '…the cost of capital used in S4 (8.5%)

would … be more consistent with the regulatory precedents noted by the Commission'. The DAA appears to be arguing that it requires a ratio of FFO-debt of at least 20 percent in order to comply with certain Standard and Poor's ratings 'thresholds', and that its cost of capital must be high enough in order to ensure that this ratio is achieved.

We do not agree with this argument. The cost of capital for a regulated utility should not be thought of as being determined as a residual endogenous variable that can be altered in order to guarantee the achievement by the regulated utility of some set of projected financial ratios. This would undermine the regulatory rationale for estimating the utility's cost of capital in the first place, and it would seriously curtail the efficiency aspects of the regulatory objective. It would, in essence, put the cart before the horse.

The cost of capital has many components (such as the risk free rate, the equity risk premium and the tax rate) that are completely independent of the regulated utility's financial performance. The regulated utility's financial performance also has many components (such as the operational efficiency of its regulated activities and the nature, extent and efficiency of its unregulated activities and their financing) that are more or less independent of the cost of capital. It follows that there is no necessary close relation between a regulated utility's cost of capital and its FFO. FFO can rise or fall independently of movements in the cost of capital, and is incorrect to argue that a high (low) FFO necessitates a high (low) cost of capital.

It would also be inappropriate for a regulator to anticipate the behaviour of credit rating agencies. With a public utility that is government-owned or even partially government owned, it is well understood that the market will factor into the bond's yield a very small probability of default. In this context, a minor downgrade or upgrade within the investment grade is likely to have a negligible affect on a regulated utility's ability to borrow money and on their cost of debt. A similarly minor downgrade within the investment grade might signal a marginal increase in risk to equity investors, and this might plausibly increase the cost of equity. The effect, however, is likely to be very minor. There is also ample evidence in the academic literature that the market anticipates ratings downgrades, and that on announcement of the downgrade there is unlikely to be any significant changes to stock price and hence perceived risk (see, for example, Hand, Holthausen and Leftwich (1992)). If markets are efficient, the current yield on any bond should reflect the market's assessment of the company's credit risk, including any anticipated changes to their ability to safely cover interest payments and repay principal.

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Table 1
Estimates of DAA's WACC

Parameter:	Estimated by: Hutson Kearney	NERA	Aer Lingus
Cost of equity			
Real risk-free rate	2.6%	3.0%	2.6%
Equity risk premium	6.0%	6.0%	5.0%
Asset beta	0.61	0.70	0.51
Equity beta	1.10	1.40	0.89
Real cost of equity	9.2%	11.4%	7.05%
Cost of debt			
Real risk-free rate	2.6%	3.0%	2.6%
Debt premium	1.1%	1.0%	1.1%
Real cost of debt	3.7%	4.0%	3.7%
Gearing	50%	46%	46%
Corporate tax rate	12.5%	12.5%	12.5%
Post-tax WACC	6.4%	7.5%	-
Pre-tax WACC	7.4%	8.5%	6.1%