Appendix 8 – Cost of Capital for Dublin Airport for 2019 Determination

Source: NERA

NERA
ECONOMIC CONSULTING

Cost of Capital for Dublin Airport for 2019 Determination

A Report for daa plc

1 July 2019

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Executive Summary

Daa commissioned NERA Economic Consulting (NERA) to review the Commission of Aviation Regulation (CAR)'s advisor Swiss Economics' (SE) analysis of Dublin Airport's cost of capital for the 2019 Determination, which will apply from 2020 for a period of at least 4 years.

In its May 2019 Draft Determination for the Maximum Level of Airport Charges at Dublin Airport 2020-2024, the CAR proposes a WACC of 4 of per cent, compared to the CAR's 2014 determination of 5.8 per cent. The CAR's proposed reduction of cost of capital allowance is mainly based on its advisor SE's analysis of daa's beta risk, risk-free rate, total market returns, and cost of debt. However, we identify several flaws in the CAR and SE's analysis that lead to an understatement of Dublin Airport's cost of capital for the 2019 Determination. These errors risk setting the allowed return too low where substantive investment is necessary to maintain core infrastructure and deliver capacity growth.

There is no basis to set an asset beta for 2019 Determination below the asset beta of 0.60 used for 2014 Determination, given that daa's risk going forward is expected to be at least as high or indeed higher than in the 2014 Determination

The CAR's proposed asset beta of 0.43 to 0.46 for 2019 Determination implies a substantial reduction in risk for daa over the next regulatory period, relative to the 2014 Determination where the asset beta was set at 0.60. The CAR has not explained how this reduction in allowed beta can be justified with reference to changes in daa's risk over time. In addition, there are several issues with the CAR and SE's beta analysis that underestimates daa's beta for the 2019 Determination.

SE's estimation method of the listed beta comparators is flawed, and underestimates the comparators' betas. SE makes two errors when estimating the betas of publicly listed airport comparators: i) using domestic stock market indices, when regional stock market indices are more appropriate, and ii) using the Hamada formula to un-lever and re-lever estimated betas, when the Miller formula is more suitable and consistent with financial theory. Correcting for SE's methodological errors, empirical evidence from listed comparator betas does not support a reduction in airport beta risk, and suggests an increase in risk.

SE's comparability assessment is flawed and places undue weight on poor comparators, leading to understatement of daa's beta. In determining the asset beta for daa, SE assesses various risk factors and assigns weights to comparator betas based on their comparability to daa. However, SE makes several errors in designing the weighting scheme, leading to undue reliance on airports with significantly lower risk, and mixing up empirical evidence with regulatory determinations at different times. In contrast to SE's approach, which is based on a broad but dissimilar set of flawed comparators, we argue that daa's beta should be estimated based on the closest comparator airports with most comparable regulatory regimes and demand/supply profiles.

The CAR and SE's point estimate of beta of 0.6 for the 2019 Determination implies a substantial reduction in risk relative to the 2014 Determination, but the CAR has not provided sufficient evidence for such a reduction. In contrast, the construction of the North Runway project will increase daa's cost fixity and operating leverage, and in the event of a demand shock, it will also increase cash-flow volatility and expose daa to greater systematic risk.

There is also no evidence of decrease in daa's risk compared to other Irish regulated companies, and the beta allowances have generally increased since last price control for most of these comparators.

Overall, we conclude there is no basis for the CAR to set an asset beta for the 2019 Determination below the asset beta of 0.60 used for the 2014 Determination, given that daa's risk going forward is expected to be at least as high, or indeed higher, than in the 2014 Determination.

SE's RfR estimate relies only on short-term evidence and neglects long-run evidence, in contrast to Irish regulatory precedent

In the 2019 Draft Determination, the CAR adopts SE's RfR proposal of -0.14 per cent, based on current yields and forward rates of German and Irish government bonds. However, SE's approach relies only on short-run evidence and places no weight on other existing evidence from Irish regulatory precedent and long-term estimates, resulting in a drastically lower RfR estimate for daa compared to the CAR's previous determination and with Irish regulatory precedent. Moreover, the CAR is selective on the Thessaloniki Forum recommendations it follows, since the CAR's decision to rely on German bonds as a lower bound for the RfR is not part of the Forum recommendations.

Instead, we consider that a more moderate approach is to take into account the historical evidence and regulatory precedent. We therefore recommend estimating daa's RfR taking into account a wider set of evidence, including the current market evidence, historical evidence and regulatory precedent.

SE's analysis contains flaws that underestimate daa's cost of debt, which partially explains why the CAR's proposed new cost of debt is significantly lower than the regulatory precedent

In past price reviews, the "debt premium" approach has been the predominant method used by Irish regulators to set cost of debt, including the CAR's 2014 Determination for daa. In the CAR's 2019 Draft Determination, the CAR proposes to use a new approach that blends the costs of embedded debt and new debt at a notional investment grade credit rating. Based on this new method, the CAR and SE estimate a cost of debt range of 0.65 to 1.04 per cent, with a point estimate of 0.85 per cent. This proposed cost of debt is substantially lower than the CAR's 2014 range of 2.5 to 3 per cent, with a point estimate of 3 per cent.

We identify a number of issues that could lead to underestimation of daa's cost of debt, and that partially explain why the CAR's proposed new cost of debt is significantly below the regulatory precedent. First, SE's derivation of daa's cost of new debt is flawed because it relies on only three airport issuers and a small sample of comparator bonds, which undermines the robustness of its analysis. SE also fails to control for the maturities of comparator bonds, potentially underestimating daa's cost of new debt allowance. In addition, while we agree with SE that data suggests the existence of an Irish country risk premium, SE's approach to estimate the Irish country risk premium has a number of errors:

- SE attempts to estimate the country risk premium by comparing the traded yields of Irish and other European utility bonds, but fails to control for credit ratings, maturities and other factors that could significantly influence the yield spread and bias the estimated country risk premium.

- SE's calculation of the "uptick" for notional credit rating analysis relies on a small sample of bonds, and underestimates the spread between A and BBB rated debt. SE estimates the "uptick" to be 5 to 12 bps, based on the real bond yield spread of few selected utilities bonds rated A and BBB.

Correcting for these errors, we estimate the credit spread to be between 47 and 59 bps based on A and BBB rated European broad market bond benchmark, which control for credit rating, maturity, liquidity requirement and various other factors of the constituents.

Using the same embedded/new debt approach, and correcting for these issues, we estimate the cost of debt to be 1.19 to 1.43 per cent, higher than the CAR and SE's cost of debt range of 0.65 to 1.04 per cent

We estimate the cost of new debt to be 1.24 to 1.48 per cent, based on yield of BBB-rated European bond benchmark index with matching years to maturity, and adjusted for the expected increase in the bond yield leading to the future regulatory period. We estimate the cost of embedded debt to be between 0.68 per cent, based on the debt portfolio information presented in SE's report.

In contrast to SE's approach, we calculate the cost of embedded debt including the bank margin as part of the base interest rate in addition to the transaction cost, in accordance with the view of daa Treasury department. We estimate the ratio between embedded and new debt to be 44:56 using the forecast of debt amount provided by daa, and the transaction costs to be 20 to 30 basis points based on regulatory precedent.

Overall, the embedded/new debt approach suggests the weighted average cost of debt of daa for the 2019 determination is between 1.2 to 1.4 per cent. The cost of debt from this approach is at the lower end of our estimate of 1 to 3 per cent using the debt premium approach, since it does not consider the long-run historical interest rate evidence that has been taken into account in all the regulatory precedent in Ireland.

Aiming up is useful to mitigate the risk and costs of setting a cost of capital that is too low, but regulatory precedent suggests implicit aiming up could be higher than 50 bps

We agree with the CAR and SE's recommendation of uplifting the final WACC estimate in order to mitigate risks associated with measurement errors. Irish and UK regulators have generally determined an allowed rate of return towards or at the top end of proposed ranges (or "aiming up"), including the CAR's approach at 2014. This recognises that there is significant scope for error in estimating cost of capital parameters, and the consequences or costs of setting an allowed return that is too low to attract investment outweighs the cost of setting the cost of capital too high.

SE states in its report that its approach sets the allowance at the top end of the explicit aiming up allowances of other regulators. However, review of regulatory precedent shows that SE's proposed 50 bps is lower than the top end of the aiming up range, which is 95 bps determined by the CAR in 2014. If SE's objective is indeed to provide daa with an aiming up allowance at the top end of Irish precedent as it states in the report, then the aiming up would be 95 bps rather than 50 bps.

1. Introduction

Daa plc has commissioned NERA Economic Consulting (NERA) to review the Commission of Aviation Regulation (CAR)'s advisor Swiss Economics' (SE) analysis of Dublin Airport's cost of capital for the 2019 Determination.

In its May 2019 Draft Determination for the Maximum Level of Airport Charges at Dublin Airport 2020-2024, the CAR proposes a WACC of 4 of per cent. The CAR proposal for both the WACC and its components relies mainly on the analysis of the CAR's advisor, SE.[1] We review and discuss SE's approach in the following sections and propose corrections to SE's analysis when appropriate.

The report is structured as follows:

- Section 2 responds to SE's assessment of beta;
- Section 3 responds to SE's estimate of risk-free rate (RfR);
- Section 4 responds to SE's assessment of total market return (TMR);
- Section 5 responds to SE's assessment of cost of debt; and
- Section 6 responds to SE's proposed aiming-up.

[1] Commission for Aviation Regulation (9 May 2019), Maximum Level of Airport Charges at Dublin Airport 2020-2024 – Draft Determination, p.37, para 8.2. Swiss Economics (12 March 2019), Dublin Airport Cost of Capital for 2019 Determination.

2. Beta

In this section, we respond to the analysis presented by the CAR and SE on daa's beta for the 2019 Determination. We start by summarising the CAR and SE's analysis, and then set out the methodological errors, the unexplained deviations from regulatory precedent, and unsupported assumptions that SE makes in its analysis.

We identify the following main issues with the CAR and SE's analysis:

- SE's estimation method of the listed beta comparators is flawed, and underestimates the comparators' betas. After correcting for the errors, including the use of domestic reference market index and Hamada re-levering formula, empirical evidence on comparator betas supports a higher beta for daa for the 2019 Determination;
- SE determines daa's beta as a weighted average of comparator betas, based on the comparators' similarity to daa. However, SE's assessment is flawed as it assigns arbitrarily determined weights to each risk factor, places unduly weights on comparators that have significantly lower risk profile, and combines current empirical data with outdated regulatory precedent. Instead, daa's beta should be estimated based on the closest comparator airports that have the most comparable regulatory regimes and demand/supply profiles; and
- The CAR and SE's point estimate for the 2019 Determination implies substantial reduction in risk relative to the 2014 Determination, and relative to Irish regulated companies, which is unjustified. Instead, evidence supports an increase in daa's risk in the 2019 Determination relative to the 2014 Determination.

Overall, we conclude there is no basis for the CAR to set an asset beta for the 2019 Determination below the asset beta of 0.60 used for the 2014 Determination, given that daa's risk going forward is expected to be at least as high or indeed higher than in the 2014 Determination. The CAR's proposed asset beta of 0.43 to 0.46 for the 2019 Determination implies a substantial reduction in risk for daa over the next regulatory period, relative to the 2014 Determination as well as compared to other regulated sectors, for which the CAR and SE provide no valid justification or evidence.

2.1. Summary of the CAR's and SE's beta analysis

In its report for the CAR[2], SE presents evidence on asset beta for two types of comparators as relevant for estimating the asset beta for Dublin Airport for the 2019 Determination: i) empirical estimates of listed international airports, and ii) regulatory decisions of unlisted comparable airports.

SE estimates an asset beta range of 0.43 to 0.46, based on the weighted average of empirical beta estimates of listed airports and beta decisions of unlisted airports, weighted by the "comparability" scores assigned by SE. For the listed comparators, SE estimates the 1-year daily betas, 2-year daily betas, and 5-year weekly betas against respective domestic stock price indices. SE explains that using a domestic market index is in line with the Thessaloniki

[2] Swiss Economics (12 March 2019), op. cit., p.37-49.

Forum recommendations, and notes that the impact on the asset beta estimates would be marginal using the broader regional market indices.[3] SE uses the Hamada formula to un-lever the estimated equity betas and re-lever them to derive daa's asset beta. The CAR argues that the Hamada formula is appropriate in this case because it "adjusts the equity beta for the tax benefit of debt," and claims this explains in part why the betas are lower than in the 2014 Determination.[4] For the unlisted airports, SE presents their betas from regulatory determination, namely the 2014 Determinations for London Heathrow and Gatwick Airport, and the 2016 Determination for Rome Airport.

In determining the beta for daa, SE weighs these two types of evidence, empirical and regulatory, by assigning comparability scores to each comparator based on its assessment of ten risk factors. SE's assessment has three key risk categories: i) regulatory environment, ii) demand structure, and iii) business structure, which together sum up to the ten risk factors considered. For each risk factor, SE examines whether an airport is similar to Dublin Airport and assigns a point if it deems the airport to be a suitable comparator under that measure. SE then calculates the weights for each airport by dividing each airport's assigned points by the total number of points given to all airport comparators. Using this approach, SE concludes that Dublin Airport's asset beta falls in the range of 0.43 to 0.46, based on the weighted averages of 5-year weekly betas and 2-year daily betas of comparators with empirical estimates and the betas of comparators with regulatory evidence only, respectively. SE proposes a beta point estimate of 0.45 for the 2019 Determination, compared to daa's current beta of 0.6. SE's estimate therefore implicitly assumes a substantial reduction in daa's systematic risk since the 2014 Determination.

In its Draft Determination, the CAR provides the following reasons for the reduction in daa's risk: i) more flexible regulatory framework in light on the new process for consideration of supplementary capex allowances; ii) a recovery in the Irish economy with consequent improvement in credit ratings; iii) strengthening of flight demand; iv) higher diversification of airlines with more routes available; and v) increased market power of Dublin Airport.[5] The CAR also regards the increase in the sample of comparable airports to adequately reflect the change in the airport operator over time (i.e. from Aer Rianta in 2001 to the Dublin Airport only 2014).[6] Moreover, the CAR rejects our argument that daa's high operating level increases risk exposure, arguing incorrectly that other airports are also making substantial investments without additional risk reflected in their beta estimates.[7] Aer Lingus and Ryanair also show a misunderstanding of daa's risk in their responses. Air Lingus supports lower beta estimates considering the move to transfer/hub infrastructure and the increased financial

[3] Swiss Economics (12 March 2019), op. cit., p.37, para 124; Appendix A.2.3.

[4] Commission for Aviation Regulation (9 May 2019), Maximum Level of Airport Charges at Dublin Airport 2020-2024 – Draft Determination, p.41, para 8.17.

[5] Commission for Aviation Regulation (9 May 2019), Maximum Level of Airport Charges at Dublin Airport 2020-2024 – Draft Determination, p.40.

[6] Commission for Aviation Regulation (9 May 2019), Maximum Level of Airport Charges at Dublin Airport 2020-2024 – Draft Determination, p.40, para 8.22.

[7] Commission for Aviation Regulation (9 May 2019), Maximum Level of Airport Charges at Dublin Airport 2020-2024 – Draft Determination, p.47, para 8.60.

stability of Aer Lingus and Ryanair, the two main airlines.[8] Ryanair states that Copenhagen, Zurich and Vienna are the best comparators to daa.[9] We address these arguments in the sections below.

2.2. SE's empirical estimates rely on a flawed methodology which leads to understated asset beta for daa

SE makes two errors when estimating the betas of publicly listed airport comparators: i) using domestic stock market indices, when regional stock market indices are more appropriate, and ii) using the Hamada formula to un-lever and re-lever estimated betas, when Miller formula is more suitable and consistent with financial theory. Correcting for SE's methodological errors, empirical evidence from listed comparator betas does not support a reduction in airport beta risk, and instead suggests an increase in risk.

We explain the problems with SE's approach in further detail below, drawing on financial theory and regulatory precedent.

Europe-wide stock index should be used as benchmark for estimating betas of European comparators, rather than domestic stock index

SE's approach of estimating betas for European airports based on domestic large-cap stock indices is flawed for a number of reasons:

- European economic and capital markets are highly integrated and there is no strong evidence of the so-called "home bias" in European investors, indicating that wider European market index, rather than the domestic large-cap stock indices, is a better proxy for investment universe;
- Analysis of comparator airport ownership shows that domestic stock indices do not accurately reflect the investment universe of the marginal investor in major airports, such as AdP and AENA; and
- The domestic large-cap stock market indices used by SE do not include AdP, Copenhagen, Fraport and Vienna, which means that these indices, by definition, cannot represent the investment universe for the investors in these airports.

Under the CAPM framework, the choice of the market index should reflect the investment portfolio of the marginal investor of the comparators. In principle, we consider that an investor in European assets is likely to diversify his or her portfolio across the European market, given the common currency in major countries and free capital movement. While several academic studies argue some equity investors prefer investing in domestic stocks despite the wider benefits of diversification, the extent of such "home bias" would depend, amongst other, on the explicit or implicit barriers to trade such as informational asymmetries. We do not consider such investment constraints would apply to the major countries in the European Union, such as, for example, Spain, France and Germany. On the contrary, the use of a domestic market index for a country may not offer the required level of diversification

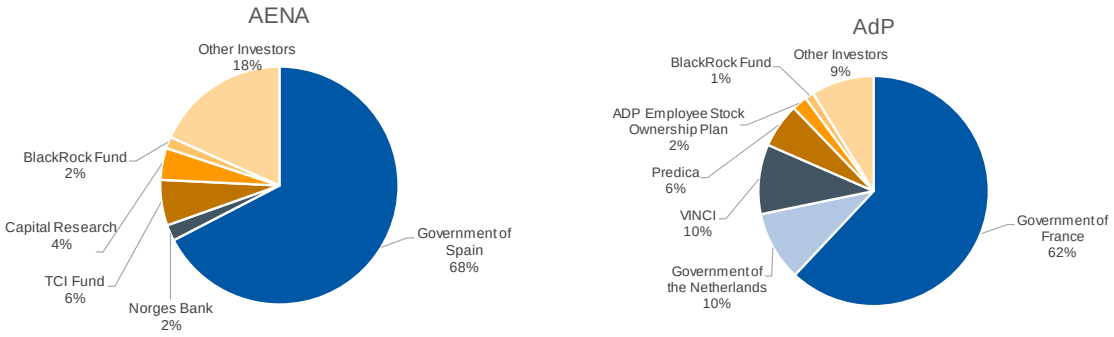
[8] Commission for Aviation Regulation (9 May 2019), Maximum Level of Airport Charges at Dublin Airport 2020-2024 – Draft Determination, p.45, para 8.54.

[9] Commission for Aviation Regulation (9 May 2019), Maximum Level of Airport Charges at Dublin Airport 2020-2024 – Draft Determination, p.46, para 8.56.

for an investor, since a domestic index implicitly restricts the investor's investment universe to stocks in that country. Therefore, the wider European market index, rather than the domestic large-cap stock indices, should be used as the reference market for estimating betas for European airports, such as AdP, AENA, Copenhagen, Fraport, Vienna and Zurich, given the Europe-wide index reflects the appropriate investment universe for the marginal investor in these airports.[10]

SE's approach reflects a conceptual error associated with using domestic stock market indices as the reference market is that they do not reflect the investment universe of the marginal investors. As established in finance literature, the asset beta should be estimated using the investment universe of the *marginal investor* in the company.[11] Once the marginal investor in the company is identified, the stock market index should represent the investment universe available to the marginal investor to diversify its portfolio of assets. For European airport stocks, we consider the *marginal investors* are likely to be an internationally diversified investment fund, as opposed to locally constrained investors, based on our analysis of shareholder ownership of AENA and AdP shown in Figure 2.1. Whilst these airports have large state ownerships, the sophisticated investment managers are more likely to complete trades, and hence their behaviours are more likely to affect the share price (and, as a result, the beta of the asset). Since the investment universe for these sophisticated investors are wider than just the country in which this specific asset is located, domestic stock market indices are not representative of these marginal investors' investment universe, and instead the wider Stoxx Europe index is more appropriate to reflect the diversification opportunities available to such investors.

Figure 2.1: The marginal investor of listed comparators are likely internationally diversified investors, whose reference market is beyond domestic market index



Source: NERA analysis.

[10] We acknowledge that "home bias" could exist for less integrated market, such as Turkey. It is unlikely that Turkey is at the same level of economic integration with European market as Germany or France is, which makes a domestic stock market index more suitable for Turkish companies. As SE shows in its Figure 22, while most European airports typically have a higher beta when estimated against a European index, indicating a closer co-movement with the wider European market than the domestic market, TAV has a lower beta when estimated against the European index. This suggests that the Turkish market might exhibit "home bias" to some extent, and European stock market index might not be suitable. Reference: Swiss Economics (12 March 2019), op. cit., p.75.

[11] For example, common finance textbook suggests that: "While most risk and return models in use in corporate finance agree (…) that risk should be measured from the perspective of a marginal investor who is well diversified". Source: Damodaran, A., Applied Corporate Finance: Second Edition, 2004, Chapter 3, page 21.

Another theoretical issue with using the domestic large-cap stock indices to proxy the reference market is that the domestic indices often do not include the comparator stocks as constituents, creating a conceptual contradiction. The "reference market" for a stock, based on which the beta is estimated, should in theory include all the investable assets available to the marginal investor, and should, by definition, include the stock itself. Nevertheless, domestic large-cap indices in several countries do not include the comparator airport stocks, such as AdP, Copenhagen, Fraport and Vienna.[12] This leads to a conceptual contradiction that the marginal investors are investing in a stock that is out of their investable universe. Therefore, a broader regional stock market index, such as the Europe Stoxx 600 index, is a better proxy for market portfolio index, and is conceptually coherent.[13]

SE uses the Hamada re-levering formula that assumes the firm has constant debt level regardless of RAB growth, which is not supported by empirical evidence

An important step in estimating the asset betas is the un-levering and re-levering process, which takes into account the difference of financial leverage of the comparators and the target firm. In its analysis, SE uses the "Hamada formula" in re-levering the asset beta, and the CAR supports SE's approach as this formula "adjusts the equity beta for the tax benefit of debt."[14] However, this is a common misconception that the Hamada formula adjusts the beta for tax benefits because the formula includes tax rate as a parameter. The Hamada formula, based on the Modigliani and Miller's theorem and the CAPM, is accurate only if the company is financed with a constant level of debt.[15] However, the airports' debt levels change over time, which violates the key assumption of the Hamada formula. Therefore, the Miller formula used in our report is a more appropriate method to un-lever and re-lever the betas, since its underlying assumption of constant leverage ratio, rather than constant debt, is more consistent with empirical evidence and supported by regulators, such as the CAA in the UK.[16]

Correcting for SE's error, empirical evidence from beta comparators does not support a reduction in airport beta risk, and instead suggests an increase in risk

Using the correct methodologies, we present below the updated empirical evidence on the betas for listed airport comparators in Figure 2.2 and Table 2.1. As shown in Figure 2.2, comparator asset betas have on average increased since the 2014 Determination, and have stayed relatively stable since our first report. In contrast to the CAR's and SE's conclusion,

[12] The domestic indices used by SE, such as CAC40, OMX Copenhagen benchmark, DAX Kursindex and Austria Traded indices, include only the few largest and most traded companies in each stock exchange, which do not include these countries' airport stocks. Instead, the airport comparator stocks are included in their respective "Mid-Cap" indices, as well as the domestic wider "All Share" indices.

[13] We note that while AENA, AdP, Fraport and Zurich are included in the Stoxx Euro 600 index, Copenhagen and Vienna are not. However, because Copenhagen and Vienna are exposed to lower risk than DAA, we do not rely on the beta estimates of these two comparators

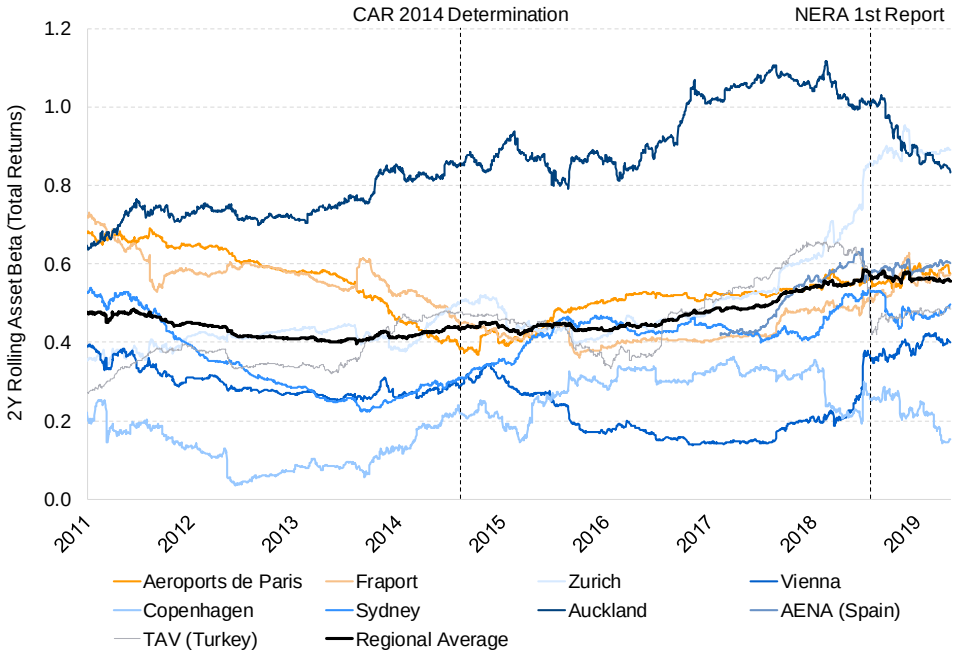
[14] Commission for Aviation Regulation (May 2019), Maximum Level of Airport Charges at Dublin Airport 2020-2024 Draft Determination, p.40. para 8.17.

[15] Brealey, Myers and Allen (2011) explains that Hamada formula is "*still used in practice, but (…) exact only in the special case where there is a level, perpetual stream of cash flows and fixed, perpetual debt. Most financial managers use the plain, after-tax WACC, which assumes constant market-value debt ratios and therefore assumes rebalancing. That makes sense, because the debt capacity of a firm or project must depend on its future value, which will fluctuate."* Source: Brealey, Myers and Allen (2011), Principles of Corporate Finance, p.485-486

[16] PwC (November 2017), Estimating the cost of capital for H7, A report prepared for the Civil Aviation Authority (CAA), p.80.

the empirical evidence of comparator airport betas does not support a reduction in risk, but instead suggests an overall increase in risk since the 2014 Determination.

Figure 2.2: Updated estimates of airport comparators 2-Year rolling asset betas



Note: NERA calculations use daily data and regional stock indices. Asset beta estimates delivered using net debt. ADP and Fraport estimates based on net debt derived from the annual reports.
Source: NERA analysis. Cut-off date 26 April 2019.

Table 2.1: Updated estimates of beta for listed comparator airports

Airport	Country	2 Year	5 Year
Aena (Spain)	Spain	0.60	n.a.
Aeroports de Paris	France	0.58	0.53
Auckland	New Zealand	0.84	0.93
Copenhagen	Denmark	0.15	0.28
Fraport	Germany	0.57	0.45
Sydney	Australia	0.50	0.45
TAV	Turkey	0.49	0.47
Vienna	Austria	0.40	0.21
Zurich	Switzerland	0.89	0.56
Average		**0.56**	**0.48**

Source: NERA analysis. Cut-off date 26 April 2019.

2.3. SE's comparability assessment is flawed and places unduly weight on poor comparators, leading to understatement of daa's beta

In determining the asset beta for daa, SE assesses various risk factors and assigns weights to comparator betas based on their comparability to daa. However, SE makes several errors in designing the weighting scheme, leading to unduly reliance on airports with significantly lower risk, and mixing up empirical evidence with regulatory determinations from different years. In this section, we explain the issues associated with SE's weighting scheme, use examples to compare and contrast SE's and our approach to risk assessment. We also set out the reasons why our approach provides a better estimate of daa's beta, and how SE's method leads to underestimation of daa's beta.**SE's design of weighting scheme is flawed, leading to unduly reliance on airports with significantly lower risk, and understatement of daa's beta**

SE's design of the weighting scheme is underpinned by the number of comparability measures within each risk factor - the more measures assigned to the risk category, the greater weight the risk category has, hence the greater influence. However, SE provides no theoretical basis for how it chooses the number of comparability measures for each risk factor category, which appears to be arbitrarily determined. For example, the regulatory environment has a total of five measures, while the demand structure has three measures, and the business structure has two measures. Changing the number of measures within the categories can have an impact on asset beta.

In addition, the weighting scheme ignores the relative importance between risk factor categories by assigning a weighting for each star, and assigning equal weight to each category whether for regulatory environment, demand structure, or business structure. This approach effectively dilutes the influence of principal risk factors that should have higher weighting in the relative risk assessment weights, such as demand risk and regulatory regime, and places high weighting on the secondary risk measures. As a result, SE's weighting implies that principal risk determinants, such as traffic risk sharing mechanism, are as important as the aeronautical revenue share, which has an indirect effect on airport's beta.

A direct consequence of SE's flawed weighting scheme design is that SE fails to exclude the airports that have significantly different risk profiles from daa's, and places unduly weightings on these unsuitable comparators in calculating daa's beta. Indeed, SE acknowledges that some of the airports in their sample are not comparable (e.g. Copenhagen, Frankfurt, Sydney and Zurich each score zero or one out of five stars on the regulatory environment metrics), but still give them important weights in calculating the average, making the data sample unnecessarily noisy and leading to downward biased beta estimates.

As shown in our first report, our preferred approach is to apply a relative risk assessment to separate out the closest comparators to daa from the airports that have significantly different regulatory risk profiles and other principal risks. Our approach is in contrast to SE's approach, which unnecessarily spreads the weights onto various risk factors, and defeats the purpose of painstakingly sifting out the comparators. Our approach is also widely supported by regulators in the UK and Europe, whereas SE's approach is a completely new proposition which lacks any track record of regulatory precedent.

A comparison between SE and our relative risk assessments illustrates the difference in our approaches, and explains why our approach is preferred

Below we compare and contrast our approach with SE's approach using AdP and Fraport as an example. Table 2.2 shows a comparison between SE and NERA's approaches to relative risk assessment for AdP and Fraport.

As shown in Table 2.2, SE's approach is too mechanical and rigid to reflect the important nuances in regulatory and demand environments, which are critical in assessing airports' relative risks. SE's approach also omits important directional information about risk (i.e. relatively higher or lower), which leads to a potentially directional bias in the weighted average beta for daa. As a result, although both SE and NERA agree that AdP is a close comparator to daa and Fraport is a relatively poor comparator, SE's weighting scheme barely distinguishes this fact, and assigns an 8 per cent and 6 per cent weighting factor to AdP and Fraport, respectively. In contrast, our approach recognises this important distinction and only includes AdP as a relevant comparator in calculating the beta for daa.

In its Draft Determination, the CAR further suggests that the new asset beta estimate is potentially better as it uses a wider set of airport comparators than its initial beta estimates in 2001 and 2005.[17] As we discussed above, for relative risk assessment, an approach based on a narrow and comparable set of comparators is preferable to a broad but noncomparable set of comparators, because the narrower and comparable set can provide a more precise proxy for daa's beta, which is a result of the thorough and painstaking relative risk analysis.

[17] Commission for Aviation Regulation (9 May 2019), Maximum Level of Airport Charges at Dublin Airport 2020-2024 – Draft Determination, p.41, para 8.23.

Table 2.2: Comparison of SE's and NERA's approach to assessing relative risks

ADP	Swiss Economics		NERA	
Category	**Rating**	**Rationale**	**Rating**	**Rationale**
Regulatory environment	★★☆☆☆	5 years, price cap. Regulator approves charges, hybrid till, and adjustments linked to traffic, investments, operating costs etc.	AdP has similar regulatory risk	5-year price cap AdP protected by the traffic risk sharing mechanism
Demand structure	★☆	Similar aeronautical revenue share. Higher passenger numbers.	AdP has lower risk	AdP has greater size, lower low-cost airlines share, more transfer flights than point-to-point flights, indicating lower business risk than daa
Business structure	★☆	Listed. Geographically diversified.	-	
Conclusion	**8% weighting factor**		**Beta should be considered a low anchor point given the similar regulatory risk and lower demand risk factors.**	

Fraport	Swiss Economics		NERA	
Category	**Rating**	**Rationale**	**Rating**	**Rationale**
Regulatory environment	★☆☆☆☆	Period length at operator discretion, regulator approves charge level, till at operator discretion (historically dual), and operator can initiate consultation on charges at their discretion.	Fraport has significantly lower regulatory risk	Lower risk due to operator discretion over length of regulatory period, timing of reviews/ consultations, and till structure.
Demand structure	★☆	Similar aeronautical revenue share. Higher passenger numbers.	Fraport has lower risk	Fraport has larger airport size, higher proportion if business flights, lower share of low-cost flights, and more transfer flights, indicating lower risk than daa
Business structure	★☆	Listed. Geographically diversified.	-	
Conclusion	**6% weighting factor**		**Beta should <u>not</u> be considered a good comparator due to significantly lower regulatory risk and demand risk**	

Source: Swiss Economics Draft Report, NERA Report

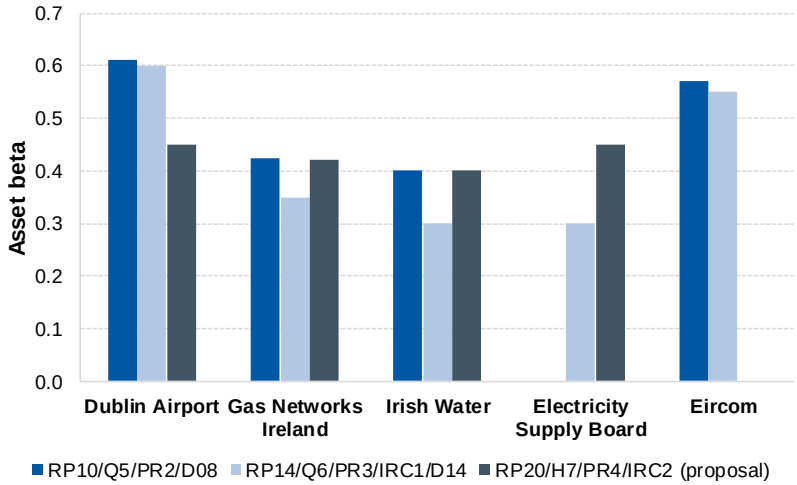
2.4. The CAR and SE's proposed asset beta implies a substantial reduction in daa's risk since the 2014 Determination and relative to other regulated companies for which the CAR and SE provide no evidence

The CAR and SE's point estimate for the 2019 Determination implies substantial reduction in risk relative to the 2014 Determination, and relative to Irish regulated companies, which is unjustified

The CAR's and SE's proposed asset beta of 0.43 to 0.46 is significantly below the asset beta of 0.6 in the CAR's 2014 Determination. However, neither the CAR nor SE explained the reasons or provided any valid evidence underlying the proposed reduction in risk and consequently in daa's asset beta. We find that there is no basis for the CAR to set an asset beta for the 2019 Determination below the asset beta of 0.6 used for the 2014 Determination, given that daa's risk going forward is expected to be at least as high or higher than the 2014 Determination, and indeed there is no evidence of change in relative risk compared to other Irish regulated companies.

As shown in Figure 2.3, the CAR's and SE's proposed asset beta for daa in the 2019 Determination is significantly lower than its 2014 Determination allowed asset beta. In addition, Figure 2.3 shows that the CAR's proposed asset beta for daa implies a substantial reduction in relative risk for daa compared to regulated Irish energy, water, and telecom companies, which the CAR and SE provide no evidence for. In contrast, the beta allowances have generally increased since last price control for most of the Irish regulated companies.

Figure 2.3: Comparison of changes in allowed asset beta in Irish regulated businesses



Note: We compare the asset beta across regulatory control period on a consistent debt beta basis of 0 to ensure the asset betas are comparable across industries and across regulatory periods. We note that these values may differ from the asset betas stated in the regulatory determinations.
Source: NERA analysis of regulatory precedent.

The CAR's arguments for a reduction in beta risk are not well-evidenced

In its Draft Determination, the CAR argues that a number of changes have reduced the risks faced by daa, which should translate into a lower beta allowance. The CAR's arguments include:

- Reduced country risk: credit rating of Ireland recovered from BBB+ stable (Fitch) in 2012 to A+ stable (Fitch) in 2017;
- Reduced company risk: credit rating of Dublin Airport is A-;
- Increase in passenger numbers: additional 10.3m passengers between 2014-18;
- Increase in number of airlines: 46 scheduled airlines in 2018 compared to 29 in 2014; and
- Increase in market power measured by concentration: mitigate business risks, such as that driven by having a higher share of leisure or low-cost passengers.

However, the CAR has not provided sufficient evidence to support its proposition that these changes are related to a reduction in *beta risk* of daa. While a lower country risk or an increase in passenger number would seem to reduce risks, these changes do not necessarily translate to a lower *beta risk*, which measures the systematic risk and co-movement of daa's equity return with the market returns. Indeed, these observations' exact impact on daa's beta risk is rather unclear. For example, in respect of the lower country risk, Spain experienced a similar improvement in credit rating to Ireland[18], but Spain's listed airport group AENA's asset beta shows no reduction over this time period, as there are other factors impacting the changes in beta. Also, similar to daa's experience of increase in passenger numbers, a number of comparator airports saw substantial rise in passenger numbers (e.g. Auckland Airport), but some of which are also accompanied by an increase in asset beta over this period, contradicting the CAR's argument. Therefore, unless the CAR provides sufficient evidence to establish the relationships between these changes and the reduction in beta, these observations cannot be considered as evidence to rationalise a lower beta allowance.

Instead, evidence supports an increase in daa's risk in the 2019 Determination relative to the 2014 Determination

In contrast to the CAR's and SE's proposed reduction in beta allowance, daa's beta risk exposure increased in the 2019 Determination due to the additional risk from the construction of the North Runway project in 2015. Since this investment project will increase daa's cost fixity and operating leverage, in the event of a demand shock it will also increase cash-flow volatility and expose daa to greater systematic risk.

As we explained in our 2018 report,[19] daa's capex is expected to rise from approximately €100 million in 2018 to over €600 million in 2022 due to a combination of core projects required to maintain current infrastructure, capacity projects (terminals 1 and 2, and airfield),

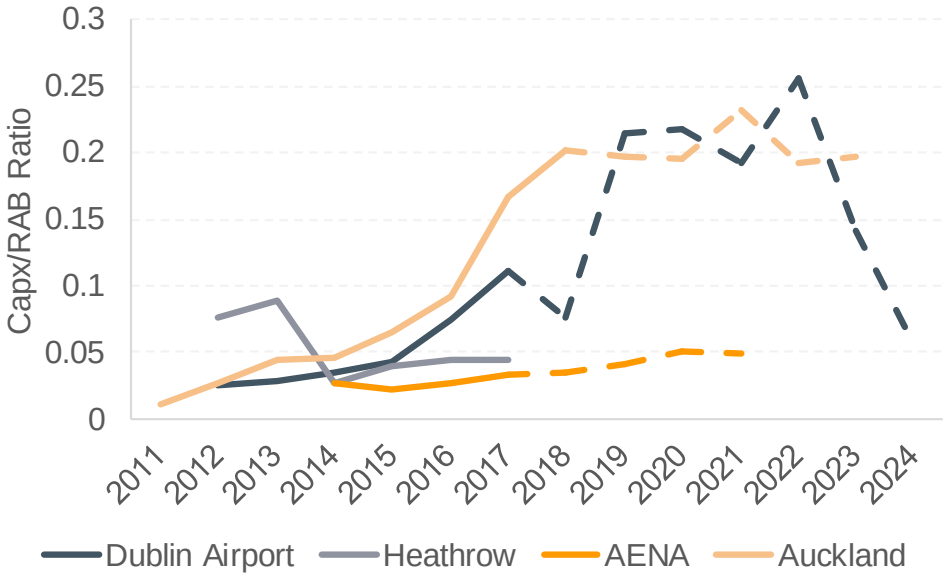
[18] In July 2012 Spain had a BBB rating (Fitch), which was upgraded to an A- rating in Jan 2019

[19] NERA (11 December 2018), Cost of Capital for Dublin Airport – 2019 Determination, p.30.

as well as other potential projects identified in its Capital Investment Plan.[20] The CAR sets a price path for daa every 5 years, during which they are subject to volume risk. In the upcoming reset period (2020-2024), daa will face a relatively higher share of fixed costs than in previous years due to an increase in capex to maintain current infrastructure, capacity projects for terminals 1, 2 and the airfield, as well as other projects as explained in its capital investment plan. The large cash outflows involved will be sunk costs, i.e. they will not be able to be reversed in case of a demand shock. During the construction phase, daa is therefore expected to have higher operational leverage than in the past, and relative to comparators that will not undertake such large-scale capex projects.

In its Draft Determination, the CAR suggests other airports, such as AENA, AdP, Auckland and Copenhagen, are making investments of comparable or larger amounts in capital projects.[21] However, the CAR fails to consider the magnitude of the investment projects proportionally to the regulated asset bate (RAB) of the airport, since the impact of the Capex program on the operational leverage and beta depends on the size of the asset base. As shown in Figure 2.4, daa shows a much higher capex/RAB ratio than other comparator airport, and therefore the risks associated with higher operating leverage are especially relevant to daa, since it is a relatively small airport compared to other major hub airports.

Figure 2.4: Daa's Capex/RAB ratio is comparable to Auckland, but above AENA and Heathrow



Note: Dashed lines indicate forecasts.
Source: Dublin Airport Regulatory Accounts and Forecasts, Heathrow Airport Regulatory Accounts, AENA Financial Statement, AIAL Annual Price Setting Disclosure and Draft Regulatory Proposal.[22]

[20] See: Dublin Airport (2018) Capital Investment Plan 2020+, Consultation, p. 6. Link: http://www.aviationreg.ie/_fileupload/2019%20Determination/Dublin%20Airport%20Consultation%20-%20CIP%202020%20.pdf

[21] Commission for Aviation Regulation (9 May 2019), Maximum Level of Airport Charges at Dublin Airport 2020-2024 – Draft Determination, p.47, para 8.60.

[22] Auckland International Airport Ltd. (2016), Draft Pricing Proposal, p.125.

In addition, the large investment programs made by AENA, AdP and Auckland support our relative risk assessment that these airports are the closest beta comparators to daa in term of investment policies. In respect of operational leverage and cost fixity, Auckland is the most comparable to daa, with the Capex-to-RAB ratio close to that of daa.[23]

2.5. Conclusion on Beta

Our analysis shows that SE's estimation method of the listed beta comparators is flawed, and underestimates the comparators' betas. After correcting for the errors, including using domestic reference market index and Hamada re-levering formula, empirical evidence on comparator betas supports a higher beta for daa for the 2019 Determination. In addition, SE's relative risk assessment is flawed as it assigns arbitrarily determined weights to each risk factor, places unduly weight on comparators that have significantly lower risk profile, and combines current empirical data with outdated regulatory precedent. Instead, daa's beta should be estimated based on the closest comparator airports that have the most comparable regulatory regimes and demand/supply profiles. Finally, the CAR and SE's point estimate for the 2019 Determination implies substantial reduction in risk relative to the 2014 Determination, and relative to Irish regulated companies, which is unjustified.

Overall, we conclude there is no basis for the CAR to set an asset beta for the 2019 Determination below the asset beta of 0.60 used for the 2014 Determination, given that daa's risk going forward is expected to be at least as high or indeed higher than in the 2014 Determination.

[23] Auckland (2018), Annual Disclosures 2018, Commerce Commission Information Disclosure Template, p.6.

Commission for Aviation Regulation (7 October 2014), Maximum Level of Airport Charges at Dublin Airport, 2014 Determination, pp. 17, 19.

3. Risk-free Rate

In this section, we respond to the CAR and its consultant SE's proposed risk-free rate (RfR) for the 2019 Determination. We start by summarising SE's RfR analysis and the CAR draft 2019 Determination. We then explain that SE's overreliance on current market evidence ignores other existing evidence from regulatory precedent and long-term estimates, resulting in a drastically lower RfR estimate for daa compared to the CAR's previous determination and Irish regulatory precedent. Instead, we consider a more moderate approach is to take into consideration the historical evidence and regulatory precedent.

Moreover, we highlight that the CAR is selective on the Thessaloniki Forum recommendations that follows, since the CAR's decision to rely on German bonds as a lower bound for the RfR is not part of the Forum recommendations.

Our conclusion is that the daa's RfR should take into account a wider set of evidence, including the current market evidence, historical evidence and regulatory precedent.

3.1. Summary of CAR's and SE's RfR analysis for 2019 Determination

In the 2019 Draft Determination, the CAR adopts SE's RfR proposal of -0.14 per cent, based on current yields and forward rates of German and Irish government bonds.[24] In establishing its estimates, SE presents three types of evidence: i) German and Irish government bond yields with remaining maturity of 8 to 12 years, averaged over a period of 1, 2 and 5 years[25]; ii) inflation rates from ECB survey forecasts and index-linked German government bonds, which SE uses to deflate the nominal yields:[26] and iii) forward adjustment to the real rates, aiming to reflect the market expectations of a raise in government bonds rates over the regulatory period, 2020 to 2024. To estimate the forward adjustment, SE calculates the yearly difference between ECB forward estimates of AAA-rated and all Euro area bonds yield, as of 28 December 2018.[27]

SE proposes a real RfR within the range of -0.72 and 0.45 per cent, with a point estimate of -0.14 per cent.[28] The CAR argues that this -0.14 per cent estimate is aligned with UK regulatory precedent, and that SE's RfR approach is aligned with Irish regulatory precedent and consistent across the WACC parameters.[29] However, the -0.14 per cent estimate is below

[24] According to SE, the reliance on current yields instead of historical averages is grounded on existing lower rates: "bond yields are currently on a low level. However, we do not believe that the current state is the result of momentary market distortions." Swiss Economics (12 March 2019), op. cit., p.27, para 66.

[25] Swiss Economics (12 March 2019), Dublin Airport Cost of Capital for 2019 Determination, p.17-18.

[26] Swiss Economics (12 March 2019), op. cit., p.19-20.

[27] Swiss Economics (12 March 2019), op. cit., p.23, Table 6.

[28] The upper bound, -0.21 per cent, is the 5-year average of the real Irish bond yield; the lower bound, -1.19 per cent, is the 2-year average of the German bond yield. SE then applies a forward uplift within the range of 47 to 66bps, as informed by market expectations for AAA rated Euro area bonds and all Euro area bonds, respectively. Source: Swiss Economics (12 March 2019), op. cit., p.27, Table 8.

[29] Commission for Aviation Regulation (9 May 2019), Maximum Level of Airport Charges at Dublin Airport 2020-2024 – Draft Determination, p.39, para 8.13.

the CAR's 2014 determination and other Irish regulatory precedent, and evidences the CAR's selective use of the Thessaloniki Forum recommendations.[30]

3.2. SE's RfR estimate relies only on short-term evidence and rejects long-run evidence, which is in contrast to Irish regulatory precedent

SE's approach relies only on short-run evidence and places no weight on long-run evidence, which has been the established approach in Irish regulatory precedent. In its Draft Determination, the CAR supports this approach as historical evidence and regulatory precedent "overlooked the recent market evolution towards negative real rates and the continued expectation of negative yields in the medium term."[31]

In contrast, we consider there is merit in considering a more extensive body of evidence, and also taking a more long-term approach in estimating the RfR, as the short-run evidence can be unstable. Our approach is also more in line with the approaches taken by other Irish regulators to place weight on long-run risk free evidence "in the interest of supporting stability in regulatory policy for Irish utilities," which is consistent with the rationale in the recent decision made by the CER.[32] Therefore, we recommend estimating the RfR based on a wider set of evidence, such as long-run historical averages of government bond yields, current and short-run market evidence (such as spot and forward rates), and recent regulatory precedent in Ireland.

SE argues that the use of current yields to estimate the RfR is consistent with regulatory precedent, as the CAR also used current market evidence when deciding its lower bound for the 2014 review. However, SE's argument cannot explain the drastic reduction in their proposed RfR for the 2019 Determination relative to the CAR 2014 Determination and other regulatory precedent. As shown in Figure 3.1, the 2019 Draft Determination's approach to RfR clearly deviates from the common regulatory practice adopted by Irish regulators to consider long-run evidence as an anchor point for RfR, in the interest of supporting stability in regulatory policy for Irish utilities."[33]

In addition, although we do not fully agree with all the guidelines in the Thessaloniki Forum, the CAR and SE have accepted and supported the Thessaloniki Forum recommendations in their reports. It appears, nonetheless, that the CAR and SE have been selective in what

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30 Although SE recognises that its point estimate of -0.14 per cent is significantly below the CAR's 2014 determination of 1.5 per cent for the risk-free rate, it argues that its approach is equal to the CAR's approach at 2014, and that this lower RfR estimate can be explained by the decrease in German government bond yields.

SE further argues that despite the inconsistency with Irish regulatory precedent, this RfR estimate is consistent with the CAA plans for Heathrow and consistent with the approach used for other WACC parameters.

Swiss Economics (12 March 2019), op. cit., p.26, para 62-63.

31 Commission for Aviation Regulation (9 May 2019), Maximum Level of Airport Charges at Dublin Airport 2020-2024 – Draft Determination, p.45, para 8.53.

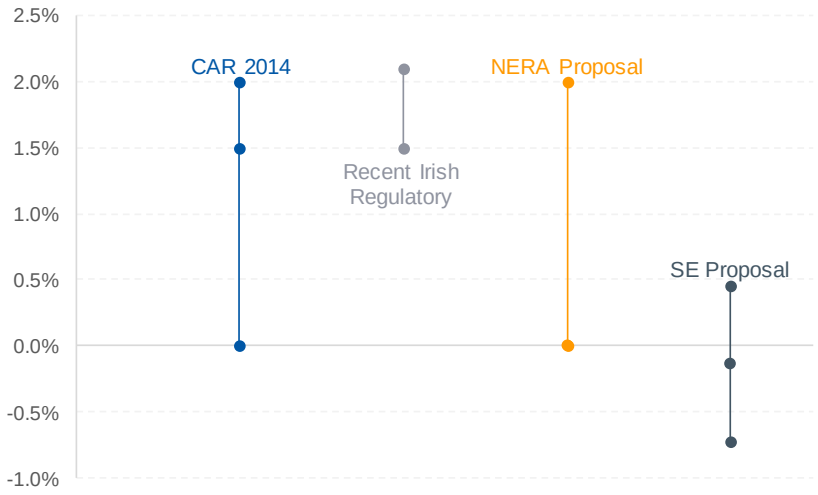
32 See Irish and UK RfR regulatory precedent in

Commission for Energy Regulation (30 August 2017), Decision on October 2017 to September 2022 Transmission Revenue for Gas Networks Ireland, p.114.

33 Commission for Energy Regulation (30 August 2017), Decision on October 2017 to September 2022 Transmission Revenue for Gas Networks Ireland, p.114.

Thessaloniki Forum recommendations to follow. While the CAR and SE follow the recommendations for beta, the CAR and SE choose to place weight on German government bond yields, rather than Irish government bond, which is inconsistent with the Thessaloniki Forum recommendations.[34]

Figure 3.1: The CAR's RfR is only supported by short-run evidence



Source: NERA analysis.

3.3. Conclusion on RfR

In conclusion, we recommend estimating the RfR based on a wider set of evidence, such as long-run historical averages of government bond yields, current and short-run market evidence (such as spot and forward rates), and recent regulatory precedent in Ireland. Table 3.1 compares our approach with SE's approach, and our proposed estimates for RfR.

Table 3.1: The CAR and SE only relies on current market yield, whereas we also consider historical evidence and regulatory precedent

	NERA		The CAR and SE	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Regulatory Precedent	0.50%	2.10%	0.00%	2.10%
Historical Evidence	2.50%	2.60%	-	-
Current Yield + Uplift	0.46%	0.70%	-0.72%	0.45%
RfR range	0.00%	2.00%	-0.72%	0.45%

Source: NERA analysis.

[34] The Forum states that "the numerical value of the risk-free rate should be reviewed taking into account the forward rate on the issuance of government bonds of the Member State in which the airport is located, if the government bonds of such a Member State are considered risk free. Thessaloniki Forum of Airport Charges Regulators (December 2016), Recommendations for the Setting and the Estimation of the WACC of Airport Managing Bodies, p.4.

4. Total Market Return

In this section, we respond to the CAR and SE's proposal for the Total Market Return (TMR) in the 2019 Determination. We start by summarising SE's TMR analysis and proposals for the 2019 Determination. Following, we discuss the flaws in SE's analysis of historical data, namely the use of a Blume estimator with 10 years holding period inconsistent with the 1 to 5 years holding period supported by the literature. We also explain that the World TMR is a more reliable investment universe than the European TMR, due to lower sensitivity to sample changes and more information available.

Following, we explain the flaws in SE's forwards looking evidence, as SE's one-stage Dividend Discount Model (DDM) is overly simple and relies on a flawed dividend growth assumption (i.e. the dividend growth for Euro Stoxx 50 price index). Instead, a more reliable approach is to use a multi-stage DDM based on dividend growth forecasts of equity analysists for broader indices, like the Stoxx Europe 600 index or Stoxx All Europe index.

We conclude on an updated TMR range of 6.4 to 6.7 per cent supported by historical evidence. Despite the flaws in SE's approach, the CAR's final TMR estimate is broadly aligned with ours.

4.1. Summary of the CAR and SE's TMR analysis for 2019 Determination

For the 2019 determination, the CAR adopted SE's TMR estimate of 6.43 per cent, within the range 6.05 to 6.8 per cent, based on a "TMR approach."[35] The "TMR approach" is also the approach we followed in the first report. [36]

To estimate the TMR, SE relies on both historical and forward-looking evidence. For the historical TMR, SE uses a Blume averaging method for the Irish and European equity returns reported in the DMS book for the period 1900 to 2017.[37] SE estimates an historical TMR range of 6.05 per cent to 6.8 per cent, based on European and Irish equity returns, respectively.[38] For the forward-looking TMR, SE uses evidence from its own DDM model, which follows the classic model of Gordon (1962)[39] and relies on data from the Stoxx Europe 50 price index for the period 2001 to 2018 to forecast future dividends.[40] SE concludes on a

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35 "Total market returns (the sum of the RfR and the ERP) are more stable over time than either of the individual components." Swiss Economics (12 March 2019), Dublin Airport Cost of Capital for 2019 Determination, p.28, para 79.

This conclusion was also supported by Ofgem academic consultants and Bundesbank analysis, as suggested by SE. Swiss Economics (12 March 2019), op. cit., p.30.

36 NERA (11 December 2018), Cost of Capital for Dublin Airport – 2019 Determination, p.3.

37 Swiss Economics (12 March 2019), op. cit., p.32.

SE assumes a holding period of 10 years for the Blume formula.

38 SE disregarded UK evidence for the TMR to maintain consistency with the approach used for other WACC parameters. Swiss Economics (12 March 2019), op. cit., p.32, para 103.

39 Swiss Economics (12 March 2019), op. cit., p.33, para 107.

40 SE estimated an average dividend growth of 1.99 per cent for the dividends of all Stoxx Europe 50 companies over the period 2001 to 2018. Swiss Economics (12 March 2019), op. cit., p.33, para 109.

TMR forward-looking range of 6.11 to 6.33 per cent.[41] The CAR argues that this approach is consistent with the Thessaloniki Forum recommendations, and that the 6.43 per cent TMR estimate is aligned with both the CAR's 2014 Determination of a 6.5 per cent point estimate, and other Irish regulatory precedent.[42]

4.2. SE historical evidence assumes holding period inconsistent with the literature, and uses the European TMR which is sensitive to sampling changes

There are two issues with SE's analysis of TMR historical evidence:

- Using Blume estimator with 10 years holding period, which is inconsistent with the 1 to 5 years holding period supported by the investor surveys; and
- Using only the European TMR and failing to consider the World TMR, which is a more reliable investment universe and has lower volatility and increased information available, justifying the use of a world equity returns estimate as opposed to a European one.

We explain each of these issues in more detail below.

Investor survey supports 1 to 5 years holding period rather than SE's 10 years holding period assumption, which leads to underestimation of TMR

SE proposes to use Blume's method and assumes a 10-year holding period of long-run historical returns which is inconsistent with surveys of equity market participants, and UK regulatory precedent. Instead, the evidence supports relatively short holding periods of 1 to 5 years, even for investors typically regarded as having longer-term investment horizons (e.g. pension funds and retail investors):

- A 2018 survey of asset management firms by the Investment Association found that UK retail investors typically held a particular fund for around 3 years;[43]
- A 2016 survey by Schroders found that individual investors typically hold their investments for around 3 years, while pension fund investors have an average holding period of 4.7 years (4.4 years if we consider only the UK and Europe);[44]

41 Swiss Economics (12 March 2019), op. cit., p.33.

42 Commission for Aviation Regulation (9 May 2019), Maximum Level of Airport Charges at Dublin Airport 2020-2024 – Draft Determination, p.42.

SE's final ERP estimate, based on the above TMR and RfR, is within the range 6.19 to 6.94 per cent, with a point estimate of 6.56 per cent. This estimate is above the CAR's 2014 Determination of 5 per cent due to the shift from an "ERP approach" to a "TMR approach." Swiss Economics (12 March 2019), op. cit., p.36.

43 The Investment Association (September 2018), Asset Management in the UK 2017-2018, The Investment Association Annual Survey, p.71; available at https://www.theinvestmentassociation.org/assets/files/research/2018/20180913-fullsummary.pdf.pdf

44 Schroders (2016), Global Investor Study 2016 – Plan Sponsors, pp.4-5; available at: https://www.schroders.com/en/sysglobalassets/digital/insights/2016/pdfs/global-investors-study-pension-funds.pdf

- A survey of equity market participants by the CFA Institute UK suggests that the average holding period is between 1-2 years;[45] and
- Helm and Tindall (2009)[46] find that most utilities are held by private equity or infrastructure funds, where the former have an average holding period of 4-5 years while the latter tend to be more long-term.

Therefore, a holding period assumption of 1 to 5 years is more appropriate for estimating historical TMR than SE's assumption of 10 years. As shown in Table 4.1, our TMR estimates using the Blume estimator, with an evidence supported holding period of 1 to 5 years, are 6.4 to 6.7 per cent.

Table 4.1: A Blume adjustment with shorter holding periods supports higher TMR Estimates

	Arithmetic Mean	Blume-adjusted TMR
Ireland		
1Y holding	6.7	6.7
2Y holding	6.7	6.7
5Y holding	6.7	6.6
10Y holding	6.7	6.5
World		
1Y holding	6.5	6.5
2Y holding	6.5	6.5
5Y holding	6.5	6.4
10Y holding	6.5	6.4

Note: The estimates are below SE's estimates because DMS 2019 publication shows a decreased return for both Ireland and the world.
Source: NERA analysis based on DMS (February 2019), Credit Suisse Global Investment Returns Yearbook, p.14.

SE's long-term European TMR is sensitive to the countries considered in the sample. A better proxy for the market is the World TMR.

Since Irish investors can rely on the performance of other countries to assess how the returns on Irish equity will evolve, we agree with using international TMR evidence when estimating the Irish TMR. However, we consider that the world TMR is more representative of the sample of countries Irish investors can use to form its' expectations, and is less volatile to the countries included in the sample because it is based on a broader set of countries. For example, the European equity returns for the period 1900-2011 are 6.7 per cent,[47] while for the period 1900-2012 the European equity returns are 6.1 per cent.[48] This material 60bps

[45] Source: Kay Review of UK Equity Markets and Long-Term Decision Making, Interim Report, Feb 2012; CFA UK response to the Kay Review of UK Equity Markets and Long-Term Decision Making – Call for Evidence.

[46] Helm and Tindall (November 2009), The evolution of infrastructure and utility ownership and implications, *Oxford Review of Economic Policy*, Vol 25, pp 411 – 434

[47] DMS (February 2012), Credit Suisse Global Investment Returns Yearbook, p.187

[48] DMS (February 2013), Credit Suisse Global Investment Returns Yearbook, p.201.

differential is based on the inclusion of Austria and Russia only in the 2013 sample. In contrast, the World TMR is less sensitive to the inclusion of additional countries, as the world TMR includes more countries and is therefore more robust to changes in the country sample.

4.3. SE's forward-looking evidence is based on an overly simplistic model and incorrect assumptions, leading to downward bias

SE provides a DDM to estimate the forward-looking TMR, but makes a number of modelling errors that can underestimate the TMR:

- Relying only on a one-stage DDM, which is overly simplistic for a high growth country such as Ireland, whereas a multi-stage model is more realistic;
- Using a large-cap stock index, Stoxx Europe 50 price index, whereas a broad-market stock index is more appropriate; and
- Using a dividend growth rate based on the historical dividend growth rate, whereas forward-looking dividend growth forecast is more relevant.

SE's single-stage model is overly simplistic as it does not consider the different phases of economic growth. In contrast, multi-stage DDM approaches are more commonly considered by UK regulators and the CMA.[49] Reputable institutions such as the Bank of England[50] also provide estimates based on multi-stage DGMs, as we show in our first report. In addition, SE uses Stoxx 50 Europe index, which only includes the European stocks with largest market capitalisation. Using such index not only restricts the investable universe in estimating the DDM, but also introduces a size bias as large stocks tend to have lower expected growth rate. Instead, a broad market equity index such as Stoxx 600 index or Stoxx All Europe index is preferred as it includes a wider investment universe and eliminates any size premium, thus providing a more reliable DDM estimate.

Furthermore, SE's constant dividend growth rate is based on the historical dividend growth rate of constituents of Stoxx 50 Europe index, which may not reflect the market expectation going forward, and defeats the purpose of using a forward-looking model like DDM. Our preferred approach is to use the forecasted dividend growth rate provided by equity analysts,

[49] CMA (March 2014), Northern Ireland Electricity Limited price determination, pp.13-30 and 13-31; For the 2015 Bristol Water determination, the CMA relied on the same TMR estimate as in the 2014 NIE determination (Source: CMA (October 2015), Bristol Water plc, A reference under section 12(3)(a) of the Water Industry Act 1991, p.332).

[50] Bank of England (2017), An improved model for understanding equity prices, Quarterly Bulletin 2017 Q2.

which reflects the current market expectation of economic growth. This approach is also supported by US regulatory precedent,[51] academic literature,[52] and central banks.[53]

Our preferred DDM is the multi-stage DDM developed by Bank of England, as we present in our first report. The Bank of England estimates the European TMR based on the Euro Stoxx index, equity analyst estimates of short-term dividend growth, and a long-run dividend growth assumption based on long-run GDP growth estimates. We provide further details in Appendix B.

4.4. Conclusion on TMR

In conclusion, we identify a number of flaws in SE's analysis of TMR, including:

- Using Blume estimator with 10 years holding period, inconsistent with the 1 to 5 years holding period supported by the investor survey evidence;
- Using only the European TMR and failing to consider the World TMR, which is a more reliable investment universe with lower sensitivity to outliers; and
- Using a flawed one-stage DDM that underestimate the forward-looking TMR.

We conclude that an updated TMR range of 6.5 to 6.7 per cent supported by historical evidence, and cross-checked by forward-looking evidence, is a more robust estimate. Despite the flaws in SE's approach, the CAR's final TMR estimate is broadly aligned with ours.

[51] In fact, the use of analysts' forecasts as inputs in to the DGM has a long history in US rate of return testimony and US court decisions consider it the most reliable way of applying a DGM. For example, in 2014, the Federal Energy Regulatory Commission (FERC) relied on security analyst forecasts published by the Institutional Brokers Estimate Systems, when estimating short-term growth rates in the first step of the model. Federal Energy Regulatory Commission, Docket No. EL11-66-001, Opinion No. 531 – Order on Initial Decision, Issued: June 19 2014, p.10, para 17.

[52] The use of analyst forecasts also reflects the general approach in academic literature, for example: i) Chin, M. and Polk, C. (2015) use I/B/E/S survey data for calculating short-term dividend growth rates in a DGM model used for estimating expected UK returns; ii) Li et al (2013) also use I/B/E/S analyst forecasts as the basis for estimating growth rates that are then used for solving a DGM,.

[53] The use of analyst forecasts in the DGM model is also consistent with approaches by central banks including the BoE as well as the European Central Bank (ECB). While the ECB notes that the use of analyst forecasts may be problematic, it also points that: "a better gauge for earnings and dividend expectations than analysts' expectations is hard to come by. (…) In fact, these data constitute the most widely used source of forward-looking earnings expectations for practitioners"

5. Cost of Debt

In this section, we respond to the CAR and SE's analysis on cost of debt for Dublin Airport for the 2019 Determination. We first summarise the CAR's and SE's analysis of cost of debt, and set out our concerns with their methods. We then present our cost of debt estimate as a weighted average of cost of embedded debt and new debt at the notional investment grade.

In past price reviews, the "debt premium" approach has been the predominant method used by Irish regulators to set cost of debt, including the CAR's 2014 Determination for daa and other recent regulatory decisions. In the CAR's 2019 Draft Determination, the CAR proposes to use a new approach that blends the costs of embedded debt and new debt at a notional investment grade credit rating. Based on this new method, the CAR and SE estimate a cost of debt range of 0.65 to 1.04 per cent, with a point estimate of 0.85 per cent. This proposed cost of debt is substantially lower than the CAR's 2014 range of 2.5 to 3 per cent with a point estimate of 3 per cent. SE explains that this decrease is mainly due to the observed decrease in government bond yields since the 2014 determination.

In our review of the CAR and SE's analysis, we identify a number of issues that could lead to underestimation of daa's cost of debt, which are part of the reasons why the CAR's proposed new cost of debt is significantly lower than the regulatory precedent. Using the same embedded/new debt approach, and correcting for these issues, we estimate the cost of debt to be 1.2 to 1.4 per cent.

5.1. Summary of SE's cost of debt analysis for 2019 Determination

The CAR recognises that its cost of debt estimate, as provided by SE, is significantly below the 2014 Determination and other Irish regulatory precedent. SE estimates the cost of debt for Dublin Airport for the 2019 Determination based on weighted average cost of embedded and forecast cost of new debt over 2020-2024. In the CAR's view, the decrease since 2014 is justifiable based on a decrease in the cost of new and embedded debt, but aligned with the Thessaloniki Forum recommendations.[54]

SE estimates the cost of embedded debt to be 0 to 0.04 per cent in real terms, based on daa's expected cost of borrowings on its existing debt obligations over the period of 2020 to 2024. SE calculates the actual debt costs based on daa's debt portfolio as at October 2018, which includes fixed-rate debt and floating-rate debt. For the floating-rate debt, SE uses a forward-rate adjustment based on Euro area government bond yields to account for the expected increase in interest rate over the 2020-2024 period. SE's calculations of interest rate do not include the "bank margins" paid over the lifetime of the loans, which it addresses as an overall transaction cost.

SE estimates the cost of new debt to be 0.31 per cent to 0.89 per cent in real terms, based on comparators' cost of debt, plus a country-specific risk premium, and a forward-looking adjustment. SE estimates the comparators' cost of debt to be -0.17 per cent to 0.05 per cent in real terms, based on the historical averages of traded yields of three airports' Euro-denominated bonds with a remaining time to maturity between 8 to 12 years and rated investment-grade. SE then adds the Irish country risk premium between 1 to 18 bps,

[54] Commission for Aviation Regulation (9 May 2019), Maximum Level of Airport Charges at Dublin Airport 2020-2024 – Draft Determination, p.42.

calculated as the difference between yields on Irish utilities bonds and European utility bonds, as well as a forward-rate adjustment.

SE estimates the weight between embedded and new debt to be 67per cent and 33 per cent respectively, based on the expected ratio of embedded debt to new debt over 2020-2024. SE calculates the "unadjusted" overall cost of debt to be 0.10 per cent to 0.32 per cent, as the weighted average of cost of embedded and new debt.

SE then adds a transaction cost of 50 to 60 bps, and an uptick for notional credit rating of 5 to 12 bps to the "unadjusted cost of debt", arriving at the final cost of debt range of 0.65 to 1.04 per cent. SE's transaction cost is based on its analysis of daa's bank margins on actual debt, which includes issuance costs for new debt and maintenance cost for existing debt such as bank fees and margins, interest rate hedges, and costs related to maintaining a credit rating. SE calculates the "uptick for notional credit rating" based on the observed spread between real bond yields of selected utilities with credit ratings between "A" and "BBB".

5.2. SE's derivation of daa's cost of new debt is flawed and biased downward

SE uses the traded yields of corporate bonds issued by other airports as the primary evidence for Dublin Airport's cost of new debt. SE's sample includes nine bonds issued by three airports, namely AdP, Amsterdam Schiphol Airport and Sydney Airport. SE considers the Euro-denominated bonds with a remaining time of maturity between 8 to 12 years with investment-grade credit ratings.[55] SE calculates the one-year, two-year, and five-year averages of the traded yields for each airport's bonds, and then calculates the average yields across the three airports for one-year, two-year, and five-year averaging periods. SE then calculates the comparator's cost of debt range to be -0.17 per cent to 0.05 per cent in real terms, which it uses as the basis of daa's cost of new debt.

SE' derivation of the basis of daa's cost of new debt is flawed for the following reasons:

- SE relies on only three airports issuers and a small sample of comparator bonds, which has low statistical power and weak robustness; and
- SE fails to control for the maturities of comparator bonds, potentially underestimating daa's cost of new debt allowance.

First, SE's analysis relies on a small sample size of comparator bonds, which could lead to unreliable and potentially biased estimates for daa's cost of new debt. Indeed, SE only uses bonds issued by three comparator airports, namely ADP, Amsterdam airport, and Sydney airport, but does not consider the evidence from bonds issued by other comparators, compromising the robustness of the estimates.

In addition, the maturities of SE's comparator bond sample are likely biased downward. SE's sample includes bonds with remaining maturity of 8 to 12 years, which approximates the yield at issue of comparator bonds with tenor at issuance of a weighted average of 8 to 12 years. However, SE provides no evidence that daa's average tenor at issue should be 8 to 12 years. Given that daa's recently issued bond has a 12-year maturity, it is likely that daa's expected average tenor at issue over the next regulatory period will be at the top end of the

[55] Swiss Economics (12 March 2019), op. cit., p.52, para 176.

range of 8 to 12 years, if not higher than 12 years. Therefore, using bond comparator sample with average maturity lower than 12 years potentially underestimates the term premium faced by daa's bonds. Furthermore, SE's use of rolling averages of traded bond yield, rather than yield at issue, further exacerbates the underestimation of daa's tenor at issue. Since the comparator bonds' remaining maturities decrease as they approach the maturity dates, the term risk premium component of the bond yields would also decrease over time. This effectively reduces the tenors of the comparator bonds for daa, and further understates daa's efficient cost.

Overall, SE's use of small sample size undermines the robustness of the analysis, and its failure to correctly control for maturities leads to an underestimation of daa's cost of new debt. Indeed, SE itself observes that the traded yield of daa's bond has been higher than the average traded yield of comparator bonds, which supports that SE's calculated average airport bond yields understates the bond yield of daa.[56]

5.3. SE's country-specific risk premium is flawed

In its analysis, SE considers that it is appropriate to add a country specific adjustment to the base cost of debt derived from comparator bonds. SE estimates the Irish country risk premium to be 1 to 18 bps, based on the one-year and five-year average of spread between Irish utility bonds and other European utility bonds. While we agree with SE that data suggests the existence of an Irish country risk premium, SE's approach to estimate the Irish country risk premium has a number of errors.

SE attempts to estimate the country risk premium by comparing the traded yields of Irish and other European utility bonds, but fails to control for credit ratings, maturities and other factor that could significantly influence the yield spread and bias the estimated country risk premium.[57] In addition, SE's reference point for measuring the Irish country risk premium is ambiguous, since the estimated premium is heavily influenced by the choice of countries and bonds in the comparator sample. SE's calculation again suffers from the small sample size issue, as it is based on the bond yields from only eight European utilities, clearly not representative and statistically robust for the country risk premium analysis.

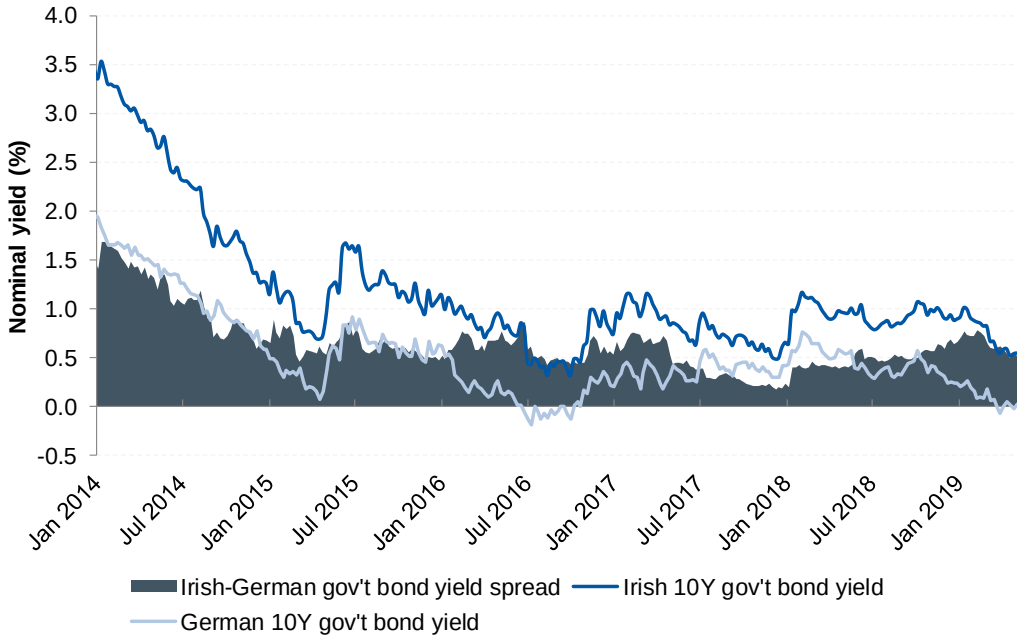
A preferred approach is to estimate the Irish country risk premium based on the yield spread between the treasury bonds of the same maturity issued by Irish government and another country with lower sovereign risk, such as Germany. The government yield spread approach provides a more objective and precise measure of the country risk than SE's approach, as it reflects only the sovereign risk differential while controlling for other risk factors. Figure 5.1 shows the Irish-German government bond yield spread suggests a country risk premium of around 60 bps, higher than the range estimated by SE. Nevertheless, we acknowledge that the use of country risk premium crucially depends on the reference point. For example, the country risk premium estimated using treasury spread approach should be used to calculate a cost of debt built up from a government bond yield, rather than corporate bond yields, because corporate bond yield implicitly includes a country risk premium. In Section 5.6, we set out an alternative approach that relies on a corporate debt benchmark index matching the

[56] Swiss Economics (12 March 2019), op. cit., p.53, para 181-182

[57] For example, it is not clear whether SE has considered other risk factors that may significantly obscure the country risk premium estimate, such as coupon structure (fixed or floating rate), indexation (nominal or index-linked bond), and embedded optionality (callable bond or prepayment options).

notional investment credit rating and maturity, which circumvents the issue with explicitly measuring country risk as it is reflected in the currency and credit rating.

Figure 5.1: Irish-German government bond yield spread suggests a country risk premium of around 60 bps



Source: NERA analysis.

5.4. SE's uptick for notional credit rating analysis relies on small sample of bonds and underestimates the spread between A and BBB rated debt

SE adds an "uptick for notional credit rating" that reflects the differential between the daa's notional credit rating and actual ratings, in order to keep the cost of capital consistent with the notional credit rating for financeability test. SE estimate the "uptick" to be 5 to 12 bps, based on the real bond yield spread of few selected utilities bonds rated A and BBB.

SE's analysis of credit spread between A and BBB-rated bond is inaccurate and subject to errors. First, SE's analysis relies on few observations, namely four A-rated companies and five BBB-rated companies, which makes the estimate statistically inaccurate and unreliable.

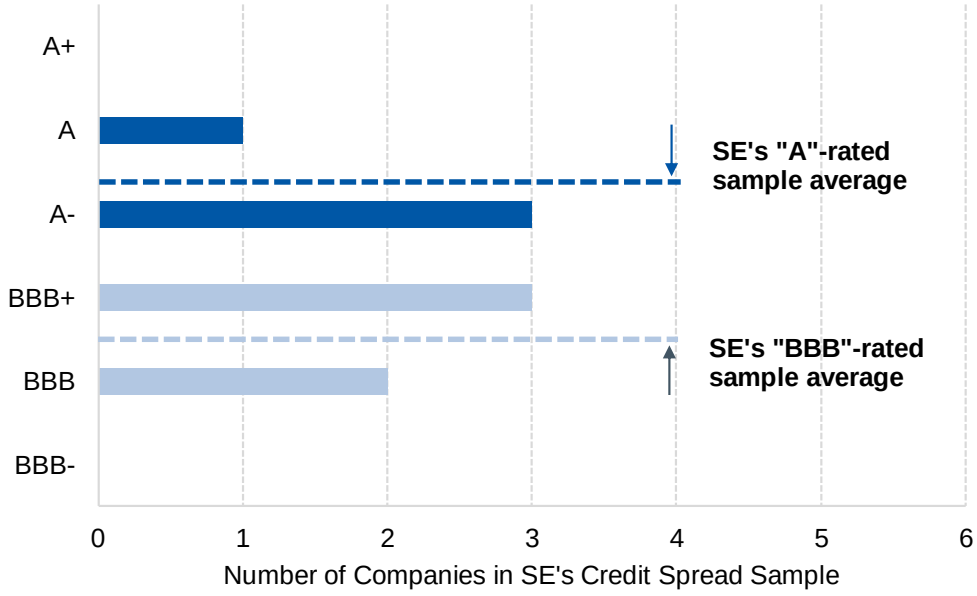
In addition, SE fails to adequately control for the maturities of the comparator bond sample, and the embedded term premium due to maturity differences can lead to biases in the estimated rating spread. SE's bond sample includes bonds with maturity of 8 to 12 years, but such screening is insufficient to control for the term spread. For example, the European Central Bank's yield curve implies a term premium of around 30 bps between 8 and 12 years.[58]

SE also fails to control for sub-rating in estimating the credit spread. SE's "A" rated bond sample includes three "A-" bonds rated and one "A" rated bond, whereas its "BBB" rated

[58] See ECB yield curve: www.ecb.europa.eu/stats/financial_markets_and_interest_rates/euro_area_yield_curves

bond sample includes three "BBB+" rated bonds and two "BBB" rated bonds. Therefore, SE's "A" sample average yield is tilted towards "A-" rating, and "BBB" rated sample average is tilted towards "BBB+" rating, which makes the estimated credit spread lower than the A/BBB spread, as shown in Figure 5.2. Furthermore, SE adds this credit spread to the weighted average of embedded debt cost, which reflects the "A-" current rating of daa, and the new debt cost, which has an average rating between A+ and A.[59] Together, these two sources of inaccuracy make SE's estimated "uptick" biased and unreliable.

Figure 5.2: SE fails to control the sub-rating in its credit spread sample, resulting in a biased credit spread

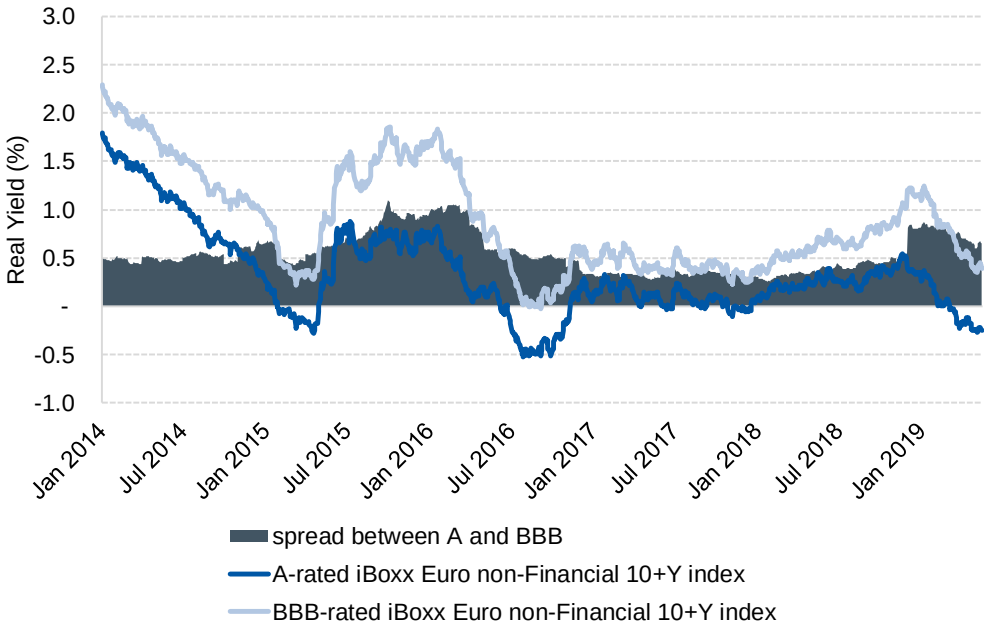


Source: NERA analysis.

To understand the direction and magnitude of the bias in SE's credit spread estimate, we use an alternative approach based on evidence from broad market bond benchmark indices. The benchmark indices control for credit rating, maturity, liquidity requirement and various other factors of the constituents, making it preferred to constructing comparator samples from individual bonds. We estimate the credit spread between A and BBB rated European bond with 10+Y maturities to be between 47 and 59 bps, substantially higher than SE's estimated 5 to 12 bps, as shown in Figure 5.3 and Table 5.1.

[59] SE estimate the cost of new debt based on a sample of comparator bonds, 78 per cent of which are rated A +, and the rest rated BBB+, which implies an average sample rating between A+ and A.

Figure 5.3: Credit spread between A and BBB-rated Euro denominated 10+Y benchmark bond indices



Source: NERA analysis.

Table 5.1: Credit spread implied from benchmark indices suggests that SE's estimated credit spread is biased downward

Historical averages	A/BBB Benchmarks spread	SE's estimated spread
1Y average	0.59%	0.09%
2Y average	0.47%	0.12%
5Y average	0.56%	0.05%

Source: NERA analysis.

5.5. Using the embedded/new debt approach, but correcting for SE's mistakes, we estimate the cost of debt to be 1.2 to 1.4 per cent

Our preferred approach to estimating daa's efficient cost of new debt is to rely on a suitable European bond benchmark index, and adjust for the expected increase in the bond yield leading to the future regulatory period. This approach has a number of advantages compared to SE's method, including the greater sample size, higher liquidity, and methodical control of credit rating, maturity and other pricing factors. Instead of using prices of only a few individual comparator bonds, the bond benchmark index draws on prices from broader fixed income market, which offers considerably higher liquidity and reliability. In addition, the bond market benchmark indices follow systematic and frequent screenings to control for the credit ratings and remaining maturity, allowing us to select the benchmark index suitable for the efficient company with a notional credit rating.

To estimate the efficient cost of new debt for daa, we consider the most suitable benchmark index to be the Euro-denominated Corporate non-Financial 10+Y with a credit rating of BBB, which is consistent with the proposed notional credit rating for daa, and with the tenor at

issuance of daa's recently issuer bond.[60] We estimate the current debt cost to be 0.78 per cent in real terms[61], based on the one-year average of the spot yield of the index. We add a further 46 to 70 bps to reflect the expected increase in corporate bond yield between now and 2022 (mid-point of 2020-2024), consistent with the current market evidence of government bond yield as shown in Table 3.1. Our estimate for cost of new debt in real terms is 1.24 to 1.48 per cent, as shown in Table 5.2.

Table 5.2: Cost of new debt

Cost of new debt component	Lower bound	Upper bound
Current real debt cost (1Y average)	0.78%	0.78%
Forward rate adjustment	0.46%	0.70%
Cost of new debt	1.24%	1.48%

Source: NERA analysis.

As shown in Table 5.3, we estimate the real cost of embedded debt to be between 0.68 per cent, based on the debt portfolio information presented in SE's report. In contrast to SE's approach, we calculate the cost of embedded debt including the bank margin as part of the base interest rate in addition to the transaction cost, in accordance with the view of daa Treasury department.

Table 5.3: daa's cost of embedded debt

[redacted]

Note: (1) daa fixed its floating debt (EIB €260m) in January 2019 at an interest rate of 1.05 per cent to maturity.
(2) We convert the nominal interest rate to real interest rate using the expected inflation of 1.54 per cent, same as the assumption used by the CAR and Swiss Economics.
Source: NERA analysis.

We estimate the weight between embedded and new debt using the forecast of debt amount provided by daa, which takes into account the debt required for the capital investment program as shown in Table 5.4. We calculate the average new debt weight to be 56 per cent

[60] Euro-denominated Corporate non-Financial 10+Y rated BBB has an average maturity of 13.1 years, which is the benchmark index that has the maturity closest to daa's recently issued bond with maturity of 12 years.

[61] We use the expected inflation of 1.54 per cent, same as SE.

over the period of 2020 to 2024, which we draw on to calculate the weighted average cost of debt.

Table 5.4: daa's forecasted total debt

We estimate the total cost of debt to be 1.19 to 1.43 per cent, based on the weighted average of embedded and new debt cost approach, as shown in

Table 5.5. Although using the same approach, our estimate is higher than the CAR and SE's approach as we correct a number of issues that lead to underestimation of daa's cost of new debt, and we rely on more reliable source of evidence such as broad debt market index. Our approach reflects the current market expectation of borrowing costs for corporate bonds, and reflects the current interest rate environment. We do not estimate an explicit country risk premium and uptick for notional credit rating, since the Euro-denominated debt benchmark index already controls for credit rating that matches, and this approach also reduces risk of estimation error. The cost of debt from this approach is at the lower end of our estimate of 1 to 3 per cent from the debt premium approach, since it does not consider the long-run historical interest rate evidence, which has been taken into account in all the regulatory precedent in Ireland.

Table 5.5: We estimate the cost of debt range to be 1.19 to 1.43 per cent using the weighted average of embedded and new debt approach

	Lower bound	Upper bound	NERA methodology
cost of embedded debt (real)	0.68%	0.68%	weighted average real borrowing cost of existing debt excluding bank margin
cost of new debt (real)	1.24%	1.48%	current yield of BBB-rated Euro-denominated non-Financial Corporate Index (10+Y) adjusted for forward uplift
Weight of new debt (real)	56%	56%	average weight of new debt over 2020-2024
weighted average cost of debt (real)	0.99%	1.13%	weighted average of cost of embedded and new debt
Transaction costs	0.20%	0.30%	Based on regulatory precedent
Allowed cost of debt (real)	**1.19%**	**1.43%**	**Weighted average cost of debt plus transaction cost**

Source: NERA analysis.

5.6. Conclusion on Cost of Debt

In conclusion, we find that SE's analysis contains some major issues that lead to underestimation of daa's cost of debt, which partially explains why the CAR's proposed new cost of debt is significantly lower than the regulatory precedent, in addition to the change of approach. These issues include:

- Relying on a small sample of comparator bonds to estimate new debt cost, country risk premium, and uptick for notional credit rating, resulting in low statistical power and weak robustness, while introducing potential biases; and
- Failing to adequately control for credit ratings, maturities and other factors when estimating cost of debt and country risk premium, leading to underestimation of cost of new debt allowance.

Using the same embedded/new debt approach, but correcting for SE's mistakes, we estimate the cost of debt to be 1.19 to 1.43 per cent, which is on average around 50 bps higher than SE's estimated range of 0.65 to 1.04 per cent, as shown in Table 5.6.

Table 5.6: Comparison between SE's and NERA's cost of debt under the embedded/new debt

	CAR's DD/Swiss Economics			NERA update using embedded/new debt approach		
	Lower bound	**upper bound**	**Point Estimate**	**Lower bound**	**upper bound**	**Point Estimate**
Cost of Embedded Debt	0%	0.04%	0.02%	0.68%	0.68%	0.68%
Cost of New Debt	0.31%	0.89%	0.60%	1.24%	1.48%	1.36%
New Debt Weight	33%	33%	33%	56%	56%	56%
Cost of debt (excl. t-cost)	0.10%	0.32%	0.21%	0.99%	1.13%	0.68%
Transaction Costs	0.50%	0.60%	0.55%	0.20%	0.30%	0.25%
uptick for notional credit rating	0.05%	0.12%	0.09%	-	-	-
Allowed cost of debt	**0.65%**	**1.04%**	**0.85%**	**1.19%**	**1.43%**	**1.31%**

Source: NERA analysis.

6. Aiming up

In this section, we respond to SE's analysis on the aiming up for Dublin Airport for the 2019 Determination. We start by summarising SE's beta analysis and proposals for 2019 Determination. We then explain that SE's rationale to narrow the risks of underestimating the lower WACC is based on sound theory and considerations.

We also show that SE's analysis of an explicit aiming up does not consider implicit WACC allowances that regulators have given by deciding on a point estimate above the midpoint of the WACC range. If considering the implicit aiming up, the CAR/SE's 50 bps aiming up for daa appears to be low relative to recent implicit aiming up determined by the CAR and ComReg in 2014.

6.1. Summary of SE's aiming up analysis for 2019 Determination

SE recommends uplifting the final WACC estimate by 50 basis points in order to mitigate risks associated with measurement errors. SE considers that aiming up the WACC is "prudent and necessary", based on three reasons: Dublin Airport's CIP 2020+, combined with other ongoing capital projects (e.g. North Runway), will result in investments in excess of €2bn, ii) regulatory precedent in Ireland has implicitly and explicitly included "aiming up"; and iii) the dynamic effects of air transport due to the industry's strong effects on trade, tourism, and economic growth are expected to be larger compared with other utilities.

The key rationale is that the consequences of under-estimating the true WACC, which would lead to underinvestment and, according to the CAR harm passengers in a more substantial long-term way, are more severe than the consequences of over-estimating the true WACC in the case of Dublin Airport, a key gateway of Ireland's economic growth.[62] Also, SE provides Irish regulatory precedents on an explicit aiming up WACC , which ranges between 15 to 22 bps in the water and electricity sectors, and 53 bps in the telecoms sector.

6.2. We agree with SE's rationale to for aiming up, but regulatory precedent suggests implicit aiming up could be higher than the CAR and SE's proposed 50 bps

We agree with SE that the consequences of under-estimating the true WACC are more severe than over-estimating the WACC. As mentioned in the SE report, in daa's case, the WACC should be set carefully to allow the smooth implementation of daa's investment plan. SE is correct in recognising that this plan will be critical for daa's sustainable growth in the long run, and increased likelihood of financial distress and the incentives for underinvestment as a result of insufficient cost of capital allowance may have significant consequences for the customer experience and overall Dublin airport business in the long-term.

SE states in its report that its approach sets the allowance at the top end of the explicit aiming up allowances of other regulators.[63] However, review of regulatory precedent shows that

[62] Commission for Aviation Regulation (9 May 2019), Maximum Level of Airport Charges at Dublin Airport 2020-2024 – Draft Determination, p.43.

[63] Swiss Economics (12 March 2019), op. cit., p.64, para 231

SE's proposed 50 bps is much lower than the top end of the aiming up range, which is 95 bps determined by the CAR in 2014.

As shown in Table 6.1, SE fails to consider that Irish regulatory precedent on explicit aiming up allowances are based on rates that are already above the mid-point estimate. On the contrary, SE's aiming up is based on the mid-point estimate of its range. We derive an implicit aiming up estimate by calculating the difference between the regulator financial decision, including the explicit aiming up allowance, and the mid-point of the WACC range. As shown in Table 6.1, the implicit aiming up using SE's approach forms the range between 30 to 95 bps. If SE's objective is indeed to provide daa with an aiming up allowance at the top end of Irish precedent as it states in the report, then the aiming up would be 95 bps rather than 50 bps.

Table 6.1: SE's aiming up considers only explicit aiming ups

Regulator	Decision	Final Decision	Mid-point estimate	Implicit aiming up
AR (2019)	Dublin Airport	3.99%	3.49%	50bps
CAR (2014)	Dublin Airport	5.80%	4.85%	95bps
ComReg (2014)	Mobile, Fixed Line and Broadcasting	7.02%	6.13%	90bps
CER (2016)	Irish Water	5.20%	4.90%	30bps
CER (2015)	TSO and TAO	4.95%	4.64%	31bps

Source: NERA analysis of Irish regulatory precedent.
Note: We compare the WACC decisions across regulatory control period on a consistent real and pre-tax basis. We note that these values may differ from the WACC's stated in the regulatory determinations.

Appendix A. Regulatory Precedent on RfR and TMR

In this Appendix, we set out the regulatory precedent on RfR and TMR.

A.1. Regulatory Precedent on RfR

SE's RfR approach is inconsistent with Irish regulatory approaches, which generally placed greater weight on long-run evidence on the RfR in the interest of support stability in regulatory policy. The failure to consider a significant body of RfR evidence, and particularly only considering the evidence that provides the lowest RfR estimates, results in an RfR of -0.14 per cent which is below Irish precedent, as shown in table below.

Table A.1: Irish regulators have not generally drawn on low spot and forward yield evidence at recent reviews

	Description	Real RfR
CER (2017)	Gas Network Ireland	1.90%
CER (2016)	Irish Water IRC2	2.00%
CER (2016)	ESBN/EirGrid PR4	1.90%
ComReg (2014)	Mobile, Fixed Line, and Broadcasting	2.10%
Range		**1.90%-2.10%**

Source: NERA analysis of regulatory determinations.

A.2. Regulatory Precedent on TMR

As shown below, recent Irish regulatory decision on TMR supports a range of 6.65 to 7.1 per cent, with the most recent CER decision at 6.65 per cent. In its recent 2017 decision, the CER determined a real TMR range of 6.5 per cent to 6.75 per cent with a point estimate of 6.65 per cent.[64]

Table A.2: Recent Irish regulatory decisions on TMR

	Description	Real TMR
CER (2017)	Gas Network Ireland	6.65%
CER (2016)	Irish Water IRC2	6.75%
CER (2016)	ESBN/EirGrid PR4	6.65%
ComReg (2014)	Mobile, Fixed Line, and Broadcasting	7.10%
Range		**6.65%-7.10%**

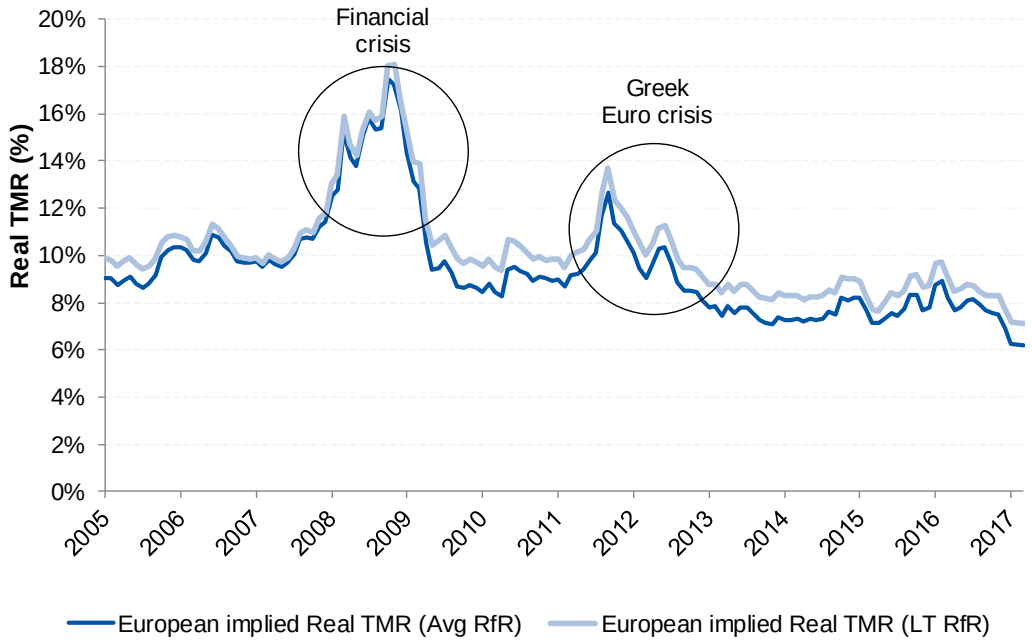
Source: NERA analysis of regulatory precedent.

[64] Commission for Energy Regulation (30 August 2017), Decision on October 2017 to September 2022 Transmission Revenue for Gas Networks Ireland, p.116

Appendix B. Bank of England's DDM Model

As mentioned in our 2018 report, for the forward-looking cross-check we rely on the Bank of England estimates for the European TMR, based on the Euro Stoxx index. The Bank of England uses equity analyst estimates of short-term dividend growth, and a long-run dividend growth assumption based on long-run GDP growth estimates for the different regions from which companies derive their earnings. Figure B.1 shows the Bank of England TMR estimates for Europe.

Figure B.1: European TMR based on Bank of England DGM model



Note: The Bank of England estimates the DDM using a time varying risk-free rate for all maturities (where available) and a long-run risk-free rate assumption. We calculate a TMR as the sum of the Bank of England's reported ERP and an i) average of the real risk-free rate for all available maturities and 2) the real risk-free rate at the longest maturity available. To calculate the real risk-free rate for the European market, we deflate the Euro Area AAA-rated nominal sovereign bond yield using the long-term inflation forecast for the corresponding periods, both published by the European Central Bank. Given the European long-term inflation forecast was based on Harmonised Index of Consumer Prices (HICP), identical to the UK Consumer Prices Index (CPI), the implied TMR should be considered as a CPI-deflated return.

Source: NERA analysis of Bank of England (2017), An improved model for understanding equity prices, Quarterly Bulletin 2017Q2, p.94 and European Central Bank yield curve data.

As shown in Figure B.1, the TMR estimate from the DGM has been relatively stable over time, apart from the global financial crisis period as well as the Greek euro crisis period where it showed elevated values. The relative stability of the TMR supports the theory that the recent reductions in the risk-free rate have been offset by increases in the ERP resulting in a stable TMR over time, consistent with SE's approach.

Table B.1 shows the estimates of the TMR based on Bank of England DGM data. To smooth for volatility in equity markets, we present evidence of the forward-looking TMR for spot (March 2017 in line with latest data from the BoE) as well as 1 and 5-year historical

averaging periods. The forward-looking estimate of real TMR for the European equity market is in the range of 6.2 to 8.7 per cent, according to the Bank of England's DGM.

Table B.1: Bank of England DGM support a real TMR (CPI deflated) in the range of 8.2 to 9.1 per cent for UK market and 6.2 to 8.7 for European market

	Market Index	Spot (Mar 2017)	1Y average (Mar 2017)	5Y Average (Mar 2017)
Europe TMR (average RfR)	Euro Stoxx	6.2	7.4	7.9
Europe TMR (LT RfR)	Euro Stoxx	7.1	8.2	8.7

Note: The Bank of England estimates the DDM using a time varying risk-free rate for all maturities (where available) and a long-run risk-free rate assumption. We calculate a TMR as the sum of the Bank of England's reported ERP and an i) average of the real risk-free rate for all available maturities and ii) the real risk-free rate at the longest maturity available. For the UK estimates, we use the implied real gilt yields published by Bank of England to proxy the UK real risk-free rates. Since the implied real gilt yield is a RPI-deflated measure, the implied TMR should be considered as a RPI-deflated return. We convert the UK real-RPI TMR to real-CPI TMR by adding a RPI-CPI wedge of 100 bps based on the most recent UK Office of Budget Responsibility forecast. For the European estimates, we derive the real risk-free rate using the Euro Area AAA-rated nominal sovereign bond yield and long-term HICP inflation forecast for the corresponding periods, both published by the European Central Bank. The implied real TMR is therefore a CPI-based return.

Source: NERA analysis of Bank of England (2017), An improved model for understanding equity prices, Quarterly Bulletin 2017Q2, p.94, Bank of England yield curve data, and European Central Bank yield curve data using March 2017 as cut-off date (later data from BoE on the TMR not available)

Qualifications, assumptions and limiting conditions

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