swiss economics

Dublin Airport Cost of Capital for 2022 Determination

Final Version

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Executive Summary

Swiss Economics (SE) estimates the efficient real pre-tax WACC for Dublin Airport for the 2023-26 period to be between 3.87 percent and 4.51 percent, with a point estimate of 4.24 percent. This estimate is based on an update to the cost of capital analysis we conducted in 2019 to inform the Commission for Aviation Regulation's (CAR) Determination on the Maximum Level of Airport Charges at Dublin Airport 2020 -2024 (2019 Determination).

The primary change in our assessment concerns the data used in the analysis. We updated the financial markets data underlying the empirically derived estimates of the various WACC components with a more recent dataset including data up to 31 December 2021.

Methodological changes are limited to two specific amendments of the 2019 methodology:

- **Asset Beta**: We exclude stock returns from time periods that were impacted by the Covid-19 pandemic in our empirical assessment of Beta values. As such, we explicitly estimate *non-pandemic* Betas, focusing on before- and after periods only. This reflects our reasoning that the observed spikes in empirical comparator Betas during the first months of the pandemic are not informative for Dublin Airport's risk profile going forward.
- **Cost of New Debt**: Given continued evidence of the average maturity of Dublin Airport's debt at the time of issuance being longer than 10 years, we change the notional investment horizon for debt to 15 years. Thus, we focus exclusively on the iBoxx EUR BBB Non-Financials 10+ Years index to estimate Dublin Airport's Cost of New Debt. To be consistent with this change in methodology, we use a series of average inflation expectations over 15 years to convert nominal Cost of New Debt to real Cost of New debt.

The resulting changes on the level of Dublin Airport's WACC can be summarised as follows:

- We observe a significant increase in the Cost of Equity from 5.96 percent to 6.60 percent that is primarily attributed to an increase in Dublin Airport's Asset Beta from 0.50 to 0.56. This increase is not due to Covid-19, but rather reflects a general trend observed in airport Betas.
- We notice a decrease in the Cost of Debt from 0.69 percent to -0.06 percent. The decrease is primarily driven by a reduction in real interest rates on Dublin Airport's embedded debt due to an increase in inflation expectations in recent months. Also, the real Cost of New Debt has decreased as nominal yields have not increased to the same extent as inflation expectations.
- Overall, the two effects largely balance out. Our estimate of Dublin Airport's real pre-tax WACC over the 2023-26 period decreases by 1 basis point compared to our advice for the 2019 Determination.

Our advice on the level of each component of the regulatory real pre-tax WACC for Dublin Airport is reported in the table below.

SE regulatory WACC advice for 2023-26 period and comparison with 2019 Determination

	CAR 2019	SE Advice 2022	Difference
Gearing	50%	50%	unchanged
Tax rate	12.50%	12.50%	unchanged
RFR	-0.61%	-1.07%	46 bps ▼
TMR	6.38%	6.25%	13 bps ▼
ERP	6.99%	7.32%	33 bps ▲
Asset Beta	0.50	0.56	0.06 ▲
Equity Beta	0.94	1.05	0.11 ▲
Cost of equity (post-tax)	5.96%	6.60%	64 bps ▲
Cost of debt (pre-tax)	0.69%	-0.06%	75 bps ▼
Aiming up	0.50%	0.50%	unchanged
Advice on regulatory pre-tax WACC	**4.25%**	**4.24%**	**1 bps ▼**

Note: All values are reported in real terms. Point estimates reflect our estimates of the most likely values. daa's tax rates is assumed to remain at 12.5 percent. Following the Irish government's decision to set the corporate tax rate at 15 percent for firms with a turnover of more than EUR 750m starting in 2023 a sensitivity analysis is performed using this rate (see Appendix B.7). The reported 2019 values are based on Swiss Economics advice, which differ from CAR's final decision where an alternative calculation (one proposed in the 2019 Report's appendix) was used.

Source: Swiss Economics.

Table of Contents

List of Tables

List of Figures

Abbreviations

APP	Asset Purchasing Programme
bn	billion
bps	basis points
CAA	The UK Civil Aviation Authority
Capex	capital expenditure
CAPM	Capital asset pricing model
CAR	Commission for Aviation Regulation
CER	Commission for Energy Regulation
CIP 2020+	Capital Investment Programme 2020+
CNMC	Comision Nacional de los Mercados y la Competencia
DDM	Dividend Discount Model
DMS	Dimson, Marsh, and Staunton
DORA	Documento de Regulacion Aeroportuaria
ECB	European Central Bank
EIB	European Investment Bank
ERP	Equity Risk Premium
GDP	Gross Domestic Product
IMAP	Ingreso Máximo Annual por Pasajero
ISIN	International Securities Identification Number
m	million
OLS	Ordinary Least Squares
PEPP	Pandemic Emergency Purchase Programme
Q	quarter
RFR	Risk-free Rate
SE	Swiss Economics
TMR	Total Market Return
WACC	Weighted Average Cost of Capital
WHO	World Health Organisation

1 Introduction

1.1 Background

1 The Commission for Aviation Regulation (CAR) commissioned Swiss Economics SE AG (Swiss Economics) to update its report on Dublin Airport's efficient pre-tax cost of capital that was published in September 2019 (2019 report)[1].

2 An update to the cost of capital calculation is one part of CAR's comprehensive review of all the building blocks of its 2019 Determination on the maximum level of airport charges (2019 Determination).

3 The current report updates the work conducted by Swiss Economics in 2019. It is based on a similar methodology but uses more recent market data.

4 The calculations in the current report are based on data until 31 December 2021. The data underlying our analysis will be updated again prior to the final report. Due to the current uncertainty in financial markets this update may result in changes to various parameters.

1.2 Methodology

5 Most parts of the methodology to determine the appropriate rate of return using the Weighted Average Cost of Capital (WACC) approach is unchanged compared to the 2019 report. For methodological details regarding these unchanged parts, we refer to the 2019 report.

6 All changes to the methodology compared with the 2019 report are indicated in the present report. These include primarily the following components:

- The calculation of the Beta values is amended to take the effect of Covid-19 into account;
- The calculation of cost of new debt is amended to take the changes regarding the average duration of embedded debt into account

1.3 Structure

7 The remaining parts of the report are structured as follows:

- in Section 2, we analyse Dublin Airport's notional gearing;
- in Section 3, we quantify the appropriate level of the risk-free rate;
- in Section 4, we assess the risk premium for holding equity;
- in Section 5, we estimate Dublin Airport's Beta;
- in Section 6, we determine the cost of debt for Dublin Airport;
- in Section 7, we discuss arguments for aiming up the WACC; and
- Section 8 concludes.

[1] Jaag, C. et al. (2019). Dublin Airport Cost of Capital for 2019 Determination. Final Report. A report by Swiss Economics for the Commission for Aviation Regulation. URL: https://www.aviationreg.ie/_fileupload/2019%20Determination/Final%20Determination/Cost%20of%20Capital%20for%202019%20Determination%20Final%20Report.pdf [21.4.2022].

2 Gearing

2.1 Methodological changes compared to 2019 report

8 We are not aware of any compelling reasons to update the methodology for determining Dublin Airport's notional gearing compared to the 2019 Report.

9 In the interest of regulatory consistency, we recommend keeping the notional capital structure used in past decisions including the 2019 decision.

Box 1: Summary of the 2019 report gearing methodology

The 2019 report gearing methodology was based on the following components:

- Notional capital structure, i.e. a hypothetical capital structure that an efficient airport operator would choose in order to minimise the cost of capital;
- Regulatory precedent on gearing ratios of comparator airports.

2.2 Stakeholder response regarding the optimal level of gearing

10 Ryanair expressed in its response to CAR's issues paper (CP1/2022) the view, that the assumption of a 50 percent notional gearing rate for Dublin Airport needs to be revisited.

11 Ryanair argued for a higher gearing, given the "historically low" cost of debt. Ryanair also argued that other regulators assume a notional gearing of up to 60 percent.

12 We do not agree with Ryanair and see no material reasons to adjust the notional gearing rate of 50 percent:

- While it is true that e.g. the UK Civil Aviation Authority (CAA) proposes a higher gearing rate than 50 percent for the upcoming Heathrow regulatory period H7 (CAA, 2021), the proposed range of 61 to 62 percent is very close to previous gearing levels of 60 percent that were used in older decisions (including decisions where debt rates were higher).
- Other regulators assume lower values. The Spanish regulator Comision Nacional de los Mercados y la Competencia (CNMC), for example, determined a gearing rate of 33 percent for AENA in 2021 (CNMC, 2021).
- Finally, the effect of moderate changes within a reasonable range of gearing levels is negligible. A sensitivity analysis of the effect of using a gearing of 60 percent on the WACC (see Appendix B.1) shows that the effect on the WACC is minimal. The effect from the decrease of the weight of the cost of equity is offset by an increase of the level of the cost of equity driven by an increase of the equity beta.

2.3 Conclusion

13 We advise to continue using a gearing rate of 50 percent.

14 Table 1 summarises our advice.

Table 1: Summary gearing rate

	Range (in %)	Point estimate (in %)
2022 SE advice	45 – 55	50
CAR 2019 Determination	45 – 55	50

Source: Swiss Economics.

3 The risk-free rate

3.1 Methodological changes compared to 2019 report

15 We have not changed the methodology for assessing the level of the risk-free rate (RFR) compared to the 2019 Report. Changes in the level of the RFR are exclusively due to updated market evidence.

16 We observe that current real yields of Irish and German government bonds have decreased compared to the 2019 Report.

Box 2: Summary of the 2019 report risk-free rate methodology

The methodology used in the 2019 report for assessing the RFR considered the following evidence:

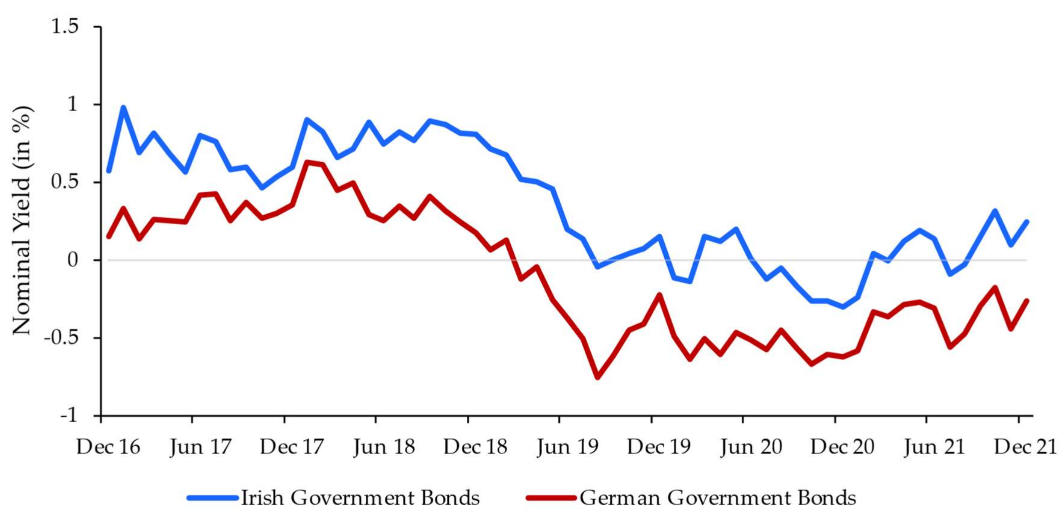
- Market evidence from Irish and German government bond yields (1-, 2-, and 5-year averages);
- Forward rates implied by Euro area government bonds (average from 2020 to 2024);
- An assessment of the impact of current monetary policy (e.g. the impact of quantitative easing);
- Regulatory precedent.

The evidence from forward rates was then added to the evidence from current bond yields. As is the case for all WACC elements, the level of the RFR was expressed in real terms. The conversion from nominal to real rates was done using the Fisher equation (Fisher, 1930).

3.2 Nominal government bond yields

17 **Figure 1** shows series of average nominal yields of Irish and German government bonds with remaining time to maturity between 8 to 12 years.[2] The series indicate the range of the RFR in nominal terms based on current market data.

Figure 1: Average nominal yields of Irish and German government bonds



[2] The complete lists of Irish and German government bonds used in the report are presented in Table 32 and Table 33 in Appendix A.

Note: The series reflect arithmetic averages of the yields of Irish and German (non-inflation-linked) government bonds with a residual time to maturity between 8 and 12 years at each point in time (see Appendix A for a list of bonds included in the analysis).

Source: Swiss Economics based on Refinitiv Eikon data.

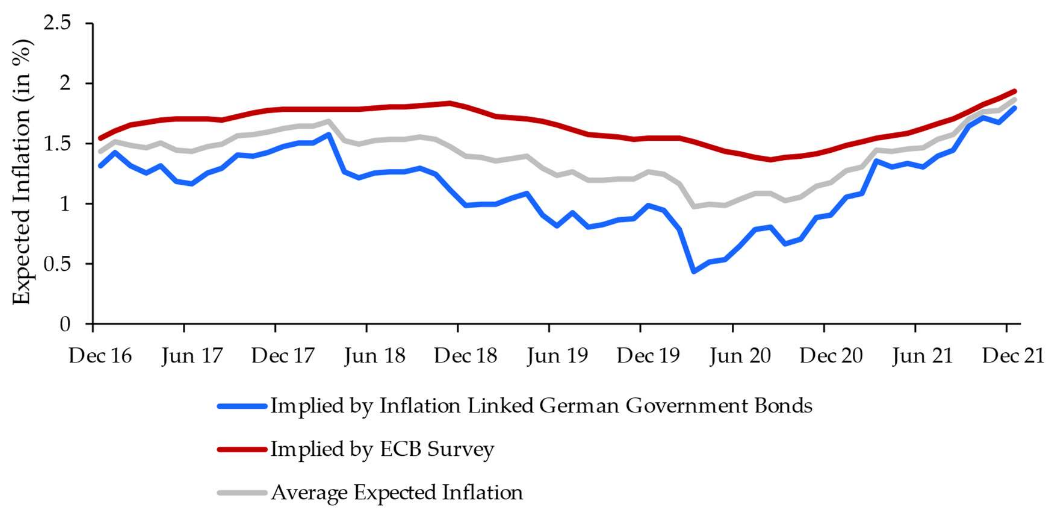
3.3 Real government bond yields

18 To be consistent with other regulatory building blocks, we express the level of the RFR and all other WACC components in real terms.

19 Similar to the 2019 Report, nominal government bond yields are converted to real yields using inflation expectations, which are approximated by two proxy variables. First, we use survey data maintained by the European Central Bank (ECB). Second, we use yield data on inflation-linked German government bonds, which directly incorporate the market's inflation expectations.[3]

20 **Figure 2** illustrates the rate of expected long-term inflation derived from the two sources. We use an average of the two series to convert nominal yields to real rates.

Figure 2: Expected annual inflation over the next 10 years



Note: The expected rate of inflation based on the ECB survey of professional forecasters was calculated using the geometric mean of expected annual inflation over the next 10 years. Monthly values were interpolated from quarterly observations. Inflation expectations implied by German government bonds were derived from the spread between nominal German government bonds and inflation-linked German government bonds using the Fisher transformation. We used monthly averages of the nominal yield series and the series of average yields from German inflation-linked bonds with 8 to 12 years remaining to maturity (DE0001030542, DE0001030559, DE0001030567, DE0001030583).

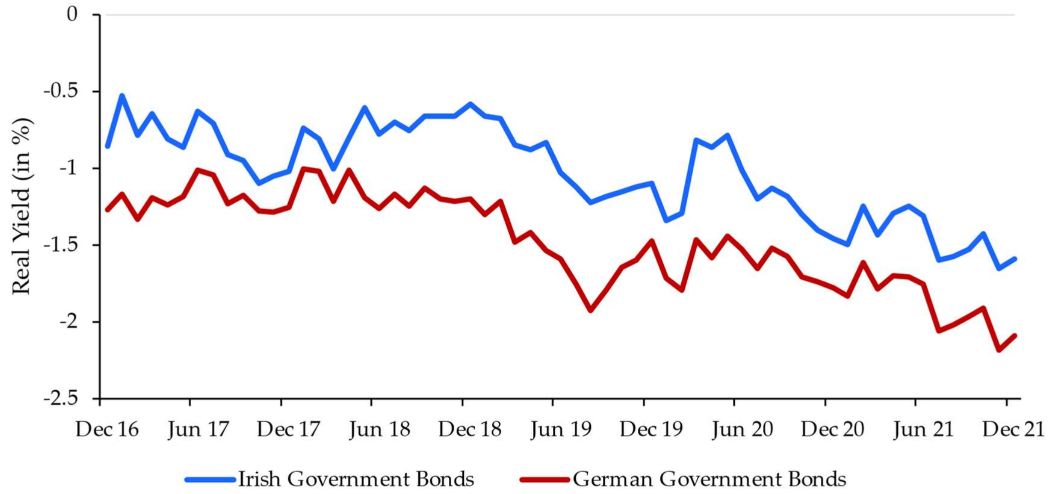
Source: Swiss Economics based on ECB's Survey of Professional Forecasters and Refinitiv Eikon data.

21 With recent increases in inflation rates, also the market's expectations of long-run inflation have started to increase significantly.

22 The resulting time series of real yields for German and Irish government bonds are presented in **Figure 3**.

[3] Inflation expectations inherent in the yields of inflation-linked bonds are extracted by comparing them with nominal yields of German government bonds with comparable remaining time to maturity.

Figure 3: Real government bond yields



Source: Swiss Economics based on Refinitiv Eikon data.

23 We calculate averages over 1-year, 2-year, and 5-year periods to estimate the current real RFR. The results are presented in **Table 2**. The results reveal a decrease in real yields of government bonds compared to the results in the 2019 Report, which can be explained by the fiscal policies implemented in many advanced economies in response to the Covid-19 crisis (see Baker et al., 2021). These fiscal policies have been funded through a substantial increase in the issuance of government debt. A decline of government bond yields both in nominal and real terms to historically low levels has been observed in the following. A possible explanation could be a general increase in the savings rate due to the pandemic and generally uncertain times.

Table 2: Average real yields

Bond	1-year average	2-year average	5-year average
Irish Government Bonds	-1.45%	-1.30%	-1.03%
German Government Bonds	-1.89%	-1.76%	-1.49%

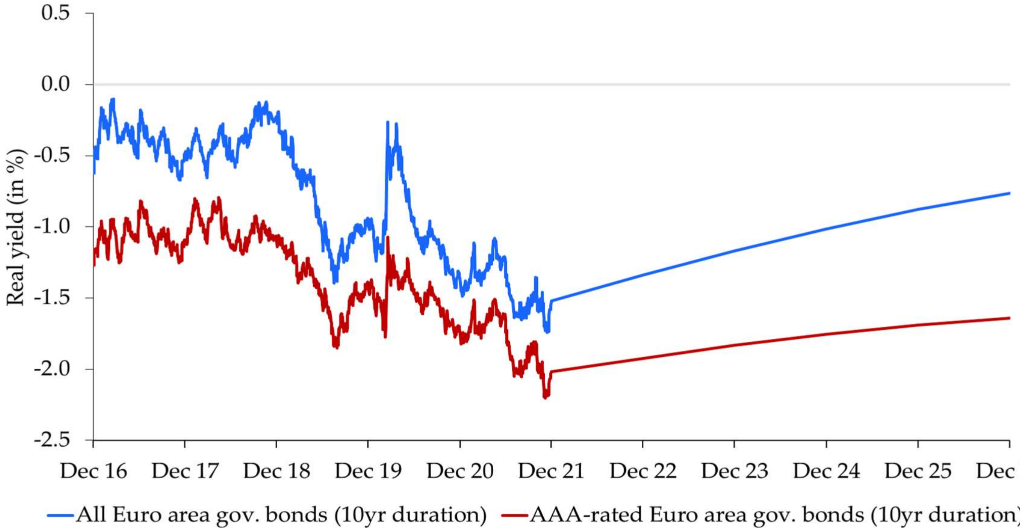
Note: 1-year averages are calculated over the period from January 2021 to December 2021, 2-year averages are calculated over the period from January 2020 to December 2021, and 5-year averages are calculated over the period from January 2017 to December 2021. Only Euro denominated bonds with 8 to 12 years remaining to maturity were considered. Conversion from nominal to real terms based on inflation expectations derived from ECB survey and spread between nominal and inflation-linked German government bonds.

Source: Swiss Economics based on Refinitiv Eikon data.

3.4 Forward rates

24 **Figure 4** depicts implied real forward yields of Euro area government bonds with a remaining duration to maturity of 10 years from 31 December 2021 onwards. Data points before December 2021 are actual real yields.

Figure 4: Forward rates implied by government bond spot rates



Note: Spot rates on 31 December 2021 were used as the basis for the calculation of forward rates.

Source: Swiss Economics based on ECB data.

25 **Table 3** summarises market expectations about the increase in yields during the upcoming regulatory period.

Table 3: Expected real future yields from 2022 to 2026

Forward rate	All Euroarea bonds	Delta to Dec 21	AAA-rated Euroarea bonds	Delta to Dec 21
2022	-1.34%	0.18%	-1.92%	0.10%
2023	-1.17%	0.35%	-1.83%	0.19%
2024	-1.01%	0.51%	-1.76%	0.26%
2025	-0.88%	0.64%	-1.69%	0.33%
2026	-0.76%	0.76%	-1.64%	0.38%
2022 - 2026 Average	-1.03%	**0.49%**	-1.77%	**0.29%**

Note: Last row shows arithmetic means across all years. Delta to December 2021 values represent the difference in yields to 31 December 2021.

Source: Swiss Economics.

26 Expected real future yields are found to be increasing over the upcoming regulatory period until 2026. For all Euro area bonds the markets expect an average increase of 49 basis points and an average increase of 29 basis points in real yields for AAA-rated Euro area bonds.

3.5 Conclusion

27 We believe the RFR to be used for the 2022 Determination ranges **from -1.60 percent to -0.54 percent**. This conclusion is based on the following observations:

- Historic averages of government bond yields suggest a range from approximately -1.89 percent to -1.03 percent.
- Forward rates reveal market expectations of an increase in government bond yields between 2022 and 2026 from 29 basis points to 49 basis points.

28 Table 4 summarises our findings on the RFR.

Table 4: Evidence on the RFR

		SE lower bound	SE upper bound	SE point estimate
	Evidence from current yields	-1.89%	-1.03%	
+	Evidence from forward rates and monetary policy	29 bps	49 bps	
=	**RFR**	**-1.60%**	**-0.54%**	**-1.07%**

Source: Swiss Economics.

29 Our advice for the 2022 Determination implies a decrease in the RFR compared to the 2019 Determination of 46 basis points consistent with recent developments on international bond markets. **Table 5** compares our advice to the values used in the 2019 Determination.

Table 5: Summary real RFR

	Range (in %)	Point estimate (in %)
2022 SE advice	-1.60 – -0.54	-1.07
CAR 2019 Determination	-1.12 – -0.10	-0.61

Source: Swiss Economics.

4 The equity risk premium

4.1 Methodological changes compared to the 2019 Report

30 We have not changed the methodology of the 2019 Report for the estimation of the equity risk premium (ERP). We continue to use a backward-looking estimate based on long-term historic stock market returns and a forward-looking estimate based on dividend discount model.

Box 3: Summary of the 2019 report equity risk premium methodology

In 2019 the ERP was based on the following evidence:

- backward-looking evidence of the TMR using long-term averages of market returns;
- forward-looking evidence of the TMR based on a dividend discount model.

4.2 Quantification of the TMR

31 The ERP is expressed as the difference between expected returns of the market portfolio (TMR) and the RFR. The level of the RFR was determined in section 3. We estimate the appropriate level of the TMR below in two ways.

- First, we employ a backward-looking method based on long-term historic averages.
- Second, we estimate the TMR using a Dividend Discount Model (DDM) which is a forward-looking estimation.

4.2.1 Backward-looking estimate

32 We rely on the data provided by Dimson, Marsh, and Staunton (DMS, 2022) to estimate long-term averages of total market returns. The 2022 edition of the DMS-yearbook contains data on Irish and European real equity returns from 1900 to 2021.

Table 6 reports mean equity returns for Ireland and Europe using arithmetic, geometric, and Blume's averaging methods (see Blume 1974). Results have not changed significantly compared to the 2019 report. For the data provided by DMS (2022) only the arithmetic mean of European equity returns changed from 6.2 percent previously to 6.1 percent now.[4] Also, Blume's averages changed slightly since the 2019 report from 6.80 percent to 6.81 for Irish equity returns and from 6.05 percent to 5.97 percent for European equity returns. Thus, the differences between the backward-looking estimate in 2019 and now, displayed in **Table 7**, are minor.

Table 6: Average equity returns over the 1900-2021 period (in percent)

Equity returns	Arithmetic mean	Geometric mean	Blume's method
Irish equity returns	7.00	4.40	6.81
European equity returns	6.10	4.30	5.97

Note: Blume's method (BM) gives a weighted estimate of the arithmetic (AM) and geometric means (GM) based on the time period over which the mean was calculated (N) and on the time period over which returns are to be forecasted (T). The method is based on the following formula:
$BM=(T-1)/(N-1)\times GM+(N-T)/(N-1)\times AM$, with T = 10 years holding period and N = 121 observations of historic returns

Source: Swiss Economics based on DMS (2022).

[4] It must be noted that DMS only reports values with one decimal place. The change might therefore seem larger or smaller than it actually is due to the rounding of the estimates.

Table 7: 2019 versus now: Delta of the backward-looking ERP estimate (in percent)

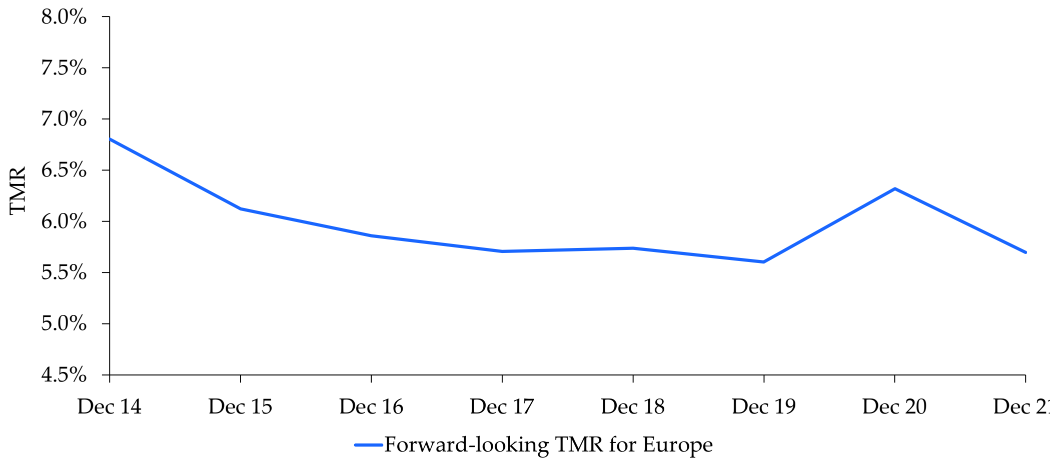
Equity returns	Delta arithmetic mean	Delta geometric mean	Delta Blume's method
Irish equity returns	0.00	0.00	0.01
European equity returns	-0.10	0.00	-0.08

Source: Swiss Economics based on DMS (2018) and DMS (2022)

4.2.2 Forward-looking estimate

33 We use a forward-looking dividend discount model (DDM) as a second source of evidence for the level of the TMR. An update of the DDM calculated as explained in the 2019 report is shown in **Figure 5**.

Figure 5: Forward-looking TMR for Europe (assuming constant dividend growth)



Note: The analysis spans the period of 2014 to 2021. Yearly price and dividend data were summed over all constituents of the STOXX Europe 50 price index. A constant dividend growth rate was assumed. The constant dividend growth rate was calculated by taking an arithmetic average of the yearly OECD real GDP forecast.

Source: Swiss Economics based on Bloomberg data.

34 The results of the DDM **(Table 8)** confirm the long-term stability of the TMR and are comparable in magnitudes with the results shown in the 2019 report.

Table 8: Average forward-looking TMR estimates over the recent past

	1-year average	2-year average	5-year average
TMR	5.70%	6.01%	5.81%

Source: Swiss Economics.

4.3 Conclusion

35 We estimate an updated range for the TMR between 5.70 percent and 6.81 percent with a point estimate at 6.25 percent. This is 12 basis points lower than the TMR of 6.38 percent that was estimated in the 2019 report. **Table 9** summarises our findings regarding the level of the TMR.

Table 9: Evidence on the TMR

		SE lower bound	SE upper bound	SE point estimate
	Evidence from backward-looking evidence	5.97%	6.81%	
	Evidence from forward-looking evidence	5.70%	6.01%	
Min./Max.	TMR	5.70%	6.81%	6.25%

Source: Swiss Economics.

36 The range for the ERP was derived by subtracting our point estimate of the RFR of -1.07 percent from the TMR range. **Table 10** summarises our advice regarding the level of the ERP.

Table 10: ERP summary

	Range (in %)	Point estimate (in %)
2022 SE advice	6.77 – 7.87	7.32
CAR 2019 Determination	6.57 – 7.41	6.99

Source: Swiss Economics.

37 Our advice for the 2022 Determination implies an increase in the ERP of 33 basis points compared to our 2019 Determination. This is mainly caused by the decrease of the RFR from -0.61 percent to -1.07 percent.

5 Beta

5.1 Methodological changes compared to the 2019 Report

38 The methodology for estimating Dublin Airport's Asset Betas is based on the 2019 report but is adjusted to take account of the impact of Covid-19.

Box 4: Summary of the 2019 report Beta methodology

The following evidence to determine Asset Betas was used:

- Asset Beta estimates from regression analysis of exchange-listed comparator airports' stock price movements based on 1 year / daily, 2 years / daily, and 5 years / weekly data;
- comparator Betas from international regulatory precedent; and
- information on comparator airports' regulatory environment, demand structure, and business structure to weight their relevance as a benchmark for Dublin Airport's risk exposure.

European airport stock returns were regressed on a European-area stock index (STOXX Europe 600) and non-European airport stock returns on their respective national stock price indices using OLS. Equity Betas were converted to Asset Betas using the Hamada-formula including net debt to equity ratios and effective tax rates (Hamada, 1972).

39 Clearly, airports and aviation generally were more exposed to Covid-19-related revenue impacts than most other industries. Drops in passenger numbers due to travel restrictions and changed traffic behaviour had a direct impact on passenger levels and revenues. Thus, Betas estimated during the pandemic (*Pandemic* Betas) are likely to be higher than Betas estimated in normal times (*Non-Pandemic* Betas).

40 We use *Non-Pandemic* Betas in order to determine Dublin Airport's risk factor. Thus, we made specific amendments to the 2019 methodology to correct for the impact of Covid-19 on empirically estimated comparator Betas. This concerns predominantly the time horizons over which the Asset Betas are calculated. We exclude all observations of 2020 from the estimation, as 2020 was the year with the largest distortions on the stock market caused by the pandemic. For most airport stocks, co-movements with stock indices seem to have normalised by the end of 2020.

41 Specifically, Asset Betas are estimated based on the following data:

- Pre-pandemic (until the end of 2019) 1 year / daily, 2 years / daily, and 5 years / weekly data;
- Post-pandemic (from the beginning of 2021) 1 year / daily data.

42 We believe it is appropriate to use *Non-Pandemic* Betas for the determination of Dublin Airport's cost of capital during the next regulatory period for the following reasons:

- First, we expect that shocks to passenger numbers due to the pandemic are likely to be much less drastic than in the past. There may still be selective outbreaks and corresponding impacts on traffic, however, worldwide shutdowns of air travel seem increasingly unlikely with Covid-19 becoming endemic in many parts of Europe and the world.[5]

[5] This does not mean that we believe that passenger numbers will return to pre-pandemic levels immediately. However, this dampened development of pax numbers can be anticipated and be forecasted reasonably well in our view. Thus, it should not be an element of financial risk affecting Dublin Airport's capital costs, but should rather be dealt with in other regulatory building blocks, e.g. in traffic forecasts.

- Second, there may be an argument to include an uplift to the Beta to reflect the possibility of future catastrophic events (including, but not limited to pandemics) which occur by their very definition only a few times every century and are therefore typically not reflected in the time periods used for the empirical estimation.
  - However, it is likely that future catastrophic events will not affect airport stocks nearly as much as the early days and weeks of the Covid-19 pandemic did. As there was a lack of comparable precedent during the past 20 years (arguably 9/11 was the last event with comparable effects on the airline industry), there may have been considerable uncertainty in financial markets as to whether and how airport regulators and governments would react to such events. This uncertainty is likely to be eliminated now after most governments or airport regulators took measures to remedy the impact on airports.[6] Some examples of governmental interventions include Aéroports de Paris which received a repayable advance by the French government and Copenhagen Airport which received financial support from the Danish government in 2020. When the next catastrophic event unfolds, investors are likely to anticipate that similar measures will be taken to mitigate its impact on airport revenues and profits, likely softening the drop in stock prices.
  - In addition, CAR has reacted swiftly and firmly to the drop in passenger numbers caused by the Covid-19 outbreak. Notably in 2020, CAR waived the compliance requirement with the ex-ante per passenger price cap (see Table 3.2 in CAR (2021)[7]). This allowed Dublin Airport to collect EUR 9.94 per passenger (instead of the ex-ante price cap per passenger of EUR 7.19) and resulted in approximately EUR 21m additional aeronautical revenue (i.e., an increase of 39%), mitigating the impact of the pandemic on finances. Also, CAR suspended the clawback mechanism for unspent Capex i.e., approximately EUR 24m in 2020 associated with unspent Capex will not be clawed back because of this decision. CAR's intervention was arguably more decisive than other airport regulators' intervention.[8] Thus, the spike in Betas observed for comparator airports may overstate Dublin Airport's risk exposure to catastrophic events.
  - Furthermore, an analysis of the impact of Covid-19 on Asset Betas assuming various probabilities of the frequency of catastrophic events suggests that the effect on Asset Betas is relatively small (see Appendix B.4). Contingent on the probability assumed, the difference to our estimates (see **Table 17**) is between 0 and 0.04 for the upper and between

[6] Regulators in all OECD countries (except Chile and Colombia) adopted measures to support the aviation sector by April 2021. State Support to the Air Transport Sector: Monitoring developments related to the Covid-19 crisis. URL: State Support to the Air Transport Sector: Monitoring developments related to the Covid-19 crisis. URL: https://www.oecd.org/corporate/State-Support-to-the-Air-Transport-Sector-Monitoring-Developments-Related-to-the-COVID-19-Crisis.pdf [08.06.2022]

[7] Draft Decision on the Second Interim Review of the 2019 Determination in relation to 2022. URL: https://www.aviationreg.ie/_fileupload/Draft%20Decision(2).pdf [21.4.2022]

[8] For example, the UK CAA abstained from following London Heathrow airport's request for an early adjustment (still within Q6) of its RAB that would have led a significant increase in airport charges and rather waited for the upcoming regulation in H7. Covid-19-related measures are only foreseen for H7. URL: https://www.caa.co.uk/News/Economic-regulation-of-Heathrow-Airport-Limited/#:~:text=travel%20will%20recover.-,RAB%20adjustment,through%20airport%20charges%20from%202022. URL: https://www.caa.co.uk/News/Economic-regulation-of-Heathrow-Airport-Limited/#:~:text=travel%20will%20recover.-,RAB%20adjustment,through%20airport%20charges%20from%202022. [08.06.2022]

0 and 0.02 for the lower bound. This holds for the whole range regarding the frequency of pandemic-like events under consideration.

43 Also, the UK Civil Aviation Authority follows an approach in its initial proposals for H7 that focuses on non-pandemic Betas (see CAA (2021), Section 2: Financial issues). It estimates Betas both on pre- and post-Covid-19 data. However, in contrast to our approach it puts some weight on the observations during the pandemic. The CAA uses estimated probabilities of a pandemic happening as weights. The lower bound of CAA Beta estimation assumes a pandemic event to happen every 50 years, whereas the upper bound estimation is based on a pandemic occurring once every 20 years (see also Appendix B.4. for a similar analysis for Dublin airport).

5.2 Stakeholder response regarding the Beta estimation

44 In their response to CAR's issues paper CP1/2022, Dublin Airport have highlighted the severe impact of the Covid-19-pandemic on airports in general and on Dublin Airport specifically. In relation to the Beta, Dublin Airport request that the regulatory Asset Beta reflects the increased level of risk due to the pandemic in line with empirical evidence from capital markets.

45 According to Dublin Airport, one element required to better reflect its risk exposure is to use the right comparator airports. Instead of using a relatively broad sample of airports weighted for their comparability with Dublin Airport along various dimensions (such as regulation, demand structure and business structure), Dublin Airport suggest relying on comparator airports under similar regulation only. We have included respective sensitivity analyses under section 5.4 and Appendix B.2 and a discussion on why it is appropriate to use a larger sample of comparator airports in section 5.3.

46 Dublin Airport also argue that there has been an increase in empirical Betas of listed airports in recent years (and particularly since the pandemic has started), which should be taken into account. By focussing on post-pandemic as well as on pre-pandemic Betas, our methodology also captures more recent trends in the development of empirical Betas.

5.3 Comparator Asset Betas

47 We analyse airport stock returns to empirically estimate Dublin Airport's Asset Beta. Our sample consists of nine exchange-listed airports, namely Aena Spain (AENA), Aéroports de Paris (ADP), Auckland Airport (AIA), Copenhagen Airport (KBHL), Fraport Frankfurt (FRA), Sydney Airport (SYD), TAV Turkey (TAVHL), Vienna Airport (FLU), and Zurich Airport (FHZN).

48 To estimate raw betas of the comparator airports we regress European airport stock returns on a European-area stock index (STOXX Europe 600) and non-European airport stock returns on their respective national stock price indices.

49 As in the 2019 report we use a large sample of comparable airports for several reasons.

- Using a large sample of comparator airports reduces the risk of skewed estimates due to outliers.
- A large set of comparators enables us to model the risk profile of Dublin Airport more precisely. Basing the choice of comparators only on the regulatory framework and reducing the list of comparators to only three airports as proposed by Dublin Airport leads to an unbalanced sample. Following Dublin Airport's line of thinking Aena Spain, Aéroports de Paris and Zurich Airport would be the only adequate comparators. However, these airports operate on a far larger scale than Dublin Airport. Aena Spain operates 46 airports throughout Spain and Zurich Airport operates 8 and partly owns 4 airports in different regions of

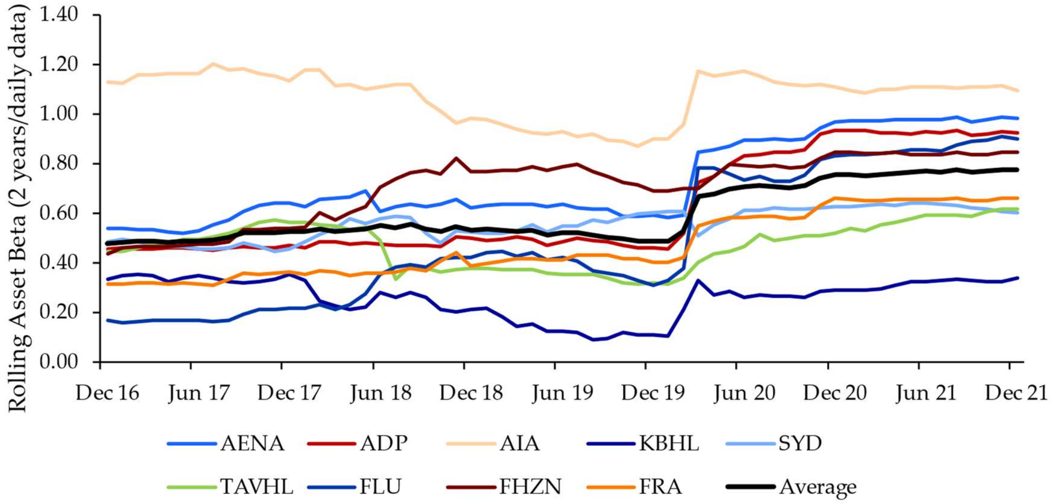
the world. Groupe ADP also contains a significant number of subsidiaries throughout the world. While we deem those comparators to be important it is implausible to assume that reducing the set of comparators to only these three airports would reflect Dublin Airports risk profile adequately.

- Additionally, we disagree with the notion that regulatory models for airport charges can be perfectly compared as simplistically as suggested by Dublin Airport ("multi-year price caps that allocate volume and cost risk to the airport"). In practice there are differences among these regulatory models which makes the choice of "perfect comparators" challenging. Examples include the following:
  - Dublin Airport faces only partial cost risk: It faces most Opex risk except for certain costs which are passed through to users (such as Local Authority rates). Its exposure to Capex risk is limited by the Stage Gate process, which allows for costs of projects to change as the project design is developed, and also by the CAR approach of grouping allowances for smaller projects.
  - The regulatory framework for Dublin Airport has a relatively flexible interim review mechanism, with no specific limitation on what the regulator can include in the scope of an interim review. Volume risk has been shared between Dublin Airport and users in the current period through the current interim review.
  - In France, there is a legislative overlay requiring "moderation" in year-over-year changes to the airport charges. Thus, it is unlikely that Dublin Airport's current year-over-year price cap increase proposal for 2023 would be possible for ADP. There is no such overlay at Dublin Airport, which allows a full risk re-set at a determination or interim review.
  - In Dublin, the till structure is an important part of the regulator's powers. CAR has chosen to use a single till. In Spain, Switzerland, and France, the till structure is set in legislation. AENA is dual till, meaning that commercial investments are fully at the risk of the airport operator. Zurich and ADP have hybrid till.

5.3.1 Impact of Covid-19 on Asset Betas

50 **Figure 6** shows 2-year rolling Asset Betas for the exchange-listed comparator airports. The black line displays the mean value across all comparator airports. A significant upwards trend can be observed from March 2020, when the World Health Organisation (WHO) officially declared the Covid-19 pandemic.

Figure 6: 2-year rolling Asset Betas for comparator airports

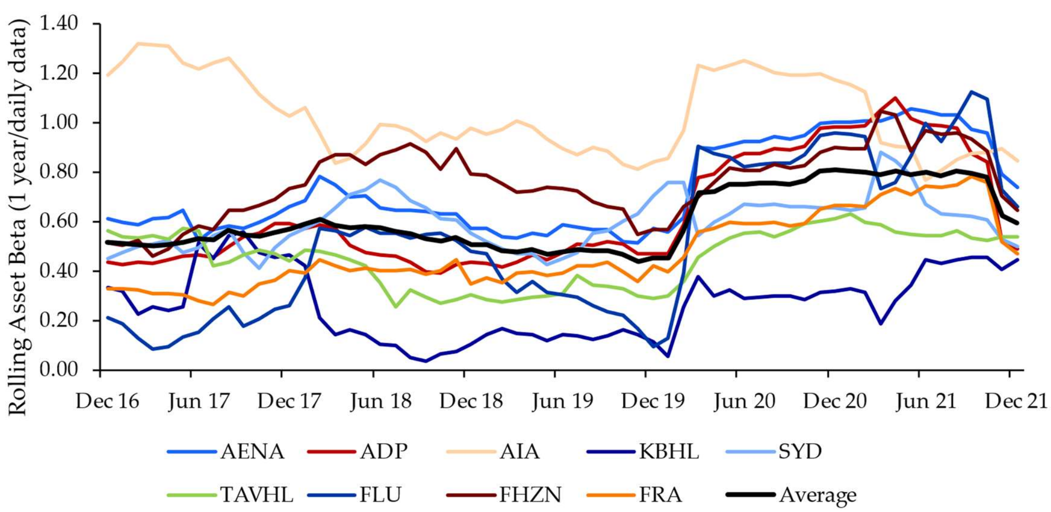


Notes: Estimates based on daily return data and a time horizon of two years. Betas were de-levered using the Hamada-formula and most recent data on net debt, equity and effective tax rates.

Source: Swiss Economics based on Bloomberg data.

51 **Figure 7** displays 1-year rolling Asset Betas. With the reduced averaging period, the volatility of the Asset Betas increases. Nevertheless, the trend across all comparator airports until the end of 2020, evidenced through the arithmetic average series, is comparable to **Figure 6**. However, this trend seems to have reverted recently, beginning in the second half of 2021, and Asset Betas tend to decrease again.

Figure 7: 1-year rolling Asset Betas for comparator airports



Notes: Estimates are based on daily return data and a time horizon of one year. Betas were de-levered using the Hamada-formula and most recent data on net debt, equity and effective taxes.

Source: Swiss Economics based on Bloomberg data.

52 In the following empirical analysis, we use a combination of pre-pandemic data until December 2019 and post-pandemic data from January 2021 until December 2021 to estimate the Asset Betas of the comparator airports over various time horizons and frequencies. Thus, we focus on non-pandemic time periods and omit market distortions due to Covid-19.

5.3.2 Empirically estimated Asset Betas

53 Based on our analysis in the previous section, we use the following four datasets of airport stock returns and stock price indices with varying time horizons and data frequencies:

- Daily data over the 1-year pre-pandemic period from January 2019 to December 2019
- Daily data over the 2-year pre-pandemic period from January 2018 to December 2019
- Weekly data over the 5-year pre-pandemic period from January 2015 to December 2019
- Daily data over the 1-year post-pandemic period from January 2021 to December 2021

54 **Table 11** reports the resulting empirically estimated Asset Betas based on the various datasets.

Table 11: Asset Betas of exchange-listed comparator airports

Airport	1 year / daily data pre-pandemic	2 years / daily data pre-pandemic	5 years / weekly data pre-pandemic	1 year / daily data post-pandemic
Aena (Spain), AENA	0.60	0.60	0.52	0.74
Aéroports de Paris, ADP	0.57	0.56	0.61	0.49
Auckland Airport, AIA	0.79	0.86	1.00	0.85
Copenhagen Airport, KBHL	0.12	0.11	0.44	0.44
Fraport (Frankfurt), FRA	0.58	0.56	0.55	0.47
Sydney Airport, SYD	0.71	0.59	0.42	0.50
TAV (Turkey), TAVHL	0.41	0.44	0.50	0.54
Vienna Airport, FLU	0.09	0.31	0.25	0.66
Zurich Airport, FHZN	0.61	0.77	0.53	0.64

Note: Based on Ordinary Least Squares (OLS)-regressions of stock market data from airports and a European price index (national price indices were used for TAV, Auckland, and Sydney). Estimated Betas were de-levered using the Hamada-formula based on net debt/equity ratios and effective tax rates. Pre-pandemic datasets cover data until 31 December 2019. Post-pandemic dataset covers data from 1 January 2021 until 31 December 2021.

Source: Swiss Economics based on Bloomberg data.

5.3.3 Asset Betas from regulatory precedent

55 As in the 2019 report, we complement the list of empirically estimated comparator Asset Betas with values from the relevant regulatory precedent (see **Table 12**). The regulatory Asset Betas of Aeroporti di Roma and London Gatwick Airport remain unchanged relative to 2019 determination (i.e., 0.57 and 0.52 respectively).

56 The Asset Beta of the London Heathrow Airport increases from a range of 0.42 - 0.52 (point estimate of 0.47) in 2019 to a range of 0.52 - 0.67 in 2022 according to the H7 Initial Proposals published by the UK Civil Aviation Authority (see CAA (2021), Section 2: Financial issues). The increase in Heathrow's Asset Beta is due to the CAA considering an uplift to the Asset Beta caused by the pandemic. In our analysis of the post-pandemic Asset Beta, we use the average point estimate of CAA's range of 0.59. However, since this value represents a post-pandemic Asset Beta, we assume an Asset Beta of 0.47 – as used in the 2019 report – for the calculation of the weighted pre-pandemic Betas.

Table 12: Asset Betas from regulatory precedent

Airport	Decision and Regulatory Period	Asset Beta
London Heathrow Airport Limited	CAA (2021), Initial Proposal	0.52 – 0.67
Aeroporti di Roma	ENAC (2016), 2017-2021	0.57
London Gatwick Airport	CAA (2014), Q6	0.52

Note: At the time of writing the report no update for the regulatory Asset Betas for Aeroporti di Roma and Gatwick were available.

Source: CAA (2021), ENAC (2016), CAA (2014)

5.4 Weighting of comparator airports

57 As a starting point for the reassessment of the weighting scheme of comparator airports, we analyse how empirically estimated Betas changed during the pandemic.

58 **Table 13** shows the results with respect to the change of Betas in March 2020, in the first quarter of 2020, and in the first half of 2020.

Table 13: Change in Betas during the pandemic

Airport	Change in Beta March 2020	Change in Beta First Quarter 2020	Change in Beta First Half 2020
Aena (Spain)	+46%	+56%	+61%
Aeroport de Paris	+33%	+66%	+87%
Auckland Airport	+27%	+46%	+49%
Copenhagen Airport	+49%	+229%	+149%
Fraport (Frankfurt)	+23%	+33%	+41%
Sydney Airport	-28%	-23%	-5%
TAV (Turkey)	+28%	+59%	+93%
Vienna Airport	+131%	+867%	+776%
Zurich Airport	+6%	+24%	+42%

Note: All Betas are estimated on 1 year / daily data.

Source: Own calculation based on Bloomberg data.

59 The results in **Table 13** show that, except for Sydney Airport, all Betas increased substantially in March 2020 but also in the first quarter and in the first half of 2020.

60 Next, it is assessed, whether the regulatory regime can explain the differences in the change in Betas during the pandemic. For this reason, the correlation of the regulatory regime – as shown in **Table 15** below, which is based on our 2019 report – and the change in Betas is assessed. The strength of the regulatory regime indicated in points in the second column in **Table 15** reflects the similarity of an airport's regulatory regime and, at the same time, how strict an airport's regulation is: Zero points hence describe a soft regulatory regime, i.e., a regime that protects an airport from demand shocks. Five points describe a strict regulatory regime which heavily exposes an airport to risk.

61 **Table 14** shows the resulting correlation coefficients between an airports' regulatory regime and the change in Betas for different timespans in 2020.

Table 14: Correlation or regulatory regime and change in Betas

Correlation of regulatory regime and changes in Betas	Correlation coefficient
Change in Beta March 2020	0.29
Change in Beta First Quarter 2020	0.13
Change in Beta First Half 2020	0.19

Source: Own calculation base on Bloomberg data.

62 The results in **Table 14** point to no clear relationship (or only a very weak relationship) between the regulatory regime and the change in Betas during the pandemic. Although the correlation coefficient with respect to changes in Beta in March 2020 can be classified as weakly positive, the coefficients with respect to changes in Beta in the first quarter and the first half of 2020 are too close to zero for deducing a clear relationship between the variables.

63 Nevertheless, **Table 15** not only presents an update of our weighting scheme as introduced in the 2019 report but also an alternative weighting based exclusively on the regulatory environment of an airport (see the last column in **Table 15**). A corresponding sensitivity analysis of the impact of this alternative weighting on weighted Asset Betas is conducted in Appendix B.2. The results of this analysis show, that the impact of the weighting scheme is negligible. We hence use the same weighting methodology as in our 2019 report considering all relevant weighting factors.

64 Note that even when considering all factors in the weighting of comparator airports, the weighting more strongly takes regulatory factors into account compared with factors related to an airport's demand and business structure, since regulatory factors account for five out of a total of nine points that can be awarded to each comparator airport. This is in line with the notion, that the regulatory environment is a principal risk factor.

Table 15: Comparator airports' weighting scheme

Airport	Regulatory environment	Demand structure	Business structure	Total	Weights (all factors)	Weights (regulatory enviroment)
Aena (Spain)	★★★☆☆	☆☆	★☆	★★★★☆☆☆☆☆	7.7%	12.5%
Aéroport de Paris	★☆☆☆☆	★☆	★☆	★★★☆☆☆☆☆☆	5.8%	4.2%
Aeroporti di Roma	★★★☆☆	★☆	★☆	★★★★★☆☆☆☆	9.6%	12.5%
Auckland Airport	★★☆☆☆	★★	★★	★★★★★★☆☆☆	11.5%	8.3%
Copenhagen Airport	☆☆☆☆☆	★☆	★★	★★★☆☆☆☆☆☆	5.8%	0.0%
Fraport (Frankfurt)	★☆☆☆☆	★☆	★☆	★★★☆☆☆☆☆☆	5.8%	4.2%
London Gatwick Airport	★★★☆☆	★★	★☆	★★★★★★☆☆☆	11.5%	12.5%
London Heathrow Airport	★★★★★	☆☆	★☆	★★★★★★☆☆☆	11.5%	20.8%
Sydney Airport	★☆☆☆☆	★★	★★	★★★★★☆☆☆☆	9.6%	4.2%
TAV (Turkey)	★★☆☆☆	★☆	★☆	★★★★☆☆☆☆☆	7.7%	8.3%
Vienna Airport	★★☆☆☆	★☆	★☆	★★★★☆☆☆☆☆	7.7%	8.3%
Zurich Airport	★☆☆☆☆	★☆	★☆	★★★☆☆☆☆☆☆	5.8%	4.2%

Note: The methodology follows the description in the 2019 report. Compared to the 2019 report the regulatory regime of Aéroport de Paris is awarded one point less, since the regulatory period of Aéroport de Paris was reduced from five to one year. Demand and business structures remain unchanged and are based on the same data as in the 2019 report. An update of the demand structure data is not meaningful in line of the strong but temporary demand effects of Covid-19.

Source: Swiss Economics.

5.5 Weighted Asset and Equity Betas

65 Estimates of Dublin Airport's Asset Betas based on weighted comparator airport betas are reported in **Table 16**.[9]

Table 16: Asset Betas of comparator airports and their weights

Airport	1 year / daily data pre-pandemic	2 years / daily data pre-pandemic	5 years / weekly data pre-pandemic	1 year / daily data post-pandemic	Weight
Aena (Spain)	0.60	0.60	0.52	0.74	7.7%
Aéroports de Paris	0.57	0.56	0.61	0.49	5.8%
Aeroporti di Roma	0.57	0.57	0.57	0.57	9.6%
Auckland Airport	0.79	0.86	1.00	0.85	11.5%
Copenhagen Airport	0.12	0.11	0.44	0.44	5.8%
Fraport (Frankfurt)	0.58	0.56	0.55	0.47	5.8%
London Gatwick Airport	0.52	0.52	0.52	0.52	11.5%
London Heathrow Airport	0.47	0.47	0.47	0.59	11.5%
Sydney Airport	0.71	0.59	0.42	0.50	9.6%
TAV (Turkey)	0.41	0.44	0.50	0.54	7.7%
Vienna Airport	0.09	0.31	0.25	0.66	7.7%
Zurich Airport	0.61	0.77	0.53	0.64	5.8%
Weighted Asset Beta	**0.52**	**0.54**	**0.54**	**0.59**	

Note: Airport Asset Betas only vary for empirically estimated estimates. Asset Betas of Aeroporti di Roma, London Gatwick Airport, and London Heathrow Airport were not empirically estimated but adopted from the most recent regulatory decisions available in the relevant time periods. For Aerporti di Roma and London Gatwick Airport, the Asset Betas remain constant across all time periods, as there were no new regulatory decisions published. For London Heathrow Airport, the pre-pandemic Asset Beta of 0.47 was taken from CAA's H6 decision and the updated value of 0.59 was taken from CAA's 2021 initial proposal for H7.

Source: Swiss Economics.

66 We re-levered Asset Betas to Equity Betas using the Hamada-Formula using Dublin Airport's notional gearing level and tax rate. Since Ireland introduces an increased corporate tax rate of 15 Percent starting in 2023 for companies with revenues of more than EUR 750m we perform a sensitivity analysis using this rate (see Appendix B.6). In our main analysis we continue to assume an effective tax rate of 12.5 percent. Notional gearing is assumed to be 50 percent (see Section 2 for a discussion), which yields a re-leveraging multiplicator of 1.88.

Table 17: Dublin Airport Asset and Equity Beta

	1 year / daily data pre-pandemic	2 years / daily data pre-pandemic	5 years / weekly data pre-pandemic	1 year / daily data post-pandemic
Asset Beta	0.52	0.54	0.54	0.59
Equity Beta	0.98	1.02	1.02	1.12

Source: Swiss Economics.

67 **Table 17** reveals a range for the Equity Beta from 0.98 to 1.12, depending on the time horizon and the data frequency that is used in the estimation.

[9] For comparison, we also calculate Dublin Airport's Asset Betas using datasets that include the pandemic period. The estimation results are documented in Appendix B.3.

5.6 Conclusion

68 Dublin Airport's Asset Beta ranges from 0.52 to 0.59. This finding is based on the following evidence:

- empirical estimates of exchange-listed comparator airport Asset Betas;
- regulatory precedent of Asset Betas at comparator airports that are not listed; and
- an assessment of comparability between airports.

69 Asset Betas were re-levered to Equity Betas using the notional gearing rate and effective tax rate. **Table 18** summarizes the resulting Equity Betas.

Table 18: Evidence on the Beta estimation

		SE lower bound	SE upper bound	SE point estimate
	Evidence from weighted average Asset Betas	0.52	0.59	0.56
x	Re-levering multiplicator	1.88	1.88	1.88
=	**Equity Beta**	**0.98**	**1.12**	**1.05**

Note: The re-levering multiplicator is defined by the following formula [1 + debt / equity x (1 - tax rate)]. We used a gearing ratio of 50 percent for all values.

Source: Swiss Economics.

70 We advise to set a point estimate for Dublin Airport's Asset Beta of 0.56 and a corresponding point estimate of Dublin Airport's Equity Beta of 1.05.

71 **Table 19** summarises our advice on the range of the Equity Beta and compares it to our advice in the 2019 report.

Table 19: Equity Beta summary

	Range	Point estimate
2021 SE advice	0.98 – 1.12	1.05
CAR 2019 Determination	0.91 – 0.95	0.94

Source: Swiss Economics.

6 Cost of debt

6.1 Methodological changes compared to the 2019 Report

72 We amended the methodology for estimating Dublin Airport's cost of new debt to better reflect actual time periods until repayment at issuance of Dublin Airport's debt. We increased the notional investment horizon underlying our cost of new debt estimate. In the 2019 report, we used a notional investment horizon of 10 years for the cost of new debt in line with our assessment of the cost of equity. Given continued evidence that the average time to maturity at issuance of daa's debt is approximately 15 years, we solely focus on bond yields of an index for corporate bonds with a remaining maturity of more than 10 years as a benchmark.[10] The average remaining time to maturity of the bonds included in this index is approximately 14 years. For the 2019-Determination we had also considered a similar index for bonds with a remaining time to maturity of between 7 to 10 years.

Box 5: Summary of the 2019 report cost of debt methodology

In the 2019 report, the rate of cost embedded debt was based on the following evidence:

- daa's current cost of existing debt;
- our estimate of Dublin Airport's debt payments for embedded debt over the 2020-24 period.

For the rate on new debt two reference indices of EUR-denominated investment grade corporate bonds were used.

6.2 Cost of embedded debt

6.2.1 Current cost of embedded debt

73 **Table 20** lists all currently outstanding daa borrowings and the related interest payment obligations. EIB loans are grouped according to whether they were already drawn in 2019 or whether they have been drawn since.

74 Compared to 2019 the nominal interest rates for embedded debt decreased from an average of 2.19 percent to an average of 1.53 percent in December 2021. In addition, inflation expectations increased from 1.22 percent in 2019 to 1.87 percent in December 2021. Consequently, real interest rates for embedded debt went down significantly. The weighted average of embedded debt thus decreased from 0.96 percent in 2019 to -0.33 percent in December 2021. At the same time, daa's debt more than doubled from EUR 781.5m in 2019 to EUR 1,686.8m at the end of 2021.

[10] For consistency, we calculated inflation expectation assuming a 15-year horizon instead of the 10-year horizon which is assumed for elements relating to the cost of equity.

Table 20: daa debt structure December 2021

Name	Current Loan Amount (€m), Dec 2021	Weight	Nominal interest rate	Real interest rate Dec 2021
[✂]	[✂]	[✂]	[✂]	[✂]
[✂]	[✂]	[✂]	[✂]	[✂]
Bond 2028	400.00	23.71%	1.55%	-0.31%
Bond 2028 Tap	159.97	9.48%	0.50%	-1.34%
Bond 2032	500.00	29.64%	1.60%	-0.26%
Total	**1,686.8**	**100%**	**1.53%**	**-0.33%**

Note: Reported are interest rates and loan amounts as of December 2021. Nominal interest rates are converted to real interest rates using a rate of 1.87 percent for expected inflation as of December 2021.

Source: Swiss Economics based on daa data.

6.2.2 Forecast of the cost of embedded debt over the 2022-26 period

75 A likely scenario of the development of borrowings from existing debt agreements over the next regulatory period until 2026 is depicted in **Table 21**. As no additional information is available as to how loans are planned to be amortised, constant amortisation rates have been assumed for loans. According to daa's information bonds are not amortising.

Table 21: Existing Debt structure forecast over 2022-26 period

Name	Amortising	2022	2023	2024	2025	2026
[✂]	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
[✂]	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
Bond 2028	No	400	400	400	400	400
Bond 2028 Tap	No	160	160	160	160	160
Bond 2032	No	500	500	500	500	500
Total		**1,628**	**1,570**	**1,518**	**1,468**	**1,418**

Note: Reported are forecasted loan amounts as of December 2021. Nominal interest rates are converted to real interest rates using a rate of 1.87 percent for expected inflation as of December 2021.

Source: Swiss Economics based on daa data.

76 **Table 22** reports the development of real interest rates over the next regulatory period for the various debt categories using expected inflation of 1.87 percent. The continued amortisation of EIB loans, especially those with higher interest rates, leads to a further decrease in the real interest rates for embedded debt.

Table 22: Forecast of real interest rates per embedded debt class over 2022-26 period

Debt category	Fixed / Floating	2022	2023	2024	2025	2026	Average (2022-2026)
[✂]	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
[✂]	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
Bond 2028	Fixed	-0.31%	-0.31%	-0.31%	-0.31%	-0.31%	-0.31%
Bond 2028 Tap	Fixed	-1.34%	-1.34%	-1.34%	-1.34%	-1.34%	-1.34%
Bond 2032	Fixed	-0.26%	-0.26%	-0.26%	-0.26%	-0.26%	-0.26%
Weighted Average		**-0.36%**	**-0.39%**	**-0.42%**	**-0.44%**	**-0.46%**	**-0.41%**

Note: Nominal rates are converted to real rates using long-term inflation expectations of 1.87 percent in December 2021. All loans have fixed interest rates.

Source: Swiss Economics based on daa data.

6.2.3 Summary on cost of embedded debt

77 **Table 23** shows the upper and lower bound of the real cost of embedded debt. The SE lower bound stems from the weighted average of the real interest rate forecast. The upper bound is the real interest rate as of December 2021 under the assumption of a constant cost of embedded debt. Both real interest rates were implied using long-term inflation expectations of 1.87 percent.

Table 23: Summary on cost of embedded debt

	SE lower bound	SE upper bound
Real cost of embedded debt	-0.41%	-0.33%

Source: Swiss Economics.

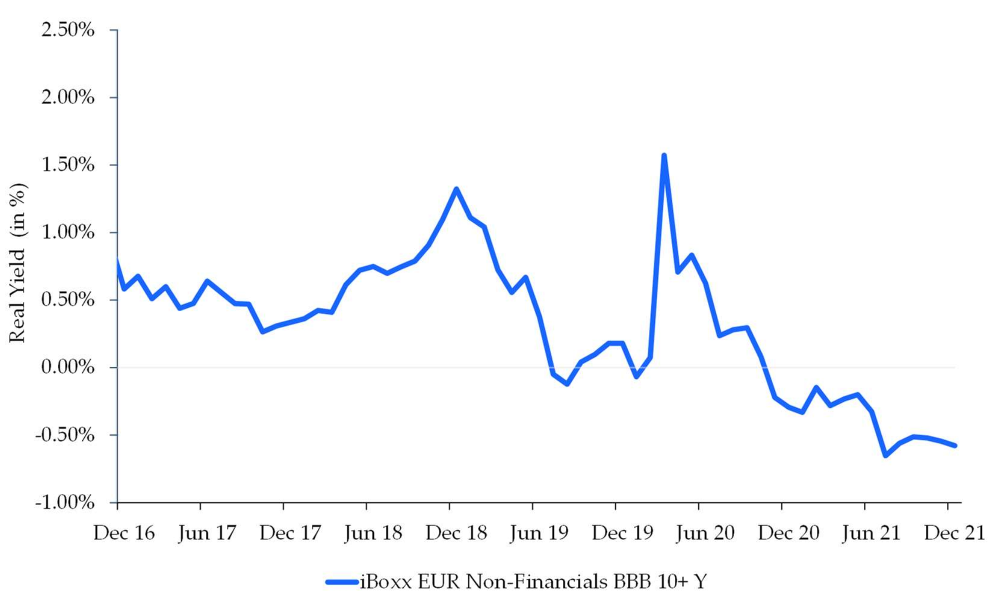
78 Compared to the 2019 report the estimates went down significantly, leading to a negative value for cost of embedded debt. As stated above, the main reasons are the decrease in nominal interest rates and the higher expected inflation compared to 2019. Also, the difference between lower and upper bound decreased from 82 basis points in 2019 to 8 basis points now.

6.3 Cost of new debt

79 We use a bond index to estimate the cost of new debt. The iBoxx EUR BBB Non-Financials indices are designed to reflect the performance of EUR denominated bonds from non-financial corporations with a BBB investment grade rating. This investment grade is the standard assumption for WACC calculations in the industry. Compared to the 2019 WACC report, we only use the real yields for the iBoxx EUR BBB Non-Financials with a remaining maturity of more than 10 years since the average duration of daa's loans in 2021 is roughly 15 years. For consistency, the real yields were calculated using the expected inflation looking 15 years ahead.

80 **Figure 8** depicts real yields of the iBoxx EUR BBB Non-Financials indices over the last five years. Since mid-2020 we find a decrease in real yields, which dropped below zero at the end of 2020 and stayed there until December 2021, impacting, therefore, the estimate of the cost of new debt below.

Figure 8: Real yields of the iBoxx EUR BBB Non-Financials 10+ Years



Note: At the time of gathering the data the average time to maturity of the index's titles was roughly 14 years.

Source: Swiss Economics based on Refinitiv Eikon data.

81 Similar to government bond yields (see section 3), underlying the observed decrease in real yields is an increase in inflation expectations in the context of the Covid-19 pandemic which was not followed by a countervailing increase in nominal yields as predicted by economic theory. This could be explained, at least in part, due to the ECB's asset purchasing program (APP) which started in September 2019 and was reinforced during the pandemic with the Pandemic Emergency Purchase Programme (PEPP).

82 Also, we observe a reduced risk premium for BBB-graded investments since the spread between A-rated European corporate non-financials and BBB-rated European corporate non-financials decreased.[11] In addition to the fiscal stimulus packages during the pandemic, an increase in the euro area's saving rate (see, Thomas Mayer, Gunther Schnabl, 2021; ECB Economic Bulletin, 2021[12]) might have increased demand for lower graded corporate bonds due to the prospect of relatively high yields and a perceived low risk. This perception of low risk for lower graded debt might have been triggered by aforementioned policies. Thus, reinforcing the downward pressure on the nominal yields. (OECD, 2021[13]).

83 **Table 24** reports 1-year averages, 2-year averages, and 5-year averages of real yields for the relevant iBoxx EUR Non-Financials indices. Due to the current market situation all the averages decreased markedly compared to the last WACC determination. Only the 5-year average of the index yields a non-negative result.

Table 24: Real yields based on the iBoxx index

Index	1-year average	2-year average	5-year average
iBoxx EUR Non-Financials BBB 10+ years remaining to maturity	-0.40%	-0.02%	0.31%

Note: Based on arithmetic averages of monthly yields up to December 2021.

Source: Swiss Economics based on Refinitiv Eikon data.

84 **Table 25** summarises our findings regarding the cost of new debt. Whereas both estimates are positive, their values have decreased significantly with respect to the 2019 Report. The upper bound decreased by 16 basis points and the lower bound by 74 basis points. Especially the lower bound draws the point estimate down significantly from 0.90 percent in 2019 to 0.45 percent in 2021.

Table 25: Evidence on cost of new debt

	Cost of new debt	SE lower bound	SE upper bound
	Current investment grade yields	-0.40%	0.31%
+	Forward-looking adjustment of new debt	0.29%	0.49%
+	Issuance costs	0.10%	0.10%
=	**Cost of new debt**	**0.00%**	**0.90%**

Source: Swiss Economics.

[11] Table 37 in Appendix B.3 displays the spreads of the 1-year and 2-year averages ranging at 21 basis points and 31 basis points, respectively. In the 2019 report those estimates were at 74 basis points and 65 basis points, respectively.

[12] https://www.ecb.europa.eu/pub/economic-bulletin/html/eb202105.en.html

[13] https://www.oecd-ilibrary.org/sites/d8489039-en/index.html?itemId=/content/component/d8489039-en#section-d1e13259

6.4 Weighting of embedded and new debt

6.4.1 Planned future debt

85 At the time of writing the draft report no updated information on planned future debt was available, therefore we use the same weighting between the cost of embedded debt and cost of new debt as in the 2019 report, assuming continued development of the debt structure. The weighting can be updated ahead of the final report in support of the Final Decision if more recent information should be made available in the meantime.

86 **Table 26** shows the estimates handling of then undrawn debt and treating it as embedded debt.

Table 26: Share of new debt from 2019 WACC Report

Cost of new debt	Share of new debt (lower bound)
Share of new debt (treating undrawn debt as embedded)	38%
Share of new debt (treating undrawn debt as new)	60%

Note: Since the then undrawn debt has been drawn in the meantime, its share (38 percent) is used for the weighting in the current WACC calculation below.

Source: Swiss Economics.

6.5 Conclusion

87 We believe the real cost of debt for Dublin Airport ranges from -0.26 percent to 0.14 percent. The range is based on weighted cost of embedded debt and new debt and is summarised in **Table 27**. The significant drop in the cost of debt lies on the one hand, on low nominal interest rates for embedded debt. On the other hand, we find constantly increasing inflation expectations since 2020. This increase in inflation expectation did not yet have any or only a very limited impact on the nominal yields of iBoxx BBB Non-Financials.

Table 27: Weighted cost of debt

Debt category	Share (lower bound)	Lower bound	Share (upper bound)	Upper bound
Cost of embedded debt	62%	-0.41%	62%	-0.33%
Cost of new debt	38%	0.00%	38%	0.90%
Weighted cost of debt		**-0.26%**		**0.14%**

Source: Swiss Economics.

88 **Table 28** summarises our findings on the range of the cost of debt and compares it to the range set in the 2019 Determination.

Table 28: Summary cost of debt

	Range (in %)	Point estimate (in %)
2022 SE advice for cost of debt	-0.26 – 0.14	-0.06
CAR 2019 Determination	0.37 – 1.02	0.69

Source: Swiss Economics.

7 Aiming Up

7.1 Methodological changes compared to the 2019 Report

89 We have not changed our view regarding the level of an appropriate aiming up component compared to the 2019 Report.

Box 6: Summary of the 2019 report aiming-up methodology

Based on an analysis of Irish precedent in other regulated industries, the 2019 report included an aiming-up-component of 50 basis points. There are several reasons for this:

- Mitigation of (asymmetric) risks associated with measurement error;
- Dublin Airport's Capital Investment Plan 2020+ (CIP) resulting in elevated capital needs;
- No implicit aiming up in other WACC components;
- Presumably strong dynamic effects of air transport due to the industry's strong effects on trade, tourism, and economic growth (larger compared with other utilities).

7.2 Stakeholder response regarding the aiming-up

90 Ryanair expressed in its response to CAR's issues paper (CP1/2022) the view, that there is no evidence to support an aiming-up allowance. Specifically, Ryanair does not agree with the notion, that an overestimation of the WACC is worse than an underestimation.

91 Furthermore, Ryanair is of the opinion that an aiming-up allowance is unjustified since the level of Dublin airport's capital expenditure is significantly reduced compared with the 2019 determination.

92 We do not agree with Ryanair's claim and are of the opinion, that the key reasons to support an aiming-up component mentioned in the 2019 report are still valid:

- Risk of measurement errors in the WACC components;
- Asymmetric economic effects of under- relative to overinvestment since underinvestment is likely to have asymmetric dynamic effects on welfare;
- No implicit aiming-up in other WACC components – in contrast to other Irish regulatory precedent.

93 While we agree that a reduced CIP within this price control period may reduce Dublin airport's capital needs, the pandemic and its aftereffects likely increase the airport's capital needs. Hence, we see no compelling reasons to adjust the aiming-up component of 50 basis points.

7.3 Conclusion

94 We advise to uplift the estimate of the WACC by 50 basis points in order to mitigate risks associated with measurement errors.

95 **Table 29** summarises our advice on aiming up.

Table 29: Summary aiming up

	Range	Point estimate
2022 SE advice	n/a	50 bps
CAR 2019 Determination	n/a	50 bps

Source: Swiss Economics.

8 Conclusion

96 We estimate the efficient level of real cost of capital for Dublin Airport based on updated data till the end of 2021 to be between 3.87 percent and 4.51 percent, with a point estimate of 4.24 percent.

97 **Table 30** summarises our update findings for each WACC component.

Table 30: Ranges and point estimates for all individual WACC components

	Lower bound	Upper bound	Point estimate
Gearing	45%	55%	50%
Tax rate	12.50%	12.50%	12.50%
RFR	-1.59%	-0.54%	-1.07%
TMR	5.70%	6.81%	6.25%
ERP	6.77%	7.87%	7.32%
Asset Beta	0.52	0.59	0.56
Equity Beta	0.98	1.12	1.05
Cost of equity (post-tax)	5.55%	7.65%	6.60%
Cost of debt (pre-tax)	-0.26%	0.14%	-0.06%
Aiming up	0.50%	0.50%	0.50%
Advice on regulatory pre-tax WACC	**3.87%**	**4.51%**	**4.24%**

Note: All values are reported in real terms. Point estimates reflect our estimates of the most likely values. daa's tax rates is assumed to remain at 12.5 percent. Following the Irish government's decision to set the corporate tax rate at 15 percent for firms with a turnover of more than EUR 750m starting in 2023 a sensitivity analysis is performed using this rate (see Appendix B.7).

Source: Swiss Economics.

98 **Table 31** summarises our point estimates and compares them with the values of the 2019 Determination.

Table 31: SE regulatory WACC advice and comparison with 2019 Determination

	CAR 2019	SE Advice 2022	Difference
Gearing	50%	50%	-
Tax rate	12.50%	12.50%	unchanged
RFR	-0.61%	-1.07%	46 bps ▼
TMR	6.38%	6.25%	13 bps ▼
ERP	6.99%	7.32%	33 bps ▲
Asset Beta	0.50	0.56	0.06 ▲
Equity Beta	0.94	1.05	0.11 ▲
Cost of equity (post-tax)	5.96%	6.60%	64 bps ▲
Cost of debt (pre-tax)	0.69%	-0.06%	75 bps ▼
Aiming up	0.50%	0.50%	-
Advice on regulatory pre-tax WACC	**4.25%**	**4.24%**	**1 bps ▼**

Note: All values are reported in real terms. Point estimates reflect our estimates of the most likely values. daa's tax rates is assumed to remain at 12.5 percent. Following the Irish government's decision to set the corporate tax rate at 15 percent for firms with a turnover of more than EUR 750m starting in 2023 a sensitivity analysis is performed using this rate (see Appendix B.7). The reported 2019 values are based on Swiss Economics advice, which differ from CAR's final decision where an alternative calculation (one proposed in the 2019 Report's appendix) was used.

Source: Swiss Economics.

99 Our updated advice implies a decrease in the regulatory WACC of 1 basis point compared to the 2019 Determination. Hence, although there is an increase in the cost of equity, this is nearly cancelled out by a decrease in the cost of debt.

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A Appendix A: Irish and German Government Bonds Data

100 Table 32 and Table 33 list all Irish and German Government Bonds used in the present report.

Table 32: Irish Government Bonds

ISIN	Maturity	Coupon
IE00B6X95T99	18 Mar 2024	3.40
IE00B4TV0D44	13 Mar 2025	5.40
IE00BV8C9418	15 May 2026	1.00
IE00B4S3JD47	20 Mar 2023	3.90
IE00BKFVC568	15 May 2027	0.20
IE00BDHDPR44	15 May 2028	0.90
IE00BJ38CR43	15 May 2030	2.40
IE00BFZRQ242	18 Mar 2031	1.35
IE00BH3SQ895	15 May 2029	1.10
IE00BKFVC899	18 Oct 2030	0.20
IE00B7XWNN51	20 Jul 2027	5.72
IE00B8J2NN65	20 Jul 2027	5.72
IE00BMQ5JL65	18 Oct 2031	0.00
IE00BFZRPZ02	15 May 2033	1.30
IE00B8HCPH68	20 Mar 2032	5.82
IE00B7Z55X64	20 Mar 2032	5.82
IE00BMD03L28	18 Oct 2032	0.35
IE00BKFVC345	15 May 2035	0.40

Source: Refinitiv Eikon.

Table 33: German Government Bonds

ISIN	Maturity	Coupon	Type
DE0001135226	4 Jul 2034	4.75	
DE0001135176	4 Jan 2031	5.50	
DE0001134922	4 Jan 2024	6.25	
DE0001135143	4 Jan 2030	6.25	
DE0001135085	4 Jul 2028	4.75	
DE0001135069	4 Jan 2028	5.63	
DE0001141786	13 Oct 2023	0.00	
DE0001030716	10 Oct 2025	0.00	
DE0001030708	15 Aug 2030	0.00	
DE0001102325	15 Aug 2023	2.00	
DE0001141794	5 Apr 2024	0.00	
DE0001102408	15 Aug 2026	0.00	
DE0001030732	15 Aug 2031	0.00	
DE0001104842	16 Jun 2023	0.00	
DE0001102465	15 Feb 2029	0.25	
DE0001104859	15 Sep 2023	0.00	
DE0001102499	15 Feb 2030	0.00	

DE0001104867	15 Dec 2023	0.00	
DE0001102523	15 Nov 2027	0.00	
DE0001102515	15 May 2035	0.00	
DE0001102440	15 Feb 2028	0.50	
DE0001102366	15 Aug 2024	1.00	
DE0001102457	15 Aug 2028	0.25	
DE0001102564	15 Aug 2031	0.00	
DE0001141836	10 Apr 2026	0.00	
DE0001141778	14 Apr 2023	0.00	
DE0001102374	15 Feb 2025	0.50	
DE0001141828	10 Oct 2025	0.00	
DE0001102390	15 Feb 2026	0.50	
DE0001102580	15 Feb 2032	0.00	
DE0001102556	15 Nov 2028	0.00	
DE0001102507	15 Aug 2030	0.00	
DE0001102473	15 Aug 2029	0.00	
DE0001102382	15 Aug 2025	1.00	
DE0001102358	15 May 2024	1.50	
DE0001102309	15 Feb 2023	1.50	
DE0001141810	11 Apr 2025	0.00	
DE0001102416	15 Feb 2027	0.25	
DE0001102531	15 Feb 2031	0.00	
DE0001141802	18 Oct 2024	0.00	
DE0001141851	16 Apr 2027	0.00	
DE0001104834	10 Mar 2023	0.00	
DE0001030583	15 Apr 2033	0.10	Inflation-Linked
DE0001030567	15 Apr 2026	0.10	Inflation-Linked
DE0001030559	15 Apr 2030	0.50	Inflation-Linked
DE0001030542	15 Apr 2023	0.10	Inflation-Linked

Source: Refinitiv Eikon.

B Appendix B: Sensitivity analyses

B.1 Sensitivity analysis of the WACC with respect to different Gearing rates

101 **Table 34** reports the regulatory pre-tax WACC that results from different assumptions regarding the notional gearing rate.

Table 34: Sensitivity analysis regarding Gearing rates

	Gearing of 30%	Gearing of 40%	Gearing of 50%	Gearing of 60%	Gearing of 70%
WACC	4.12%	4.18%	4.24%	4.30%	4.35%

Source: Swiss Economics

102 The results in Table 34 show that a higher gearing rate coincides with a higher WACC, however, the effect of the gearing rate on the resulting WACC is small. The reason for this small effect is that the gearing rate affects two components of the WACC calculation: Equity Betas and the share of the cost of equity (and the cost of debt). Whereas higher gearing rates lead to higher Equity Betas and, hence, to a higher cost of equity, a higher gearing rate will also reduce the weighting of the cost of equity relative to the cost of debt in the WACC calculation.

B.2 Sensitivity of the Asset Beta in connection to different weighting schemes

103 **Table 35** reports weighted Asset Betas based on all weighting factors (identical to the Betas in **Table 16** above) and Asset Betas using a weighting exclusively based on regulatory factors. As shown in the last row of Table 35, the difference in the resulting Asset Betas is negligible.

104 This holds even more when point estimates are compared: The point estimate for an Asset Beta that takes all weighting factors into account equals 0.56. This is identical to the point estimate for an Asset Beta that takes only regulatory factors into account (up to two decimal places).

Table 35: Sensitivity analysis regarding weighting scheme

Airport	1 year / daily data pre-pandemic	2 years / daily data pre-pandemic	5 years / weekly data pre-pandemic	1 year / daily data post-pandemic
Aena (Spain)	0.60	0.60	0.52	0.74
Aéroports de Paris	0.57	0.56	0.61	0.49
Aeroporti di Roma	0.57	0.57	0.57	0.57
Auckland Airport	0.79	0.86	1.00	0.85
Copenhagen Airport	0.12	0.11	0.44	0.44
Fraport (Frankfurt)	0.58	0.56	0.55	0.47
London Gatwick Airport	0.52	0.52	0.52	0.52
London Heathrow Airport	0.47	0.47	0.47	0.59
Sydney Airport	0.71	0.59	0.42	0.50
TAV (Turkey)	0.41	0.44	0.50	0.54
Vienna Airport	0.09	0.31	0.25	0.66
Zurich Airport	0.61	0.77	0.53	0.64
Weighted Asset Beta all factors	**0.52**	**0.54**	**0.54**	**0.59**
Weighted Asset Beta only regulatory factors	**0.52**	**0.55**	**0.53**	**0.61**
Difference in Asset Betas	**-**	**0.01**	**0.01**	**0.02**

Source: Swiss Economics

B.3 Sensitivity analysis of Beta calculated with data including pandemic period

105 For comparison, we also calculate Dublin Airport's Asset Betas using datasets that include the pandemic period. Specifically, we use the following two datasets in addition to our previous analysis in the main text:

- Daily data over the 2-year period from January 2020 to December 2021
- Weekly data over the 5-year period from January 2017 to December 2021

106 Table 36 reports the estimation results and compares them with the Asset Betas calculated using 2-years and 5-years pre-pandemic data (see Table 16). It is evident, that Asset Betas have been significantly higher during the pandemic period.

Table 36: Asset Betas of comparator airports

Airport	2 years / daily data	5 years / weekly data	Weight
Aena (Spain)	0.98	0.84	7.7%
Aéroports de Paris	0.93	0.94	5.8%
Aeroporti di Roma	0.57	0.57	9.6%
Auckland Airport	1.10	1.09	11.5%
Copenhagen Airport	0.33	0.56	5.8%
Fraport (Frankfurt)	0.66	0.95	5.8%
London Gatwick Airport	0.52	0.52	11.5%
London Heathrow Airport	0.59	0.59	11.5%
Sydney Airport	0.60	0.70	9.6%
TAV (Turkey)	0.62	0.67	7.7%
Vienna Airport	0.90	0.90	7.7%
Zurich Airport	0.84	0.92	5.8%
Post-pandemic weighted Asset Beta	**0.72**	**0.76**	
Pre-pandemic Weighted Asset Beta	**0.54**	**0.54**	
Difference in Asset Beta	**+33%**	**+41%**	

Note: Airport Asset Betas only vary for empirically estimated estimates. Airport Asset Betas from regulatory decisions (i.e. Aeroporti di Roma, London Gatwick Airport, and London Heathrow Airport) remain constant across the various methodologies. 2 years/daily dataset covers data until from 1 January 2020 until 31 December 2021. 5 years/weekly dataset covers data from 1 January 2017 until 31 December 2021.

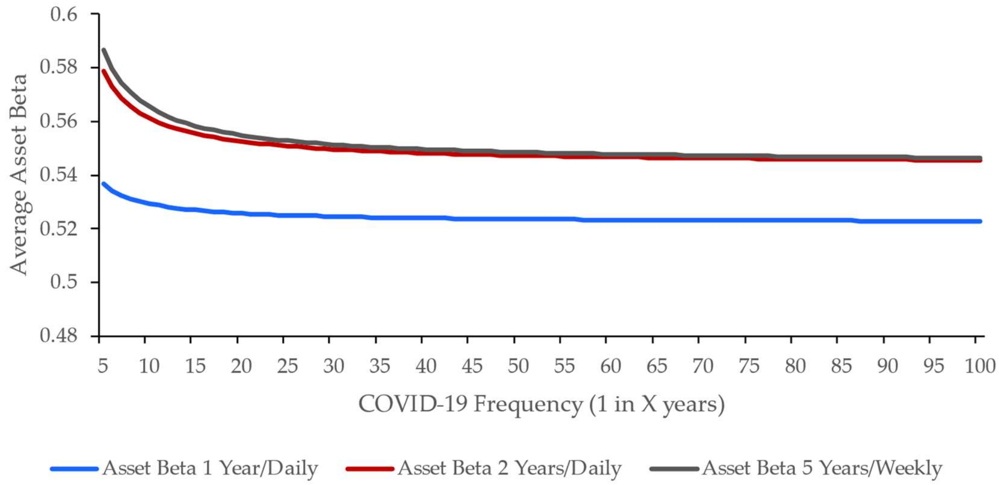
Source: Swiss Economics based on Bloomberg data.

B.4 Sensitivity analysis of Beta with respect to Covid-19 adjustments

107 To estimate the impact of an event like Covid-19 on the value of Beta, in a first step we calculate Asset Betas during various time periods before and after the Covid-19 pandemic began. That is, for the pre-pandemic Betas we use data until 31 December 2019 and for the pandemic Betas we use data that include the pandemic period, i.e. until 31 December 2021. In a second step, we calculate a weighted average of pre-pandemic and pandemic Asset Betas using various frequencies at which pandemic-like events might occur in future.

108 **Figure 9** illustrates the weighted average Asset Betas for different frequencies of pandemic-like events, i.e. from one in five years to one in 100 years.

Figure 9: Weighted average Asset Betas at different frequencies of Covid-19



Notes: Average Asset Betas are calculated as a weighted average of the pre-pandemic and pandemic Asset Betas using various frequencies of COVID-19 as weights.

Source: Swiss Economics based on Bloomberg data.

109 As the figure shows, the average Asset Betas fall as the frequency of pandemic-like events decreases. The estimated Asset Betas range between 0.54 - 0.59 if Covid-19 would occur once every five years and between 0.52 – 0.55 if Covid-19 would occur once every 100 years.

B.5 Sensitivity analysis for cost of debt at a BBB+ credit rating

110 CAR requested we also determine daa's cost of capital also for a notional credit rating at BBB+.

111 We use EUR iBoxx indices for yields from A and BBB rated non-financial corporate bonds to determine BBB+ non-financial yields under the assumption of constant spreads, using the same methodology as in the 2019 report.

112 Table 37 shows A and BBB rated non-financial corporate bonds with remaining duration of more than 10 years. Especially 1- and 2-year averages show a very low spread compared to the same averages in the 2019 report.

Table 37: Spread between A and BBB rated corporate bonds

Index	1-year average	2-year average	5-year average
iBoxx EUR Non-Financials A	-0.62%	-0.35%	-0.08%
iBoxx EUR Non-Financials BBB	-0.41%	-0.03%	0.31%
Delta A to BBB	0.21%	0.32%	0.40%
Delta BBB+ to BBB (1/3 x Delta A to BBB)	**0.07%**	**0.11%**	**0.13%**

Source: Swiss Economics based on Refinitiv Eikon data.

113 Table 38 shows both the upper and lower bound of the estimated downward adjustment to the BBB rated non-financials. The range of the implied BBB+ rated non-financial corporate bonds is between -0.14 percent and 0.83 percent.

Table 38: Summary cost of new debt for a BBB+ credit rating

	Lower bound	Upper bound
Cost of new debt at BBB credit rating	0.00%	0.90%
Downward adjustment for notch from BBB+ to BBB	0.13%	0.07%
Cost of new debt at BBB+ credit rating	**-0.14%**	**0.83%**

Source: Swiss Economics based on Refinitiv Eikon data.

114 Applying the weighting of embedded and new debt displayed in Table 39 we find the cost of debt ranging between -0.31 percent and 0.11 percent using BBB+ rated non-financial bonds.

Table 39: Weighted cost of debt at BBB+ credit rating

Debt category	Share (lower bound)	Lower bound	Share (upper bound)	Upper bound
Cost of embedded debt	62%	-0.41%	62%	-0.33%
Cost of new debt at BBB+ credit rating	38%	-0.14%	38%	0.83%
Weighted cost of debt		**-0.31%**		**0.11%**

Source: Swiss Economics based on Refinitiv Eikon data.

115 The difference between both estimates for the cost of debt is shown in Table 40. The point estimate for cost of debt decreases from -0.06 percent to -0.10 percent when using the higher credit rating.

Table 40: Summary cost of debt at BBB+ and BBB credit rating

	Range (in %)	Point estimate (in %)
2022 SE advice for BBB+ credit rating	-0.31% – 0.11%	-0.10%
2022 SE advice for BBB credit rating	-0.26% – 0.14%	-0.06%

Source: Swiss Economics based on Refinitiv Eikon data.

116 Based on a BBB+ credit rating our estimate of the real pre-tax WACC for Dublin Airport is displayed in **Table 41**.

Table 41: Ranges and point estimates for all individual WACC components based on BBB+ credit rating

	Lower bound	Upper bound	Point estimate
Gearing	45%	55%	50%
Tax rate	12.50%	12.50%	12.50%
RFR	-1.59%	-0.54%	-1.07%
TMR	5.70%	6.81%	6.25%
ERP	6.77%	7.87%	7.32%
Asset Beta	0.52	0.59	0.56
Equity Beta	0.98	1.12	1.05
Cost of equity (post-tax)	5.55%	7.65%	6.60%
Cost of debt (pre-tax)	-0.31%	0.11	-0.10
Aiming up	0.50%	0.50%	0.50%
Advice on regulatory pre-tax WACC	**3.85%**	**4.49%**	**4.22%**

B.6 Sensitivity analysis calculating cost of new debt with the 2019 methodology

117 In **Table 42** the average real yields based on iBoxx indices are displayed for bonds with remaining maturity of 7 to 10 years and of more than 10 years. The bond index averages with shorter duration of maturity are significantly lower than its longer counterparts which evidently impacts the estimation of the cost of new debt displayed in **Table 43**.

Table 42: Average real yields based on iBoxx indices

Index	1-year average	2-year average	5-year average
iBoxx EUR Non-Financials BBB 10+ years remaining to maturity	-0.40%	-0.02%	0.31%
iBoxx EUR Non-Financials BBB 7-10 years remaining to maturity	-0.75%	-0.37%	-0.12%

Source: Swiss Economics based on Refinitiv Eikon data.

118 Using the above table to estimate the cost of new debt using the 2019 methodology draws the estimation of the lower bound of the cost of new debt down by 36 basis points. Table 43 implies a point estimate of 0.27 percent, which is lower than the estimate of 0.45 percent used for this report.

Table 43: Evidence on cost of new debt

	Cost of new debt	SE lower bound	SE upper bound
	Current investment grade yields	-0.75%	0.31%
+	Forward-looking adjustment of new debt	0.29%	0.49%
+	Issuance costs	0.10%	0.10%
=	**Cost of new debt**	**-0.36%**	**0.90%**

Source: Swiss Economics based on Refinitiv Eikon data

B.7 Sensitivity analysis for a different tax rate

119 **Table 44** shows the difference in resulting WACC point estimates between assuming a Tax rate for Dublin airport of 15 percent and 12.5 percent.

120 A lower tax rate slightly decreases the resulting pre-tax WACC from 4.29 percent to 4.24 percent.

Table 44: Sensitivity analysis regarding the tax rate

	Point estimate with tax rate of 15.00%	Point estimate with tax rate of 12.50%
Gearing	50%	50.00%
Tax rate	**15.00%**	**12.50%**
RFR	-1.07%	-1.07%
TMR	6.25%	6.25%
ERP	7.32%	7.32%
Asset Beta	0.56	0.56
Equity Beta	1.03	1.05
Cost of equity (post-tax)	6.49%	6.60%
Cost of debt (pre-tax)	-0.06%	-0.06%
Aiming up	0.50%	0.50%
Regulatory pre-tax WACC	**4.29%**	**4.24%**

Source: Swiss Economics

swiss economics

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