Analysis of the distribution of passenger risk at Dublin Airport

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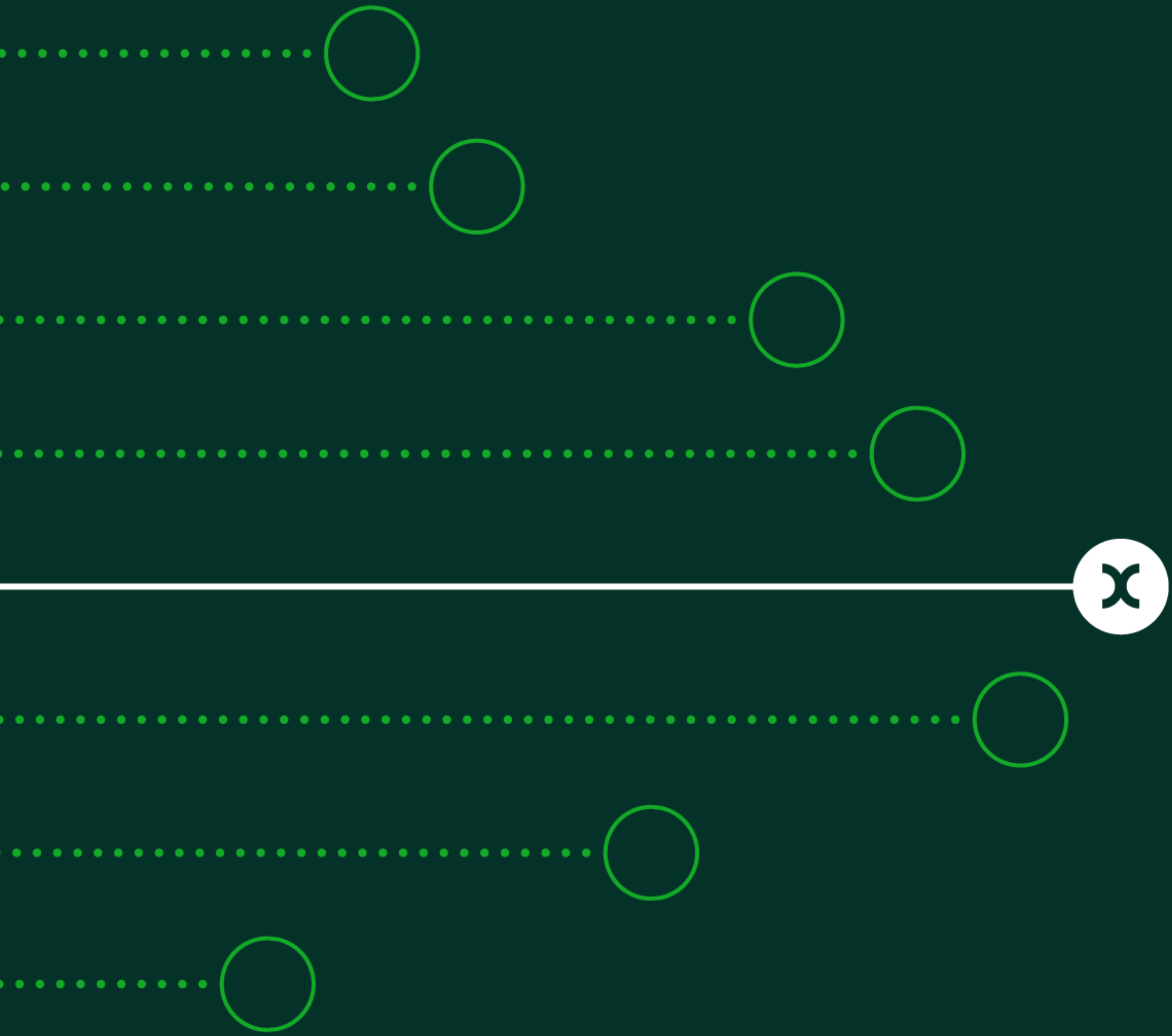

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Executive summary

Dublin Airport's exposure to passenger risk in the current regulatory framework

Airport charges at Dublin Airport are regulated through a per-passenger price cap set by the Irish Aviation Authority (IAA) at the start of the price control period based on its projections for that period. The two key drivers of the level of the price cap are: (1) the IAA's expectations of Dublin Airport's expenditure (and required revenues); and (2) the number of passengers across which this revenue can be recovered.

As passenger forecasts determine the price cap, while outturn passengers determine actual revenue, Dublin Airport's financial performance (defined as earnings before interest, depreciation and amortisation, or EBITDA) may vary depending on the difference between forecast and outturn passenger numbers. By allocating to Dublin Airport the risk associated with passenger outturns differing from forecasts, the IAA strongly incentivises the airport to manage this risk—scaling up to take advantage if passenger growth is higher than expected and scaling down if there is a negative shock to passenger numbers.

However, under this regulatory framework, if structural factors cause the IAA's passenger forecasts to systematically diverge from outturns in one direction, then Dublin Airport will be exposed to asymmetric financial risk. Such a systematic divergence would require an adjustment to the calculation of the price cap to ensure that: 'the forecast should be set on a centreline basis, aiming to set up a "fair bet".'[1]

Historical financial performance and implications for future outcomes

In its Issues Paper for the 2026 Determination, the IAA observed that Dublin Airport's EBITDA over 2010–24 balanced out to near-target levels, with net outperformance of 0.26% of EBITDA. The IAA concludes that this demonstrates that it has successfully calibrated a 'fair bet' for Dublin Airport: 'across a sample of 15 years where three of those years were

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[1] IAA (2025), '2026 Determination on Airport Charges at Dublin Airport: Issues Paper Consultation', 29 July, p. 76, https://www.iaa.ie/docs/default-source/publications/corporate-publications/economic-regulation/2026-determination-on-airport-charges-at-dublin---issues-paper-consultation.pdf?sfvrsn=714ca45f_9 (accessed 5 February 2026). (Henceforth 'IAA 2026 Determination'.)

impacted by the major pandemic downside, the “fair bet” has materialised very closely.’[2]

However, the IAA's analysis focuses on a relatively short time horizon, and is dominated by two exceptional periods during which passenger outturns deviated from forecasts. In the first period, 2015–19, it set a passenger forecast just ahead of a major increase in passenger demand driven by an expansion of low-cost-carrier routes to Europe and economic growth. In the second period, 2020–22, the forecast was set the year before the COVID-19 pandemic, which considerably suppressed passenger demand for several years.

While these two exceptional periods have broadly ‘cancelled out’, this will not necessarily persist in the future. The 2015–19 outperformance does not indicate a structural forecasting bias. We would not expect the IAA to systematically under-forecast passenger numbers more often than it over-forecasts them.

Indeed, as the IAA has noted, its approach to setting the building blocks (including passenger forecasts) is to undertake a ‘centreline forecasting exercise’.[3] In its Issues Paper, the IAA identifies that it does not expect that alternatives to its passenger forecast approach would ‘actually or systematically produce better forecasts, particularly for the medium or longer term’.[4] We would therefore expect that, over the long term, such forecasting errors would approximately cancel out, with the IAA under-forecasting in some periods and over-forecasting in others (as it has done in the past).

We differentiate between the risk associated with the regulatory forecast—which, as set out above, would be symmetrical in expectation—from the within-period risk of a negative shock to passenger demand caused by an exogenous shock (i.e. a shock outside the airport’s control). While the COVID-19 pandemic is a recent and severe example of such a shock, broader analysis of such historical downside shocks indicates that these are persistent events that are expected to continue, and potentially even increase, into the future. A key feature of events such as extreme weather, 9/11, the Icelandic volcanic ash disruption, and COVID-19 are that they reduce passenger demand without being offset by corresponding upside shocks of equivalent magnitude. Airports’ (and airlines’) ability to offset downside shocks through compensating upside growth is limited by operational

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[2] IAA 2026 Determination, p. 37.
[3] IAA 2026 Determination, p. 27.
[4] IAA 2026 Determination p. 43.

factors, including the constraints of the slot allocation regime, the infrastructure at the airport and underlying passenger demand.

This asymmetric risk to passenger numbers means that, over the long term, the number of expected passengers at Dublin Airport will be lower than the IAA's GDP-based forecast. This asymmetry is recognised and compensated for in other regulatory regimes—such as that of the UK Civil Aviation Authority (CAA) at Heathrow Airport.[5]

Assessing the degree of asymmetric passenger risk that Dublin Airport faces

To quantify the asymmetric risk for Dublin Airport, we have adopted an approach similar to that used by the CAA. We have modelled expected passenger and EBITDA based on three sources of passenger uncertainty.

First, we model historical variance in Irish GDP growth, which flows through to passenger demand based on the IAA's traffic forecasting approach. We assume that this source of risk has symmetric distribution around the IAA's passenger forecast, reflecting the fair bet risk to which Dublin Airport is exposed relative to a centreline forecast. We calibrate the level of risk exposure based on our analysis of historical data.

Second, we model shocks that are of medium severity or are 'transient', which we estimate to occur with 26.3% annual probability based on our analysis of historical passenger data. These asymmetric downside shocks are estimated to reduce passenger numbers by 1.1% in a given year (relative to a counterfactual with no shock), and are calibrated based on the impact on outturn passengers at Dublin Airport according to the historical severity of events (such as 9/11 and the Icelandic ash cloud). The product of these two factors provides an expected annualised impact of transient shocks of -0.3%. By way of comparison, although the CAA's methodology and underlying data[6] differ, it directly adjusts passenger forecasts by -0.87% per annum to account for equivalent transient shocks.

Third, we model pandemic-scale or 'extreme' shocks. Based on analysis by the US Government's Centres for Disease Control and Prevention, we model these as occurring with a 2.0% annual probability. Using the

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[5] It is notable that the CAA implemented this adjustment prior to the Covid-19 pandemic. Even without the subsequent evidence of extreme shocks, regulators already considered the asymmetric risks faced by airports to be sufficiently material to warrant an adjustment.

[6] The CAA calibrates its shocks based on downside shocks observed in Heathrow Airport's historical passenger data.

impact of the most recent ‘extreme’ shock (the impact of COVID-19 on Dublin Airport), we model an extreme shock as reducing passengers by approximately 70% in the first year, recovering over the subsequent two years. The approach to quantifying these parameters is consistent with the methodology established by the CAA for Heathrow's H7 determination.

The impact of these three factors on Dublin Airport’s financial performance is calculated using simplified building blocks calibrated to historical trends: per-passenger operating expenditure (OPEX) and commercial revenue, with capital costs held constant over the period. This approach ensures that we capture the offsetting operating cost savings that Dublin Airport could theoretically deliver during a period of suppressed demand.

We generate 5,000 simulations of passenger demand over 2027–31, calculate the resulting EBITDA based on a price cap set using the IAA's passenger forecast. We then compare this to the counterfactual of a fair bet where Dublin is exposed to symmetrical risk only (the first category above). Our results demonstrate significant expected underperformance over the five years of the 2027–31 period.

Implications for the 2027–31 review

To ensure that the 2027–31 period is a fair bet for Dublin Airport, we quantify the financial adjustment required to offset the impact of asymmetric downside shocks. It is important to note that, by construction, this adjustment does not compensate Dublin Airport for the entirety of its regulatory risk exposure. Rather, it is the isolated, stand-alone impact of downside asymmetric traffic shocks on Dublin Airport’s expected EBITDA.

The required adjustment grows over the first three years because 'unforeseen shocks' cannot pre-date the price control period (as otherwise they would be incorporated into the forecast). As our modelling of extreme shocks assumes a three-year impact profile, 2027 could be affected by a crisis in that year only, whereas 2029 could be affected by a 2027 pandemic (year 2 of recovery), a 2028 pandemic (year 1 of recovery), or a 2029 pandemic (year of the pandemic).[7] While the profile of allowances outlined below would reflect the years in

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[7] For the avoidance of doubt, we include a conservative assumption in our model (i.e. one that reduces the level of the estimated risk adjustment); namely that in each simulation run of one regulatory period in our model, there are three possible outcomes: no shock, at most one transient shock, *or* at most one extreme shock.

which the impact of shocks would be expected to materialise, any adjustment of allowances could be reprofiled across the period.

Asymmetric risk allowance required to achieve a fair bet (€m)

	Units	Row	2027	2028	2029	2030	2031
Allowance for transient shocks	€m	[a]	0.9	1.0	1.1	1.2	1.4
Allowance for extreme shocks	€m	[b]	5.4	10.3	14.0	15.6	17.3
Total asymmetric risk allowance (ARA)	**€m**	**[c]=[a]+[b]**	**6.3**	**11.3**	**15.1**	**16.9**	**18.7**
Allowed revenue excluding ARA	€m	[d]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Allowed revenue including ARA	**€m**	**[e]=[c]+[d]**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Passenger forecast (fPAX)	m	[f]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Price cap excluding ARA	**€**	[g]=[d]/[f]	10.9	11.6	12.5	13.6	14.7
Price cap including ARA	**€**	[h]=[e]/[f]	11.1	11.9	12.9	14.0	15.1

Note: All currency amounts are inflation-adjusted to December 2025. Our simulation aims to replicate Dublin Airport's price-cap model faithfully while remaining internally consistent under uncertainty. Passenger numbers (in expectation) and capital costs are aligned with the airport's inputs. For commercial revenues and OPEX, we use a regression-based representation calibrated to the airport's five-year forecasts so that, when passenger volumes follow the forecast, expected EBITDA is on target (see Appendix 3.3A2.2).
This functional form is required for simulation consistency, i.e. to allow outcomes to co-move with passenger variability in a transparent, tractable way. As such, it inevitably smooths some item-level timing and step-changes in Dublin Airport's detailed build-up. As a result, our ex-ante price cap matches Dublin Airport's in level and design, but may differ slightly year by year solely due to this necessary modelling choice.
Source: Oxera analysis.

Additional asymmetric risk due to the passenger cap

Since 2007, Dublin Airport has been subject to a cap of 32 million passengers per year (mppa). There is significant uncertainty regarding when the 32mppa cap will be adjusted, and whether it might be raised (e.g. to 40mppa) or removed entirely. Assuming that the cap is expected to remain in place in some form, or for some years, of the 2027–31 period, we have quantified the additional downside asymmetric risk exposure for Dublin Airport. Our analysis also assumes that a 40mppa cap[8] will apply for the duration of the 2028–31 period—a cap of a different level or duration would imply a different adjustment.

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[8] We have used this assumption as it is consistent with the 'constrained view' within Dublin Airport's Regulatory Proposition 'constrained view'.

The rationale for an additional asymmetric risk adjustment relating to the passenger cap is distinct to, and separate from, the impact of downside shocks. Regardless of the level of downside shocks, as the regulatory forecast of passenger numbers approaches the passenger cap, the scope to outperform the regulatory forecast diminishes. For those years when the regulatory forecast is the same as the level of the passenger cap, no outperformance is possible on traffic, while the scope for underperformance remains.

This creates additional asymmetric risk exposure for Dublin Airport, which we quantify by adjusting the model summarised above. We show the results of this analysis in the table below. The first two rows correspond to the same source of asymmetric risk quantified in our initial calculation of the risk adjustment factor, but now with the passenger cap. The third row corresponds to the incremental risk associated with the cap.

Asymmetric risk allowance required to achieve a fair bet—with passenger cap (€m)

	Units	Row	2027	2028	2029	2030	2031
Allowance for transient shocks	€m	[a]	0.9	0.6	0.5	0.5	0.4
Allowance for extreme shocks	€m	[b]	5.4	10.0	13.4	14.7	16.1
Passenger cap allowance	€m	[c]	0.0	6.6	8.8	8.0	7.7
Total allowances	**€m**	**[d]=[a]+[b]+[c]**	**6.3**	**17.2**	**22.7**	**23.2**	**24.3**
Allowed revenue excluding allowances	€m	[e]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Allowed revenue including allowances	€m	[f]=[d]+[e]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
fPAX	m	[g]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Price cap excluding allowances	€	[h]=[e]/[g]	10.9	11.6	12.6	13.9	15.3
Price cap including allowances	€	[h]=[f]/[g]	11.1	12.1	13.2	14.5	15.9

Source: Oxera analysis.

1 Background

1.1 Introduction

In this section, we assess Dublin Airport's passenger demand risk. In particular, we consider how the airport is exposed to this risk, and whether the risk is symmetrically distributed. We then explore how different regulators have addressed asymmetric risk and consider which approach might be most appropriate if Dublin is found to be subject to asymmetric risk.

1.2 Dublin Airport's historical and regulatory context

Dublin Airport faces significant uncertainty over passenger demand.[9] Demand for air travel is driven by many factors, some of which affect different groups of passengers (e.g. leisure and business travellers) in different ways. Demand for air travel is also affected by exogenous shocks, meaning that, for a period of time, passenger numbers can vary significantly and unexpectedly from long-run trends. This can be seen by examining the passenger numbers at Dublin Airport since 2000, as shown in Figure 1.1 below.

Despite passenger numbers at Dublin Airport increasing over the last 25 years, there have been two clear drops: one due to the global financial crisis (GFC) and the other due to the COVID-19 pandemic. In addition, there have been many smaller shocks to passenger numbers, such as the grounding of aircraft following the Icelandic ash cloud in 2010 and the impact of snow in 2011. These shocks illustrate the uncertainty that is inherent in the aviation sector, as none of these shocks could be accurately forecast when setting traffic forecasts for the price control period.

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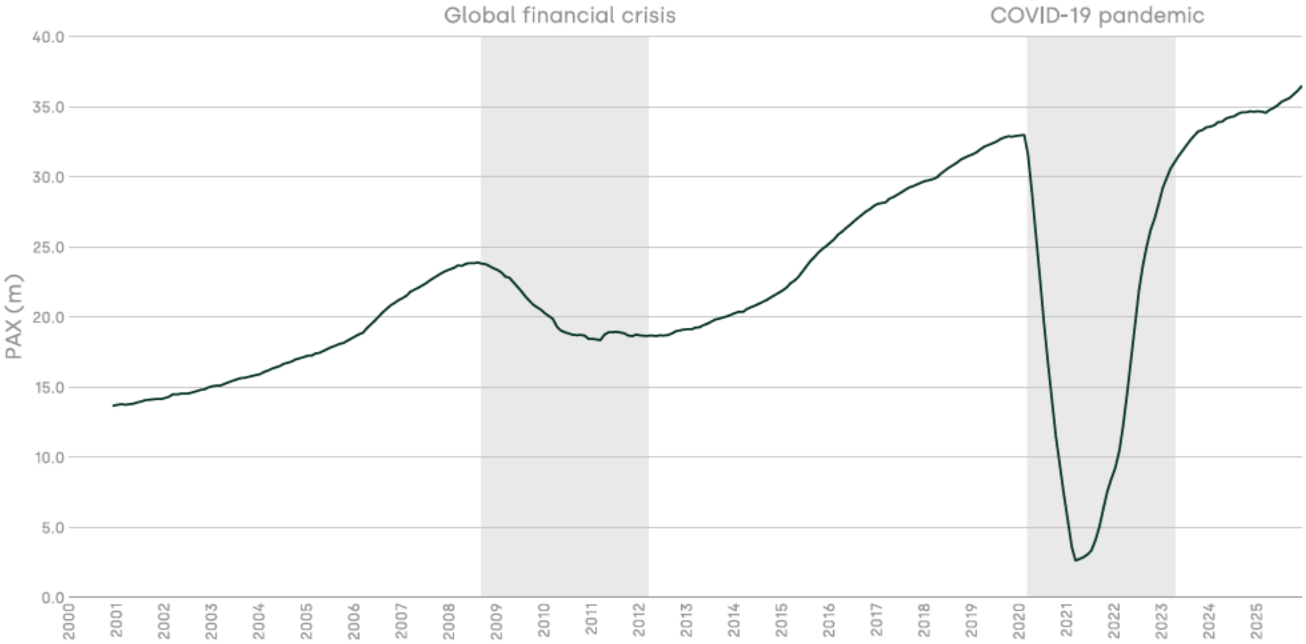
[9] Demand uncertainty for airports is much greater than for other regulated sectors, such as energy and water.

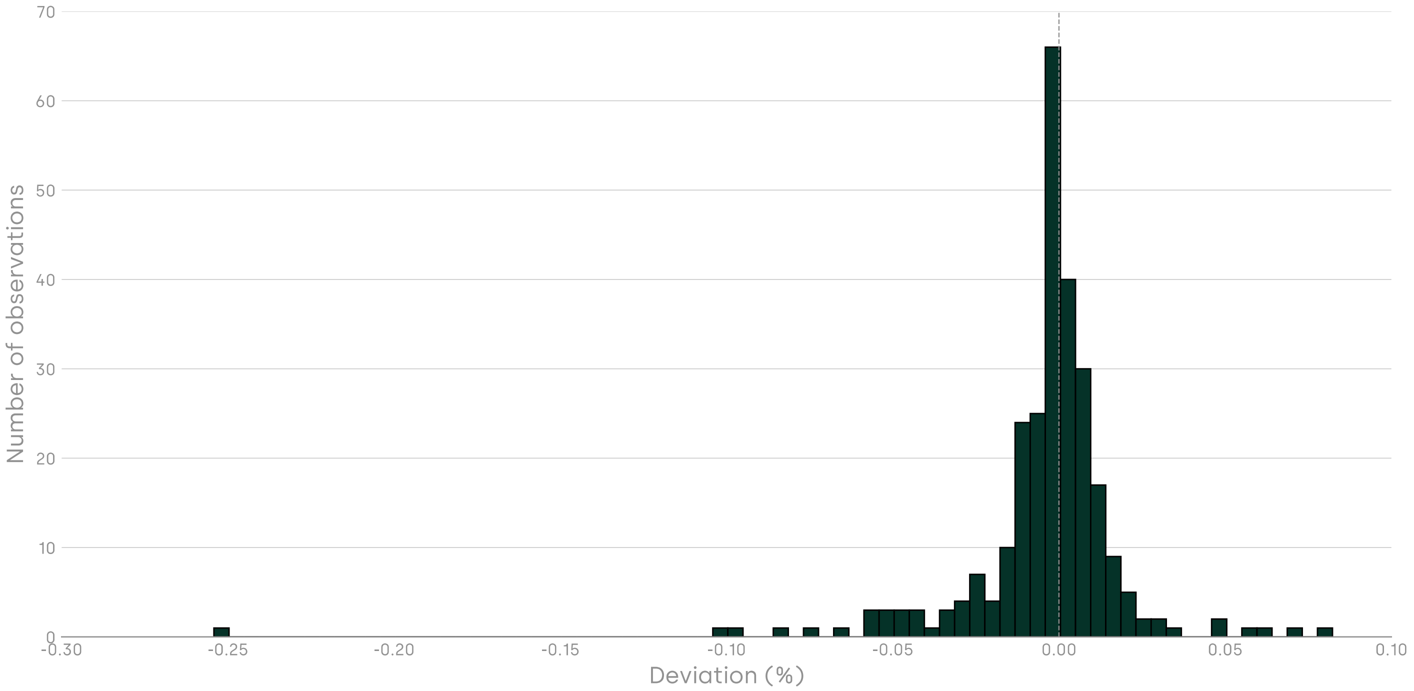
Figure 1.1 Dublin Airport passengers numbers, 2000–25



Note: Passenger numbers are calculated on a 12-month rolling basis.
Source: Oxera analysis of Dublin Airport passenger numbers.

Figure 1.2 below highlights the asymmetric nature of demand risk. Most observations lie very close to zero, indicating that month-to-month deviations from trend are typically small and centred around the expected value. However, the left-hand tail is noticeably longer and contains several large negative deviations, whereas the right-hand tail is relatively short and thin. In other words, passenger demand can fall sharply below trend in adverse conditions, but there is a much smaller chance of similarly large positive deviations above trend. This imbalance between the frequency and size of negative versus positive outcomes is what constitutes risk asymmetry and underpins the need for an asymmetric risk allowance.

Figure 1.2 Distribution of deviations in passenger numbers (2000-2025, excluding the COVID-19 pandemic)



Note: The deviation is defined as the percentage difference between deseasoned monthly passenger numbers and a counterfactual extrapolated trend. The COVID-19 pandemic period from March 2020 to April 2023 is excluded. For details on the methodology, see Appendix 3.3A2.3.2.
Source: Oxera analysis of Dublin Airport passenger numbers.

The risk resulting from uncertainty over passenger numbers is compounded by Dublin Airport's regulatory model, which is based on a per-passenger price cap. The price cap is set at the start of the price control period based on the IAA's projections for that period. As passenger forecasts determine the price cap, while outturn passengers determine actual revenue, Dublin Airport's EBITDA varies based on any difference between forecast and outturn passenger numbers.

This price cap offers certainty to airlines and passengers, but it reduces Dublin Airport's flexibility to respond to passenger demand shocks. For example, when faced with a shock to demand, firms with revenue caps, such as in the UK energy and water sectors, can alter their prices, potentially raising prices when demand is low to cover fixed costs. Dublin Airport is unable to do this as the IAA sets maximum prices for the duration of the five-year price control period.

Dublin Airport carries all the risk of passenger numbers deviating from forecasts, as its regulatory model does not include a traffic risk-sharing (TRS) mechanism. Some airports, such as Heathrow, are exposed to only a proportion of traffic risk. For example, if Heathrow's passenger numbers deviate from forecasts, but are within 10% of forecasts, the airport bears only 50% of the difference in aeronautical revenue from the forecast, with the rest being recouped from airlines over future periods.[10] Dublin, conversely, is exposed to all the passenger demand risk. The IAA has stated that this is a benefit of Dublin Airport's regulatory model, as it has incentivised the airport to increase its operating expenditure (OPEX) where this was required to expand capacity and accommodate higher demand.[11]

1.3 Demand risk, financeability and the fair-bet principle

The IAA notes that Dublin Airport needs to remain financeable in order to be able to deliver its capital programme. Ensuring that Dublin Airport remains financeable is thus a key aspect of the IAA fulfilling its overall objective 'to protect and promote the reasonable interests of current and prospective users'.[12]

As the IAA has noted:

> Although it is no longer a primary objective for us to enable daa to operate Dublin Airport in a financially viable manner, we consider it to be implicit in promoting the reasonable interests of Users
>
> **IAA (2025), '2026 Determination on Airport Charges at Dublin Airport: Issues Paper Consultation', 29 July, p.10.**

In assessing financeability, the IAA uses S&P's methodology, which cites demand risk as one of four key factors that influence a business's risk profile.[13] During the 2022 financeability assessment, the IAA noted that the most significant downside risk that Dublin Airport faced was passenger numbers falling below the forecast level, and that, were downside risks to materialise, Dublin Airport might not be able to achieve the required financial ratios.[14] It is therefore necessary to ensure that the airport does not face uncompensated passenger demand risk that could compromise its financial viability.

In its Issues Paper for the 2026 Determination on Airport Charges, the IAA noted that Dublin Airport's outperformance and underperformance over the past three regulatory periods had balanced out to a small level

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[10] For divergences above 10% of forecast, the airport bears 105% of out- or underperformance. See CAA (2023), 'Economic Regulation of Heathrow Airport: H7 Final Decision Section 1: Regulatory Framework', March, pp. 25–30.

[11] IAA (2025), '2026 Determination on Airport Charges at Dublin Airport: Issues Paper Consultation', 29 July, p. 35. (Henceforth, 'IAA 2026 Determination'.)

[12] IAA 2026 Determination, para. 3.5.

[13] IAA 2026 Determination, para. 10.24.

[14] IAA 2026 Determination, para. 10.24.

of outperformance (equivalent to 0.26% of total EBITDA for the period).[15] In periods when Dublin Airport has outperformed the IAA's forecasts, this has been achieved through a combination of outturn passenger volumes exceeding forecasts, OPEX savings and higher growth in commercial revenue. Where the airport has underperformed the IAA's forecasts, this principally stemmed from a reduction in passenger numbers, which fell slightly below the IAA's forecasts for the 2010–14 period and significantly below its forecasts during the pandemic. The IAA argues that, given that net outperformance over 2010–24 was minimal, this represents evidence that it has calibrated allowed charges to achieve a fair bet for Dublin Airport, which is what its approach to setting charges is designed to ensure, and which is in the interests of airlines. [16]

> Consequently, across a sample of 15 years where three of those years were impacted by the major pandemic downside, the 'fair bet' has materialised very closely.
>
> **IAA (2025), '2026 Determination on Airport Charges at Dublin Airport: Issues Paper Consultation', 29 July, p.37.**

This assessment is based on a relatively limited period of 15 years, excluding periods of underperformance as a result of the immediate impact of the GFC in 2009. The 2010–24 period is also dominated by two periods when passenger numbers diverged significantly from forecast. The first is the 2015–19 period, for which the IAA set a passenger forecast just ahead of a major increase in passenger demand driven by an expansion of low-cost-carrier routes to Europe and economic growth. The second is the 2020–22 period, for which the regulatory forecast was set the year before the COVID-19 pandemic that considerably supressed passenger demand for several years.

The IAA notes that it does not expect that alternatives to its passenger forecast approach would 'actually or systematically produce better forecasts, particularly for the medium or longer term'.[17] Under that assumption, we would expect that any forecasting errors—where trends assumed in passenger forecasts differ from outturn—would cancel out in the long term. However, when looking at Dublin Airport's historical experience, we would nonetheless expect demand shocks, which are separate to the normal fluctuations in passenger numbers from forecasts, to persist. Additionally, there are reasons to expect that the

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[15] IAA 2026 Determination, p. 37.
[16] IAA 2026 Determination, paras 3.12 and 4.7.
[17] IAA 2026 Determination, p. 43.

frequency and nature of events affecting air travel may increase or become more severe in the future.[18]

Overall, while Dublin Airport's regulatory model may have resulted in the fair-bet principle being achieved in the round over 2010–24 (i.e. based on passenger demand performance and out-/underperformance in other areas such as OPEX and commercial revenues), this does not necessarily mean that the passenger demand risk that Dublin Airport faces is symmetrically distributed.

1.4 The nature of asymmetric demand risk

To assess the nature of passenger demand risk faced by airports, it is important to distinguish between two broad categories:[19]

- **changes in long-term trends for passenger demand**: for example, airline deregulation and the rise of low-cost carriers have contributed to increases in passenger numbers in many European countries over recent decades.[20] If passenger forecasts at Dublin Airport did not reflect these changes, there would be a significant divergence between forecasts and outturn passenger numbers in the long run. As these factors can be directly taken into account in passenger forecasts, we do not consider these further in this report;
- **shocks to passenger numbers**: some shocks to passenger numbers represent temporary diversions from the trend, with numbers returning to their trend level over time. For example, the Icelandic ash cloud resulted in aircraft traffic movements (ATMs) and passenger numbers falling significantly for a month, but returning to trend levels thereafter.[21] Unlike changes to long-term trends, there is no expectation that such shocks would be anticipated or that the IAA would be able to account for them in passenger forecasts, given the high uncertainty over their magnitude and timing.

Shocks to passenger numbers tend to be asymmetrically distributed. Due to the nature of the airline industry and the fixed capacity of airports, passenger demand can fall significantly faster and to a greater magnitude than it can grow. For example, at an extreme, while

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[18] IAA (2025), 'Irish State Plan for Aviation Safety 2023-2025: Volume II 2025 Update', p. 18.

[19] It is worth noting that deviations between forecast and outturn passengers can be a combination of these categories. For example, the COVID-19 pandemic represented a temporary shock to passenger numbers, which has now largely been reversed, but there are likely to be long-term impacts on demand for air travel (e.g. from business travellers) as a result.

[20] ICAO, 'Low Cost Carriers (LCCs)'.

[21] IAA (2010), 'Volcanic Ash Crisis and Recession Hit Air Traffic Figures in April', 13 May.

passenger numbers could fall to zero due to an exogenous shock in a given year (meaning a -100% difference between forecast and outturn passengers), the maximum capacity of terminals/runways and the availability of aircraft and crew mean that passenger numbers cannot be expected to exceed forecasts by 100%.

This asymmetry is a result of an efficient aviation sector. It would not be efficient for either airlines or airports to maintain significant extra capacity, with the costs of unused capacity borne by the smaller number of passengers who actually fly. Indeed, this is demonstrated by how airlines operate. Airlines typically fly with load factors above 70–80%, with many airlines at Dublin Airport having load factors significantly in excess of that.[22] Furthermore, airlines operate their aircraft with high utilisation, minimising turnaround times and maximising the number of flights an aircraft makes in a day.

As a slot co-ordinated airport, Dublin Airport is also constrained from being able to make up for lower passenger numbers on a given day, week or month caused by an exogenous shock by increasing ATMs in a following period. Thus, on an annual basis, short-term and lower-impact shocks often represent an absolute loss of passenger demand which is not recovered.[23]

For these reasons, the downside shocks that Dublin Airport faces are of a greater magnitude than any positive shocks, meaning that it is subject to asymmetric passenger demand risk.

1.5 Summary

Dublin Airport faces an asymmetric skew of traffic risks due to the presence of downside shocks which are not offset by corresponding upside shocks. The form of regulation applied to the airport compounds the financial impact of these passenger demand shocks.

Other airports are subject to the same passenger demand risks, and regulators have implemented mitigations to offset these. In 3.3A1 we review potential mechanisms to offset any asymmetric passenger demand risks faced by Dublin Airport.

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[22] Ryanair was the largest airline at Dublin Airport in 2024 and operated with a 94% load factor. See IAA 2026 Determination, p. 47; Ryanair Group (2024), 'Annual Report 2024', 26 June, p. 66.

[23] This can be compared with trend demand growing over time. Where passenger demand is growing over multiple years, Dublin Airport can expand its capital programme to accommodate more passengers. However, passengers wishing to move their flights by a matter of days due to cancellations resulting from exogenous shocks cannot be accommodated as easily.

We note that any mechanism applied to offset Dublin Airport's asymmetric risk should retain the airport's current incentives to attract and accommodate increased passenger numbers and the level of price certainty that users have during the regulatory period. Furthermore, any mitigation should not be unnecessarily complex to calibrate or implement, and should offer a good degree of protection to offset the asymmetric risk that the airport faces. Based on an assessment of different approaches (see Appendix A1), we conclude that implementing an asymmetric risk allowance, calibrated to offset the impact of the downside shocks that Dublin Airport faces, is the best approach.

Such an approach builds on that implemented by the CAA to offset asymmetric passenger demand shocks faced by Heathrow Airport. In the following section we explore the CAA's approach, assess the magnitude and frequency of shocks to which Dublin Airport is subject, and quantify the size of the required adjustment to its allowance to ensure that it is considered a fair bet.

2 Assessing asymmetric risk at Dublin Airport

2.1 Introduction

Given that Dublin Airport is subject to an asymmetric distribution of passenger demand risk, this section first outlines the CAA's approach to assessing the magnitude and frequency of downside shocks to passenger numbers, and then sets out our quantification of equivalent shocks for Dublin Airport.

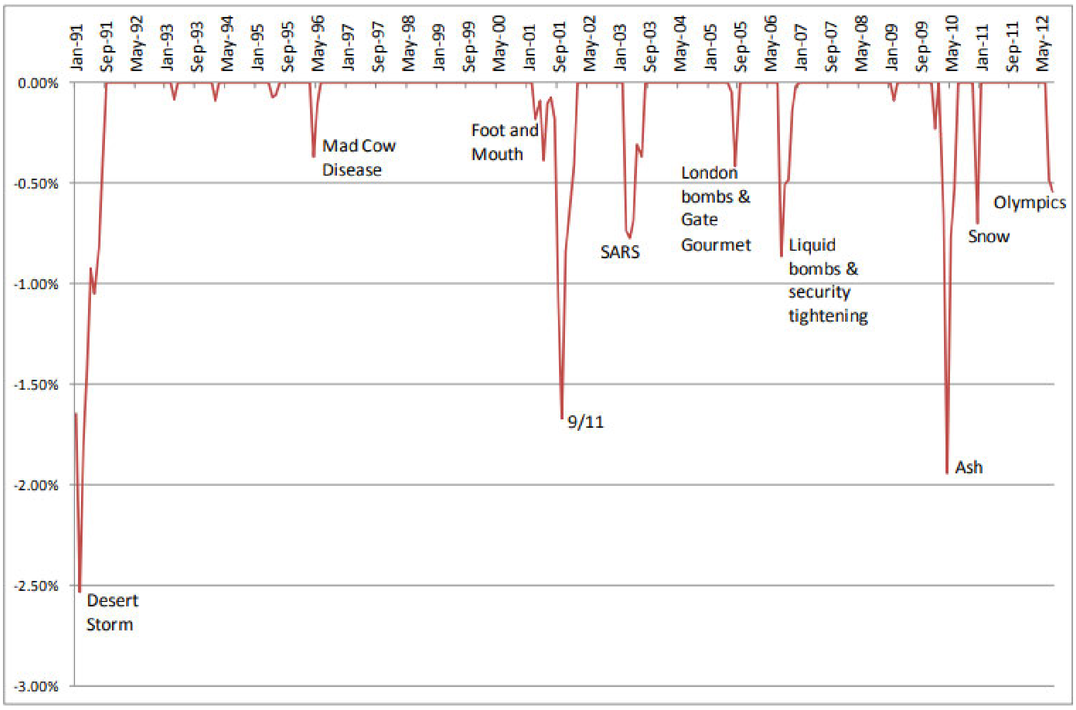
2.2 The CAA's approach to assessing asymmetric traffic risk at Heathrow Airport

The CAA has a two-step approach to offsetting asymmetric risk. First, it offsets transient shocks, which have a smaller impact but are more frequent, by adjusting the passenger forecast. Second, it offsets large-scale shocks, equivalent to the COVID-19 pandemic, by estimating an annual adjustment to the revenue allowance over the price control period.

Transient shocks offset using the 'shock factor'

As outlined in further detail in Appendix 1 (section 3.3A1.3), in 2014 the CAA investigated whether Heathrow Airport was subject to asymmetric shocks as part of the Q6 price review. This was instigated by initial analysis submitted by Heathrow Airport based on months when passenger numbers were lower than forecast. It was then determined whether these were caused by shocks that are exogenous, and whether the effect on passenger numbers was material. The data was originally analysed over the 1991–2012 period, as presented in Figure 2.1 below.

Figure 2.1 Shocks to Heathrow Airport passenger numbers



Source: CAA (2013), 'CAP1103: Economic regulation at Heathrow from April 2014: final proposals', October, p. 44.

The CAA agreed with Heathrow Airport's approach and estimated that the impact on passenger numbers was around -1.2% per year. The CAA operationalised this through an annual adjustment to its forecast of passenger numbers of 1.2%. As noted in section A1.3, this shock factor was reduced to a -0.87% adjustment in H7.[24]

It is worth noting that this shock factor adjustment pre-dates the COVID-19 pandemic—consistent with the purpose of this adjustment, to account for smaller, more frequent, non-pandemic shocks on an airport's financial performance.

Extreme shocks offset using an asymmetric risk allowance

The H7 price control was set over 2021–23 during COVID-19.[25] As part of this, the CAA determined that there should be an additional adjustment to offset the impact of these lower-frequency, higher-impact shocks. Unlike the adjustment outlined above, this adjustment was

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[24] CAA (2023), 'Economic Regulation of Heathrow Airport: H7 Final Decision Section 1: Regulatory Framework', March, p. 7.

[25] CAA (2023), 'H7 Initial Proposals, Final Proposals, Final Determination and price control appeals', April.

operationalised as a revenue allowance, rather than an adjustment to passenger forecasts. Calculating the revenue adjustment required two parameters:

- the probability of a pandemic event occurring in a given year;
- the expected financial impact, in a year in which it occurs.

The CAA used a central estimate of 3.5% (from a 2-5% range) for the likelihood of a pandemic occurring in any one year, based on the prevalence of pandemics occurring over the 20th and 21st centuries.[26] It was assumed that the profile of the passenger impact would be the same as that experienced during COVID-19; namely that passenger numbers would drop below forecast by 73% in the first year, by 76% in the second year, and by 32% in the third year.[27]

The CAA estimated the financial impact of a pandemic by first assessing the impact on passenger numbers, and then using passenger elasticities for different building blocks. To determine the annual expected underperformance, it estimated the financial impact of a pandemic occurring in each year of the price control, with knock-on effects over subsequent years. These impacts were then weighted by the probability of such shocks occurring to yield an annual expected underperformance. This figure was the total adjustment to Heathrow's revenue allowance to offset the asymmetric shock of pandemics.

2.3 Asymmetric traffic shocks at Dublin Airport

Building on the CAA's approach, we assess the extent to which Dublin Airport is subject to similar shocks.[28] We begin by analysing monthly outturn passenger data to identify such shocks. As passenger volumes are cyclical, with the highest volumes typically recorded in July and August, we correct for monthly seasonality. We compare these adjusted (deseasoned) passenger volumes with the underlying long-term passenger trend, in a manner similar to Heathrow Airport's comparison of passenger outturns with forecasts.[29]

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[26] Using evidence from the US Centers for Disease Control and Prevention, which estimated that there were three major pandemics with a death toll of over 1 million people each in the 20th century. See CAA (2022), 'Economic regulation of Heathrow Airport Limited: H7 Final Proposals Section 3: Financial issues and implementation', June, pp. 118–119.

[27] CAA (2022), 'Economic regulation of Heathrow Airport Limited: H7 Final Proposals Section 3: Financial issues and implementation', June, pp. 116.

[28] For details on the methodology, see Appendix A2.3.2.

[29] We deviate from the approach applied to Heathrow Airport as monthly passenger forecasts were not available. However, our approach does not conflate shocks with systematic deviations between forecast and outturn. Since assessing forecast accuracy is not our objective, using a data-driven long-term trend allows us to identify shocks more reliably.

Figure 2.2 below shows the result of this comparison, with subfigure (a) based on the available passenger data at Dublin Airport, from 2000 to 2025. This subfigure highlights the scale of the pandemic, which produced a sharp and unprecedented decline in passenger volumes. As this represents an extreme and infrequent shock, we assess it separately from more moderate shocks that occur more frequently.

As in the CAA's approach, we distinguish between:

- **transient shocks**, which occur more often at moderate severity;
- **extreme shocks**, which occur rarely but have a substantially larger impact.

We analyse each type of shock separately and develop adjustments tailored for each.

Subfigure (b) shows the same comparison, rescaled after excluding the COVID-19 pandemic period.[30] Negative deviations corresponding to potential transient shocks become more visible.

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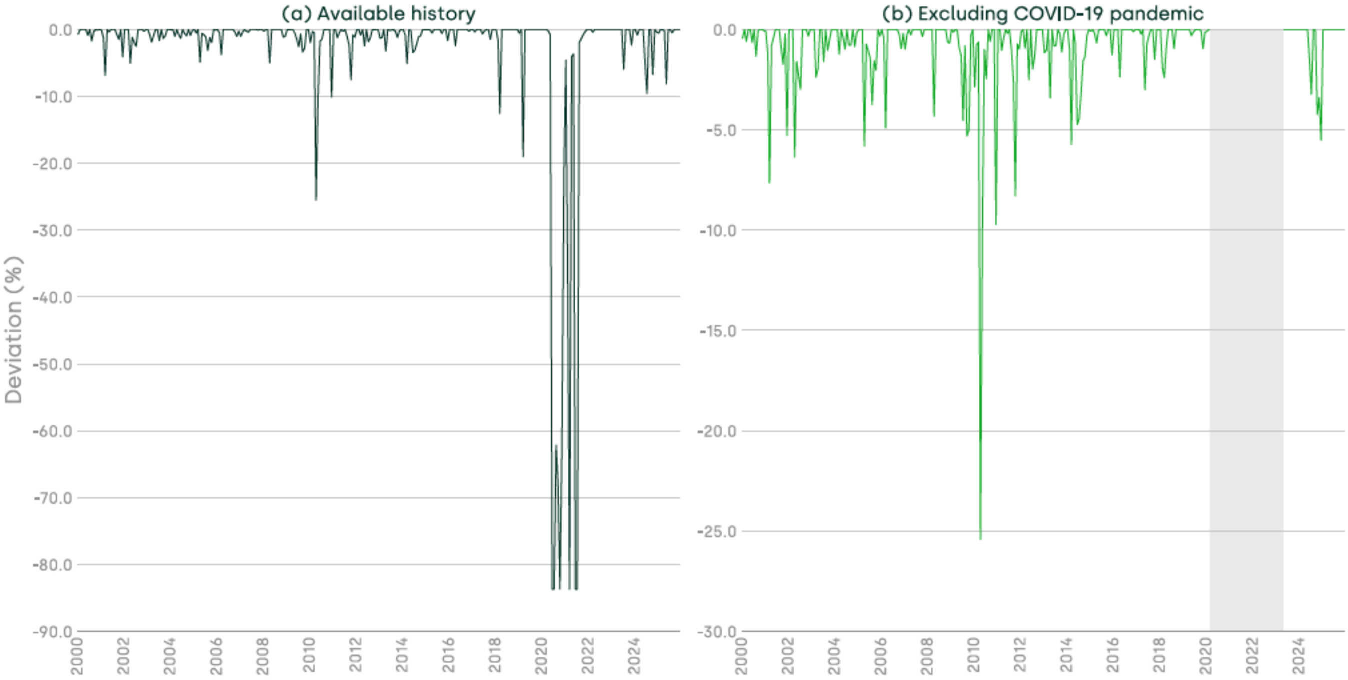
[30] We define the pandemic period as starting in March 2020, when the World Health Organization (WHO) declared COVID-19 a pandemic, and ending in April 2023, the last full month before the WHO declared the end of the pandemic. See World Health Organization (2026), 'Coronavirus disease (COVID-19) pandemic', accessed 18 February 2026.

Figure 2.2 Difference between actual and predicted monthly passenger numbers, 2000–25



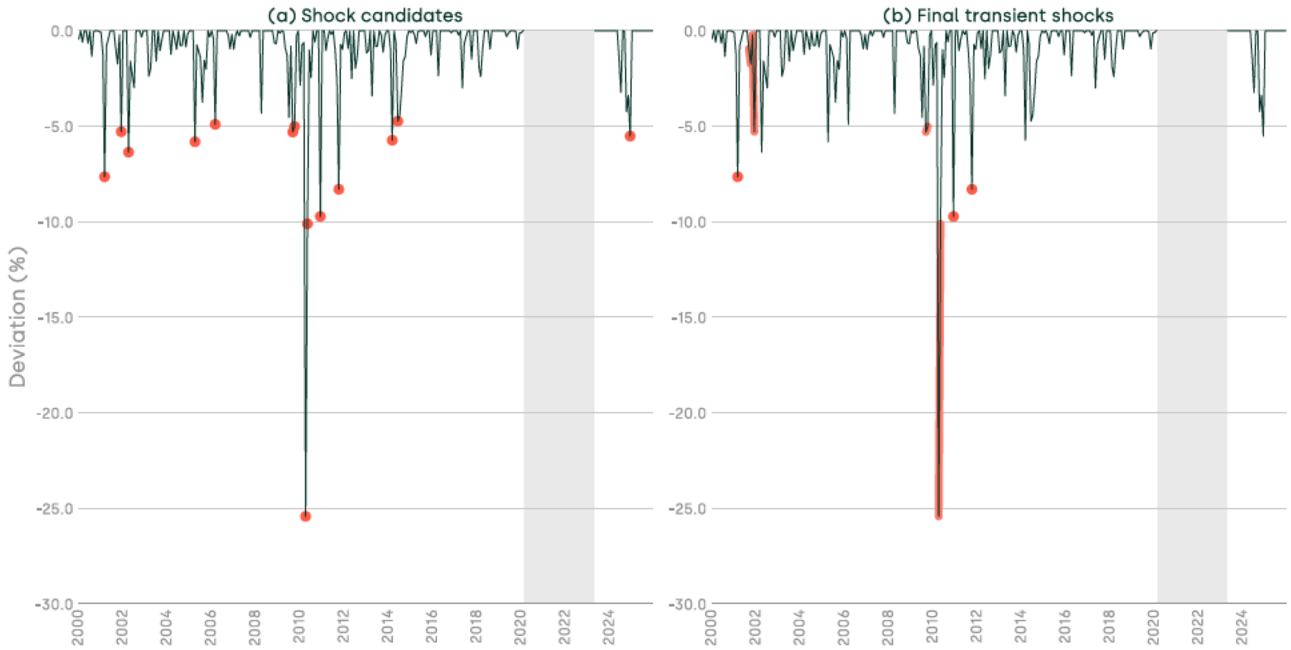
Note: These figures show the negative deviation of deseasoned monthly passenger volumes from the underlying long-term passenger trend. Subfigure (a) presents the history of available data. Due to the magnitude of the pandemic, the values in this figure have been winsorised at the lower second percentile (i.e. where values were beneath the second percentile, they were replaced by the second percentile). Subfigure (b) shows the results of the analysis excluding the COVID-19 pandemic (from March 2020 to April 2023, shaded in grey).
Source: Oxera analysis based on Dublin Airport's figures for monthly passenger numbers.

We proceed to systematically identify transient shocks from the data, excluding the pandemic period. In a first step, we identify months with unusually large negative deviations by selecting observations in the lower fifth percentile of the distribution. This yields an initial list of 14 transient shocks, shown by subfigure (a) of Figure 2.3 below.

To ensure that these deviations reflect true shocks, we shortlist the shocks identified to those with a clear exogenous (to Dublin Airport) operational rationale. We do this by researching each month and qualitatively identifying whether there was indeed a shock. Where an exogenous shock could not be identified, the observation is excluded from subsequent analysis. This gives a shortlist of six transient shocks, shown in subfigure (b) of Figure 2.3:

1. March 2001: Airbus accident and labour dispute;[31]
2. December 2001: related to 9/11 terrorist attacks. Similar to the analysis underpinning the CAA's adjustment for Heathrow Airport, we consider this shock to begin in September 2001 and end in December 2001;[32]
3. September and October 2009: related to the GFC;
4. April and May 2010: related to the Icelandic ash cloud;
5. December 2010: extreme weather due to snow;
6. October 2011: extreme weather.

Figure 2.3 Identifying transient shocks



Note: Subfigure (a) shows the quantitatively derived set of months during which there had potentially been a transient shock (red points). Subfigure (b) shows the final list of transient shock periods after qualitative verification (red regions). The region shaded in grey reflects the COVID-19 pandemic and is excluded from the analysis.
Source: Oxera analysis based on Dublin Airport's figures for monthly passenger numbers.

In addition to identifying the above transient shocks, we estimate the frequency and severity of extreme shocks. The only shock of this magnitude that has occurred during the 2000–25 period is the COVID-19 pandemic. We assume the same severity and multi-year profile of this

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[31] We identified two exogenous shocks occurring in this month. As our analysis uses monthly data, it is not possible to isolate the impact of each shock separately. We therefore consider this as one shock.
[32] CAA (2024), 'Economic regulation of Heathrow airport: H7 final issues', CAP2980, Appendix C, p. 65.

shock in our modelling: as such, we model a 70% drop in passenger numbers in the first year of the shock, followed by a two-year recovery. We note that this is lower than that observed for Heathrow.[33]

We cannot estimate the frequency of these shocks using the same dataset as for transient shocks, as there is only one extreme event within our sample. We instead use the same source as the CAA, the US Government's Centres for Disease Control and Prevention, which estimates that pandemic-like shocks occur every 20 to 50 years.[34] We take a conservative estimate from this range, assuming that these events occur once every 50 years, with a 2% probability in any year.

We quantify separate adjustments for the two distinct types of shocks based on their frequency and severity, as follows. Further detail of how these figures are estimated is included in Appendix A2.3.2.

- Transient shocks are estimated to occur with a probability of 26.3% per year. In years when they occur, they are expected to reduce passenger numbers by around 1.1% relative to a counterfactual without transient shocks.
- Extreme shocks are estimated to occur with a probability of 2% per year. When they occur, they are expected to lead to a drop in passenger numbers of 70% in the year in which they occur followed by a two-year recovery period during which passenger numbers gradually recover to baseline as conditions stabilise (i.e. passenger numbers take three years to fully recover).

These results indicate the extent to which Dublin Airport is exposed to asymmetric traffic shocks, with both transient and extreme events influencing passenger volumes. By quantifying the frequency and severity of each type of shock separately, we provide a basis for incorporating these risks into forward-looking assessments. This ensures that the price control appropriately reflects both less severe but more frequent shocks, and the possibility of rare but severe disruptions.

2.4 The expected impact of asymmetric risk on Dublin Airport

Based on the likelihood and severity of the shocks estimated above, we assess their financial impact and the corresponding adjustment that

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[33] This is based on the observed drop of 74.4% at Dublin Airport using the same methodology as for transient shocks, but without excluding the COVID-19 period (compare with Figure 2.2(a)). We round this figure down to 70% to take a conservative approach. See CAA (2022), 'Economic regulation of Heathrow Airport Limited: H7 Final Proposals Section 3: Financial issues and implementation', June, p. 116.

[34] CAA (2022), 'Economic regulation of Heathrow Airport Limited: H7 Final Proposals Section 3: Financial issues and implementation', June, p. 119.

would be required to Dublin Airport's revenue allowance to ensure that it remains a fair bet in the presence of these asymmetric risks.

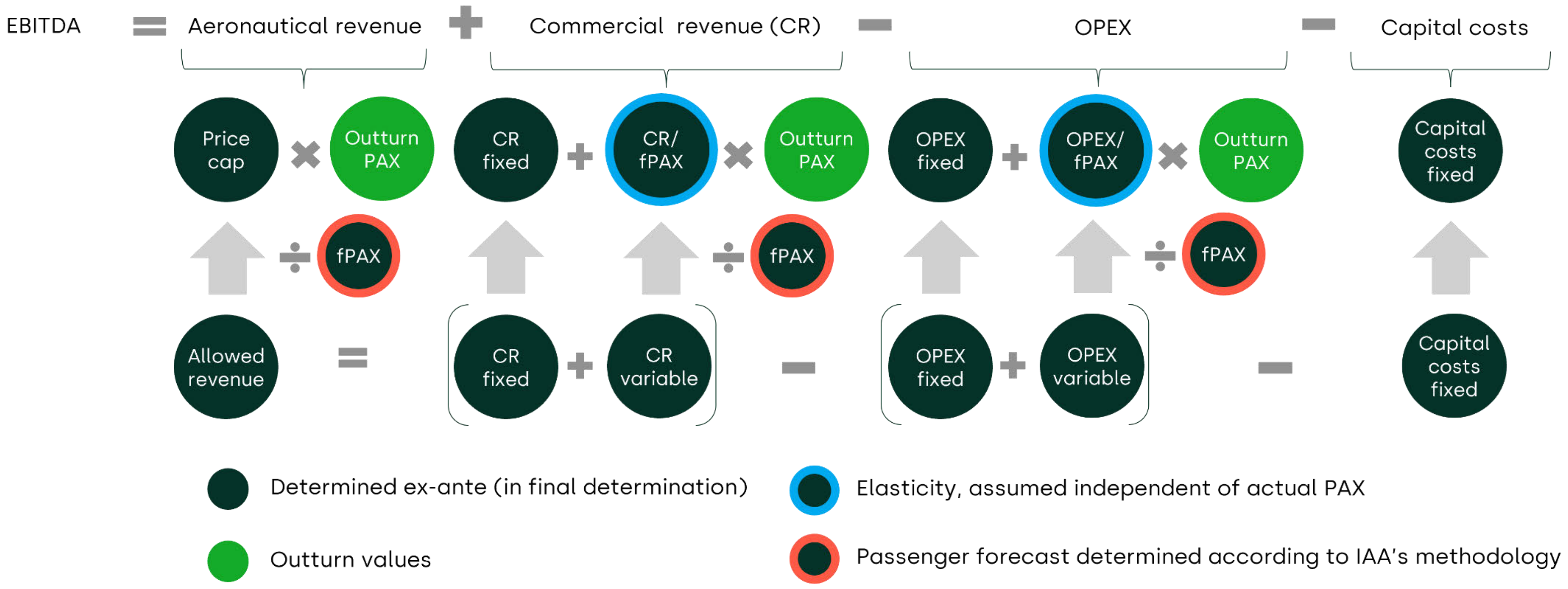
We model asymmetric risk using a Monte Carlo simulation, which allows us to quantify how shocks of different size and timing affect Dublin Airport's EBITDA. Such a simulation generates a large number of possible future paths for passenger demand over a five-year regulatory period, applying random shocks in each iteration according to the calibrated frequencies and severities. We set out the approach at a high level below, but further details on the modelling approach and assumptions are provided in Appendix A2.

2.4.1 Impact of shocks on expected passenger performance

Under the building-blocks framework, Dublin Airport's price cap is set such that, on a per-passenger basis (set by reference to a passenger forecast), allowed aeronautical revenues cover OPEX and capital costs, after deducting commercial revenue.

below illustrates how the building blocks of the price control affect our modelling of Dublin Airport's EBITDA under various passenger outturn scenarios.

Figure 2.4 Building-blocks model used in simulation



Note: This figure shows the regulatory model and how EBITDA is modelled in the Monte Carlo simulation. fPAX refers to forecast passengers.

Source: Oxera, based on IAA 2026 Determination, pp. 26–27.

Much of Dublin Airport's price control is directly linked to passenger numbers, as the key building blocks vary with traffic. When outturn passengers deviate from the passenger forecast used to set the price cap, this creates financial out- or underperformance within the year.

Consistent with the building-blocks model, each run of our Monte Carlo simulation applies the annual price-cap calculation based on projected commercial revenues, OPEX and capital costs, divided by the forecast number of passengers. For each year of the simulated regulatory period, financial performance is calculated by keeping the building blocks at their initial values (i.e. fixing them ex ante) and adjusting only those elements that vary with the actual number of passengers. This logic is illustrated in Figure 2.4; only outturn passengers (depicted by the green bubble) are varied in the simulation. This isolates the effect of variation in outturn passengers on revenues and costs.[35] For details on how the parameters of the building-blocks model are calibrated, see Appendix A2.2.

The IAA sets a price cap by determining allowed revenues and dividing these by a forecast of passenger numbers ('fPAX' in Figure 2.4). For the purposes of our analysis, we use Dublin Airport's forecast of passenger numbers for the 2027–31 regulatory period. This forecast is based on a blended model, using forecasts and cost drivers from a variety of sources, and we use it to remain consistent with Dublin Airport's other price control assumptions.

Passenger numbers can diverge from forecasts for a number of reasons, and these variations are an important driver of financial outcomes. For the purposes of the Monte Carlo simulations, we distinguish between three components: annual (normally distributed) fluctuations in economic growth around the forecast; lower-frequency, high-impact (transient) shocks; and higher-frequency, lower-impact (extreme) shocks.[36] The first reflects how passenger numbers change from year to year in normal conditions, while the second and third capture the effects of unexpected events ranging from transient to extreme shocks.

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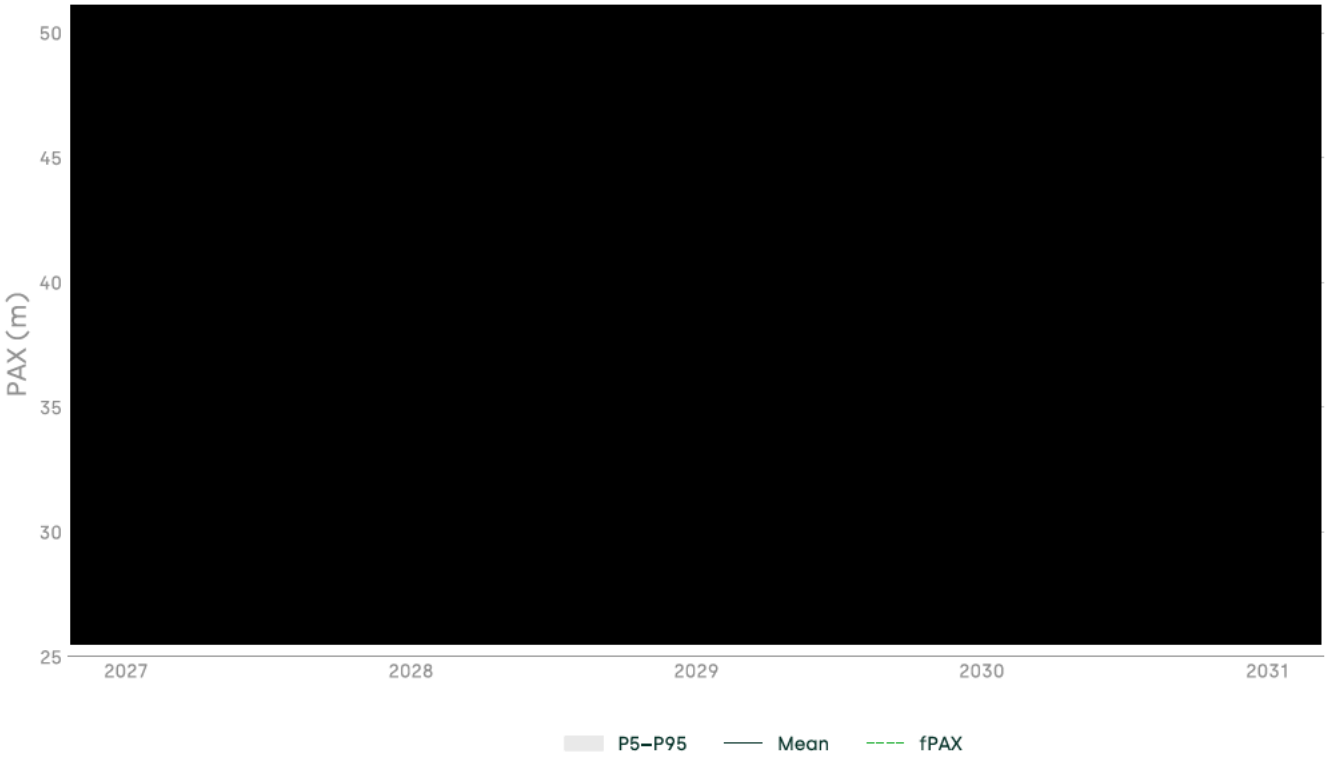
[35] This means that out- or underperformance due to differences in commercial revenues, OPEX or capital costs are not included in the simulation. Any out- or underperformance is driven by passenger numbers.

[36] To estimate this normally distributed variance we use historical variance in Irish GDP growth over time. Passenger growth is based on the simulated GDP growth rate, multiplied by the IAA's elasticity of GDP growth to passenger growth, estimated at 1.03. While the underlying passenger forecast we use is not the IAA's Irish GDP-based forecast, we nonetheless apply this approach to capture variation in outturn passengers from forecast driven by economic conditions.

In some simulations, there are no shocks, and there could be strong passenger demand growth due to above-average economic growth. In others, economic growth may fall short of the forecast, leading passenger numbers to underperform, even in the absence of shocks. Finally, in some simulations there are shocks, meaning that passenger numbers fall significantly.

The range and average passenger outcomes across simulations are shown in Figure 2.5 below. As both the baseline demand path and the IAA's fPAX are based on the same input, the expected realised demand path should align with the fPAX (shown by the dashed green line). Due to the presence of shocks, however, the realised demand path (the solid line) is shifted down relative to the fPAX, reflecting the asymmetric impact of these shocks on passenger numbers.

Figure 2.5 Simulated traffic performance of Dublin Airport, 2027–31



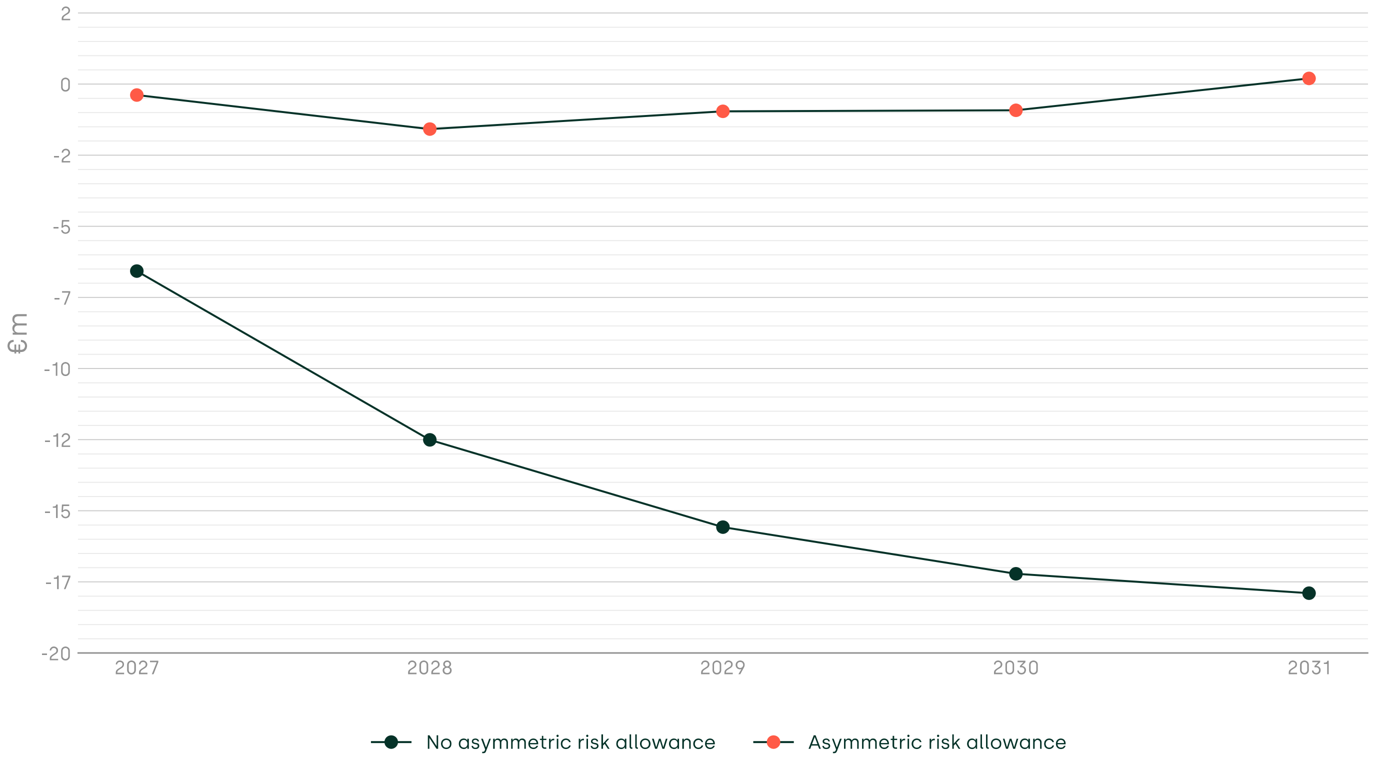
[redacted]

Note: Comparison of forecast passengers with the distribution of simulated outturn passengers. The shaded region shows the range between the 5th and the 95th percentiles (P5–P95).
Source: Oxera analysis.

2.4.2 Calculating an asymmetric risk allowance

The previous section demonstrated that shocks lead to a systematic underperformance of passenger numbers relative to the forecast. In expectation, this implies that passenger outcomes are skewed downwards: while upside deviations can occur in some simulations, the distribution is dominated by the possibility of shocks that reduce passenger volumes. When translated into financial terms, this asymmetry means that the airport is more likely to make losses than gains, as revenue under a price cap is directly linked to passenger throughput. In Figure 2.6, the line with dark markers demonstrates that EBITDA is expected to be negative in the presence of shocks. This motivates the need to consider an adjustment that compensates for the asymmetric nature of these risks.

Figure 2.6 Expected EBITDA in the presence of shocks



Note: The line with dark markers shows the mean EBITDA observed in each year of the regulatory period across all simulations without an asymmetric risk allowance. The line with red markers presents the mean EBITDA with an asymmetric risk allowance.
Source: Oxera analysis.

To estimate an asymmetric risk allowance that enables Dublin Airport's price control settlement to remain a fair bet, we adopt the same frequency–severity framework used by the CAA, but extend it to account for both transient and severe shocks (whereas the CAA dealt with transient shocks through an adjustment to the passenger forecast rather than the revenue allowance). In simple terms, this involves assessing how much passenger traffic would be lost if a shock occurred, how often such shocks are expected to happen, and the associated effect on EBITDA. We estimate the financial impact of each type of shock by comparing simulations in which there are no shocks with simulations in which a shock occurs. Bringing together the size of the loss and the likelihood of a shock then provides an estimate of the expected loss due to asymmetric risk, which forms the basis for an allowance.

Table 2.1 shows the allowances calculated for each type of shock using this approach. The two components sum to the total **asymmetric risk allowance**, which is added to modelled allowed revenue and then divided by modelled fPAX to produce an updated price cap. When applying this new price cap, Dublin Airport's expected EBITDA is brought close to a fair bet, as shown by the line with red markers in Table 2.1.

Table 2.1 Dublin Airport's asymmetric risk allowance

	Units	Row	2027	2028	2029	2030	2031
Allowance for transient shocks	€m	[a]	0.9	1.0	1.1	1.2	1.4
Allowance for extreme shocks	€m	[b]	5.4	10.3	14.0	15.6	17.3
Total asymmetric risk allowance (ARA)	**€m**	**[c]=[a]+[b]**	**6.3**	**11.3**	**15.1**	**16.9**	**18.7**
Allowed revenue excluding ARA	€m	[d]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Allowed revenue including ARA	**€m**	**[e]=[c]+[d]**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
fPAX	m	[f]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Price cap excluding ARA	**€**	[g]=[d]/[f]	10.9	11.6	12.5	13.6	14.7
Price cap including ARA	**€**	[h]=[e]/[f]	11.1	11.9	12.9	14.0	15.1

Note: Our simulation aims to replicate Dublin Airport's price-cap model faithfully while remaining internally consistent under uncertainty. Passenger numbers (in expectation) and capital costs are aligned with the airport's inputs. For commercial revenues and OPEX, we use a regression-based representation calibrated to the airport's five-year forecasts so that, when passenger volumes follow the forecast, performance is on target in expectation (see Appendix 3.3A2.2).
This functional form is required for simulation consistency, i.e. to allow outcomes to co-move with passenger variability in a transparent, tractable way. As such, it inevitably smooths some item-level timing and step-changes in Dublin Airport's detailed build-up. As a result, our ex-ante price cap matches Dublin Airport's in level and design, but may differ slightly year by year solely due to this necessary modelling choice.
Source: Oxera.

The results show that the allowance required to keep Dublin Airport a fair bet in the presence of extreme shocks is higher than that for transient shocks. For extreme shocks, the annual allowance is lowest in the first year of the regulatory period. This reflects the fact that, given that passenger forecasts will be set in 2026 (and therefore whether there is a pandemic would be known), an extreme shock can only arise (and thus start to have an impact) in 2027, and has a two-year recovery period. For instance, if a pandemic begins in 2027, the recovery would affect 2028 and 2029, but there would not be a recovery period within 2027 itself. By contrast, 2028 and 2029 can feature both the onset of a new pandemic and recovery from a prior one. For further details on the construction of the asymmetric risk allowance, see Appendix A3.2.

It is worth noting that, were this adjustment to be applied to Dublin Airport's price cap over the 2027–31 period, it would need to be calibrated with the final determination as proposed by the IAA. The results and modelling shown here depend on per-passenger elasticities for OPEX and commercial revenue, among other parameters, that are aligned with Dublin Airport's current regulatory proposition. These would need to be updated to reflect any changes made as part of the final determination.

Finally, any adjustment to allowances could be reprofiled so that adjustments are the same in each year, or to smooth the adjustments over time. This could reduce the impact of bill fluctuations on both airlines and Dublin Airport.

3 Impact of capacity constraints on Dublin Airport's asymmetric risk

3.1 Introduction

Since 2007 Dublin Airport has been subject to a 32 million passengers per annum (mppa) cap.[37] While the Irish Government has recently announced its decision to remove this cap,[38] the timeframe for doing so is not yet clear. Moreover, at this point in time, *for the next price control period*, it not yet clear whether the cap might be tightened or removed entirely. Consistent with the 'unconstrained blended' passenger forecast scenario in Dublin's Regulatory Proposition, we have assumed that the cap is removed entirely in estimating the required adjustment to the revenue allowance in section 2.

In this section, we address the changes that would be required to the asymmetric risk adjustment in the event that Dublin Airport continues to be subject to a cap on passenger numbers. In this section, we model a 40mppa cap, consistent with the 'constrained 40mn IA capped' passenger forecast scenario in Dublin's Regulatory Proposition. Were a cap to continue, but at a different level, this would necessitate a different level of asymmetric risk adjustment.

3.2 Effect of capacity constraints on Dublin Airport's asymmetric risk distribution

A binding passenger cap does not increase Dublin Airport's exposure to asymmetric risk from shocks, but it does introduce a structural asymmetry into the distribution of passenger outcomes. Risks that would be theoretically symmetric in the absence of a constraint—such as annual GDP variance—become asymmetric if the passenger forecast approaches a constraint. This is because, while traffic can deviate below the forecast level (for example if economic conditions are worse than forecast), the cap limits the degree of outperformance that can be achieved when passenger outturns exceed the forecast (for example, if economic conditions are better than forecast). This one-way constraint means that average passenger numbers will tend to underperform the forecast over time.

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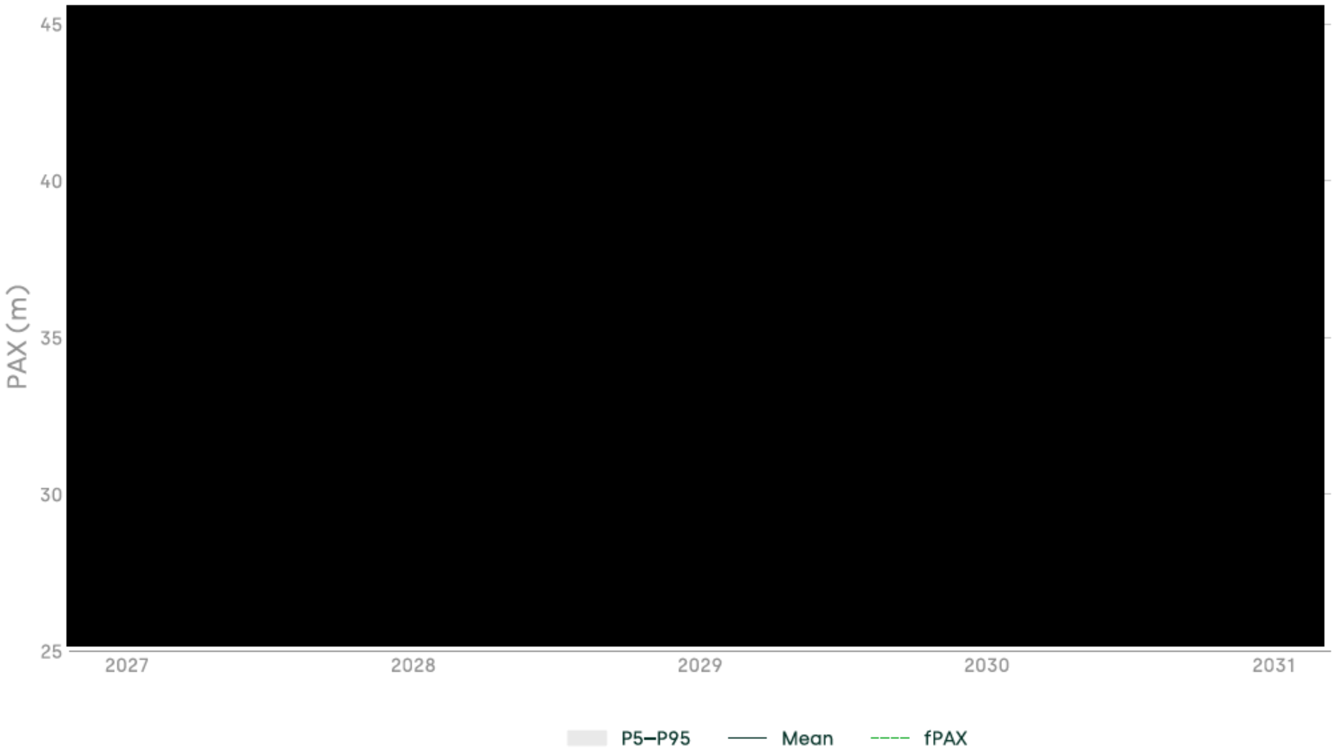
[37] IAA 2026 Determination, para. 5.28; *The Irish Times* (2026), 'Dublin Airport passenger cap set to be scrapped', 10 February.

[38] Dublin Airport (2026), 'daa welcomes Government decision to remove the passenger cap at Dublin Airport', 10 February, https://www.dublinairport.com/latest-news/2026/02/10/daa-welcomes-government-decision-to-remove-the-passenger-cap-at-dublin-airport (accessed 25 February 2026).

In the presence of a binding constraint or cap, Dublin Airport therefore faces two distinct sources of asymmetric risk: the transient and extreme shocks outlined in section 2; plus the impact of the cap in constraining upside potential. Figure 3.1 below shows the result of extending the simulation modelling described in section 2 to capture the combined impact of both these sources of asymmetric risk on passenger numbers, assuming a 40mppa cap. The dashed green line shows the fPAX, based on the same forecasting methodology employed in section 2, but with a 40mppa cap. The dark line shows the mean, or central expectation, of outturn passenger numbers, while the grey shaded area shows the range of outcomes from our simulation modelling between the 5th and 95th percentiles.

Figure 3.1 Simulated traffic performance of Dublin Airport with a 40mppa passenger cap, 2027–31


[redacted]

Note: Comparison of forecast passengers with the distribution of simulated outturn passengers for a hypothetical 40mppa cap. The shaded region shows the range between the 5th and the 95th percentiles (P5–P95).
Source: Oxera analysis.

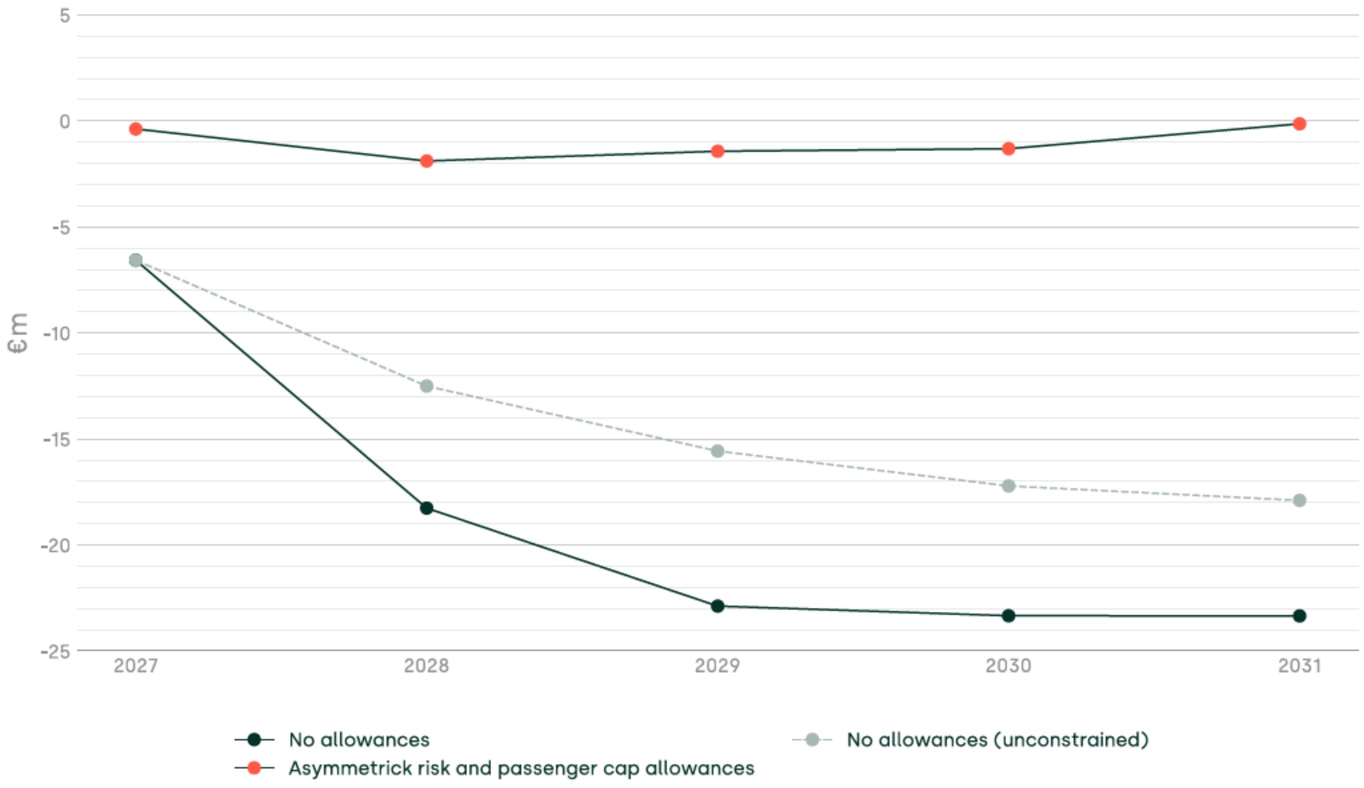
3.3 Estimating an asymmetric risk adjustment for Dublin Airport with capacity constraints

We employ an approach similar to that set out in section 2 to estimate the revenue allowance adjustment required to offset the asymmetric risk faced by Dublin Airport. Altering the approach to account for the presence of a capacity constraint involves two changes:

- fPAX modelled according to the IAA's methodology is capped at 40mppa from 2028 onwards. As allowed revenues are divided by a lower passenger figure, this results in a higher price cap. Outturn aeronautical revenues are calculated according to this constrained price cap;
- within the simulation itself, whenever passenger demand exceeds the passenger cap, outturn passenger numbers are restricted to the capped level.

As explained in the previous section, the passenger cap removes any passenger outperformance. shows that this is reflected in annual EBITDA that is more negative (shown by the dark line with dark markers) than in the absence of a capacity constraint (shown by the dashed dark line). While EBITDA (without an asymmetric risk adjustment) ranged from -€6m to -€18m without a capacity constraint, it now ranges from -€6m to -€23m.

Figure 3.2 Expected EBITDA in the presence of shocks (with capacity constraints)



Note: The solid dark line with dark markers shows the mean constrained EBITDA observed in each year of the regulatory period across all simulations without an asymmetric risk allowance. The dashed faint line shows the equivalent mean unconstrained EBITDA. The dark line with red markers presents the mean EBITDA with asymmetric risk and passenger-cap allowances.
Source: Oxera analysis.

Using the same frequency–severity approach, the required adjustments to Dublin Airport's allowances in the presence of capacity constraints are outlined in Table 3.1 below. The allowance profiles follow those of the unconstrained case (compare with Table 2.1).

The difference between the unconstrained and constrained price caps arises mechanically from the treatment of passenger numbers. In the unconstrained scenario, passenger volumes grow with the traffic forecast, leading to a steadily rising denominator in the price-cap calculation. In contrast, in the passenger-cap scenario, upside traffic growth is prevented once volumes approach 40mppa. As a result, the same (or slightly higher) level of allowed revenues is divided by a smaller passenger base, producing a higher price cap per passenger. This wedge widens over the regulatory period as the cap binds more tightly, and it becomes more pronounced once allowances are applied, both of which are spread over a smaller number of passengers in the constrained case.

Table 3.1 Dublin Airport's asymmetric risk and passenger cap allowances (with capacity constraints)

	Units	Row	2027	2028	2029	2030	2031
Allowance for transient shocks	€m	[a]	0.9	0.6	0.5	0.5	0.4
Allowance for extreme shocks	€m	[b]	5.4	10.0	13.4	14.7	16.1
Passenger cap allowance	€m	[c]	0.0	6.6	8.8	8.0	7.7
Total allowance	**€m**	**[d]=[a]+[b]+[c]**	**6.3**	**17.2**	**22.7**	**23.2**	**24.3**
Allowed revenue excluding allowances	€m	[e]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Allowed revenue including allowances	€m	[f]=[d]+[e]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
fPAX	m	[g]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Price cap excluding allowances	€	[h]=[e]/[g]	10.9	11.6	12.6	13.9	15.3
Price cap including allowances	€	[h]=[f]/[g]	11.1	12.1	13.2	14.5	15.9

Source: Oxera analysis.

A1 Regulatory adjustments to account for asymmetric risk

A1.1 Introduction

Other airports and economically regulated firms face asymmetric distributions of risk. This section explores approaches that regulators have employed to address this risk to ensure that regulated entities are financeable.

A1.2 An asymmetric risk allowance

An asymmetric risk allowance involves adjusting a company's overall revenue allowance, in absolute terms. The CAA took this approach to adjust Heathrow Airport's allowances during the H7 price control review. It introduced this allowance on the grounds that, as a result of large-scale shocks like COVID-19, airports face extreme downside risks to revenues, and thus profitability, which would not be matched by corresponding upside potential. The CAA determined that the best way to mitigate this risk asymmetry was to grant Heathrow Airport an allowance of up to £25m a year, reflecting the expected value of losses from extreme events that would disrupt passenger numbers and revenues.[39]

This allowance was based on an assumption that these events would occur, on average, every 30 years, and that the disruption to Heathrow Airport's costs and revenues would be of a similar magnitude to those experienced during the COVID-19 pandemic.[40]

Were this approach to be applied at Dublin Airport, the airport would retain the same incentives to increase passenger numbers as it currently has. Furthermore, such an approach would ensure price-cap certainty for passengers and airlines, as it would not affect the price cap within period (i.e. the price would not increase if passenger numbers were below forecast). Such an approach is therefore consistent with the wider set-up and principles of Dublin Airport's current regulatory model.

A1.3 Adjustment to passenger forecasts

Another approach is to directly adjust the passenger forecast to account for any potential downside skew. This would mean that Dublin

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[39] CAA (2023), 'Economic regulation of Heathrow Airport Limited: H7 Final Decision Section 3: Financial issues and implementation', p. 65.
[40] CAA (2022), 'Economic regulation of Heathrow Airport Limited: H7 Final Proposals Section 3: Financial issues and implementation', pp. 111–112.

Airport would be expected to slightly outperform the passenger forecast in most years, with that financial outperformance offsetting the financial underperformance that results from shocks in other years in terms of EBITDA.

As with the above approach, the CAA has applied a similar adjustment to Heathrow Airport since 2014, referred to as the 'shock factor'. The CAA found that Heathrow had been subject to a number of negative shocks that were not compensated for by upside or positive shocks to passenger demand.[41] The adjustment to passenger forecasts made at the final proposal stage of the Q6 price control was -1.2%.[42] At the H7 price control review, this adjustment was estimated at -0.87%.[43]

Similar to applying a revenue adjustment, this approach does not undermine an airport's incentives to attract passengers, and does not reduce price certainty for airlines and passengers. Additionally, it targets the root cause of the risk, and thus is likely to be effective at mitigating it, assuming that the risk is calibrated effectively. Thus, as with the approach outlined above, such an adjustment could be an appropriate mechanism to offset potential asymmetric risk at Dublin Airport.

A1.4 Other potential adjustments

In addition to these options, regulators have applied other mechanisms to mitigate risks by sharing them between the regulated entity and users. Examples include:

- TRS mechanisms applied at a number of airports, including airports across Italy and Aéroports de Paris;[44]
- TRS mechanisms for European Air Navigation Service Providers.[45]

These mechanisms allocate risk between users and the regulated company, and thus the regulated company is to some extent shielded from the downside risk, making the distribution of risks more symmetric. However, there are two drawbacks of this approach. First, these

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[41] CAA (2013), 'Economic regulation at Heathrow from April 2014: final proposals', October, p. 44.
[42] CAA (2021), 'Economic regulation of Heathrow Airport Limited: H7 Initial Proposals Section 2: Financial issues', October, p. 24.
[43] CAA (2023), 'Economic Regulation of Heathrow Airport: H7 Final Decision Section 1: Regulatory Framework', March, p. 7.
[44] Autorita di regolazione dei Trasporti (2023), 'Annex "A" to Decision No 38/2023 of 9 March 2023', 9 March, pp. 52–53. Aéroports de Paris (2010), 'Economic Regulation Agreement (ERA) between the State and Aeroports de Paris 2011-2015', 26 July, pp. 15–16.
[45] European Commission (2019), 'Commission Implementing Regulation (EU) 2019/317 of 11 February 2019 laying down a performance and charging scheme in the single European sky and repealing Implementing Regulations (EU) No 390/2013 and (EU) No 391/2013', 25 February, Art. 27.

mechanisms undermine, often at the extremes due to deadbands, the incentives of the regulated company to mitigate negative shocks or to support passenger growth, with its benefits for airlines and passengers, when demand is growing. Second, the application of a TRS mechanism would reduce only a certain amount of the traffic risk faced by an airport. For example, Heathrow's TRS mechanism includes a band of deviations 10% above and below the forecast, where only 50% of the volume risk is shared with users. While such deadbands are necessary to reduce the price-cap volatility created by such a mechanism, it means that the risk is not entirely removed.

TRS mechanisms are subject to a trade-off between minimising the level of risk that the airport is exposed to and the incentives it faces to grow passenger numbers and accommodate them. This trade-off does not exist for the asymmetric risk allowance or passenger forecast adjustment options, where, for the marginal passenger, an airport would face the same incentives to grow passenger numbers as it would with no adjustment.

Finally, another approach is to account for a perceived downside skew of risks by increasing the allowed weighted average cost of capital (WACC).[46] For Dublin Airport, adjustments to the WACC can result in different monetary impacts within a period, depending on the level of capital expenditure (CAPEX) undertaken. The CAA rejected this form of adjustment for similar reasons—noting that adjusting the cost of capital for Heathrow Airport would interfere with other regulatory mechanisms, causing unnecessary complexity.[47] While this might be appropriate for other types of risk, if it is possible to accurately quantify the expected passenger underperformance, then it may be more appropriate to make the allowance as a specific adjustment to the price cap or the passenger forecast.

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[46] Competition and Markets Authority (2020), 'Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations: Provisional findings', 29 September, p. 672, para.9.671.

[47] CAA (2021), 'Economic regulation of Heathrow Airport Limited: H7 Initial Proposals Section 2: Financial issues', October, p. 27.

A2 Modelling asymmetric risk at Dublin Airport

A2.1 Introduction

We model asymmetric risk using a Monte Carlo simulation, which allows us to quantify how shocks of different sizes and timings affect Dublin Airport's EBITDA. Such a simulation generates a large number of possible future paths for passenger demand, applying random shocks in each iteration.

The following sections set out our modelling approach in detail, including the assumptions used.

A2.2 Calibrating a simplified building-blocks model

Dublin Airport's regulatory settlement for the upcoming price control period has not yet been finalised. As such, it is not possible to know precisely how the IAA will project the underlying parameters. In this section, we set out the approach we use to generate realistic assumptions for the analysis. Our aim is to reflect what the IAA might do, while emphasising that these assumptions are illustrative rather than determinative. As such, the asymmetric risk adjustment would ultimately need to be re-calibrated using the final price control parameters as determined by the IAA.

A2.2.1 Estimating forecast passengers

The IAA sets a price cap on aeronautical revenues by determining allowed revenues and dividing these by a forecast of passenger numbers. For the purposes of our analysis, we use Dublin Airport's forecast of passenger numbers. This forecast is based on a blended model, using forecasts and cost drivers from a variety of sources and we use it to remain consistent with Dublin Airport's other price control assumptions.

To calculate the price cap from 2027, we therefore adopt Dublin Airport's forecast. The resulting passenger forecast over the regulatory period is shown in Table A2.1 Forecast passengers below, together with the implied GDP growth rate based on an elasticity of 1.03.

Table A2.1 Forecast passengers

	Units	Row	2026	2027	2028	2029	2030	2031
FPAX	m	[a]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Implied PAX growth	%	$[b]=([b]_t/[b]_{t-1})-1$	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Implied blended growth rate	%	[c]=[b]/1.03	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Source: Oxera analysis based on data from Dublin Airport.

A2.2.2 Commercial revenues

Commercial revenue refers to the non-aeronautical income generated by Dublin Airport, including from retail, car parking, property rents, advertising, and other ancillary services. Each category is driven by different factors (e.g. passenger growth, GDP growth) and responds to changes in these factors according to an elasticity.

We convert Dublin Airport's forecast of commercial revenues from its Regulatory Proposition into December 2025 prices using the consumer price index (CPI) published by the Irish Central Statistics Office. To understand how commercial revenues change when passenger numbers change, we estimate a simple relationship between the two using Dublin Airport's own forecasts. This relationship shows how much commercial revenue tends to increase/decrease when passenger numbers rise/decline.

In our simulation, commercial revenues then move in line with the simulated passenger numbers. They also vary with the strength of the estimated relationship (i.e. how sensitive revenues are to changes in passenger numbers) and the baseline level of commercial revenue. This allows the model to reflect the way commercial income naturally rises or falls as passenger volumes change.

A2.2.3 OPEX

OPEX covers the day-to-day costs of running Dublin Airport, including staff costs, utilities, maintenance, security, cleaning, and other operational support functions. These cost categories have different drivers and exhibit varying degrees of sensitivity to passenger numbers, with some costs largely fixed in the short term and others changing according to passengers.

We use Dublin Airport's forecast of OPEX and rebase these figures to December 2025 prices. To model how OPEX changes with passenger numbers, we apply the same approach as for commercial revenues: we estimate a simple relationship between OPEX and passenger numbers using Dublin Airport's own forecasts. In the simulation, OPEX then varies with the simulated passenger outcome and the estimated sensitivity of costs to passenger volumes.

A2.2.4 Capital costs

Capital costs represent the return and depreciation associated with the regulated asset base. These costs are determined by long-lived assets and financing decisions, and are therefore largely insensitive to short-term fluctuations in passenger volumes. For this reason, we treat capital costs as fixed throughout the simulated regulatory period.

For our simulation, we have used recent capital-cost projections (without triggers) provided by Dublin Airport as part of its Regulatory Proposition. All values are rebased to December 2025 prices.

A2.2.5 Price cap

After determining the building blocks in each year of the regulatory period, as described above, allowed aeronautical revenues are calculated and divided by forecast passengers to obtain a price cap.

If there are no capacity constraints, forecast passengers are unconstrained by a passenger cap, yielding an unconstrained price cap (see Table A2.2 below). This unconstrained price cap is used in the analysis described in section 2.4.22.4.2. If instead the IAA were to apply a passenger cap of 40mppa (as analysed in section 33.3), this would result in a constrained price cap (see Table A2.3 below).

Table A2.2 Unconstrained price cap

	Units	Row	2027	2028	2029	2030	2031
fPAX	m	[a]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Forecast commercial revenues	€m	[b]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Forecast OPEX	€m	[c]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Forecast capital costs	€m	[d]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Allowed revenue	€m	[e]=[c]+[d]-[a]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Price cap per passenger	€	[f]=[e]/[a]	10.9	11.6	12.5	13.6	14.7

Note: All currency amounts are inflation-adjusted to December 2025. Our simulation aims to replicate Dublin Airport's price-cap model faithfully while remaining internally consistent under uncertainty. Passenger numbers (in expectation) and capital costs are aligned with the airport's inputs. For commercial revenues and OPEX, we use a regression-based representation calibrated to the airport's five-year forecasts so that, when passenger volumes follow the forecast, performance is on target in expectation (see Appendix A2.2).
This functional form is required for simulation consistency, i.e. to allow outcomes to co-move with passenger variability in a transparent, tractable way, so it inevitably smooths some item-level timing and step-changes in Dublin Airport's detailed build-up. As a result, our ex-ante price cap matches Dublin Airport's in level and design but may differ slightly year by year solely due to this necessary modelling choice.
Source: Oxera analysis based on the IAA's methodology.

Table A2.3 Constrained price cap

	Units	Row	2027	2028	2029	2030	2031
FPAX	m	[a]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Forecast commercial revenues	€m	[b]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Forecast OPEX	€m	[c]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Forecast capital costs	€m	[d]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Allowed revenue	€m	[e]=[c]+[d]-[a]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Price cap per passenger	€	[f]=[e]/[a]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note: Forecast passenger numbers in red have been capped. All currency amounts are inflation-adjusted to December 2025.
Source: Oxera analysis based on the IAA's methodology.

A2.3 Simulating outturn passenger numbers

Passenger numbers can diverge from forecasts for a number of reasons, and these variations are an important driver of financial outcomes. For the purposes of the Monte Carlo simulation, we distinguish between two elements: the underlying evolution of passenger demand over time; and the impact of shocks that disrupt this trend. The first relates to how passenger numbers grow from year to year in normal conditions, while the second captures the effect of unexpected events, ranging from smaller, more frequent disturbances to rarer but more severe shocks.

In the following subsections, we describe how we model the baseline demand path and how we incorporate shocks into the simulation.

A2.3.1 Modelling baseline demand

Blended GDP growth is our random Monte Carlo variable. We base its distribution on year-specific inputs, where the mean is set equal to the implied blended growth rate based on Dublin Airport's forecast for that year, while the standard deviation reflects historical GDP volatility. This approach ensures that the simulation is centred on the same expectations as those used by Dublin Airport, while still reflecting the substantial uncertainty inherent in macroeconomic outturns. The growth rate generated from this distribution is then multiplied by the IAA's elasticity of 1.03 to translate it into passenger growth.

For each year of the regulatory period, the Monte Carlo simulation therefore generates a random passenger demand growth rate, as described. We apply this simulated passenger growth rate to the previous year's passenger demand to generate a demand path. At the beginning of the regulatory period in 2027, the preceding passenger demand is the same baseline used to determine forecast passengers as described in Table A2.1 Forecast passengers (i.e. [redacted]). This ensures that both forecast passengers and demand start from the same passenger number.

A2.3.2 Modelling exogenous passenger demand shocks

As noted in section 2.3, we include two broad groups of shocks in our model: transient shocks and extreme shocks. The type of shock, its corresponding probability in any given year, and its severity are summarised in Table A2.4.

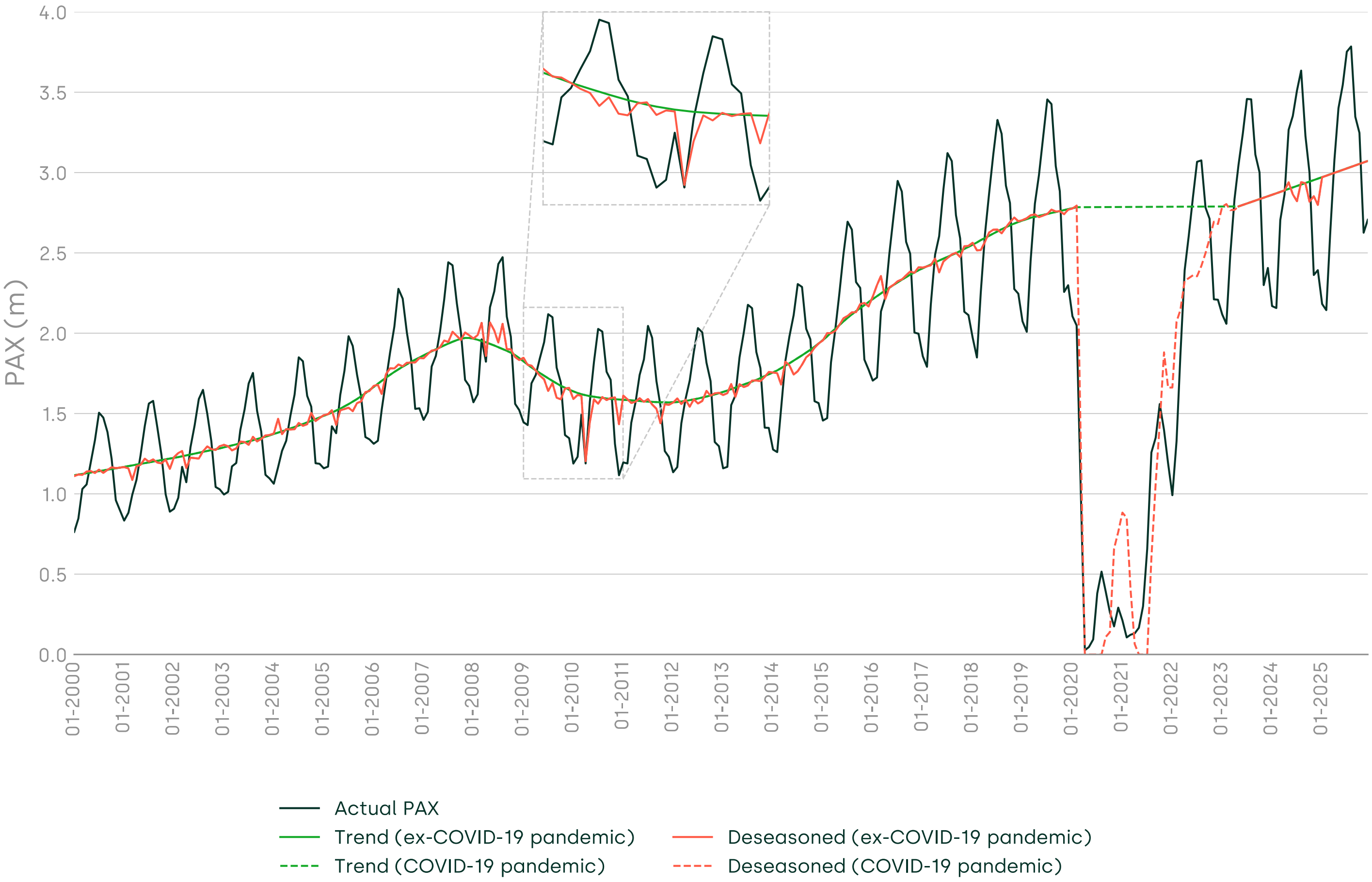
Table A2.4 Description, frequency and severity of passenger demand shocks

Shock	Examples	Profile of shock	1-year probability	5-year probability	Drop in passenger numbers in first year	Duration
Transient shocks	9/11, Icelandic ash cloud	The shock occurs in one year, with PAX recovering to the pre-shock level in the following year	26.3%	78.2%	1.1%	1 year (no recovery period)
Extreme shocks	COVID-19 pandemic	The shock occurs in one year with PAX recovering to the levels that would have occurred without the shock three year later	2.0%	9.6%	70.0%	3 years (2 years of recovery)

Note: The 5-year probability (p_5) is calculated from the 1-year probability (p_1) as follows: $p_5 = 1 - (1 - p_1)^5$.
Source: Oxera.

To determine the probability and severity of shocks, we analyse monthly outturn passenger data (the dark line in Figure A2.1 below). We first exclude the COVID-19 period and fit an underlying long-term trend in passenger numbers (the green line). We then construct a counterfactual for the COVID-19 period by linearly interpolating across the gap (the green dashed line). As passenger volumes are cyclical, with the highest volumes typically recorded in July and August, we also model monthly seasonality and extend it over the full period (the red line).

Figure A2.1 Extrapolating trends from passenger data



Note: Monthly passenger figures with extrapolated trend and deseasoned lines. The inset zooms in on the years 2009 and 2010. Dashed lines cover the COVID-19 pandemic period. The deseasoned number of passengers is floored at 0.
Source: Oxera analysis based on Dublin Airport's figures for monthly passenger numbers.

We determine the probability and severity of **transient shocks** empirically from historical passenger data by comparing these adjusted (deseasoned) passenger volumes with the underlying long-term passenger trend. Following the methodology in section 2.3, we identify six discrete shocks over the period from 2000 to 2025, excluding the COVID-19 pandemic. These six shocks correspond to an annual event probability of 26.3%. The average per-shock deviation from the trend in passenger numbers is -7.2% over the affected months. On average, a transient shock affects 1.83 months. We therefore convert the per-shock severity to an annual conditional severity of: $\frac{1.83}{12} \times -7.2\% = 1.1\%$.

For **extreme shocks**, the expected impact on passenger numbers in the first year is based on the same methodology applied for transient shocks, with the trend line based on a linear interpolation over the COVID-19 pandemic. In 2020, the deviation in deseasoned passenger numbers from the expected underlying trend is -74.4%, which is very close to the reduction of 73% determined for Heathrow Airport.[48] We use an estimate of the drop in passenger demand of 70%. We base the annual probability of an extreme shock on the CAA's assumption for Heathrow Airport that pandemic-like shocks occur between a 1-in-20-year and 1-in-50-year range.[49] We use the lower end of this range, at 2.0%, as the annual probability of extreme shocks.

Given a regulatory period of five years, the probabilities of experiencing at least one transient or extreme shock are 78.2% and 9.6%, respectively.[50] In our simulation, the shocks are implemented through a conditional Bernoulli sampling approach: an extreme shock is drawn first according to its five-year probability, and a transient shock is drawn only if no extreme shock occurs in that simulation run, using a conditional probability that preserves the correct five-year frequency. This ensures that the two shock types are mutually exclusive by construction and that their empirical frequencies in the simulation align with the intended theoretical five-year probabilities.

In modelling the impact of a crisis, we allow underlying passenger demand to evolve in each year according to the randomly drawn Monte Carlo passenger growth rates, which represent the counterfactual, non-crisis path. The crisis introduces an immediate reduction in passenger numbers in the first year, followed by a recovery period during which demand gradually converges back to this underlying level.

The recovery profile is defined such that the gap between crisis and non-crisis demand closes smoothly over the specified duration, with passenger numbers rejoining the counterfactual path exactly after the recovery period. This approach ensures that the long-term trajectory of demand remains anchored in the underlying stochastic growth assumption, and that the effect of the crisis is isolated to the intended period. The drop in passenger numbers is calculated as follows:

$$\mathrm{f_t} \;=\; (1-\mathrm{x})^{\left(1-\frac{(\mathrm{t-s})}{\mathrm{n}}\right)} \text{ if } s \le t \le s+n,$$

where t is the current year of the regulatory period, s is the first year of the shock, n is the shock duration, and x is the drop in passenger

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[48] See CAA (2022), 'Economic regulation of Heathrow Airport Limited: H7 Final Proposals Section 3: Financial issues and implementation', June, p. 116.

[49] See CAA (2022), 'Economic regulation of Heathrow Airport Limited: H7 Final Proposals Section 3: Financial issues and implementation', June, p. 119.

[50] This is determined by converting the annual shock probabilities to five-year probabilities, $1-(1-26.3\%)^5 = 78.2\%$ (transient shocks) and $1-(1-2.00\%)^5 = 9.6\%$ (extreme shock).

numbers in the first crisis year. For extreme shocks, this means that the outturn number of passengers in the first year is 30.0% of unshocked baseline demand (a drop of 70.0%), 44.8% in the second year (a drop of 55.2%), and 66.9% in the third year (a drop of 33.1%).

A3 Estimating asymmetric risk and passenger-cap allowances

A3.1 Introduction

To calculate the asymmetric risk allowance, we follow the frequency–severity methodology used by the CAA. While the CAA's asymmetric risk allowance focuses solely on extreme shocks and reflects transient shocks through a separate shock factor applied to passenger forecasts, our approach derives explicit adjustments for both types of shocks.

The CAA's methodology comprises the following four steps.[51]

1. Estimate the expected traffic loss during a shock.
2. Calculate annual loss of profit following a shock in any given year of the regulatory period.
3. Evaluate the expected frequency of shocks in the future and convert to equivalent probability of a shock in any given year.
4. Weight the loss calculated in step 2 with the probability estimated in step 3 to obtain expected losses due to asymmetric risk. This would then form the base value for the asymmetric risk allowance.

The expected traffic loss in a shock (step 1) and annual shock probability (step 3) correspond to the values set out Table A2.4.

To determine the annual loss of profit, we use a non-crisis simulation run (5,000 simulations without shocks) as the counterfactual and compare it with dedicated transient and extreme shock simulations, each consisting of 5,000 simulations in which a shock is imposed in every run to ensure stable estimates. Each shock type is simulated five times such that the shock begins in each year of the regulatory period. Across both shock types and the counterfactual, this results in a total of 55,000 simulations to derive the full set of annual allowances.

In the following, we set out the annual loss of profit according to this approach (step 2) and corresponding allowance (step 4) to mitigate the asymmetric risk.

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[51] See CAA (2022), 'Economic regulation of Heathrow Airport Limited: H7 Final Proposals', section 3, pp. 115–120.

A3.2 Asymmetric risk allowance without constraints

Table A3.1 shows the expected EBITDA (unconstrained by a passenger cap) given:

I. 5,000 simulation runs without shocks (the counterfactual);
II. 5,000 simulation runs for each year of the regulatory period, with a transient shock starting in each year (25,000 simulations in total);
III. 5,000 simulation runs for each year of the regulatory period, with an extreme shock starting in each year (25,000 simulations in total).

Table A3.1 Expected EBITDA (unconstrained by passenger cap)

	2027	2028	2029	2030	2031
I. Expected counterfactual EBITDA (€m) in absence of shocks					
	-0.5	-0.9	-0.8	-1.2	-1.8
II. Expected EBITDA (€m) given transient shock					
Shock in 2027	-3.9				
Shock in 2028		-4.7			
Shock in 2029			-5.0		
Shock in 2030				-5.9	
Shock in 2031					-7.1
III. Expected EBITDA (€m) given extreme shock					
Shock in 2027	-270.2	-222.0	-137.6		
Shock in 2028		-293.8	-244.1	-154.1	
Shock in 2029			-322.6	-272.1	-171.8
Shock in 2030				-358.5	-301.8
Shock in 2031					-396.5

Note: The results are based on the mean of I) 5,000 simulation runs without shocks; II) 25,000 simulation runs with transient shocks starting in a given year; and III) 25,000 simulation runs with extreme shocks starting in a given year. Only the duration of each respective shock is relevant. All currency amounts are inflation-adjusted to December 2025.
Source: Oxera analysis.

In Table A3.2 below, we compute expected EBITDA loss with respect to the counterfactual (corresponding to step 3 of the CAA's methodology) for both transient shocks (the difference between I. and II.) and extreme shocks (the difference between I. and III.).

Table A3.2 Expected EBITDA loss given a shock (unconstrained by passenger cap)

	2027	2028	2029	2030	2031
I. Expected EBITDA loss (€m) given transient shock					
Shock in 2027	3.4				
Shock in 2028		3.8			
Shock in 2029			4.2		
Shock in 2030				4.7	
Shock in 2031					5.2
II. Expected EBITDA loss (€m) given extreme shock					
Shock in 2027	5.4	4.4	2.7		
Shock in 2028		5.9	4.9	3.1	
Shock in 2029			6.4	5.4	3.4
Shock in 2030				7.1	6.0
Shock in 2031					7.9

Note: The results are based on the difference between the expected counterfactual EBITDA (part I of Table A3.1) and I) the expected EBITDA given a transient shock (part II of Table A3.1) and II) the expected EBITDA given an extreme shock (part III of Table A3.1). Only the duration of each respective shock is relevant. All currency amounts are inflation-adjusted to December 2025.
Source: Oxera analysis.

Finally, in Table A3.3 below, we weight the expected losses (severity) with the expected annual probability (frequency). The annual probability is 26.3% for transient shocks and 2.0% for extreme shocks (compare with Table A2.4). The sum of these weighted expected losses yields the annual asymmetric risk allowance that should be applied when Dublin Airport is not constrained by a passenger cap.

Table A3.3 Annual asymmetric risk allowance (unconstrained by passenger cap)

	2027	2028	2029	2030	2031
I. Annual asymmetric risk allowance (€m) for transient shocks					
Shock in 2027	0.9				
Shock in 2028		1.0			
Shock in 2029			1.1		
Shock in 2030				1.2	
Shock in 2031					0.7
Total	**0.9**	**1.0**	**1.1**	**1.2**	**1.4**
II. Annual asymmetric risk allowance (€m) for extreme shocks					
Shock in 2027	5.4	4.4	2.7		
Shock in 2028		5.9	4.9	3.1	
Shock in 2029			6.4	5.4	3.4
Shock in 2030				7.1	6.0
Shock in 2031					7.9
Total	**5.4**	**10.3**	**14.0**	**15.6**	**17.3**
III. Total asymmetric risk allowance (€m)					
Total (I.+ II.)	**6.3**	**11.3**	**15.1**	**16.9**	**18.7**

Note: The results are based on weighting the obtained expected annual losses for I) transient shocks (part I of Table A3.2) with the expected annual probability of 26.3% and II) transient shocks (part II of Table A3.2) with the expected annual probability of 2.0%. All currency amounts are inflation-adjusted to December 2025.
Source: Oxera analysis.

A3.3 Asymmetric risk and passenger-cap allowances with constraints

Following the same methodology as for the unconstrained case in section A3.2, Table A3.4 below shows Dublin Airport's expected EBITDA given a passenger cap of 40mppa.

Table A3.4 Expected EBITDA (constrained by passenger cap)

	2027	2028	2029	2030	2031
I. Expected counterfactual EBITDA (€m) in absence of shocks					
	-0.5	-7.2	-9.2	-8.7	-8.9
II. Expected EBITDA (€m) given transient shock					
Shock in 2027	-3.9				
Shock in 2028		-9.5			
Shock in 2029			-11.1		
Shock in 2030				-10.4	
Shock in 2031					-3.9
III. Expected EBITDA (€m) given extreme shock					
Shock in 2027	-270.2	-222.0	-134.1		
Shock in 2028		-293.8	-241.8	-143.6	
Shock in 2029			-321.0	-265.0	-153.6
Shock in 2030				-353.8	-289.6
Shock in 2031					-388.3

Note: The results are based on the mean of I) 5,000 simulation runs without shocks; II) 25,000 simulation runs with transient shocks starting in a given year; and III) 25,000 simulation runs with extreme shocks starting in a given year. Only the duration of each respective shock is relevant. All currency amounts are inflation-adjusted to December 2025.
Source: Oxera analysis.

Finally in

Table A3.5 below, we compute expected EBITDA loss with respect to the counterfactual non-shocked EBITDA for both transient shocks (the difference between I. and II.) and extreme shocks (the difference between I. and III.).

Table A3.5 Expected EBITDA loss given a shock (constrained by passenger cap)

	2027	2028	2029	2030	2031
I. Expected EBITDA loss (€m) given transient shock					
Shock in 2027	3.4				

Shock in 2028		2.3			
Shock in 2029			1.9		
Shock in 2030				1.8	
Shock in 2031					1.6
II. Expected EBITDA loss (€m) given extreme shock					
Shock in 2027	269.7	214.8	124.9		
Shock in 2028		286.6	232.6	134.9	
Shock in 2029			311.8	256.4	144.7
Shock in 2030				345.1	280.7
Shock in 2031					379.5

Note: The results are based on the difference between the expected counterfactual EBITDA (part I of Table A3.4) and I) the expected EBITDA given a transient shock (part II of Table A3.4) and II) the expected EBITDA given an extreme shock (part III of Table A3.4). Only the duration of each respective shock is relevant. All currency amounts are inflation-adjusted to December 2025.
Source: Oxera analysis.

Table A3.6 below, we weight the expected EBITDA losses (severity) with the expected annual probability (frequency). The annual probability is 26.3% for transient shocks and 2.0% for extreme shocks (compare with Table A2.4). The sum of these weighted expected losses yields the annual asymmetric risk allowance that should be applied when Dublin is constrained by a passenger cap.

Table A3.6 Annual asymmetric risk allowance (constrained by passenger cap)

	2027	2028	2029	2030	2031
I. Annual asymmetric risk allowance (€m) for transient shocks					
Shock in 2027	0.9				
Shock in 2028		0.6			
Shock in 2029			0.5		
Shock in 2030				0.5	
Shock in 2031					0.4
Total	**0.9**	**0.6**	**0.5**	**0.5**	**0.4**
II. Annual asymmetric risk allowance (€m) for extreme shocks					
Shock in 2027	5.4	4.3	2.5		

Shock in 2028		5.7	4.7	2.7	
Shock in 2029			6.2	5.1	2.9
Shock in 2030				6.9	5.6
Shock in 2031					7.6
Total	**5.4**	**10.0**	**13.4**	**14.7**	**16.1**
III. Total asymmetric risk allowance (€m)					
Total (I.+ II.)	**6.3**	**10.6**	**13.9**	**15.2**	**16.5**

Note: The results are based on weighting the obtained expected annual losses for I) transient shocks (part I of

Table A3.5) with the expected annual probability of 26.3% and II) transient shocks (part II of Table A3.2) with the expected annual probability of 2.0%. All currency amounts are inflation-adjusted to December 2025.
Source: Oxera analysis.

The above yields the asymmetric risk allowances for the unconstrained and constrained regimes using a frequency–severity framework. The constrained asymmetric risk allowance already compensates for probabilistic downside risk under a passenger-cap regime, i.e. expected losses arising from transient and extreme shocks with their observed frequencies and severities. However, the passenger cap also imposes a structural effect by truncating the upside in non-crisis years while leaving the downside broadly unchanged.

As a result, even after applying the asymmetric risk allowance, Dublin Airport's expected EBITDA under the constrained regime remains below the expected EBITDA it would achieve in the unconstrained case (after applying the unconstrained asymmetric risk allowance). The passenger-cap allowance is therefore defined as the incremental uplift required to restore financial neutrality relative to the unconstrained, risk-adjusted benchmark. Formally, this can be presented as follows. Let $E[P^U]$ and $E[P^C]$ denote the unconditional expected EBITDA in the unconstrained and constrained cases, respectively, each derived from the full Monte Carlo simulations where crisis and non-crisis outcomes occur with their empirical probabilities. We calculate the passenger-cap allowance (PCA) as:

$$PCA = (E[P^U] + ARA^U) - (E[P^C] + ARA^C).$$

This construction cleanly separates roles: the ARA in each regime compensates for stochastic asymmetric risk, while the PCA corrects for the structural expected-value loss caused by the cap's upside truncation. In implementation, we (i) estimate expected EBITDA using the full unconstrained and constrained simulations; (ii) compute the corresponding asymmetric risk allowances via the frequency–severity method; and (iii) set the passenger-cap allowance equal to the difference in these two risk-adjusted expectations. This ensures that introducing the passenger cap does not leave Dublin Airport below its unconstrained target EBITDA in expectation. Table A3.7 presents this calculation and the resulting passenger-cap allowance.

Table A3.7 Passenger-cap allowance calculation

	Row	**2027**	**2028**	**2029**	**2030**	**2031**
Expected unconstrained EBITDA with ARA	[a]	-0.4	-1.6	-1.0	-0.9	0.2
Expected constrained EBITDA with ARA	[b]	-0.4	-8.1	-9.7	-8.9	-7.5
Passenger-cap allowance	[c]=[a]-[b]	0.0	6.6	8.8	8.0	7.7

Note: Expected EBITDA is calculated as the mean of the full unconstrained and constrained simulations, where shocks occur according to their empirical probabilities.
Source: Oxera analysis.

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