

METHODOLOGY DOCUMENTATION

Price-Adjusted CORSIA Demand Model

Estimating CORSIA offset demand as a function of credit price

VERSION v3	DATE September 2026	TYPE Python	PREPARED BY AlliedOffsets Product Team
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Overview

This model estimates how much demand for carbon credits the CORSIA scheme is likely to generate, and how that demand changes as the price of eligible credits rises. It begins from published projections of international aviation offsetting requirements, distributes those requirements across the states whose airlines will be responsible for meeting them, and then tests demand at every credit price from the prevailing market price up to a premium of four hundred dollars per tonne. The result is a demand curve for each state and year rather than a single volume figure, allowing users to see at what price airlines in a given jurisdiction would be expected to reduce or abandon their use of the offsetting mechanism. Demand is modelled for four published scenarios, covering a low, medium and high projection alongside a fourth scenario adjusted to align with the 2024 ICAO published Sectoral Growth Factor (SGF).

Data Inputs

Field / Parameter	Description	Source / Notes
State pair emissions	International aviation emissions on each route between a departing and an arriving state, split between the portion that is and is not subject to offsetting requirements. Used to establish which routes fall within scope in each compliance period and how large each route is.	ICAO
Baseline emissions	Emissions recorded on each state pair in the 2019 reference year, used as the fixed baseline against which offsetting obligations and comparative regulatory costs are measured.	ICAO
Offsetting requirement scenarios	Published annual projections of total CORSIA offsetting requirements under low, medium and high growth assumptions, together with a fourth projection adjusted for expected sustainable aviation fuel uptake. These set the global volume that is then distributed across states.	ICAO periodic review inputs and IATA forecast , maintained in a shared reference sheet
International flight counts	Number of flights operated on each route in 2019, broken down by the home state of the operating airline. Used to determine which state's airlines bear responsibility for the emissions on each route.	International flight dataset from 2019, mapped to ICAO call sign data
Registered airline counts	Number of airlines registered to each state. Used as a fallback method of assigning route responsibility where flight-level data is unavailable.	ICAO
Participation lists	The set of states participating in each phase of CORSIA, and separately the set of states exempt from the second phase. These determine which routes carry an offsetting obligation in any given year.	Maintained reference lists based on ICAO participation announcements

Field / Parameter	Description	Source / Notes
Forecast market price	AlliedOffsets' central forecast of the carbon credit market price for each future year. Used as the anchor point from which price sensitivity is measured.	AlliedOffsets market price forecast, medium scenario
CORSIA-eligible price premium	The ratio between the volume-weighted average transaction price of credits aligned to the first phase of CORSIA and that of non-aligned credits. Used to uplift the general market price forecast to a CORSIA-eligible price forecast.	AlliedOffsets transaction and pricing data
Historical retirement prices and volumes	Retirement transactions with an estimated price at the retirement date, used to measure how purchase volumes have historically responded to price.	AlliedOffsets credits database
CORSIA enforcement laws	The set of states that have issued specific domestic regulations enforcing CORSIA compliance. Used to identify jurisdictions where airlines are expected to be far less price-sensitive.	AlliedOffsets policy and compliance database
European carbon allowance price	The forward price of a European emissions allowance, used to estimate what airlines would pay if international aviation emissions were instead covered by the European Emissions Trading System.	Exchange-traded allowance futures, fixed at model build

Logical Flow

1

Establish routes in scope

Each route between a pair of states is assessed against the participation lists for the relevant compliance period. For 2024, the routes in scope are those between states participating in the first phase. For 2025 and 2026, an expanded participation list applies. From 2027 onwards, all routes are in scope except those where either state is exempt from the second phase, with routes already captured under the earlier list retained. Emissions on routes that fall outside scope in a given period are excluded from that period's obligation.

2

Align country naming conventions

The flight dataset and the emissions dataset use different naming conventions for a number of states. A translation table reconciles these so that routes can be matched between the two sources. Several dependent territories and special administrative regions are consolidated into the sovereign state whose airlines operate there.

3

Assign route responsibility to a host state

CORSIA obligations fall on airline operators rather than on routes, so the emissions of each route must be attributed to the states whose airlines fly it. The primary method uses 2019 flight data: each state receives the share of route emissions matching the share of flights its airlines operated on that route. Where a route has no flight data, the entire route is attributed to whichever of the two states has more registered airlines. Where neither state has registered airlines, the route is attributed to the departing state.

4

Convert emissions into shares of global demand

Host-state emissions are aggregated and expressed as each state's proportion of total in-scope emissions, calculated separately for each participation period. This converts absolute historical emissions into a distribution key, on the assumption that future emissions grow proportionally to their historical position.

5

Distribute scenario volumes across states and years

Each state's share is applied to the published annual offsetting requirement for each of the four scenarios, producing a demand volume for every combination of host state, route, year and scenario across the period from 2024 to 2035. The share used depends on the year, so that the distribution reflects the participation rules in force at the time.

6

Estimate total covered emissions

Total emissions attributable to each state and year are estimated as eighty-five per cent of the 2019 baseline plus the offsetting requirement for that year. This provides the emissions base needed to compare the cost of CORSIA compliance against alternative regulatory regimes.

7

Derive the price at which CORSIA ceases to be economic

For each state a ceiling price is established, above which airlines would be expected to stop buying credits. For departures from European Economic Area states this is derived from what airlines would instead pay under the European Emissions Trading System, recognising that a broader set of emissions would be covered there. For a small number of states with known domestic carbon pricing or compliance obligations, a fixed jurisdiction-specific value is used instead. Where estimated emissions fall below the level the European system would require, the ceiling is set to zero.

8

Measure historical price sensitivity

Historical retirement transactions are grouped by whole-dollar price and year, and the relationship between price and volume is estimated so that each additional dollar of price corresponds to a constant percentage change in volume. The resulting sensitivity is then reduced to reflect the fact that compliance buyers, who must meet a legal obligation, are considerably less responsive to price than the voluntary market from which the relationship was measured.

9

Test demand across the price range

For each year, demand is recalculated at every price point from the forecast market price up to a premium of four hundred dollars per tonne. Below the forecast market price, demand is held at its full unadjusted level. Above it, demand decays at the measured sensitivity rate in proportion to how far the price sits above the forecast. Adjusted demand is capped so that it can never exceed the underlying offsetting requirement. Finally, wherever the price remains below a state's ceiling price, demand is restored to the full requirement, on the basis that airlines facing a more expensive alternative will continue to buy.

10

Express results at absolute price levels

Each row is tagged with its CORSIA phase, compliance period and the deadline by which the obligation must be settled. The price premium used in the sweep is added to the forecast market price at that deadline, so results are reported as absolute credit prices rather than as premiums.

Key Calculations

Host state route share

The proportion of a route's emissions attributed to a given state is the number of flights operated on that route by airlines of that state, divided by the total number of flights on the route in 2019. Where this cannot be calculated, the full route is attributed to a single state and the share is set to one.

State share of global offsetting requirement

A state's share is its total attributed in-scope emissions divided by the sum of in-scope emissions across all states for the same participation period. Three separate share sets are maintained, corresponding to the 2024 participation

	list, the 2025 list and the second-phase scope, and the appropriate set is selected according to the year being modelled.
Total covered emissions	Estimated emissions for a state and year are eighty-five per cent of the 2019 baseline emissions for that state, plus the offsetting requirement projected for that year under the scenario being modelled.
European comparative compliance requirement	The emissions level a state would be permitted under the European system is its 2019 baseline reduced by four point three per cent for each year elapsed since 2019, applied on a compounding basis. This is calculated only for departures from European Economic Area states.
Ceiling price for European departures	The ceiling is calculated as the allowance price multiplied by the emissions exceeding the permitted European level, divided by that same excess less the CORSIA offsetting requirement. This expresses the point at which the total cost of meeting CORSIA obligations would match the total cost of covering a broader set of emissions under the European system. Where the offsetting requirement is zero, the calculation reduces to the allowance price applied to the excess emissions. Any negative result, which arises where emissions already sit below the permitted European level, is set to zero.
Fixed jurisdictional ceiling prices	For a small number of states, the calculated ceiling is replaced with a fixed value reflecting known domestic policy. These values are applied uniformly across all scenarios and years and override any value derived from the European comparison.
Price sensitivity coefficient	Historical retirement volumes are grouped by whole-dollar price and transaction year, restricted to transactions below fifty dollars per tonne. The relationship between price and the natural logarithm of volume is estimated, which yields a constant percentage change in volume for each additional dollar of price. That percentage is then reduced to one quarter of its measured value to reflect compliance-driven rather than voluntary purchasing behaviour.
Price-adjusted demand	Adjusted demand equals the unadjusted requirement multiplied by the sensitivity factor raised to the power of the distance between the tested price and the forecast market price. Where the tested price is at or below the forecast market price, the distance is treated as zero and demand is unchanged. Adjusted demand is then capped at the unadjusted requirement, and is reset to the full requirement wherever the state's ceiling price is at or above the tested price.
CORSIA-eligible price forecast	The general market price forecast for each year is multiplied by the ratio between the volume-weighted average price of credits aligned to the first phase of CORSIA and that of non-aligned credits, producing a forecast specific to CORSIA-eligible supply.
Reported credit price	The price reported against each demand figure is the premium used in the price sweep added to the CORSIA-eligible forecast price for the year in which that obligation falls due, rather than the year in which the emissions occur.

Assumptions

- Future international aviation emissions are assumed to grow in proportion to their 2019 distribution, so each state's share of global offsetting requirements is held constant over the forecast period.
- Responsibility for a route's emissions is attributed to states in proportion to the share of flights their airlines operated on that route in 2019. Where flight data is unavailable, the whole route is attributed to the state with more registered airlines, and where neither state has registered airlines, to the departing state. These fallbacks are applied to low-volume routes and are not weighted.
- Total covered emissions are assumed to be eighty-five per cent of 2019 baseline emissions plus the offsetting requirement, consistent with the CORSIA baseline definition in force for the current compliance periods.
- The European comparison assumes that should international aviation emissions be brought within the European Emissions Trading System, that all emissions above the permitted level would be charged at the allowance price, and that airlines would be willing to pay up to that total cost to avoid it.
- The European permitted emissions level assumes a four point three per cent annual reduction applied to a 2019 baseline.
- The European allowance price is fixed at eighty-five dollars and eighty cents per tonne throughout the forecast, based on a forward futures price captured at the time the model was built. It is not re-forecast across the projection period and should be reviewed before the document is reissued.
- Price sensitivity is measured from voluntary market retirements priced below fifty dollars per tonne. Transactions above that level are excluded from the estimation on the basis that they reflect differentiated or premium technical removals supply rather than the general price-volume relationship.
- Compliance buyers are assumed to be one quarter as price-sensitive as the voluntary market from which the relationship was measured, reflecting the legal obligation to surrender credits.
- Airlines operating from states that have issued specific domestic regulations enforcing CORSIA are assumed to be substantially less price-sensitive still, at a rate of half of one per cent per dollar, up to the level of the United Kingdom ceiling price. This adjustment is defined in the current model version but is not yet reflected in the published output.
- Demand is assumed to be anchored at the forecast market price. No demand reduction is modelled at or below that price, and price sensitivity applies only to the premium above it.
- Price-adjusted demand can never exceed the underlying offsetting requirement, so the model treats the published requirement as an absolute ceiling on purchasing.
- Where a state's ceiling price is at or above the tested price, demand is assumed to remain at the full offsetting requirement with no price-driven reduction.
- Prices are tested in whole-dollar increments from zero to four hundred dollars above the forecast market price. Demand behaviour beyond that premium is not modelled.
- Obligations are assumed to be settled at the end of the relevant compliance period, so demand for a given emissions year is priced against the market forecast for the cancellation deadline rather than the emissions year itself.
- The general market price forecast is uplifted to CORSIA-eligible levels using the historical price ratio between phase-aligned and non-aligned credits. That ratio is assumed to hold constant across the forecast period.

Limitations

- The model estimates demand, not price. It produces a demand curve across a range of prices and does not itself determine where the market will clear; that requires pairing with a supply-side model.

- Route responsibility is attributed on the basis of 2019 flight patterns. Changes in route networks, airline market share or the emergence of new carriers since that date are not captured.
- Fixed jurisdictional ceiling prices are applied to a small number of states only. States with domestic carbon pricing or aviation compliance obligations that are not represented in that list will be modelled on the European comparison or on price sensitivity alone.
- Price sensitivity is derived from historical voluntary market behaviour. It assumes that the relationship between price and volume observed in that market transfers to compliance purchasing, adjusted only by a fixed scaling factor.
- Supply-side constraints are not modelled. The availability of CORSIA-eligible credits at any given price, including the effect of host country authorisation and corresponding adjustment, is outside the scope of this model.
- The model covers the period from 2024 to 2035 and does not extend beyond the currently defined compliance periods.
- Sustainable aviation fuel uptake is not reflected in this model. The model does not independently estimate the substitution effect between fuel and offsetting.

Output

The model produces one row for every combination of host state, year, scenario and tested price across the period from 2024 to 2035. Each row reports the estimated offsetting requirement before price adjustment, the price-adjusted demand volume, the ceiling price above which the state is assumed to stop purchasing, the estimated total covered emissions and 2019 baseline, the CORSIA phase and compliance period, the deadline by which the obligation must be settled, the forecast market price at that deadline, and the absolute credit price at which the demand figure applies. Reading across the price dimension for a given state, year and scenario gives that state's demand curve. Summing across states at a fixed price gives total modelled CORSIA demand at that price.