GUIDE · 5 PAGES

Risk analysis in project finance

Identify, allocate, quantify: the allocation matrix, sensitivities and the tornado, the lenders' cases, the register and its heat map.

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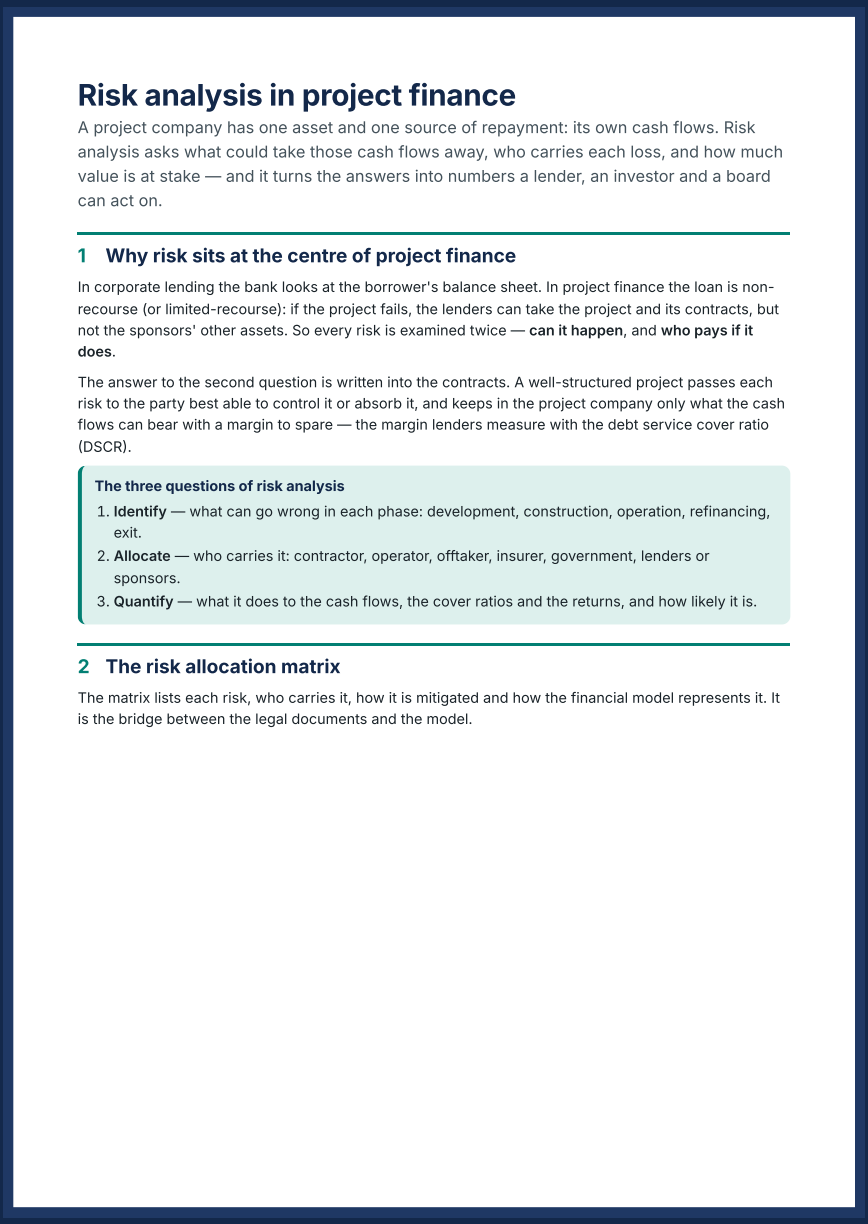

Risk analysis in project finance

A project company has one asset and one source of repayment: its own cash flows. Risk analysis asks what could take those cash flows away, who carries each loss, and how much value is at stake — and it turns the answers into numbers a lender, an investor and a board can act on.

1 Why risk sits at the centre of project finance

In corporate lending the bank looks at the borrower's balance sheet. In project finance the loan is non-recourse (or limited-recourse): if the project fails, the lenders can take the project and its contracts, but not the sponsors' other assets. So every risk is examined twice — **can it happen**, and **who pays if it does**.

The answer to the second question is written into the contracts. A well-structured project passes each risk to the party best able to control it or absorb it, and keeps in the project company only what the cash flows can bear with a margin to spare — the margin lenders measure with the debt service cover ratio (DSCR).

The three questions of risk analysis

1. **Identify** — what can go wrong in each phase: development, construction, operation, refinancing, exit.
2. **Allocate** — who carries it: contractor, operator, offtaker, insurer, government, lenders or sponsors.
3. **Quantify** — what it does to the cash flows, the cover ratios and the returns, and how likely it is.

2 The risk allocation matrix

The matrix lists each risk, who carries it, how it is mitigated and how the financial model represents it. It is the bridge between the legal documents and the model.

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Risk	Usually carried by	Mitigation	In the model
Construction cost and delay	EPC contractor (fixed price, date-certain)	Delay and performance damages, contingency, standby funding	Capex overrun and COD-delay cases; damages as income
Technology and performance	Supplier, then the project	Warranties, availability guarantees, proven technology	Lower availability, degradation, replacement capex
Resource (sun, wind, water)	Sponsors and lenders	Independent yield study; debt sized on P90/P99	P50 for equity, P90 for the lenders' case
Market price and volume	Offtaker under a long-term contract, or the project if merchant	Power purchase agreement, contract for difference, floor price	Contracted and merchant shares; price curves; low-price cases
Operating cost	O&M contractor, then the project	Fixed-price O&M, maintenance reserve	Opex escalation; major-maintenance reserve
Interest rate and inflation	Project, hedged	Interest rate swaps; indexed tariffs	Rate and inflation sensitivities; hedge ratio
Currency	Project or offtaker	Tariff in the debt's currency; FX hedging	Exchange-rate sensitivities
Political and regulatory	Government, insurers	Stabilisation clauses, political-risk insurance	Tax-rate and tariff-change cases
Counterparty	The project	Credit support, letters of credit, guarantees	Late-payment (working capital) and default cases
Refinancing	Sponsors	Long tenor; cash sweep before a balloon	Refinancing at a higher margin, or failed

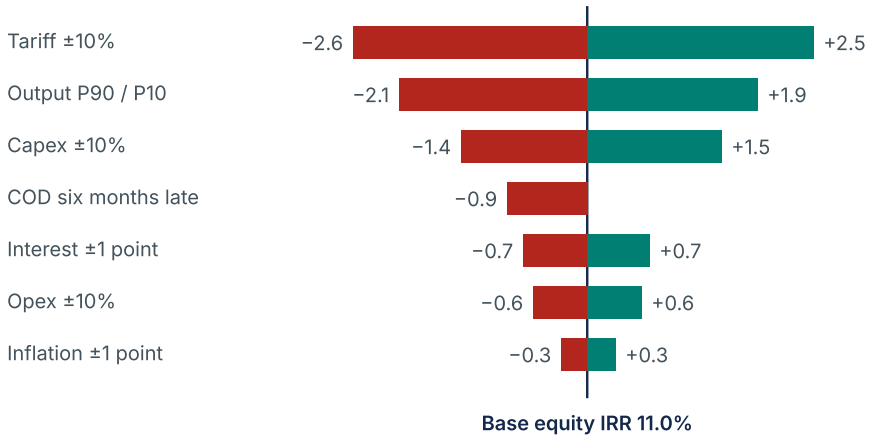
3 The tools, from simple to rich

Tool	What it answers	Watch out for
Sensitivity	One input changed at a time: how far do the returns and the cover move?	Hold the debt as sized in the base case — lenders do not resize it after the fact
Scenario	Several inputs changed together in a story: a "low case", a "lenders' downside"	A story must be internally consistent (low prices and high inflation rarely meet)
Breakeven	How far an input can move before a threshold is hit — DSCR of 1.00x, NPV of zero	Report it against the base case as a headroom in %
P50 / P90 cases	Output exceeded with 50% or 90% probability — equity looks at P50, lenders size on P90	One-year versus ten-year P90: they differ
Risk register	Every identified risk with its likelihood, impact, owner and mitigation	A register that never touches the model stays a list
Probability-weighted value	The register in money: expected loss and PARV	Overlapping risks counted twice
Monte Carlo	Thousands of runs with random draws of the inputs: a distribution of IRR and NPV	Correlations between inputs; garbage-in ranges

4 Sensitivities done well

A sensitivity changes one input and re-runs the whole model. Two rules make the results meaningful:

- **Hold the debt.** In the base case the debt is sized to the target DSCR. A sensitivity that re-sizes the debt hides the problem: the downside shows up as a smaller loan instead of a weaker cover. Lenders run sensitivities with the debt as sized, and look at the minimum DSCR and the lock-up periods.
- **Show the right outputs.** Equity IRR and NPV for investors; minimum and average DSCR, loan life cover ratio (LLCR) and any covenant breach for lenders.



A tornado chart: each bar is one sensitivity, the change in equity IRR in percentage points, largest at the top. Illustrative figures.

Typical ranges are a starting point, not a rule: capital cost ±10%, operating cost ±10%, output at the P90, a COD delay of three to six months, interest rates ±1 point, inflation ±1 point and the tariff or market price ±10%. Choose ranges from the project's own evidence — the contractor's track record, the yield study's uncertainty, the price forecaster's low case.

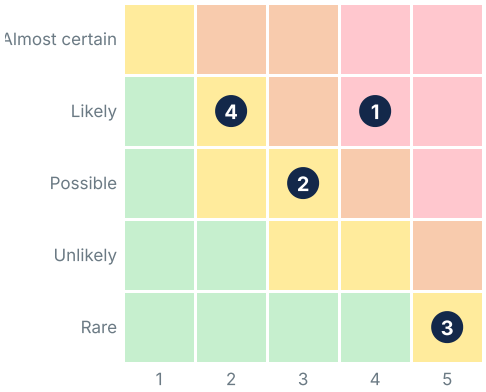
5 The lenders' view

Lenders size and test the debt on cautious cases. The **banking case** uses the P90 output, the contracted revenue and the lenders' technical adviser's costs. The debt must meet the target DSCR in every period; covenants then set two lower lines: a **lock-up** (no distributions to the sponsors) and a **default** level. A downside that pushes the DSCR below 1.00x means the cash flows no longer pay the debt service — the reserve accounts (DSRA) and the sponsors' support must.

> **Breakeven questions lenders ask**
>
> How low can the output fall before the DSCR hits 1.00x? How far can the price fall? How long can COD slip before the liquidated damages and the contingency run out? Each answer is one input solved for one threshold, with the debt held.

6 The risk register and the heat map

A risk register lists every identified risk with its **likelihood** and **impact**, each scored 1 to 5. The rating is likelihood × impact (1–25), banded for example 1–4 low, 5–9 medium, 10–14 high, 15–25 extreme. The register then records the mitigation, its owner, its date — and the rating after the mitigation, so the heat map can be shown before and after.



Likelihood up the side, impact along the bottom (1 minor … 5 severe); each risk's number in its cell.

Scoring the impact consistently

A quantified risk is best scored from what it does to value: for example the fall in the equity IRR — under 0.25 points 1, under 0.5 point 2, under 1 point 3, under 2 points 4, more 5 — raised to at least 4 when it breaks a covenant. Risks that cannot be quantified (reputation, health and safety, permits) are scored by hand against written criteria.

Scoring the likelihood

Better as a probability than a word: under 10% rare, 10–30% unlikely, 30–50% possible, 50–80% likely, above 80% almost certain. A probability can then be multiplied by an impact in money.

7 From the register to money

Once a quantified risk has a fall in value and a probability, the two multiply into an **expected loss** — the average value the risk takes away. Taking off what would make good part of the loss (damages, insurance) before multiplying gives the **probability-adjusted residual value of risk (PARV)**, the subject of its own guide in this Knowledge Center. Added up, with overlaps counted once, they show how much of the project's value is exposed and which risks deserve the management's time.

8 Common pitfalls

- **Re-sizing the debt in a sensitivity** — the cover looks fine because the loan shrank.
- **Double counting** — "lower wind" and "turbine underperformance" both modelled as lower output, then added.
- **Ignoring correlation** — high inflation often comes with high interest rates; a scenario should move them together.
- **Ranges too narrow** — a ±5% capex test on a first-of-a-kind plant says little.
- **A register divorced from the model** — scores by gut feel, never checked against a run.
- **Upsides forgotten by accident** — leaving them out is a choice; make it on purpose and say so.

In Project Finance Studio: Output › Sensitivity (the tornado, two-way tables, the breakevens, a COD delay of 0–12 months, each a full re-run with the debt held); Output › Risks (ten quantified and five qualitative risks, the heat map before and after the mitigation, the expected loss and PARV); the Excel workbook's Risks sheet carries the same.

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