GUIDE · 5 PAGES

Valuing a project and its equity

NPV, IRR, payback and MOIC; the cost of equity and the WACC; why the project and equity values differ; buying a stake; terminal value.

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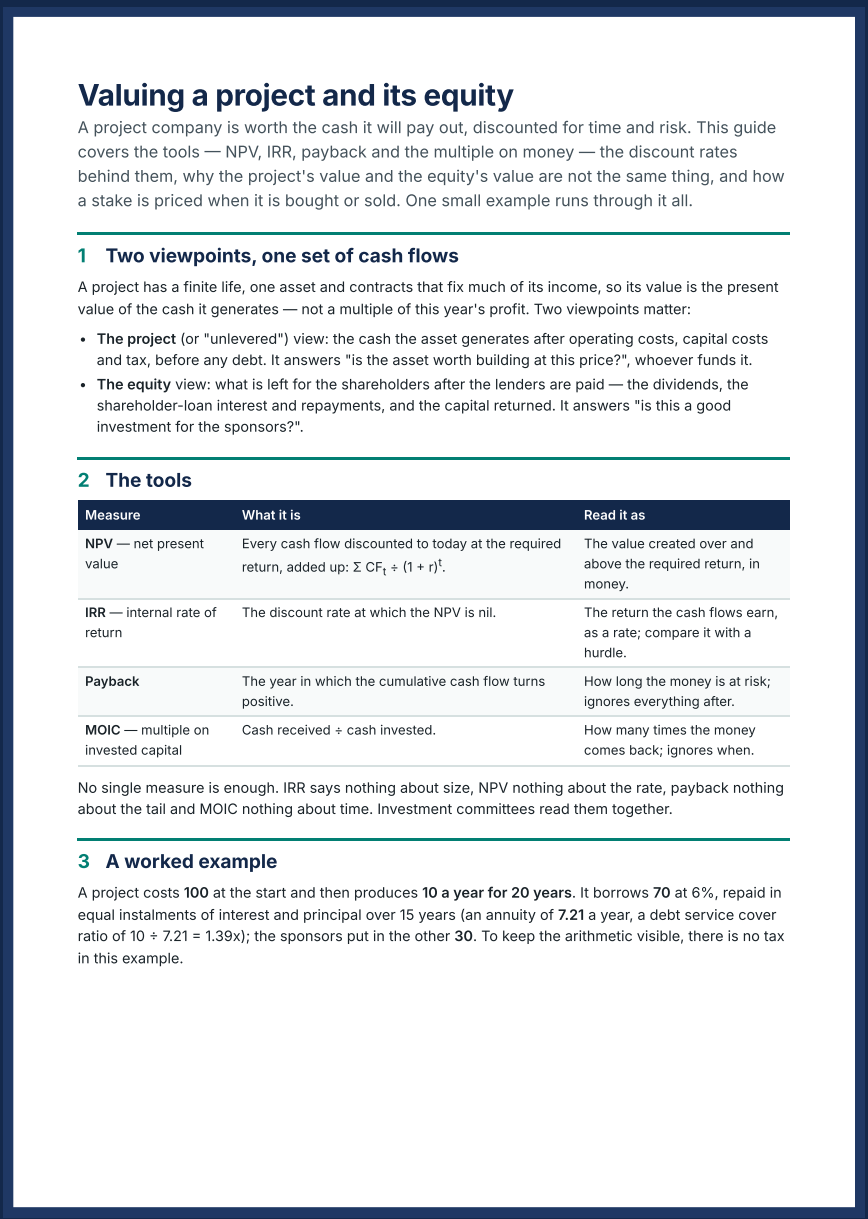

Valuing a project and its equity

A project company is worth the cash it will pay out, discounted for time and risk. This guide covers the tools — NPV, IRR, payback and the multiple on money — the discount rates behind them, why the project's value and the equity's value are not the same thing, and how a stake is priced when it is bought or sold. One small example runs through it all.

1 Two viewpoints, one set of cash flows

A project has a finite life, one asset and contracts that fix much of its income, so its value is the present value of the cash it generates — not a multiple of this year's profit. Two viewpoints matter:

- **The project** (or "unlevered") view: the cash the asset generates after operating costs, capital costs and tax, before any debt. It answers "is the asset worth building at this price?", whoever funds it.
- **The equity** view: what is left for the shareholders after the lenders are paid — the dividends, the shareholder-loan interest and repayments, and the capital returned. It answers "is this a good investment for the sponsors?".

2 The tools

Measure	What it is	Read it as
NPV — net present value	Every cash flow discounted to today at the required return, added up: $\Sigma\ CF_t \div (1 + r)^t$.	The value created over and above the required return, in money.
IRR — internal rate of return	The discount rate at which the NPV is nil.	The return the cash flows earn, as a rate; compare it with a hurdle.
Payback	The year in which the cumulative cash flow turns positive.	How long the money is at risk; ignores everything after.
MOIC — multiple on invested capital	Cash received ÷ cash invested.	How many times the money comes back; ignores when.

No single measure is enough. IRR says nothing about size, NPV nothing about the rate, payback nothing about the tail and MOIC nothing about time. Investment committees read them together.

3 A worked example

A project costs **100** at the start and then produces **10 a year for 20 years**. It borrows **70** at 6%, repaid in equal instalments of interest and principal over 15 years (an annuity of **7.21** a year, a debt service cover ratio of 10 ÷ 7.21 = 1.39x); the sponsors put in the other **30**. To keep the arithmetic visible, there is no tax in this example.

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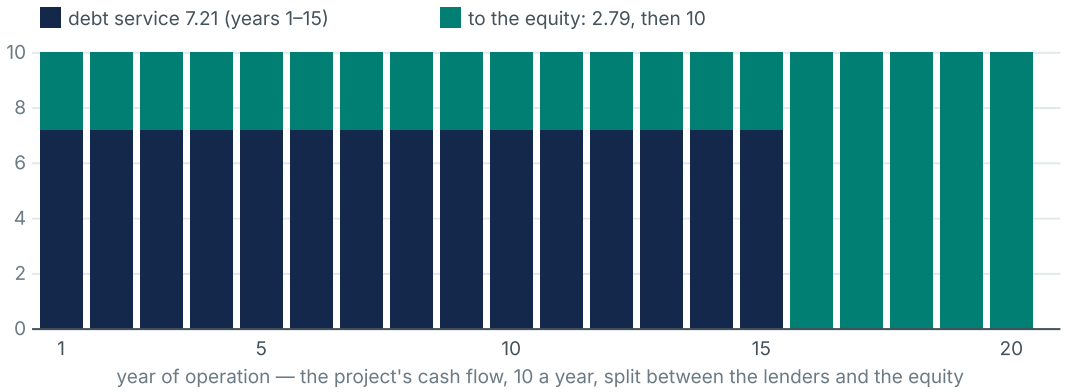

The same 10 a year: the lenders take 7.21 for 15 years, the equity gets what is left.

	Year 0	Years 1–15	Years 16–20	IRR	Payback	MOIC
Project	−100	10.00	10.00	7.75%	year 10	2.00x
Debt service	+70	−7.21	–	6.00%		
Equity	**−30**	**2.79**	**10.00**	**10.12%**	**year 11**	**3.06x**

Borrowing at 6% to fund an asset that earns 7.75% lifts the equity's return to 10.12% — **leverage**. It cuts both ways: if the cash flow is 10% lower (9 a year), the project IRR falls to 6.39% but the equity IRR falls much further, to 6.91%; 10% higher (11 a year) lifts them to 9.06% and 13.32%. The lenders' fixed claim comes first, so every change lands on the equity.

4 The discount rates

The cost of equity

The return shareholders require. The usual starting point is the capital asset pricing model (CAPM), with a premium for what the model leaves out (the country, the project's size, construction):

$$K_e = \text{risk-free rate} + \beta \times \text{equity risk premium} + \text{specific premium}$$

4.0% + 0.8 × 6.0% + 1.0% = 9.8% in the example

In practice sponsors often state a **hurdle rate** instead — the equity IRR a project must reach to be approved — from their own portfolio and the deals they compete with.

The cost of debt and the WACC

The cost of debt is the all-in rate on the loans (base rate, margin, the swap, fees). Interest is usually tax-deductible, so its cost after tax is $K_d \times (1 - \text{tax rate})$. The weighted average cost of capital blends the two:

$$\text{WACC} = E \div (D + E) \times K_e + D \div (D + E) \times K_d \times (1 - t)$$

30% × 9.8% + 70% × 6.0% = 7.14% in the example (no tax, so no tax shield)

Real or nominal — be consistent

Cash flows that include inflation (nominal) are discounted at a nominal rate; cash flows in today's money (real) at a real rate. The two are linked by the Fisher relation: (1 + nominal) = (1 + real) × (1 + inflation). A 6.09% nominal rate with 2.5% inflation is a 3.5% real rate. Mixing them — nominal cash flows at a real rate — overstates the value badly.

5 Why the project NPV and the equity NPV disagree

In the example the project NPV at the WACC is **4.80** but the equity NPV at its cost is only **0.86**. Both are "right"; they answer different questions under different assumptions. The WACC above assumes 70% debt for ever. Project debt is repaid, so the gearing falls year by year:

End of year	0	5	10	15
Debt outstanding	70.0	53.1	30.4	0.0
Value of the remaining project cash flows at the WACC	104.8	90.3	69.8	40.9
Gearing	67%	59%	44%	0%

From year 16 the project is all equity, yet the WACC still discounts it as if it were 70% cheap debt — so the project NPV is too generous. That is why project-finance investors value the **equity cash flows at the cost of equity**, and use the project IRR to compare structures and the lenders' cover ratios to test the debt. A WACC that changes with the gearing each year, or the adjusted present value method (the unlevered value plus the value of the financing), reconciles the two views.

6 The traps in IRR

- **Size.** An IRR of 25% on 1 creates less value than 12% on 100. Read it with the NPV.
- **Timing.** Cash back earlier raises the IRR even when the total is lower — a shareholder loan repaid early, a dividend paid before a reserve is funded. Check the MOIC too.
- **Reinvestment.** The IRR assumes cash received can be reinvested at the IRR itself. The modified IRR (MIRR), with a realistic reinvestment rate, removes that assumption.
- **More than one answer.** Cash flows that change sign more than once (a major overhaul, decommissioning at the end) can have two IRRs, or none. Use the NPV.

7 Dates and conventions

Discounting each year's cash as if it arrived at the year's end understates the value of cash that really comes in month by month. Discounting at mid-year raises the example's project NPV from 4.80 to 8.47 — a large gap on a thin margin. Models built on dates use XNPV and XIRR with each period's actual date, and state the **valuation date** plainly (financial close, today, or the date of a sale), with the cash before it left out or rolled forward.

8 Buying and selling a stake

When a stake changes hands, the buyer prices the cash still to come at the return it requires. Five years in, the equity in the example still has ten years of 2.79 and five years of 10 ahead. At a buyer's 9% that is worth **34.35**. The seller, who put in 30 and received 2.79 a year for five years, then earns an IRR of **11.61%** on the whole holding — more than the 10.12% it would earn by holding to the end, because the buyer accepts a lower return on a project that is built and running. That gap is the reward for taking the construction risk.

The price paid for the equity is the value of the business less the debt, plus the cash and reserves that come with it, adjusted for any shareholder loans transferred. A buyer looking for a 10% return would pay 31.77; one happy with 8%, 37.23.

9 At the end of the life: terminal value

Most concessions end with the asset handed back for nothing, so there is no terminal value. Assets that keep earning — district cooling, utilities, data centres, land owned outright — have value beyond the model's last year:

- **Growing perpetuity** (Gordon): next year's cash flow ÷ (r − g). A cash flow of 5 growing 2% a year, at 8%: 5 × 1.02 ÷ 6% = **85**.
- **Exit multiple**: EBITDA × a market multiple. EBITDA of 10 at 8 times: **80** for the business, before the debt.

Cross-check one against the other, and watch the share of the value that sits in the terminal value: when it is most of the NPV, the valuation rests on assumptions about the distant future.

10 Pitfalls

- A WACC applied to the equity's cash flows, or the cost of equity to the project's.
- Pre-tax cash flows at a post-tax rate, or nominal cash flows at a real rate.
- The debt re-sized in a sensitivity, so the equity looks protected.
- The construction period left out of the discounting — the money spent before COD is worth more than the money received after.
- An IRR with no NPV, MOIC or payback beside it.

In Project Finance Studio: Output › Returns shows the project and equity IRR, the NPVs at the cost of capital, the MOIC, the cash yield, the payback and the breakevens; Inputs › Valuation and reporting holds the cost of capital, the end of operations (handed back, an exit multiple or a perpetuity) and the exit valuation for a seller and an incoming partner; Output › Sensitivity re-runs each change with the debt held. The Excel workbook carries the same formulas.

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