Net present value and IRR

Judge an investment in today's money: discount each year's cash flow, add them up, and find the rate that gives zero.

YEAR	NET CASH FLOW	FACTOR AT 5%	PRESENT VALUE
0: invest	−200	1.000	−200
1	+80	0.952	+76
2	+80	0.907	+73
3	+80	0.864	+69
Total	**+40 undiscounted**		**NPV +18**

Illustrative, € thousand. NPV (net present value) = 218 − 200 = +18. At 10%, NPV ≈ −1, so the IRR (internal rate of return) ≈ 9.7%. Benefit-cost ratio 218 ÷ 200 ≈ 1.09.

WHAT IT IS

A euro later is worth less than one now. The **discount factor** for year t is 1 ÷ (1 + r)^t; Finance sets r, the cost of capital or a hurdle rate. **NPV** sums the discounted flows less the investment; positive means the project beats r. **IRR** is the rate where NPV = 0; it ignores size, and two sign changes can give two IRRs (Park, 2007).

HOW IT WORKS

01 Place each cash flow in its year; name who owns it.
02 Take the rate from Finance; work out the discount factors.
03 Multiply, add, less the investment: accept a positive NPV.
04 For like-for-like options, prefer NPV over IRR.
05 Test a higher rate and lower benefits; list unpriced value.

MID-LEVEL · WORKED EXAMPLE

Apply it well

The situation: A city team moves resident parking permits online in eight months for €640k; net savings are €140k in year 1, then €250k a year for three years.

At 5% (factors 0.952, 0.907, 0.864, 0.823): 133 + 227 + 216 + 206 = €782k, so NPV = 782 − 640 = +€142k; IRR ≈ 13.4%. Savings could fall 18% (142 ÷ 782) before NPV = 0.

In the exam: Show cash flows, factors, present values and the sum. State the rate's source, the rule and one sensitivity.

SENIOR · WORKED EXAMPLE

Design and lead it

The situation: A city is joining 14 online services under one login over 30 months, for about €13.5m, with funds released phase by phase.

The project manager agrees one rate with the Chief Financial Officer. Each owner signs up to its own savings, so none is counted twice (Buttrick, 2020); each release of funds re-appraises the case.

In the exam: Explain the design: one rate, owned benefits, appraisal at each gate, and non-cash value beside NPV.

WHERE IT SITS

IPMA · ICB4	PMI · *PMBOK® GUIDE* 8 · PMP® EXAM	APM · BOK 8 · PMQ EXAM
4.3.1.3 (p. 42): the business or organisational justification; 4.5.7 (p. 124): return on investment and rates of return	Guide §2.4.1 (p. 59): value metrics incl. IRR; Table 2–8 (p. 67): NPV and IRR checks. Exam outline: Process task 3	BoK (APM's Body of Knowledge) §2.3.1: NPV, NPSV (net present social value) and IRR against a hurdle rate. PMQ (APM's Project Management Qualification) objective 4

Sources: IPMA ICB4 (2015); PMI, PMBOK® Guide, 8th ed.; PMI, PMP® Examination Content Outline (2026); APM Body of Knowledge, 8th ed.; APM, PMQ handbook (v6, 2026); Kerzner, Project Management: A Systems Approach (11th ed.); Park, Contemporary Engineering Economics (4th ed.); Buttrick, The Programme and Portfolio Workout (2020)