NPV, IRR and Discounted Payback of a Project

Net present value, internal rate of return and simple and discounted payback of an investment that returns an annual saving, with optional escalation.

Method: Discounted cash flow (engineering economics)

Input parameters

Unit system: SI

Parameter	Value	Unit
Investment at the start (your currency)	1,000,000	
Saving or net cash flow in year 1 (your currency)	300,000	
Yearly escalation of the saving	5.0000	%
Life (years)	10.000	
Discount rate	10.000	%

Calculated results

Parameter	Value	Unit
Net present value (your currency)	1,231,944	
Internal rate of return	31.944	%
Simple payback (years)	3.3333	
Discounted payback (years; 0 = not within the life)	3.9209	
Profitability index (PV of savings ÷ investment)	2.2319	

Formula and method

$$NPV = -C_0 + \sum_{t=1}^{n} \frac{S(1+g)^{t-1}}{(1+i)^t} \qquad NPV(IRR) = 0 \qquad n_s = \frac{C_0}{S} \qquad PI = \frac{NPV + C_0}{C_0}$$

Variables

C_0	investment	currency
S	year-1 saving	currency
g	escalation	–
n	life	years
i	discount rate	–
NPV	net present value	currency
IRR	internal rate of return	–
n_s	simple payback	years
n_d	discounted payback	years
PI	profitability index	–
t	year	–

Method and standards

End-of-year discounted cash flows; IRR by bisection; discounted payback interpolated within the year it turns positive.

Assumptions and limits

- End-of-year cash flows; no tax, depreciation or residual value.

References

- Discounted cash flow (engineering economics)

Report details

Report reference	FCC-ESGH-BJX8 (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/general/economics/npv-irr-savings

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.