Tools and Techniques for
Economic/Financial
Analysis of Projects

Project Evaluation: Alternative Methods

- Payback Period (PBP)
- Internal Rate of Return (IRR)
- Net Present Value (NPV)
- Profitability Index (PI)

All above models are based on TVM time value of money concept.

NPV is the present value of an investment project's net cash flows minus the project's initial cash outflow.

$$NPV = \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \ldots + \frac{CF_n}{(1+k)^n} - ICO$$

NPV = PV of CIF – PV of COF

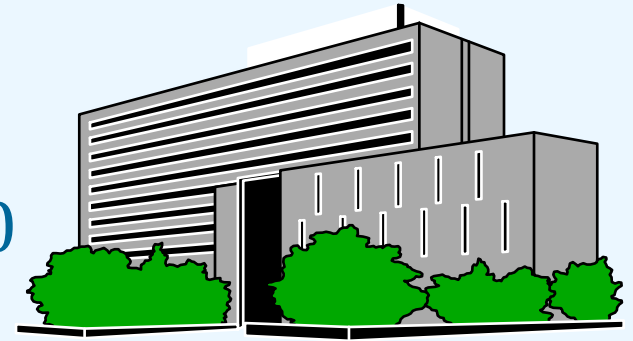**Project Acceptance Criteria using NPV:**
- ➢ If independent project Accept investments having NPV = +ve.
- ➢ If mutually exclusive projects Accept investments having higher NPV.

Valuing an Office Building

Step 1: Forecast cash flows

Cost of building = C_0 = 350

Sale price in Year 1 = C_1 = 400

Step 2: Estimate opportunity cost of capital

If equally risky investments in the capital market offer a return of 7%, then RRR=Cost of capital = 7%

NPV = PV of CIF – PV of COF

= 400*$PVF_{7\%,1yr}$ – PV of 350

$$NPV = 374 - 350 = 24$$

Exercise ------Net Present Value: NPV

Should you invest $60,000 in a project that will return $15,000 per year for five years? You have a minimum return of 8% and expect inflation to hold steady at 3% over the next five years?

Year	Net flow	Discount	NPV
0	-$60,000	1.0000	-$60,000.00
1	$15,000	0.9009	$13,513.51
2	$15,000	0.8116	$12,174.34
3	$15,000	0.7312	$10,967.87
4	$15,000	0.6587	$9,880.96
5	$15,000	0.5935	$8,901.77
		NPV=	-$4,561.54

The NPV is Negative, so don't invest.

NPV Strengths

- Cash flows assumed to be reinvested at the hurdle rate.
- Accounts for TVM.
- Considers all cash flows.

PI is the ratio of the present value of a project's future net cash flows to the project's initial cash outflow.

1st Method. $\quad$ PI = PV of CIF /**PV of initial COF**

2nd Method. $\quad$ PI = 1 + [NPV /**PV of initial COF**]

Note: $\quad$ [*Reject* as *PI < 1.00*]

If PI = 0.9643 Should this project be accepted?

No! The PI is *less than 1.00*. This means that the project is not profitable.

Strengths:

- Same as NPV .
- Allows comparison of different scale projects

Weaknesses:

- Same as NPV.
- Provides only relative profitability.
- Potential Ranking Problems.

Internal Rate of Return

IRR is the discount rate that equates the present value of the future net cash flows from an investment project with the project's initial cash outflow. A project must meet a *minimum rate of return* before it is worthy of consideration. *Higher IRR values are better!*

$$ICOF = \frac{CF_1}{(1 + IRR)^1} + \frac{CF_2}{(1 + IRR)^2} + \ldots + \frac{CF_n}{(1 + IRR)^n}$$

$$\text{Rs40,000} = \frac{\text{Rs10,000}}{(1+\text{IRR})^1} + \frac{\text{Rs12,000}}{(1+\text{IRR})^2} +$$

$$\frac{\text{Rs15,000}}{(1+\text{IRR})^3} + \frac{\text{Rs10,000}}{(1+\text{IRR})^4} + \frac{\text{Rs7,000}}{(1+\text{IRR})^5}$$

Find the interest rate (*IRR*) that causes the discounted cash flows to equal Rs40,000.

IRR = 0.1157 or 11.57%

If the management has determined that the hurdle rate is 13% for its projects   Should this project be accepted?

No! The firm will receive 11.57% for each Rupee invested in this project at a cost of 13%. [IRR < Hurdle Rate].

Example-----Internal Rate of Return

A project that costs $40,000 will generate cash flows of $14,000 for the next four years. You have a rate of return requirement of 17%; does this project meet the threshold?

Year	Net flow	Discount	NPV
0	-$40,000	1.0000	-$40,000.00
1	$14,000	0.9009	$12,173.91
2	$14,000	0.8116	$10,586.01
3	$14,000	0.7312	$9,205.23
4	$14,000	0.6587	$8,004.55
			-$30.30

This table has been calculated using a discount rate of 15%

The project doesn't meet our 17% requirement and should not be considered further.

Strengths:

- Accounts for TVM.
- Considers all cash flows.

Weaknesses:

- Difficulties with project rankings.

- Multiple IRRs in certain cases.

Ranking of project proposals *may* create contradictory results due to following reasons;

A. Scale of Investment
B. Cash-flow Pattern
C. Project Life