An Example

A company wants to invest Rs. 100. It has two options: plan A and plan B. In plan A, it would get return of Rs. 110 at the end of year 1 and in plan B, it would get return of Rs. 121 after the end of year 2.

At the initial level, it looks that plan B is more promising as it has more cash inflows.

Using the formula, we have from plan A: $100 = \frac{110}{(1+0.1)^1}$

From plan B, we have: $100 = \frac{121}{(1+0.1)^2}$

Two projects are of equal value as their present values are same.

Another Example

Ronda won Rs. 3000 as prize money. She is deciding on whether to recieve Rs. 3000 today or whether the following set of cash flows over the next three years (assuming 10% interest rate)

Time	**Future Value**	**Present Value**
Year 1	1100	1000
Year 2	1210	1000
Year 3	1331	1000

Investment Evaluation Techniques

1. Considering the TVM
   - Net Present Value
   - Internal rate of Return
   - Cost-Benefit Analysis
2. Not Considering the TVM
   - Pay Back Period
   - Accounting Rate of Return

Not Considering TVM

Payback period is the method of evaluation where no discounting of cash flow comes into play. The term 'payback period' is the period in which the initial outlay is covered with the revenues. The payback period is stated in terms of years.

Firm X wants to set up a machine which cost Rs. 1,00,000. Upon setting up this machine, firm X is expected to get a net cash flow of Rs. 10, 000 per year. Therefore, the payback period for this investment is 10 years.

A Practice Question

Investment of Rs. 1000. Which Project will they chose?

	A	B
Year 1	300	200
Year 2	500	200
Year 3	200	300
Year 4	100	300
Year 5	50	400
Year 6	20	600

Under payback method, Project A looks better. But project B looks promising for future, This is what the failure of payback method loks. It cannot foresee the future benefits.

Accounting Rate of Return (ARR)

Accounting rate of return is the ratio of estimated accounting profit of a project to the initial investment made in the project.

XYZ Company is looking to invest in some new machinery to replace its current malfunctioning one. The new machine, which costs Rs. 420,000, would increase annual revenue by Rs. 200,000 and annual expenses by Rs. 50,000. The machine is estimated to have a useful life of 12 years and zero salvage value.

Depreciation: $\frac{420{,}000}{12} = 35,000$

Average Annual Profit: 200000 - (50000+35000) = 115,000

ARR = $\frac{115000}{420000} = 0.274$ or 27.4%

For every rupee invested, 0.27 paise.

Considering TVM

Net Present Value: It consists of comparing the present value of all net cash inflows to the initial investment cost. It is calculated by discounting all future flows to the present and subtracting the present value of all outflows from the present value of all inflows.

If NPV $>$ Cost - Project accepted; If NPV $<$ Cost -Project rejected

Questions

Question: Alex promises you Rs. 900 in 3 years, what is the present value (using a 10% interest rate)?

Answer: The present value is s. 676.18. In other words, Rs. 676.18 is now as valuable as Rs. 900 would be in 3 years.

Question: You invest Rs. 500 now, and get back Rs. 570 next year. Use an interest rate of 10% to work out the NPV.

Answer: The Present value of Rs. 570 will be $\frac{570}{(1+0.1)^1} = 518.18$. NPV = 518.18 - 500 = 18.18.

So, technically, you are gaining in the context of present value.

Decision Rules

1. Stand Alone Projects
   - If NPA > 0, then accept the project
   - If NPA < 0, then reject the project.
2. Mutually Exclusive Projects If $\text{NPV}_\text{A} > \text{NPV}_\text{B}$, choose project A over B.

Another Example

Consider the following cash flows for a prospective project. The annual rate of return is 12%. Should the project be undertaken?

Investment Year	5000
Year 1	1000
Year 2	2000
Year 3	3000

$$\text{NPV}_{\text{Project}} = -5000 + \frac{1000}{(1.12)^1} + \frac{1000}{(1.12)^2} + \frac{1000}{(1.12)^3}$$

Here, $\text{NPV}_{\text{Project}} < 0$, project should not be undertaken.

Note: It is -5000 as, it is an outflow while in the other three years it is cash inflow.

Internal Rate of Return (IRR)

The IRR is the interest rate at which the present value of the three inflows just equals the Rs. 5,000 outflow.

The IRR is the rate of discount which reduces the present value of the income stream of cash flows to equality with the initial cost So the IRR is the interest rate that makes the Net Present Value zero.

An Example

An investment of Rs. 2000 value has been initiated. The plan is supposed to receive 3 yearly payments oF Rs. 100 each and Rs. 2500 as bonus in the third year. The discount rate is 10%.

Present value = 2000

Year 1 = $\frac{100}{(1+0.1)^1} = 90.91$

Year 2 = $\frac{100}{(1+0.1)^2} = 82.64$

Year 3 = $\frac{100}{(1+0.1)^3} = 75.13$ and $\frac{2500}{(1+0.1)^3} = 1878.29$

NPV = $-2000 + 90.91 + 82.64 + 75.13 + 1878.29 = 126.97$. Investment plan is ON.

If discounting rate is 12%, NPV is 19.64. Investment plan is ON.

However, when discounting rate is 12.4% NPV is -0.94, very close to 0. This is IRR.

Decision Rules

1. If IRR $>$ Opportunity rate of interest – Project accepted
2. If IRR $<$ Opportunity rate of interest – Project rejected

Stand Alone projects

1. If IRR $>$ cost of capital then accept the project
2. If IRR $<$ cost of capital then reject the project

Mutually Exclusive projects

If $IRR_A > IRR_B$ choose project A over B.

Benefit-Cost Ratio

The benefit-cost analysis method is mainly used for economic evaluation of public projects which are mostly funded by government organizations.

The present value of future cash flows is calculated and a ratio of this sum to the initial outlay is seen.

If this ratio is more than 1, the project should be accepted and if it is less than 1, it should be rejected.

An Example

1. Investment Rs. 100, present value of future returns Rs. 120. Benefit to cost ratio = 1.2

2. Investment Rs. 100, present value of future returns Rs. 80. Benefit to cost ratio = 0.8

The project which has ratio greater than 1 should be considered.