

ECO 4368

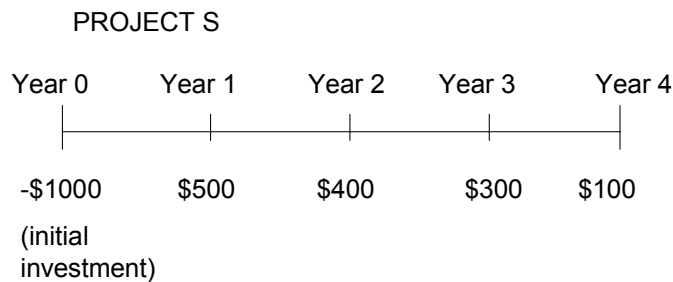
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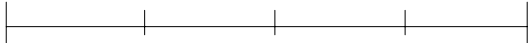
Capital Budgeting

- **Capital Budget** is an outline of planned investments in operating assets, and **capital budgeting** is the whole process of analyzing projects and deciding which ones to include in the capital budget. A firm's capital budgeting decisions define its strategic direction, because moves into new products, services or markets must be preceded by capital expenditures.
- Project Classifications:
 - Replacement-maintenance of business.
 - Replacement-cost reduction: with the purpose of lowering the cost of inputs as adopting a more cost efficient technology.
 - Expansion of existing products or markets: increasing capacity or improving distribution facilities.
 - Expansion into new products or markets.
 - Safety and or environmental projects: to comply with government regulations or labor contracts. (example: a mining company improving the safety of working conditions)

Capital Budgeting Decision Rules

- **1. Payback Period.** The payback period, defined as the expected number of years required to recover the original investment, was the first formal method used to evaluate capital budgeting projects. To see how the payback period of a project is calculated consider the following project cash flow diagram:



PROJECT L				
Year 0	Year 1	Year 2	Year 3	Year 4
				
-\$1000	\$100	\$300	\$400	\$600
(initial investment)				

$$\begin{aligned}
 \text{Payback for S} &= \text{Year before full recovery} + \frac{\text{unrecovered cost at start of the year}}{\text{cash flow during year}} \\
 &= 2 + \frac{100}{300} = 2.33 \text{ years.}
 \end{aligned}$$

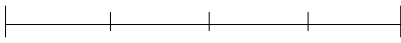
Similarly, for Project L we have

$$\text{Payback for L} = 3 + \frac{200}{600} = 3.33 \text{ years.}$$

The shorter the payback period, the better. A firm using the payback period as a decision criteria would choose project S.

However, note that payback method, although simple, makes no use of the time value of money. To account for this important drawback, some firms use a version called ‘discounted payback’ method.

- **2. Discounted Payback Period:** In this variant of the payback analysis, each future cash flow is discounted at the firm’s cost of capital.

PROJECT S					
	Year 0	Year 1	Year 2	Year 3	Year 4
					
	-\$1000	\$500	\$400	\$300	\$100
Discounted	-\$1000	\$455	\$331	\$225	\$68
At 10%					
Unrecovered		-\$545	-\$214	\$11	+\$79

	PROJECT L				
	Year 0	Year 1	Year 2	Year 3	Year 4
	----- ----- ----- ----- -----				
	-\$1000	\$100	\$300	\$400	\$600
Discounted	-\$1000	\$91	\$248	\$301	\$410
At 10%					
Unrecovered		-\$909	-\$661	-\$360	+\$50

Accordingly, discounted payback for Project S is

$$\text{Discounted Payback for S} = 2 + \frac{214}{225} = 2.95 \text{ years.}$$

and the discounted payback for Project L is

$$\text{Discounted Payback for L} = 3 + \frac{360}{410} = 3.88 \text{ years.}$$

Although the payback methods have serious faults as ranking criteria, they are useful in providing information on how long funds will be tied up in a project.

- **3. Net Present Value (NPV):** This method involves discounting the cash flow stream of a project to the current date and summing up these discounted cash flows to find the net present value of the project.

	PROJECT S				
	Year 0	Year 1	Year 2	Year 3	Year 4
	----- ----- ----- ----- -----				
	-\$1000	\$500	\$400	\$300	\$100
Discounted	-\$1000	\$455	\$331	\$225	\$68
at 10%					

For example, for Project S, the NPV (when cash flows are discounted at 10%) is given by

$$NPV_s = -1000 + 455 + 331 + 225 + 68 = \$79.$$

whereas, the NPV of Project L is

$$NPV_L = -1000 + 91 + 248 + 301 + 410 = \$50.$$

- If the NPV is positive, the project should be accepted, whereas if NPV is negative it should be rejected. If two projects are mutually exclusive and if they both have positive NPVS, the one with the higher NPV should be chosen.

- **4. Internal rate of Return (IRR):** Given a project's cash flow stream, IRR is the discount rate that equates the NPV of the project to zero.

For example, for Project S, IRR is defined as

$$-1000 + \frac{500}{1 + IRR} + \frac{400}{(1 + IRR)^2} + \frac{300}{(1 + IRR)^3} + \frac{100}{(1 + IRR)^4} = 0,$$

which yields an IRR of

$$IRR_s = 14.5\%$$

A similar calculation for Project L gives

$$-1000 + \frac{100}{1 + IRR} + \frac{300}{(1 + IRR)^2} + \frac{400}{(1 + IRR)^3} + \frac{600}{(1 + IRR)^4} = 0,$$

which yields

$$IRR_L = 11.8\%$$

If both projects have a cost of capital (or hurdle rate of 10%) and if the projects are independent, then according to IRR criteria, both projects should be accepted. Generally,

If $IRR > \text{COST OF CAPITAL} \rightarrow \text{ACCEPT}$.

If $IRR < \text{COST OF CAPITAL} \rightarrow \text{REJECT}$

Exercise 1: (IRR, CAPM and Annuity Flow Project) A company uses internally generated equity to finance its capital budget and it uses CAPM to compute its cost of capital. The risk free is 5 % and market risk premium is 10 percent. Company is considering a 3 year project which requires a date 0 outlay of \$24,018 and which generates \$10,000 in Year 1, Year 2 and Year 3. What is the highest value of beta for which the company will undertake the project?

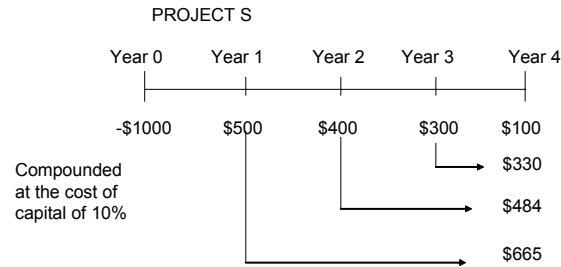
Exercise 2: (IRR, Dividend Growth and Annuity Flow Project) Consider a company which uses internally generated equity to finance its capital budget. The company uses constant dividend growth stock valuation model to compute its cost of capital and uses IRR method to evaluate projects. Company is considering a 3 year project which requires a date 0 outlay of \$69,648 and generates \$30,000 in each of the following 3 years (i.e. Year 1, Year 2 and Year 3 cash flows are all \$30,000). The company's next expected dividend is $D_1 = 4$ and its current stock price is $P_0 = \$80$. What is the highest value of the expected dividend growth rate g that the company will undertake the project?

• **5. Modified Internal rate of Return (MIRR):**

Consider the following modification of IRR, defined as

$$\text{present value of costs} = \frac{\text{Future Value of Inflows}}{(1 + MIRR)^n}$$

where n is (number of years) the life cycle of the project.



Accordingly, Future Value of Cash flows (compounded at the cost of capital 10%) is given by

$$FV = 100 + 330 + 484 + 665 = \$1579$$

and the MIRR for Project S is

$$\begin{aligned} \text{present value of costs} &= \frac{\text{Future Value of Inflows}}{(1 + MIRR)^n} \\ 1000 &= \frac{1579}{(1 + MIRR)^4} \Rightarrow MIRR = 12.1\% \end{aligned}$$

The decision criteria:

If $MIRR > \text{COST OF CAPITAL} \rightarrow \text{ACCEPT}$.

If $MIRR < \text{COST OF CAPITAL} \rightarrow \text{REJECT}$

Exercise 3: Cisco-systems consider the acquisition of a small young high-tech company. The acquisition will cost Cisco \$17.3 million and because of operating synergies, it is expected to provide annual cash flows of \$5 million in each of the next 4 years. Cisco's management is using the MIRR method to evaluate this investment. Cisco's capital structure is 100% internal equity. Cost of internal equity is 16%. What is the MIRR for this acquisition and should the company go for it?

Exercise 4 : A textile manufacturer has a new automated production line project it is considering to undertake. The project has a cost of \$750,000 and it is expected to provide annual cash flows of \$250,000 for 4 years. The firm's management is using the MIRR approach. Company's capital structure is 50% debt and 50% internal equity. Cost of internal equity is 18% and cost of debt is 10% and company has a tax rate of 40 percent. What is the MIRR for this project and should the company undertake it?