Ch. 11 The Basics of Capital Budgeting

Topics

- Net Present Value
- Other Investment Criteria
  - IRR
  - Payback

What is capital budgeting?

- Analysis of potential additions to fixed assets.
- Long-term decisions; involve large expenditures.
- Very important to firm's future.

Net Present Value

- Net Present Value: Present value of cash flows minus initial investments.
  NPV = - Initial Costs + PV(CF from Investment)
- Discount Rate = Opportunity Cost of Capital
  - Opportunity Cost of Capital: Expected rate of return given up by investing in a project.

Net Present Value

Example

Q: Suppose we can invest $50 today & receive $60 later today. What is our increase in value?

Net Present Value

Example

Suppose we can invest $50 today and receive $60 in one year. What is our increase in value given a 10% expected return?

Net Present Value

NPV = - Initial Costs + PV of Future Cash Flows

- Managers increase shareholders' wealth by accepting all projects that are worth more than they cost.
- Therefore, they should accept all projects with a positive net present value.
- The cash flow could be positive or negative at any time period.

$$NPV = C_0 + \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \ldots + \frac{C_t}{(1+r)^t}$$

Net Present Value

Example

You have the opportunity to purchase an office building. You have a tenant lined up that will generate $16,000 per year in cash flows for three years. At the end of three years you anticipate selling the building for $450,000. How much would you be willing to pay for the building? Assume that the opportunity cost of capital is 7%.

Net Present Value

Example - continued

If the building is being offered for sale at a price of $350,000, would you buy the building and what is the added value generated by your purchase and management of the building?

The Net Present Value (NPV) Rule

- Estimating NPV:
  1. Estimate future cash flows: how much? and when?
  2. Estimate discount rate.
  3. Estimate initial costs.
- Minimum Acceptance Criteria:
  Accept if NPV > 0.
- Ranking Criteria:
  Choose the highest NPV.

Good Attributes of the NPV Rule

1. Uses cash flows
2. Uses ALL cash flows of the project
3. Discounts ALL cash flows properly

- Reinvestment assumption: the NPV rule assumes that all cash flows can be reinvested at the discount rate.

Other Investment Criteria

- Payback Period
- Internal Rate of Return (IRR)
- Profitability Index

Payback Period Rule

- How long does it take the project to "pay back" its initial investment?
- Payback Period = number of years to recover initial costs
- Minimum Acceptance Criteria:
  - set by management
- Ranking Criteria:
  - set by management

Payback Period Method

Example

The three project below are available. The company accepts all projects with a 2 year or less payback period. Show how this decision will impact our decision.

	Cash Flows					
Proj.	C_0	C_1	C_2	C_3	Payback	NPV@10%
A	-2000	+1000	+1000	+10000		
B	-2000	+1000	+1000	0		
C	-2000	0	+2000	0		

Payback Period Rule

- Advantages:
  - Easy to understand.
  - Biased toward liquidity.
- Disadvantages:
  - Ignores the time value of money.
  - Ignores cash flows after the payback period.
  - Biased against long-term projects.
  - Requires an arbitrary acceptance criteria.
  - A project accepted based on the payback criteria. may not have a positive NPV.

Discounted Payback Period Rule

- How long does it take the project to "pay back" its initial investment taking the time value of money into account?
- By the time you have discounted the cash flows, you might as well calculate the NPV.

Internal Rate of Return (IRR)

- Internal Rate of Return: Discount rate at which NPV = 0.
- IRR Rule: Invest in any project offering a rate of return that is higher than the opportunity cost of capital.

- Caution
  - Mutually exclusive projects
  - Unconventional cashflows

Internal Rate of Return

Example

You can purchase a building for $350,000. The investment will generate $16,000 in cash flows (i.e. rent) during the first three years. At the end of three years you will sell the building for $450,000. What is the IRR on this investment?

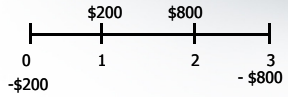
Mutually Exclusive Projects

Example

Select one of the two following projects using NPV or IRR. Assume: Cost of Capital = 7%

	Project	
Period	A	B
0	$ (350.00)	$(350.00)
1	$ 400.00	$ 16.00
2		$ 16.00
3		$ 16.00
4		$ 466.00
IRR		
NPV		

Multiple IRRs



IRR Pitfalls

- IRR may provide false information in the case of
  - Mutually exclusive projects
  - Unconventional cash flows

➔ Decision rule: Use **NPV!**

Reinvestment rate assumptions

- NPV method assumes CFs are reinvested at the cost of capital.
- IRR method assumes CFs are reinvested at IRR.
- Assuming CFs are reinvested at the opportunity cost of capital is more realistic, so NPV method is the best. NPV method should be used to choose between mutually exclusive projects.
- Perhaps a hybrid of the IRR that assumes cost of capital reinvestment is needed.

Modified IRR

- MIRR is the discount rate that causes the PV of a project's terminal value (TV) to equal the PV of costs. TV is found by compounding inflows at cost of capital.
- MIRR assumes cash flows are reinvested at the cost of capital.

Why use MIRR versus IRR?

- MIRR assumes reinvestment at the opportunity cost of capital. MIRR also avoids the multiple IRR problem.
- Managers like rate of return comparisons, and MIRR is better for this than IRR.

Profitability Index (PI)

$$PI = \frac{NPV}{Initial\ Investent}$$

- Minimum Acceptance Criteria:
  - Accept if PI > 0.
- Ranking Criteria:
  - Select alternative with highest PI.
- Advantages:
  - May be useful when available investment funds are limited.
  - Easy to understand and communicate.
  - Correct decision when evaluating independent projects.
- Disadvantages:
  - Problems with mutually exclusive investments.

Summary and Conclusions

- Practice of Capital Budgeting
  - Varies by industry: Some firms use payback, others use accounting rate of return.
  - The most frequently used technique for large corporations is IRR or NPV.
- Most popular alternatives to NPV:
  - Payback period
  - Internal rate of return
  - Profitability index