

Lecture 5

Capital Budgeting

FINA 620

What Makes a Good Decision Criteria?

- We need to ask ourselves the following questions when evaluating decision criteria
 - Does the decision rule adjust for the time value of money?
 - Does the decision rule adjust for risk?
 - Does the decision rule provide information on whether we are creating value for the firm?

NPV – Decision Rule

- ***If the NPV is positive, accept the project***
- A positive NPV means that the project is expected to add value to the firm and will therefore increase the wealth of the owners.
- Since our goal is to increase owner wealth, NPV is a direct measure of how well this project will meet our goal.

Project Example Information

- You are looking at a new project and you have estimated the following cash flows:
 - Year 0: CF = -165,000
 - Year 1: CF = 63,120; NI = 13,620
 - Year 2: CF = 70,800; NI = 3,300
 - Year 3: CF = 91,080; NI = 29,100
 - Average Book Value = 72,000
- Your required return for assets of this risk is 12%.

Computing NPV for the Project

- Using the formulas:
 - $NPV = 63,120/(1.12) + 70,800/(1.12)^2 + 91,080/(1.12)^3 - 165,000 = 12,627.42$
- Using the calculator:
 - Use the Cash Flow and NPV functions on the TI BAII Plus
 - $CF_0 = -165,000$; $C01 = 63,120$; $F01 = 1$; $C02 = 70,800$; $F02 = 1$; $C03 = 91,080$; $F03 = 1$; NPV ; $I = 12$; $CPT NPV = 12,627.41$
- ***Do we accept or reject the project?***

Payback Period

- How long does it take to get the initial cost back in a nominal sense?
- Computation
 - Estimate the cash flows
 - Subtract the future cash flows from the initial cost until the initial investment has been recovered
- Decision Rule – ***Accept if the payback period is less than some preset limit***

Computing Payback For The Project

- Assume we will accept the project if it pays back within two years.
 - Year 1: $165,000 - 63,120 = 101,880$ still to recover
 - Year 2: $101,880 - 70,800 = 31,080$ still to recover
 - Year 3: $31,080 - 91,080 = -60,000$ *project pays back in year 3*
- ***If the preset limit is 3 years, do we accept or reject the project?***

Advantages and Disadvantages of Payback

- Advantages
 - Easy to understand
 - Adjusts for uncertainty of later cash flows
 - Biased towards liquidity
- Disadvantages
 - Ignores the time value of money
 - Requires an arbitrary cutoff point
 - Ignores cash flows beyond the cutoff date
 - Biased against long-term projects, such as research and development, and new projects

Discounted Payback Period

- Compute the present value of each cash flow and then determine how long it takes to payback on a discounted basis
- Compare to a specified required payback period
- Decision Rule - ***Accept the project if it pays back on a discounted basis within the specified time***

Computing Discounted Payback for the Project

- Assume we will accept the project if it pays back on a discounted basis in 2 years.
- Compute the PV for each cash flow and determine the payback period using discounted cash flows
 - Year 1: $165,000 - 63,120/1.12^1 = 108,643$
 - Year 2: $108,643 - 70,800/1.12^2 = 52,202$
 - Year 3: $52,202 - 91,080/1.12^3 = -12,627$ project pays back in year 3
- ***Do we accept or reject the project?***

Decision Criteria Test – Discounted Payback

- Does the discounted payback rule account for the time value of money?
- Does the discounted payback rule account for the risk of the cash flows?
- Does the discounted payback rule provide an indication about the increase in value?
- Should we consider the discounted payback rule for our primary decision criteria?

Advantages and Disadvantages of Discounted Payback

- Advantages

- Includes time value of money
- Easy to understand
- Does not accept negative estimated NPV investments
- Biased towards liquidity

- Disadvantages

- May reject positive NPV investments
- Requires an arbitrary cutoff point
- Ignores cash flows beyond the cutoff date
- Biased against long-term projects, such as R&D, and new projects

Average Accounting Return

- There are many different definitions for average accounting return
- The one used in the book is:
 - Average net income / Average book value
 - Note that the average book value depends on how the asset is depreciated.
- Need to have a target cutoff rate
- Decision Rule: ***Accept the project if the AAR is greater than a preset rate.***

Computing AAR For The Project

- Assume we require an average accounting return of 25%
- Average Net Income:
 - $(13,620 + 3,300 + 29,100) / 3 = 15,340$
- $AAR = 15,340 / 72,000 = .213 = 21.3\%$
- ***Do we accept or reject the project?***

Decision Criteria Test - AAR

- Does the AAR rule account for the time value of money?
- Does the AAR rule account for the risk of the cash flows?
- Does the AAR rule provide an indication about the increase in value?
- Should we consider the AAR rule for our primary decision criteria?

Advantages and Disadvantages of AAR

- Advantages
 - Easy to calculate
 - Needed information is usually available
- Disadvantages
 - Not a true rate of return; time value of money is ignored
 - Uses an arbitrary benchmark cutoff rate
 - Based on accounting net income and book values, not cash flows and market values

Internal Rate of Return 9.4

- This is the most important alternative to NPV
- It is often used in practice and is intuitively appealing
- It is based entirely on the estimated cash flows and is independent of interest rates found elsewhere

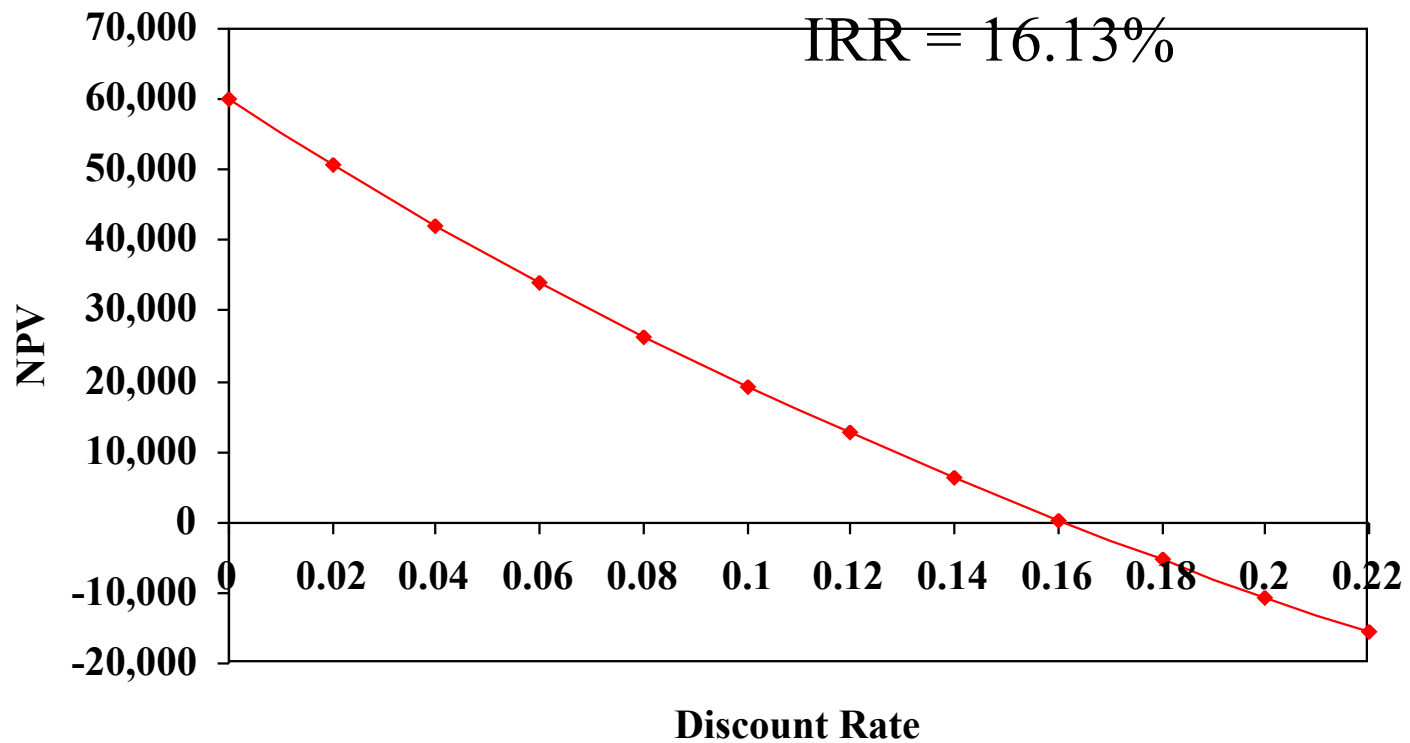
IRR – Definition and Decision Rule

- Definition: IRR is the return that makes the $NPV = 0$
- Decision Rule: ***Accept the project if the IRR is greater than the required return***

Computing IRR For The Project

- If you do not have a financial calculator, then this becomes a trial and error process
- Calculator
 - Enter the cash flows as you did with NPV
 - Press IRR and then CPT
 - $IRR = 16.13\% > 12\%$ required return
- ***Do we accept or reject the project?***

NPV Profile For The Project



IRR Advantages

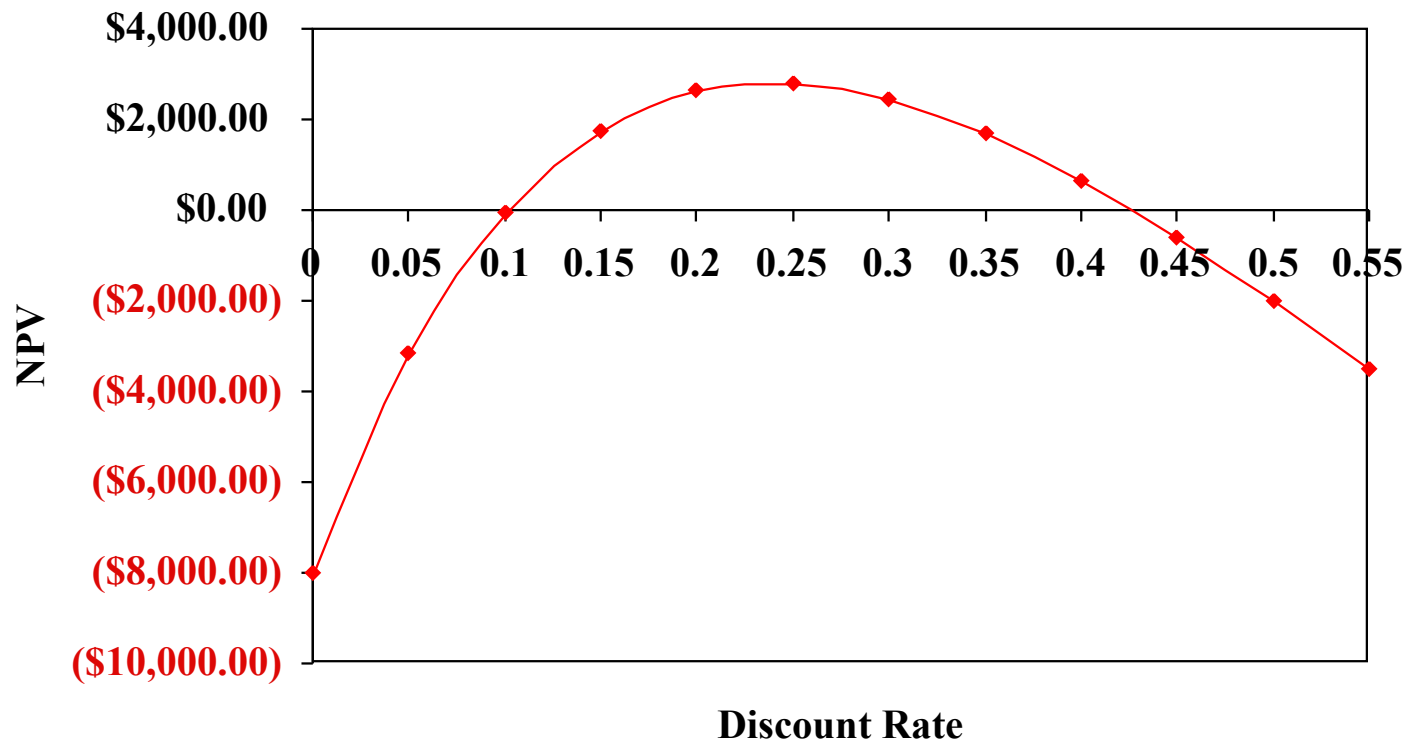
- Advantages
 - Knowing a return is intuitively appealing
 - It is a simple way to communicate the value of a project to someone who doesn't know all the estimation details
 - If the IRR is high enough, you may not need to estimate a required return, which is often a difficult task
 - Generally leads to the same answers as the NPV method
- Disadvantages
 - NPV and IRR will generally give us the same decision
 - Exceptions:
 - May result in multiple answers or no answer with non-conventional cash flows
 - May lead to incorrect decisions in comparisons of mutually exclusive investments

Non-conventional Cash Flows

- Suppose an investment will cost \$90,000 initially and will generate the following cash flows:
 - Year 1: 132,000
 - Year 2: 100,000
 - Year 3: -150,000
- The required return is 15%.
- Should we accept or reject the project?

NPV Profile

IRR = 10.11% and 42.66%



IRR and Mutually Exclusive Projects

- Mutually exclusive projects
 - If you choose one, you can't choose the other
 - Example: You can choose to attend graduate school next year at either Harvard or Stanford, but not both
- Intuitively you would use the following decision rules:
 - NPV – choose the project with the higher NPV
 - IRR – choose the project with the higher IRR

Example With Mutually Exclusive Projects

Period	Project A	Project B
0	-500	-400
1	325	325
2	325	200
IRR	19.43%	22.17%
NPV	64.05	60.74

The required return for both projects is 10%.

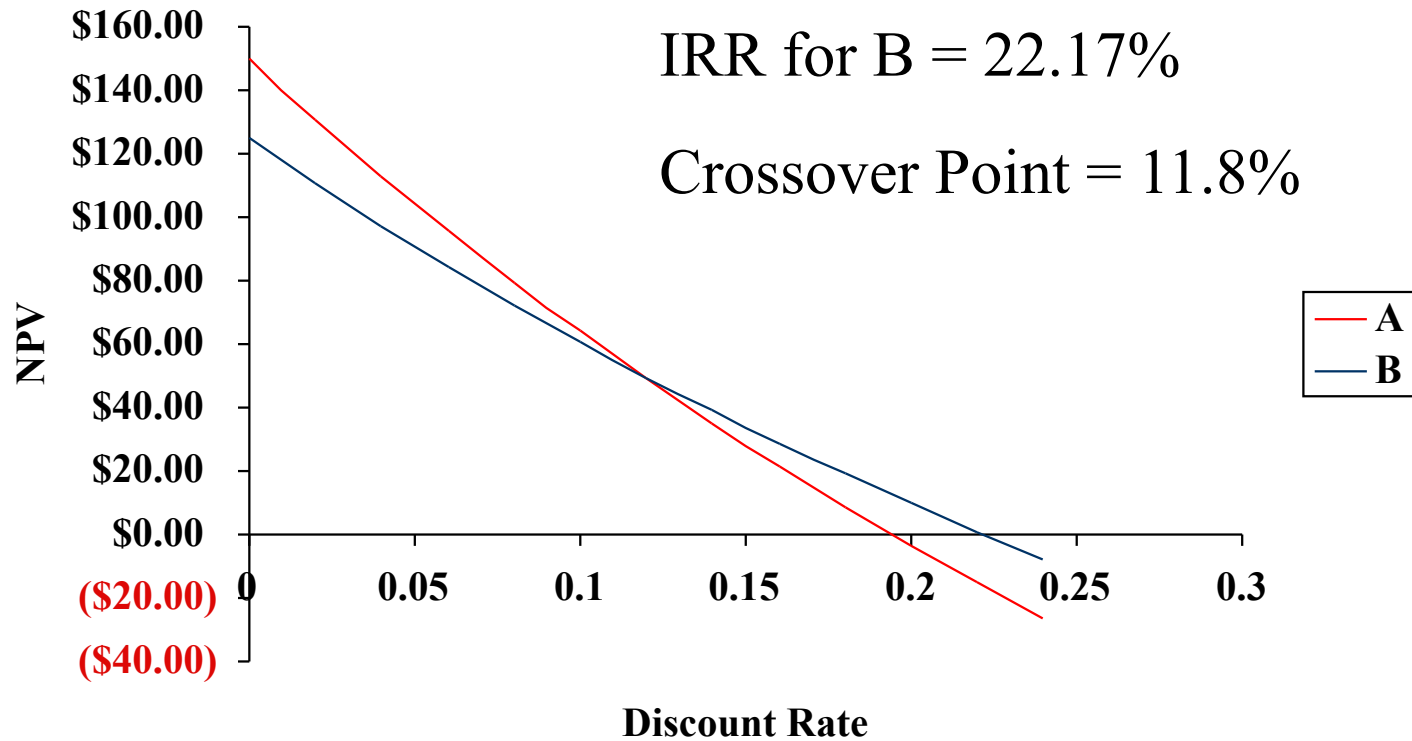
Which project should you accept and why?

NPV Profiles

IRR for A = 19.43%

IRR for B = 22.17%

Crossover Point = 11.8%



Conflicts Between NPV and IRR

- NPV directly measures the increase in value to the firm
- Whenever there is a conflict between NPV and another decision rule, you should *always* use NPV
- IRR is unreliable in the following situations
 - Non-conventional cash flows
 - Mutually exclusive projects

Profitability Index

- Measures the benefit per unit cost, based on the time value of money
- A profitability index of 1.1 implies that for every \$1 of investment, we create an additional \$0.10 in value
- This measure can be very useful in situations where we have limited capital

Advantages and Disadvantages of Profitability Index

- Advantages
 - Closely related to NPV, generally leading to identical decisions
 - Easy to understand and communicate
 - May be useful when available investment funds are limited
- Disadvantages
 - May lead to incorrect decisions in comparisons of mutually exclusive investments

The Practice of Capital Budgeting

- NPV and IRR are the most commonly used primary investment criteria
- Payback is a commonly used secondary investment criteria
- Capital budgeting techniques vary with industry.
 - Firms that are better able to estimate cash flows precisely are more likely to use NPV