Capital Budgeting Processes And Techniques

Professor Shilpa Patel

Department-commerce

The Capital Budgeting Decision Process

The Capital Budgeting Process involves three basic steps:

- Identifying potential investments
- Reviewing, analyzing, and selecting from the proposals that have been generated
- Implementing and monitoring the proposals that have been selected

Managers should separate investment and financing decisions

A Capital Budgeting Process Should:

Account for the time value of money

Account for risk

Focus on cash flow

Rank competing projects appropriately

Lead to investment decisions that maximize shareholders' wealth
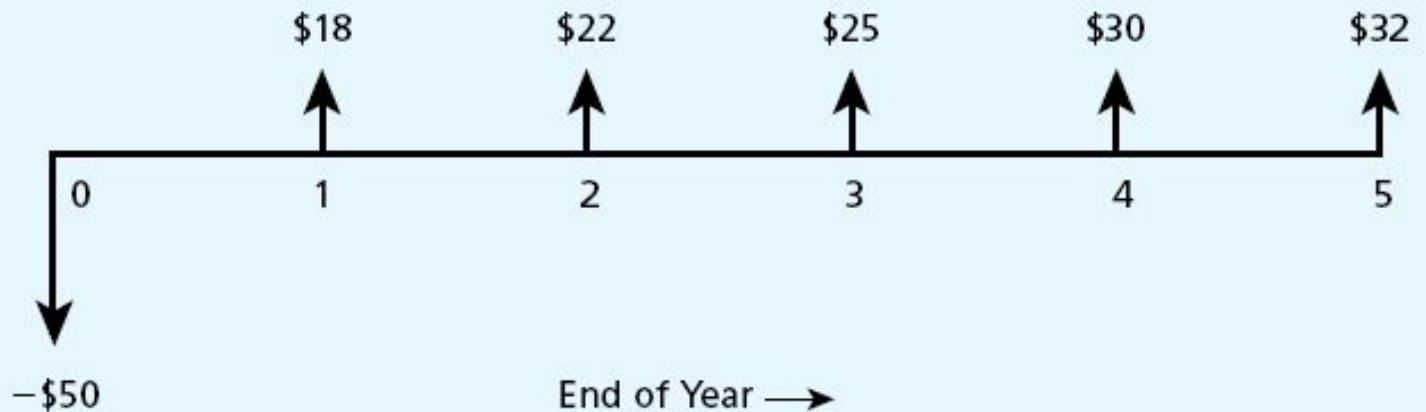
Capital Budgeting Decision Techniques

- **Payback period**: most commonly used
- **Accounting rate of return** (ARR): focuses on project's impact on accounting profits
- **Net present value** (NPV): best technique theoretically
- **Internal rate of return** (IRR): widely used with strong intuitive appeal
- **Profitability index** (PI): related to NPV

Capital Budgeting Example

Western Europe Expansion ($ in millions)

	$35	$80	$130	$160	$175
0	1	2	3	4	5

−$250   End of Year →
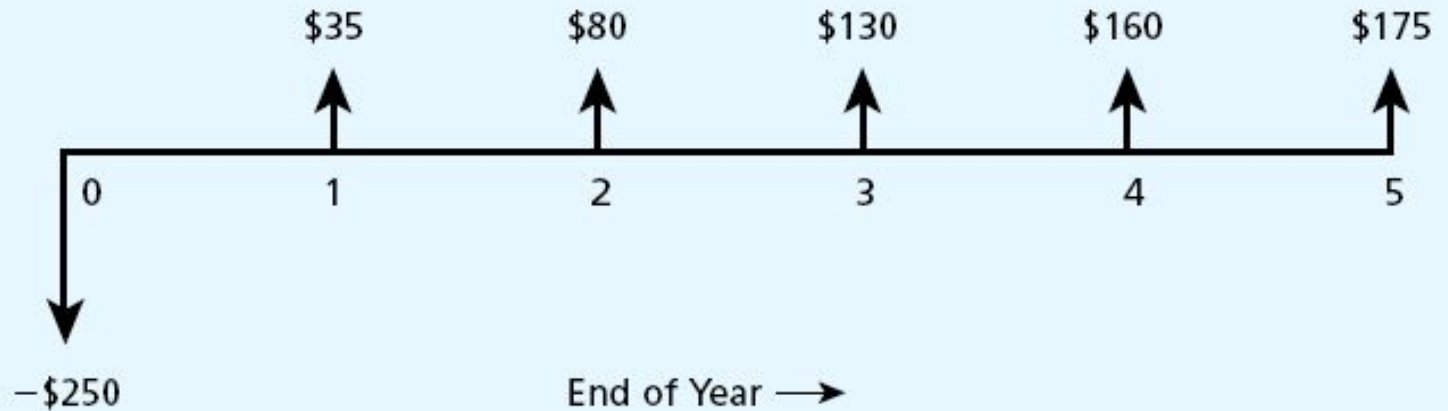
Southeast U.S. Toehold ($ in millions)

	$18	$22	$25	$30	$32
0	1	2	3	4	5

−$50   End of Year →

Payback Period

The <u>payback period</u> is the amount of time required for the firm to recover its initial <u>investment</u>

- If the project's payback period is less than the maximum acceptable payback period, accept the project
- If the project's payback period is greater than the maximum acceptable payback period, reject the project

Management determines maximum acceptable payback period

Pros And Cons Of Payback Method

Advantages of payback method:

Computational simplicity

Easy to understand

Focus on cash flow

Disadvantages of payback method:

Does not account properly for time value of money

Does not account properly for risk

Cutoff period is arbitrary

Does not lead to value-maximizing decisions

Discounted Payback Period

❑ Discounted payback accounts for time value
  ❑ Apply discount rate to cash flows during payback period
  ❑ Still ignores cash flows after payback period

Accounting Rate Of Return (ARR)

Can be computed from available accounting data

- ❑ Need only profits after taxes and depreciation
- ❑ Accounting ROR = Average profits after taxes ÷ Average investment

❑ *Average profits after taxes* are estimated by subtracting average annual depreciation from the average annual operating cash inflows

Average profits after taxes = Average annual operating cash inflows - Average annual depreciation

❑ ARR uses accounting numbers, not cash flows; no time value of money

Net Present Value

The present value of a project's cash inflows and outflows

Discounting cash flows accounts for the time value of money

Choosing the appropriate discount rate accounts for risk

$$NPV = CF_0 + \frac{CF_1}{(1+r)} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + ... + \frac{CF_N}{(1+r)^N}$$

Accept projects if NPV > 0

Net Present Value

$$NPV = CF_0 + \frac{CF_1}{(1+r)} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + ... + \frac{CF_N}{(1+r)^N}$$

A key input in NPV analysis is the discount rate

r represents the minimum return that the project must earn to satisfy investors

r varies with the risk of the firm and/or the risk of the project

Independent versus Mutually Exclusive Projects

❑ Independent projects – accepting/rejecting one project has no impact on the accept/reject decision for the other project

❑ Mutually exclusive projects – accepting one project implies rejecting another

  ❑ If demand is high enough, projects may be independent

  ❑ If demand warrants only one investment, projects are mutually exclusive

❑ When ranking mutually exclusive projects, choose the project with highest NPV

Pros and Cons Of Using NPV As Decision Rule

❑ NPV is the "gold standard" of investment decision rules

❑ Key benefits of using NPV as decision rule
- ❑ Focuses on cash flows, not accounting earnings
- ❑ Makes appropriate adjustment for time value of money
- ❑ Can properly account for risk differences between projects

❑ Though best measure, NPV has some drawbacks
- ❑ Lacks the intuitive appeal of payback
- ❑ Doesn't capture managerial flexibility (option value) well

Internal Rate of Return

Internal rate of return (IRR) is the discount rate that results in a zero NPV for the project

$$NPV = CF_0 + \frac{CF_1}{(1+r)} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + ... + \frac{CF_N}{(1+r)^N}$$
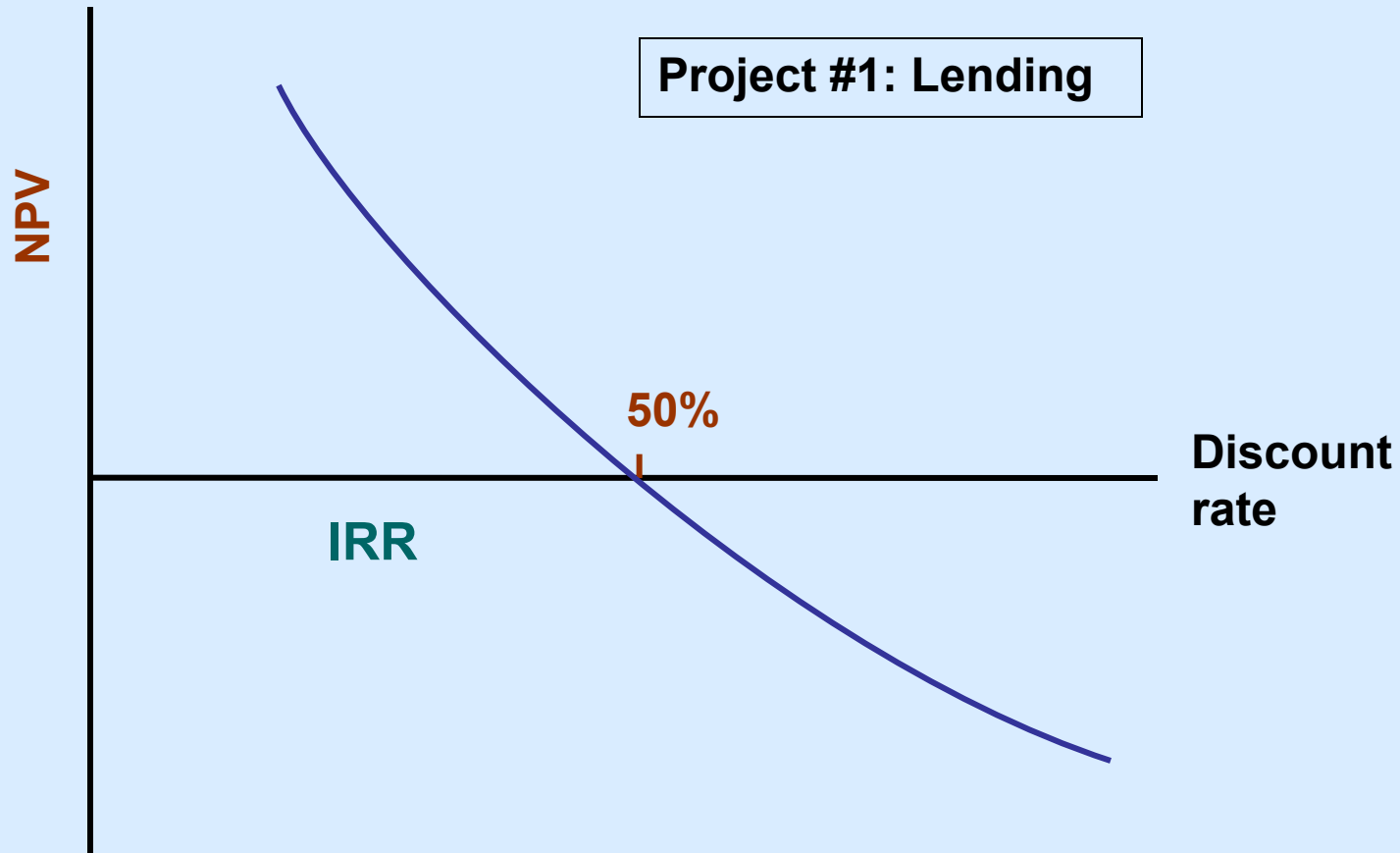
- ❑ IRR found by computer/calculator or manually by trial and error
- ❑ The IRR decision rule is:
  - ❑ If IRR is greater than the cost of capital, accept the project
  - ❑ If IRR is less than the cost of capital, reject the project
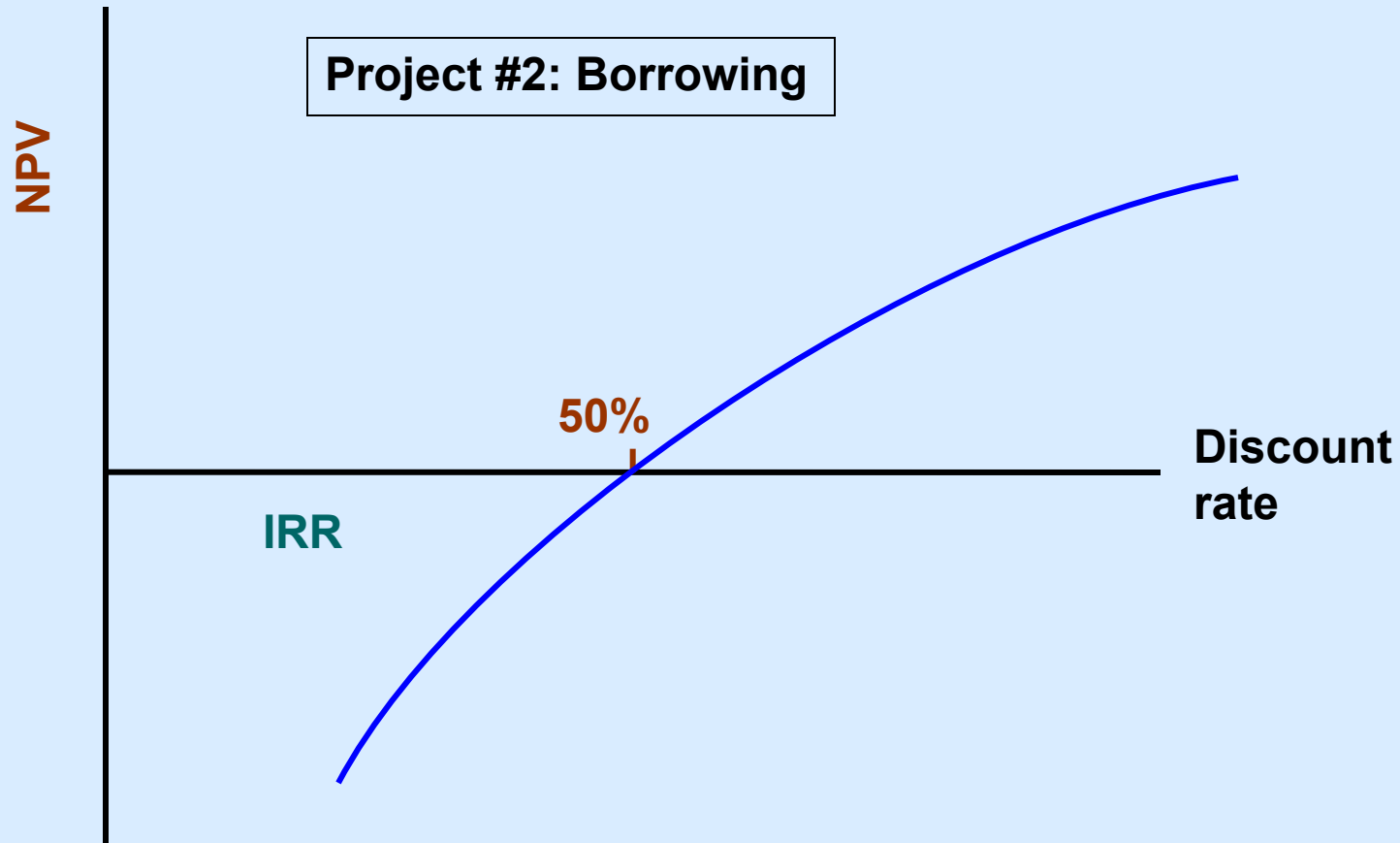
Advantages and Disadvantages of IRR

❑ Advantages
  - ❑ Properly adjusts for time value of money
  - ❑ Uses cash flows rather than earnings
  - ❑ Accounts for all cash flows
  - ❑ Project IRR is a number with intuitive appeal

❑ Three key problems encountered in using IRR:
  - ❑ Lending versus borrowing?
  - ❑ Multiple IRRs
  - ❑ No real solutions

**IRR and NPV rankings do not always agree**

Lending Versus Borrowing

Project #1: Lending

NPV

Discount rate

50%

IRR

Lending Versus Borrowing

Project #2: Borrowing

NPV

50%

IRR

Discount rate

Problems With IRR: Multiple IRRs

- ❑ If a project has more than one change in the sign of cash flows, there may be multiple IRRs.

- ❑ Though odd pattern, can be observed in high-tech and other industries.

- ❑ Four changes in sign of CFs, and have four different IRRs.

- ❑ Next figure plots project's NPV at various discount rates.

- ❑ NPV is the only decision rule that works for this project type.

Multiple IRRs
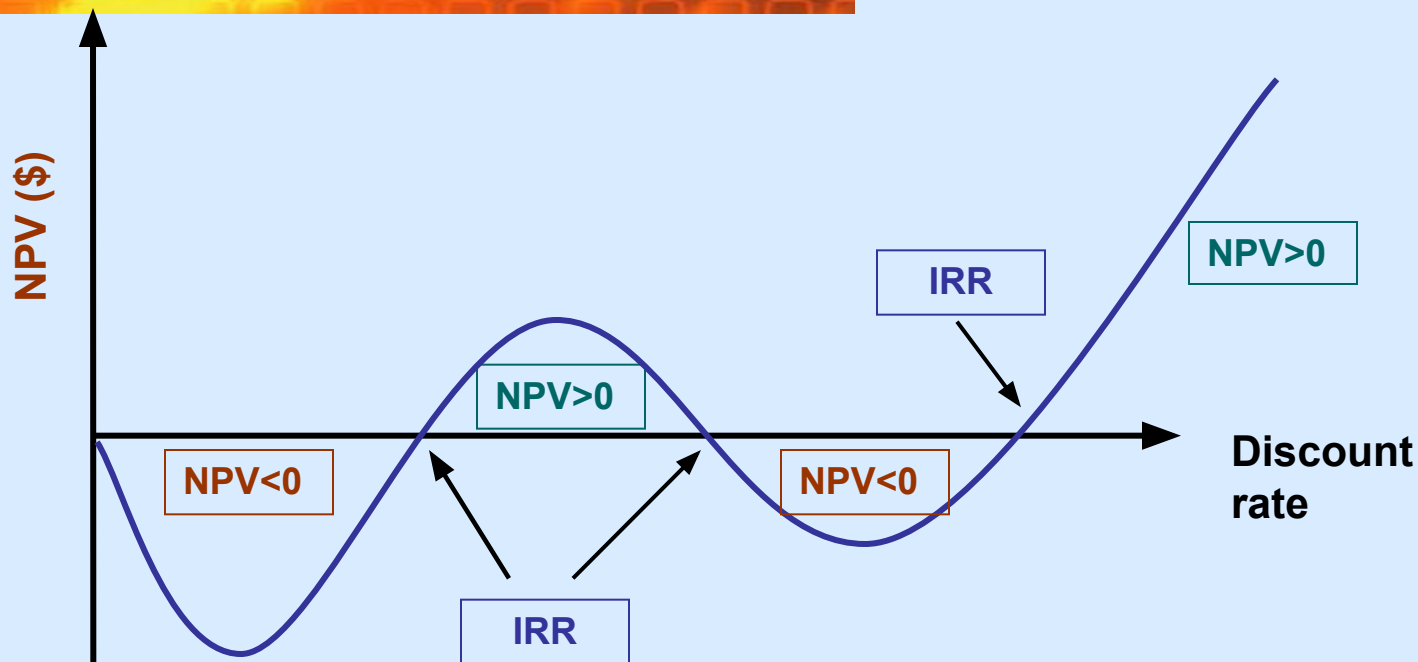
When project cash flows have multiple sign changes, there can be multiple IRRs

With multiple IRRs, which do we compare with the cost of capital to accept/reject the project?

Conflicts Between NPV and IRR: Scale

- ❑ NPV and IRR do not always agree when ranking competing projects
- ❑ The *scale* problem:
  - ❑ When choosing between mutually exclusive investments, we cannot conclude that the one offering the highest *IRR* necessarily provides the greatest wealth creation opportunity.
- ❑ Resolution to the scale problem:
  - ❑ The solution involves calculating the *IRR* for a hypothetical project with cash flows equal to the difference in cash flows between the two mutually exclusive investments.

Conflicts Between NPV and IRR: Timing
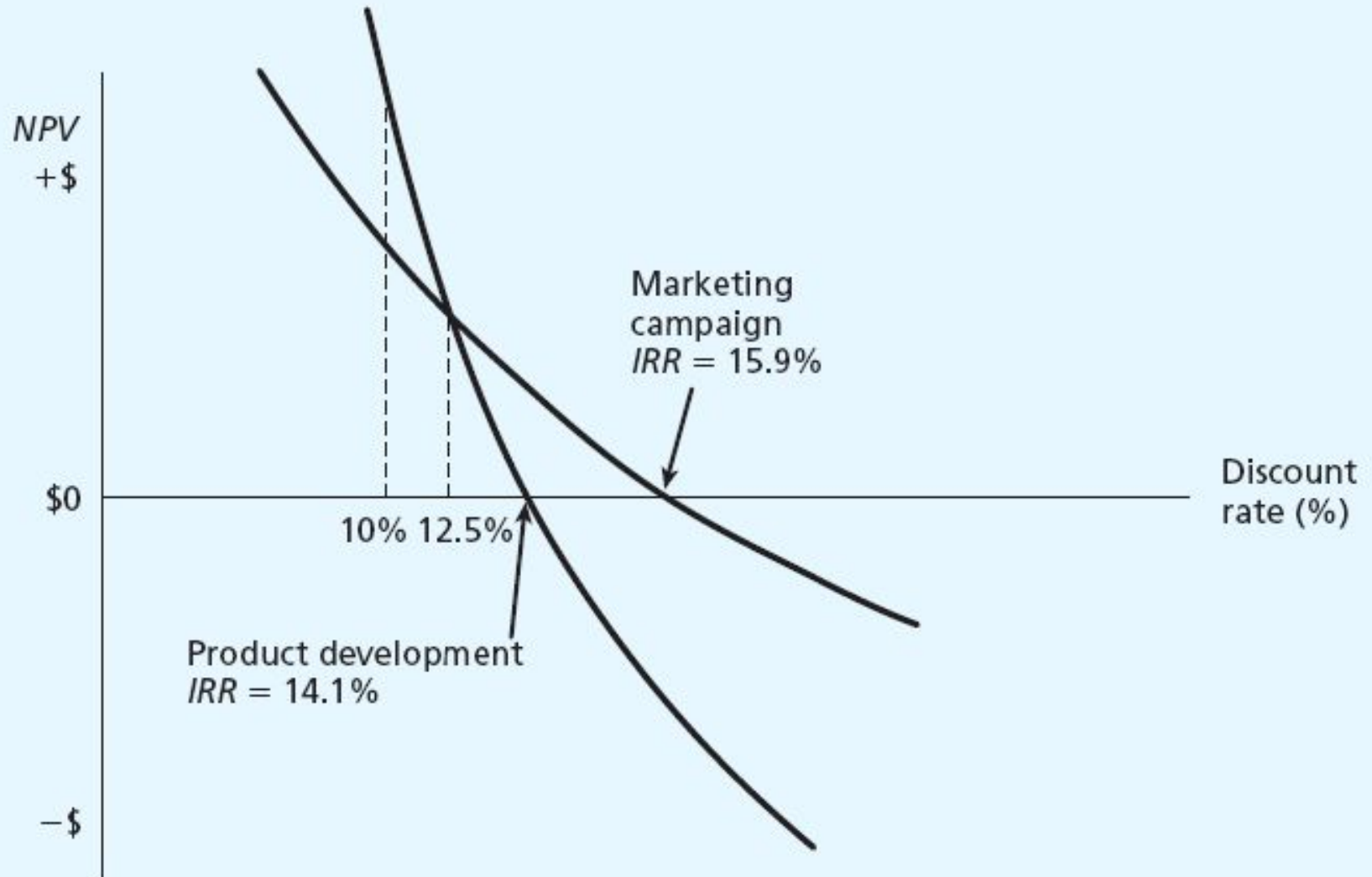
Reconciling NPV and IRR

❑ Timing and scale problems can cause NPV and IRR methods to rank projects differently

❑ In these cases, calculate the IRR of the *incremental project*

  ❑ Cash flows of large project minus cash flows of small project

  ❑ Cash flows of long-term project minus cash flows of short-term project

❑ If incremental project's IRR exceeds the cost of capital

  ❑ Accept the larger project

  ❑ Accept the longer term project

Profitability Index

Calculated by dividing the PV of a project's cash inflows by the PV of its outflows

$$PI = \frac{\dfrac{CF_1}{(1+r)} + \dfrac{CF_2}{(1+r)^2} + ... + \dfrac{CF_T}{(1+r)^T}}{CF_0}$$

❑ Decision rule: Accept projects with PI > 1.0, equal to NPV > 0

Like IRR, PI suffers from the scale problem

Capital Rationing

❑ The profitability index (*PI*) is a close cousin of the *NPV* approach, but it suffers from the same scale problem as the *IRR* approach.

❑ The *PI* approach is most useful in capital rationing situations.

❑ Thank you