Lecture Guide

for
Timothy Gallagher’s
Financial Management 7e
Principles and Practice

• 707 Slides
• Written by Tim Gallagher—the textbook author
• Use as flash cards for terminology and concept review
• Also provides a step-through of key financial calculations
• Use for notes during instructor lectures
• Affordable: $5.95

Sample Pages Follow
Capital Budgeting Decision Methods

“Everything is worth what its purchaser will pay for it.”

—Publilius Syrus
Learning Objectives

1. Explain the capital budgeting process.
2. Calculate the payback period, net present value, internal rate of return, and modified internal rate of return for a proposed capital budgeting project.
3. Describe capital rationing and how firms decide which projects to select.
4. Measure the risk of a capital budgeting project.
5. Explain risk-adjusted discount rates.
The Capital Budgeting Process

• Capital budgeting is the process of evaluating proposed investment projects for a firm.

• Managers must determine which projects are acceptable and must rank mutually exclusive projects by order of desirability to the firm.
The Accept/Reject Decision

Four methods:

• Payback Period
  – years to recoup the initial investment

• Net Present Value (NPV)
  – change in value of firm if project is undertaken

• Internal Rate of Return (IRR)
  – projected percent rate of return project will earn

• Modified Internal Rate of Return (MIRR)
Capital Budgeting Methods

- Consider Projects A and B that have the following expected cashflows:

<table>
<thead>
<tr>
<th>Time</th>
<th>PROJECT A</th>
<th>PROJECT B</th>
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<tbody>
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• What is the payback for Project A?

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Cumulative CF:
- (10,000)  3,500  3,500  3,500  3,500
- -6,500   -3,000  +500

Payback in 2.9 years
Capital Budgeting Methods (continued)

- What is the payback for Project B?

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Capital Budgeting Methods (continued)

- What is the payback for Project B?

Payback in 3.44 years
Payback Decision Rule

• Accept project if payback is less than the company’s predetermined maximum.
• If company has determined that it requires payback in three years or less, then you would:
  – accept Project A
  – reject Project B
Capital Budgeting Methods (continued)

Net Present Value

• Present value of all costs and benefits (measured in terms of incremental cash flows) of a project.

• Concept is similar to Discounted Cashflow model for valuing securities but subtracts the cost of the project.
Capital Budgeting Methods (continued)

**Net Present Value**

- Present value of all costs and benefits (measured in terms of incremental cash flows) of a project.
- Concept is similar to Discounted Cashflow model for valuing securities but subtracts of cost of project.

\[
NPV = \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \cdots + \frac{CF_n}{(1+k)^n} - \text{Initial Investment}
\]
What is the NPV for Project B?

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\( k = 10\% \)
What is the NPV for Project B?

$k=10\%$

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NPV = $3,456$
What is the NPV for Project B?

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\[ k = 10\% \]
What is the NPV for Project B?

$k = 10\%$

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NPV = $11,154$
What is the NPV for Project B?

$k = 10\%$

$\text{PV Benefits} > \text{PV Costs} \quad \$11,154 > \$10,000$
What is the NPV for Project B?

**k=10%**

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**PV Benefits > PV Costs**

\$11,154 > \$10,000

\$11,154 - \$10,000 = \$1,154 = \text{NPV}
NPV Decision Rule

• Accept the project if the NPV is greater than or equal to 0.

Example:

\[ \text{NPV}_A = $1,095 \quad > 0 \quad \text{Accept} \]
\[ \text{NPV}_B = $1,154 \quad > 0 \quad \text{Accept} \]

• If projects are independent, accept both projects.

• If projects are mutually exclusive, accept the project with the higher NPV.
Capital Budgeting Methods (continued)

• IRR (Internal Rate of Return)
  – IRR is the discount rate that forces the NPV to equal zero.
  – It is the rate of return on the project given its initial investment and future cash flows.
    • The IRR is the rate earned only if all CFs are reinvested at the IRR rate.
Calculate the IRR (through trial and error)

**IRR\textsubscript{A}**

\[ \text{NPV}_A = 0 = (3,500 \times \frac{1}{k} - \frac{1}{(1+k)^4}) - 10,000 \]

\[ k = 0.1496 = 14.96\% = \text{IRR}_A \]

**IRR\textsubscript{B}**

\[ \text{NPV}_B = 0 = \frac{500}{(1+k)^1} + \frac{500}{(1+k)^2} + \frac{4600}{(1+k)^3} + \frac{10000}{(1+k)^4} - 10,000 \]

\[ k = 0.135 = 13.5\% = \text{IRR}_B \]
IRR Decision Rule

• Accept the project if the IRR is greater than or equal to the required rate of return (k).
• Reject the project if the IRR is less than the required rate of return (k).

Example:

\[ k = 10\% \]

\[
\text{IRR}_A = 14.96\% \quad > \quad 10\% \quad \text{Accept}
\]

\[
\text{IRR}_B = 13.50\% \quad > \quad 10\% \quad \text{Accept}
\]
Capital Budgeting Methods (continued)

• MIRR (Modified Internal Rate of Return)
  – This is the discount rate which causes the project’s PV of the outflows to equal the project’s TV (terminal value) of the inflows.

  \[
  \text{PV}_{\text{outflow}} = \frac{\text{TV}_{\text{inflows}}}{(1 + \text{MIRR})^n}
  \]

  – Assumes cash inflows are reinvested at k, the cost of capital.
  – MIRR avoids the problem of multiple IRRs (described later).
What is the MIRR for Project B?

\( k = 10\% \)

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\[
10,000 = \frac{16,331}{(1 + MIRR)^4}
\]

\[ MIRR = 0.1305 = 13.05\% \]
Calculate NPV and IRR for Project A

- NPV = $1,094.53
- IRR = 14.96%

Which project(s) should the firm accept?

<table>
<thead>
<tr>
<th></th>
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<th>IRR</th>
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<tr>
<td>A</td>
<td>$1,095</td>
<td>14.96%</td>
</tr>
<tr>
<td>B</td>
<td>$1,154</td>
<td>13.5%</td>
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NPV/IRR Decision Rules

\[
\text{IRR}_{\text{Project A}} > \text{IRR}_{\text{Project B}} \\
\text{NPV}_{\text{Project B}} > \text{NPV}_{\text{Project A}}
\]

- If projects A & B are independent, accept both projects.
- If projects A & B are mutually exclusive, there is a ranking conflict.
Net Present Value Profile

Graphs the Net Present Value of the project with different required rates

Intersects the X axis at the IRR
Risk in Capital Budgeting

• Project risk needs to be considered in comparing projects with different levels of risk.
• The discount rate can be adjusted for risk when NPV is used to evaluate projects.
• The hurdle rate can be adjusted when IRR is used to evaluate projects.
There is a ranking conflict between NPV and IRR to the left of the crossover point.
What Is Capital Rationing?

• Capital rationing is the practice of placing a dollar limit on the total size of the capital budget.
• This practice may not be consistent with maximizing shareholder value but may be necessary for other reasons.
• Choose between projects by selecting the combination of projects that yields the highest total NPV without exceeding the capital budget limit.
Comparing Risky Projects Using Risk Adjusted Discount Rates (RADRs)

- Firms often compensate for risk by adjusting the discount rate used to calculate NPV.
  - Higher risk, use a higher discount rate.
  - Lower risk, use a lower discount rate

- The risk-adjusted discount rate (RADR) can also be used as a risk-adjusted hurdle rate for IRR comparisons.
Non-simple Projects

• Non-simple projects have one or more negative future cash flows after the initial investment.
Non-simple Projects (continued)

• How would a negative cash flow in year 4 affect Project Z’s NPV?

\[
\text{NPV} = \sum_{t=0}^{4} \frac{C_t}{(1+k)^t}
\]

\[
= \frac{-10,000}{1.10^0} + \frac{5,000}{1.10^1} + \frac{5,000}{1.10^2} + \frac{5,000}{1.10^3} + \frac{-6,000}{1.10^4}
\]

\[
= -10,000 + \frac{5,000}{1.10} + \frac{5,000}{1.21} + \frac{5,000}{1.331} + \frac{-6,000}{1.4641}
\]

\[
= -10,000 + 4,545 + 4,132 + 3,757 - 4,098
\]

\[
= 8,336\text{ NPV}
\]

Project Z should be rejected in this case.
Multiple IRRs

• Some non-simple projects may have more than one discount rate that results in an NPV of zero (IRRs).

• Example:
  – Cash Flows:
    – $t_0$: (160,000)
    – $t_1$: 1,000,000
    – $t_2$: (1,000,000)
Multiple IRRs (continued)

• When k=25%
  
  – \( \frac{\$1,000,000 - \$1,000,000 - \$160,000}{(1+.25)^1} \) - \( \frac{\$0}{(1+.25)^2} \)
    
    = \$800,000 - \$640,000 - \$160,000
  
  – NPV= $0

Note: When k = .25, the NPV = 0
Multiple IRRs (continued)

• When $k = 400$
  
  \[
  \frac{-1,000,000}{(1+4.00)^1} - \frac{1,000,000}{(1+4.00)^2} - 160,000 = 200,000 - 40,000 - 160,000
  \]
  
  – NPV = 0

**Note:** When $k = 4.00$, the NPV also = 0

**THIS PROJECT HAS TWO IRRS!!!**
Multiple IRRs (continued)

• Non-simple projects may have, but do not have to have, as many IRRs as there are sign changes.

• If a project has more than one IRR, use the NPV method for project accept/reject decisions.