Chapter 8
Lecture # 2-3

- Comparing Several Large Projects
- Comparing Investment Alternatives
- The Concept of Risk

Comparing Several Large Projects

- DCFROR tells us how efficiently we are using our money.

- The higher the DCFROR, the more attractive the individual investment.

Comparing Several Large Projects

Example 8.4

Our company is seeking to invest approximately $\$120 \times 10^6$ in new projects. After extensive research and preliminary design work, three projects have emerged as candidates for construction. The minimum acceptable internal discount (interest) rate, after tax, has been set at 10%. The after-tax cash flow information for the three projects using a ten-year operating life is as follows (values in $ million):

	Initial Investment	After-tax Cash Flow in Year *i*: *i* = 1	After-tax Cash Flow in Year *i*: *i* = 2–10
Project A	$60	$10	$12
Project B	$120	$22	$22
Project C	$100	$12	$20

Comparing Several Large Projects

For this example it is assumed that the cost of land, working capital, and salvage are zero. Furthermore, it is assumed that the initial investment occurs at time = 0, and the yearly annual cash flows occur at the end of each of the 10 years of plant operation.

Determine:

a. The *NPV* for each project.

b. The *DCFROR* for each project.

Comparing Several Large Projects

For Project A we get:

$$NPV = -\$60 + (\$10)(P/F,0.10,1) + (\$12)(P/A,0.10,9)(P/F,0.10,1)$$

$$= -\$60 + \frac{(\$10)}{1.1} + (\$12)\frac{1.1^9 - 1}{(0.1)(1.1^9)}\frac{1}{1.1} = \$11.9$$

The *DCFROR* is the value of i that results in an $NPV = 0$.

$$NPV = 0 = -\$60 + (\$10)(P/F,i,1) + (\$12)(P/A,i,9)(P/F,i,1)$$

Solving for i yields $i = DCFROR = 14.3\ \%$.

Comparing Several Large Projects

Values obtained for *NPV* and *DCFROR* are:

	NPV (i = 10%)	*DCFROR*
Project A	11.9	14.3%
Project B	15.2	12.9%
Project C	15.6	13.3%

Note: Projects A, B, and C are mutually exclusive because we cannot invest in more than one of them, due to our cap of $\$120 \times 10^6$. The analysis that follows is limited to projects of this type. For the case when projects are not mutually exclusive, the analysis becomes somewhat more involved and is not covered here.

Comparing Several Large Projects

Example 8.5

This is a continuation of Example 8.4.

a. Determine the *NPV* and the *DCFROR* for each increment of investment.

b. Recommend the best option.

a. Project A to Project C:

Incremental investment is $\$40 \times 10^6 = (\$100 - \$60) \times 10^6$
Incremental cash flow for $i = 1$ is $\$2 \times 10^6/\text{yr} = (\$12/\text{yr} - \$10/\text{yr}) \times 10^6$
Incremental cash flow for $i = 2$ to 10 is $\$8 \times 10^6/\text{yr} = (\$20/\text{yr} - \$12/\text{yr}) \times 10^6$

$$NPV = -\$40 \times 10^6 + (\$2 \times 10^6)(P/F,0.10,1) + (\$8 \times 10^6)(P/A,0.10,9)(P/F,0.10,1)$$
$$NPV = \$3.7 \times 10^6$$

Setting $NPV = 0$ yields $DCFROR = 0.119$ (11.9%)

Comparing Several Large Projects

Project C to Project B:

Incremental investment is $\$20 \times 10^6 = (\$120 - \$100) \times 10^6$

Incremental cash flow for $i = 1$ is $\$10 \times 10^6/\text{yr} = (\$22/\text{yr} - \$12/\text{yr}) \times 10^6$

Incremental cash flow for $i = 2$ to 10 is $\$2 \times 10^6/\text{yr} = (\$22/\text{yr} - \$20/\text{yr}) \times 10^6$

$$NPV = -\$0.4 \times 10^6 \text{ and } DCFROR = 0.094\ (9.4\%)$$

b. It is recommended that we move ahead on Project C.

Comparing Investment Alternatives

When comparing mutually exclusive investment alternatives, choose the alternative with the [illegible] net present value.

Comparing Investment Alternatives

Algorithm for Incremental Investment Analysis

Step 1: Establish the minimum acceptable rate of return on investment for such projects.

Step 2: Calculate the *NPV* for each project using the interest rate from Step 1.

Step 3: Eliminate all projects with negative *NPV* values.

Step 4: Of the remaining projects, select the project with the highest *NPV*.

The Concept of Risk

Option 1	Option 2
A new product is to be produced which has never been made in large scale.	A second plant is to be built in another region to meet increasing demand.
Pilot plant tests have been made and product sent to potential customers.	Company has dominant market position for this product.
The calculated rate of return is 33%.	The rate of return is to be 12%.

The Concept of Risk

Items that Favor Option 1	Items that Favor Option 2
High return on the investment	Well established market
Opens new product possibilities	Well-known manufacturing costs
	Transportation costs will be less
	Matured technology

The Concept of Risk

- The high rate of return of option 1 is associated with high risk.

- VP's Decision: Consider option 2 due to concern for lost market position.