Capital Budgeting Decisions

Chapter 12 – Part II

Learning Objective 3

Evaluate the acceptability of an investment project using the internal rate of return method.

Internal Rate of Return Method – Part 1

- The **internal rate of return** is the rate of return of an investment project over its useful life. It is computed by finding the discount rate that will cause the net present value of a project to be zero.
- It works very well if a project's cash flows are identical every year. If the annual cash flows are not identical, a trial-and-error process must be used to find the internal rate of return.

Internal Rate of Return Method – Part 2

General decision rule . . .

If the internal Rate of Return is …	Then the project is …
Equal to or greater than the minimum required rate of return…	Acceptable.
Less than the minimum required rate of return…	Rejected.

When using the internal rate of return, the cost of capital acts as a **hurdle rate** that a project must clear for acceptance.

Internal Rate of Return Method – Part 3

- Decker Company can purchase a new machine at a cost of $104,320 that will save $20,000 per year in cash operating costs.
- The machine has a 10-year life.

Internal Rate of Return Method – Part 4

Future cash flows are the same every year in this example, so we can calculate the internal rate of return as follows:

$$\text{PV factor for the internal rate of return} = \frac{\text{Investment requried}}{\text{Annual net cash flows}}$$

$$\frac{\$104,320}{\$20,000} = 5.216$$

Internal Rate of Return Method – Part 5

- Using the present value of an annuity of $1 table...
- Find the 10-period row, move across until you find the factor 5.216.
- Look at the top of the column and you find a rate of **14%**.

Periods	10%	12%	14%
1	0.909	0.893	0.877
2	1.736	1.690	1.647
…	…	…	…
9	5.759	5.328	4.946
10	6.145	5.650	**5.216**

Internal Rate of Return Method – Part 6

If Decker's minimum required rate of return is **equal to or greater than** 14%, then the machine should be purchased.

Concept Check 3

The expected annual net cash inflow from a project is $22,000 over the next 5 years. The required investment now in the project is $79,310. What is the internal rate of return on the project?

A. 10%

B. 12%

C. 14%

D. Cannot be determined

Concept Check 3a

The expected annual net cash inflow from a project is $22,000 over the next 5 years. The required investment now in the project is $79,310. What is the internal rate of return on the project?

A. 10%

B. 12%

C. 14%

D. Cannot be determined

Answer: B

$79,310/$22,000 = 3.605, which is the present value factor for an annuity over five years when the interest rate is 12%.

Comparing the Net Present Value and Internal Rate of Return Methods – Part 1

- NPV is often simpler to use.
- Questionable assumption:
  - Internal rate of return method assumes cash inflows are reinvested at the internal rate of return.

Comparing the Net Present Value and Internal Rate of Return Methods – Part 2

- If the internal rate of return is high, this assumption may be **unrealistic**.
- It is more realistic to assume that the cash flows can be **reinvested at the discount rate**, which is the underlying assumption of the net present value method.

Expanding the Net Present Value Method

- We will now expand the net present value method to include two alternatives.
- First, we will analyze the alternatives using the total cost approach.
- All cash inflows and all cash outflows will be included in the solution under each alternative.
- No effort will be made to isolate those cash flows that are relevant to the decision and those that are irrelevant.
- And, the net present value will be computed for each alternative.

The Total-Cost Approach – Part 1

White Company has two alternatives:

1. remodel an old car wash or,
2. remove the old car wash and install a new one.

The company uses a discount rate of 10%.

	New Car Wash	Old Car Wash
Annual revenues	$ 90,000	$ 70,000
Annual cash operating costs	30,000	25,000
Annual net cash inflows	$ 60,000	$ 45,000

The Total-Cost Approach – Part 2

If White installs a new washer . . .

Cost	$ 300,000
Productive life	10 years
Salvage value	$ 7,000
Replace brushes at the end of 6 years	$ 50,000
Salvage of old equipment	$ 40,000

Let's look at the present value of this alternative.

The Total-Cost Approach – Part 3

Install the new washer

	Year	Cash Flows	10% Factor	Present Value
Initial investment	NOW	$ (300,000)	1.000	$ (300,000)
Replace brushes	6	(50,000)	0.564	(28,200)
Annual net cash inflows	1-10	60,000	6.145	368,700
Salvage of old equipment	NOW	40,000	1.000	40,000
Salvage of new equipment	10	7,000	0.386	2,702
Net Present value				$ 83,202

If we install the new washer, the investment will yield a positive net present value of $83,202.

The Total-Cost Approach – Part 4

If White remodels the existing washer . . .

Remodel costs	$ 175,000
Replace brushes at the end of 6 years	80,000

Let's look at the present value of this second alternative.

The Total-Cost Approach – Part 5

Remodel the old washer

	Year	Cash Flows	10% Factor	Present Value
Initial investment	NOW	$ (175,000)	1.000	$ (175,000)
Replace brushes	6	(80,000)	0.564	(45,120)
Annual net cash inflows	1–10	45,000	6.145	276,525
Net present value				$ 56,405

If we remodel the existing washer, we will produce a positive net present value of $56,405.

The Total-Cost Approach – Part 6

Both projects yield a positive net present value.

	Present Value
Invest in new washer	$ 83,202
Remodel existing washer	56,405
In favor of new washer	$ 26,797

However, investing in the new washer will produce a higher net present value than remodeling the old washer.

Least Cost Decisions – Part 1

In decisions where revenues are not directly involved, managers should choose the alternative that has the least total cost from a present value perspective.

Least Cost Decisions – Part 2

- Home Furniture Company is trying to decide whether to overhaul an old delivery truck now or purchase a new one.
- The company uses a discount rate of 10%.

Least Cost Decisions – Part 3

Here is information about the trucks . . .

Old Truck

Overhaul cost now	$ 4,500
Annual operating costs	10,000
Salvage value in 5 years	250
Salvage value now	9,000

New Truck

Purchase price	$ 21,000
Annual operating costs	6,000
Salvage value in 5 years	3,000

Least Cost Decisions – Part 4

Buy the New Truck

	Year	Cash Flows	10% Factor	Present Value
Purchase price	NOW	$ (21,000)	1.000	$ (21,000)
Annual operating costs	1–5	(6,000)	3.791	(22,746)
Salvage value of old truck	NOW	9,000	1.000	9,000
Salvage value of new truck	5	3,000	0.621	1,863
Net present value				(32,883)

Keep the Old Truck

	Year	Cash Flows	10% Factor	Present Value
Overhaul cost	NOW	$ (4,500)	1.000	$ (4,500)
Annual operating costs	1–5	(10,000)	3.791	(37,910)
Salvage value of old truck	5	250	0.621	155
Net Present value				(42,255)

Least Cost Decisions – Part 5

Home Furniture should purchase the new truck.

Net Present value of costs	
Associated with purchase of new truck	$ (32,883)
Net present value of costs	
Associated with overhauling existing truck	(42,255)
Net present value in favor of purchasing the new truck	$ 9,372

Learning Objective 4

Evaluate an investment project that has uncertain cash flows.

Uncertain Cash Flows – Example – Part 1

- Assume that all of the cash flows related to an investment in a supertanker have been estimated, except for its salvage value in 20 years.
- Using a discount rate of 12%, management has determined that the net present value of all the cash flows, except the salvage value is a negative $1.04 million.
- How large would the salvage value need to be to make this investment attractive?

Uncertain Cash Flows – Example – Part 2

$$\frac{\text{Net present value to be offset}}{\text{Present value factor}} = \frac{\$1{,}040{,}000}{0.104} = \$10{,}000{,}000$$

This equation can be used to determine that if the salvage value of the supertanker is **at least $10,000,000**, the net present value of the investment would be positive and therefore acceptable.

***0.104 = 1/(1+0,12)^{20}**

Concept Check 4

Bay Architects is considering a drafting machine that would cost $100,000, last four years, provide annual cash savings of $10,000, and considerable intangible benefits each year. How large (in cash terms) would the intangible benefits have to be per year to justify investing in the machine if the discount rate is 14%?

A. $15,000
B. $90,000
C. $24,317
D. $60,000

Concept Check 4a (1 of 2)

Bay Architects is considering a drafting machine that would cost $100,000, last four years, provide annual cash savings of $10,000, and considerable intangible benefits each year. How large (in cash terms) would the intangible benefits have to be per year to justify investing in the machine if the discount rate is 14%?

A. $15,000
B. $90,000
C. $24,317
D. $60,000

Answer: C

$70,860/2.914 = $24,317

Concept Check 4a (2 of 2)

	Year	Cash Flows	14% Factor	Present Value
Investment in machine	NOW	$ (100,000)	1.000	$ (100,000)
Annual net cash inflows	1–4	10,000	2.914	29,140
Annual intangible benefits	1–4	? = 24,317	2.914	? = 70,860
Net present value				$0

Learning Objective 5

Rank investment projects in order of preference.

Preference Decision – The Ranking of Investment Projects

- Screening Decisions
  - Pertain to whether or not some proposed investment is acceptable; these decisions come first.
- Preference Decisions
  - Attempt to rank acceptable alternatives from the most to least appealing.

Internal Rate of Return Method

- When using the internal rate of return method to rank competing investment projects, the preference rule is:
- *The higher the internal rate of return, the more desirable the project.*

Net Present Value Method

The net present value of one project **cannot be directly compared** to the net present value of another project **unless the investments are equal**.

Ranking Investment Projects

$$\text{Project profitability index} = \frac{\text{Net present value of the project}}{\text{Investment required}}$$

	Project A	Project B
Net present value (a)	$ 1,000	$ 1,000
Investment required (b)	$ 10,000	$ 5,000
Profitability index (a) ÷ (b)	0.10	0.20

The higher the profitability index, the more desirable the project.

Learning Objective 6

Compute the simple rate of return for an investment.

Simple Rate of Return Method –Key Concepts

- Does not focus on cash flows – rather ***it focuses on accounting net operating income.***
- The following formula is used to calculate the simple rate of return:

$$\text{Simple rate of return} = \frac{\text{Annual increamental net operating income}}{\text{Initial investment}*}$$

*Should be reduced by any salvage from the sale of the old equipment

Simple Rate of Return Method – An Example (1 of 2)

Management of the Daily Grind wants to install an espresso bar in its restaurant that:

1. Cost $140,000 and has a 10-year life.
2. Will generate incremental revenues of $100,000 and incremental expenses of $65,000 including depreciation.

What is the simple rate of return on the investment project?

Simple Rate of Return Method – An Example (2 of 2)

$$\text{Simple rate of return} = \frac{\$35{,}000}{\$140{,}000} = 25\%$$

Criticism of the Simple Rate of Return

Shortcomings

- Ignores the time value of money
- The same project may appear desirable in some years and undesirable in other years.