Chapter 13
Capital Budgeting Decisions

Learning Objectives

- ❑Define capital budgeting decisions
- ❑Identify different types of capital budgeting decisions in any organization
- ❑Determine the payback period for an investment
- ❑Evaluate the acceptability of an investment project using the net present value method
- ❑Evaluate the acceptability of an investment project using the internal rate of return method
- ❑Evaluate an investment project that has uncertain cash flows
- ❑Rank investment projects in order of preference
- ❑Compute the simple rate of return for an investment

Capital Budgeting Decisions

- Managers often consider decisions that involve an investment today in the hope of realizing future profits (opening new outlets, developing sophisticated customer billing system, expansion of capacity, development of new product, installing new production facilities, etc.)
- The term **capital budgets** is used to describe how managers plan significant investments in projects that have long-term implications.
- Most companies must have many more potential projects than can actually be funded.
- Hence, managers must carefully select those projects that promise the greatest future return. This is very important long-term financial health of the organization.

Typical Capital Budgeting Decisions

Any decision that involves an outlay now in order to obtain a future return is a capital budgeting decision. Some of the typical capital budgeting decisions are as follows:

- **Cost reduction decisions** - Should new equipment be purchased to reduce costs?
- **Expansion decisions** - Should a new plant, warehouse, or other facility be acquired to increase capacity and sales?
- **Equipment selection decisions** - Which of several available machines should be purchased?
- **Lease or buy decisions** - Should new equipment be leased or purchased?
- **Equipment replacement decisions** - Should old equipment be replaced now or later?

Typical Capital Budgeting Decisions

Capital budgeting tends to fall into two broad categories.

1. Screening decisions relate to whether a proposed project is acceptable. For example, a company may have a policy of accepting projects only if they provide a return of at least 20% on the investment. The required rate of return is the minimum rate of return a project must yield to be acceptable.

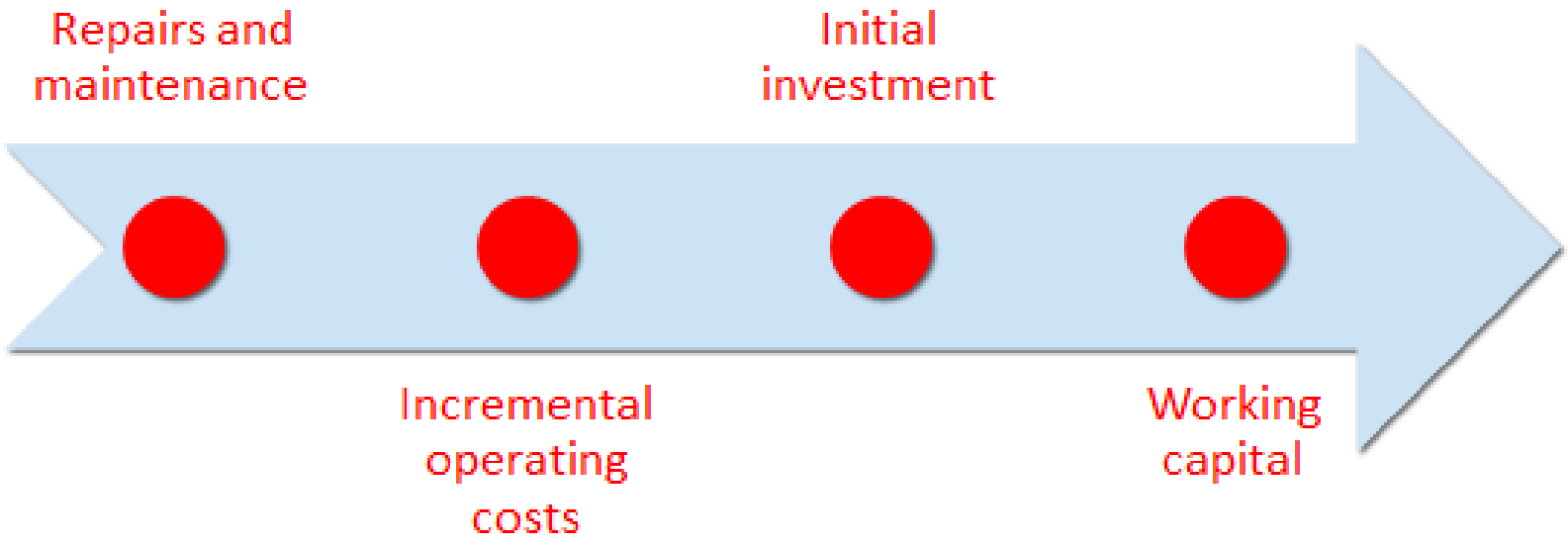
2. Preference decisions , by contrast, relate to selecting from among several acceptable alternatives. To illustrate, a company may be considering several different machines to replace an existing machine on the assembly line. The choice of which machine to purchase is a preference decision.

Cash Flows versus Operating Income

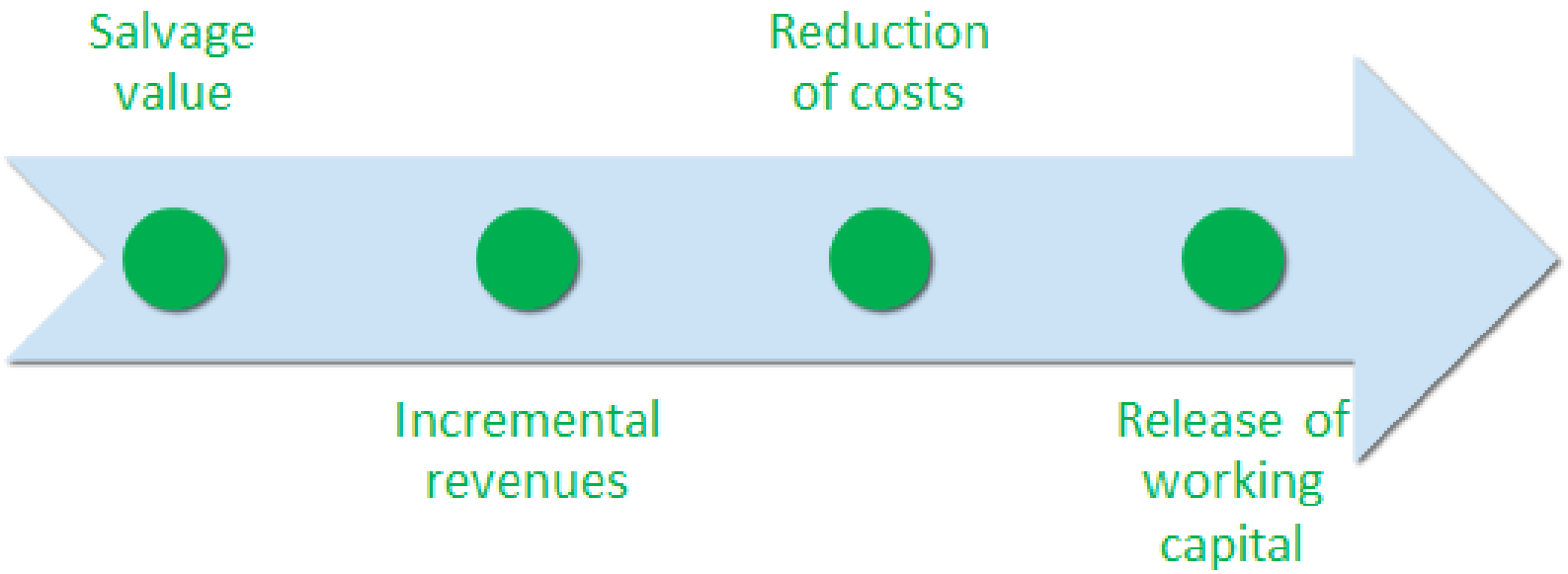
Four capital budgeting methods will be discussed in this chapter.

1. Payback Method
2. Net Present Value
3. Internal Rate of Return
   - These methods focus on analyzing the **cash flows** associated with capital investment projects.
4. The simple rate of return method focuses on **incremental net operating income**.

Typical Cash Outflows



Typical Cash Inflows



Time Value of Money

Capital budgeting usually earns returns that extend over fairly long periods of time. So, it is important to recognize ***the time value of money*** when evaluating investment proposals.

- A dollar today is worth more than a dollar a year from now.
- Therefore, projects that promise earlier returns are preferable to those that promise later returns.

Capital budgeting techniques that recognize the time value of money involves discounting cash flows.

Learning Objective

Determine the payback period for an investment.

The Payback Method

- The payback method focuses on the **payback period**, which is the length of time that it takes for a project to recoup its initial cost out of the cash receipts that it generates.

- This period is sometimes referred to as **"the time that it takes for an investment to pay for itself."**

- The basic premise of the payback method is that the more quickly the cost of an investment can be recovered, the more desirable is the investment.

The Payback Method

- The payback method analyzes cash flows; however, it does not consider the time value of money.
- When the annual net cash inflow is the same each year, this formula can be used to compute the payback period:

$$\text{Payback period} = \frac{\text{Investment required}}{\text{Annual net cash in flow}}$$

The Payback Method

- Management at the Daily Grind wants to install an espresso bar in its restaurant that -
  1. Costs $140,000 and has a 10-year life.
  2. Will generate annual net cash inflows of $35,000.
- Management requires a payback period of 5 years or less on all investments.
- What is the payback period for the espresso bar?

The Payback Method

$$\text{Payback period} = \frac{\text{Investment required}}{\text{Annual net cash inflow}}$$

$$\text{Payback period} = \frac{\$140{,}000}{\$35{,}000}$$

$$\text{Payback period} = 4.0 \text{ years}$$

According to the company's criterion, management would invest in the espresso bar because its payback period is less than 5 years.

Quick Check 1

Consider the following two investments:

	Project X	***Project Y***
Initial investment	$100,000	$100,000
Year 1 cash inflow	$60,000	$60,000
Year 2 cash inflow	$40,000	$35,000
Year 3 cash inflow	$0	$25,000

Which project has the shortest payback period?

a. Project X
b. Project Y
c. Cannot be determine

Quick Check 1a (1 of 2)

Consider the following two investments:

	Project X	**Project Y**
Initial investment	$100,000	$100,000
Year 1 cash inflow	$60,000	$60,000
Year 2 cash inflow	$40,000	$35,000
Year 3 cash inflow	$0	$25,000

Which project has the shortest payback period?

a. Project X
b. Project Y
c. Cannot be determine

Answer: a

Quick Check 1a (2 of 2)

- Project X has a payback period of 2 years.
- Project Y has a payback period of slightly more than 2 years.
- Which project do you think is better?

Evaluation of the Payback Method – Part 1

Short-comings

- Ignores the time value of money.
- Ignores cash flows after the payback period.
- Shorter payback period does not always mean a more desirable investment.

Evaluation of the Payback Method – Part 2

Strengths

- Serves as screening tool
- Identifies investments that recoup cash investments quickly
- Identifies products that recoup initial investment quickly

Payback and Uneven Cash Flows – Part 1

- When the cash flows associated with an investment project change from year to year, the payback formula introduced earlier cannot be used.
- Instead, the un-recovered investment must be tracked year by year.

Year 1	Year 2	Year 3	Year 4	Year 5
$1,000	$0	$2,000	$1,000	$500

Payback and Uneven Cash Flows – Part 2

For example, if a project requires an initial investment of $4,000 and provides uneven net cash inflows in years 1-5 as shown, the investment would be fully recovered in year 4.

Year 1	Year 2	Year 3	Year 4	Year 5
$1,000	$0	$2,000	$1,000	$500

Learning Objective

Evaluate the acceptability of an investment project using the net present value method.

The Net Present Value Method

The net present value method compares the present value of a project's **cash inflows** with the present value of its **cash outflows**. The difference between these two streams of cash flows is called the **net present value.**

The Net Present Value Method

There are two simplifying assumptions.

- All cash flows other than the initial investment occur at the **end of periods**.
- All cash flows generated by an investment project are immediately reinvested at a rate of return equal to the discount rate.

The Net Present Value Method

Lester Company has been offered a five-year contract to provide component parts for a large manufacturer.

Cost and revenue information:

Cost of special equipment	$ 160,000
Working capital required	100,000
Relining equipment in 3 years	30,000
Salvage value of equipment in 5 years	5,000
Annual cash revenue and costs:	
Sales revenue from parts	750,000
Cost of parts sold	400,000
Salaries, shipping, etc.	270,000

The Net Present Value Method

- At the end of five years the working capital will be released and may be used elsewhere by Lester.
- Lester Company uses a discount rate of 11%.
- Should the contract be accepted?

The Net Present Value Method

Annual net cash inflow from operations:

Sales revenue	$ 750,000
Costs of parts sold	(400,000)
Salaries, shipping, etc.	(270,000)
Annual net cash Inflows	$ 80,000

The Net Present Value Method

	Years	Cash Flows	11% Factor	Present Value
Investment in equipment	NOW	$ (160,000)	1.000	$ (160,000)
Working capital needed	NOW	(100,000)	1.000	(100,000)
Net present value				

Relation Between Present Value (P) and Future Value (F):

$F = P*(1+i)^n$, where,

F = Future Value

P = Present Value

i = Discount Rate

n = No. of years / Time of the Transaction

Present Value of the Annuity:

$$P = A * \{[\frac{(1+i)^{n_1}-1}{i*(1+i)^{n_1}}] * \frac{1}{(1+i)^{n_2}}\}$$

A = Amount of the annuity

i= Discount rate

n_1 = Number of the annuity

n_2 = Start of the annuity year - 1

The Net Present Value Method

	Years	Cash Flows	11% Factor	Present Value
Investment in equipment	NOW	$ (160,000)	1.000	$ (160,000)
Working capital needed	NOW	(100,000)	1.000	(100,000)
Annual net cash Inflows	1-5	80,000	3.696	295,680

Present value of an annuity of $1 factor* for 5 years at 11%.

:Annual net cash flows 11% Factor 3.696

The Net Present Value Method

- Alternatively, the individual annual net cash inflows could be discounted using the related five separate "present value of a single payment of $1 factors. That method would produce the same present value of $295,680.

The Net Present Value Method

	Years	Cash Flows	11% Factor	Present Value
Investment in equipment	NOW	$ (160,000)	1.000	$ (160,000)
Working capital needed	NOW	(100,000)	1.000	(100,000)
Annual net cash Inflows	1-5	80,000	3.696	295,680
Relining of equipment	3	(30,000)	0.731	(21,930)

Present value of $1 factor for 3 years at 11%.

: Relining of equipment 11% factor 0.731

The Net Present Value Method

	Years	Cash Flows	11% Factor	Present Value
Investment equipment	NOW	$ (160,000)	1.000	$ (160,000)
Working capital needed	NOW	(100,000)	1.000	(100,000)
Annual net cash Inflows	1-5	80,000	3.696	295,680
Relining of equipment	3	(30,000)	0.731	(21,930)
Salvage value of equipment	5	5,000	0.593	2,965
Working capital released	5	100,000	0.593	59,300

- Present value of $1 factor for 5 years at 11%.
- Total present value of the release of the working capital and the salvage value of the equipment is $62,265.

The Net Present Value Method

	Years	Cash Flows	11% Factor	Present Value
Investment equipment	NOW	$ (160,000)	1.000	$ (160,000)
Working capital needed	NOW	(100,000)	1.000	(100,000)
Annual net cash Inflows	1-5	80,000	3.696	295,680
Relining of equipment	3	(30,000)	0.731	(21,930)
Salvage value of equipment	5	5,000	0.593	2,965
Working capital released	5	100,000	0.593	59,300
Net present value				$ 76,015

Accept the contract because the project has a **positive** net present value.

Quick Check

Denny Associates has been offered a four-year contract to supply the computing requirements for a local bank.

Cash flow information:

Cost of computer equipment	$ 250,000
Working capital required	20,000
Upgrading of equipment in 2 years	90,000
Salvage value of equipment in 4 years	10,000
Annual net cash inflow	120,000

- The working capital would be released at the end of the contract.
- Denny Associates requires a 14% return.

Quick Check

What is the net present value of the contract with the local bank?

a. $150,000
b. $28,230
c. $92,340
d. $132,916

Quick Check

What is the net present value of the contract with the local bank?

a. $150,000
b. $28,230
c. $92,340
d. $132,916

Answer : b

Quick Check

	Years	Cash Flows	11% Factor	Present Value
Investment in equipment	NOW	$ (250,000)	1.000	$ (250,000)
Working capital needed	NOW	(20,000)	1.000	(20,000)
Annual net cash inflows	1-4	120,000	2.914	349,680
Upgrading of equipment	2	(90,000)	0.769	(69,210)
Salvage value of equipment	4	10,000	0.592	5,920
Working capital released	4	20,000	0.592	11,840
Net present value				$ 28,230

The Net Present Value Method

Let's look at another way to calculate the NPV.

Lester Company has been offered a five-year contract to provide component parts for a large manufacturer. Cost and revenue information:

Cost of special equipment	$ 160,000
Working capital required	100,000
Relining equipment in 3 years	30,000
Salvage value of equipment in 5 years	5,000
Annual cash revenue and costs:	
Sales revenue from parts	750,000
Cost of parts sold	400,000
Salaries, shipping, etc.	270,000

The Net Present Value Method

At the end of five years the working capital will be released and may be used elsewhere by Lester.

Lester Company uses a discount rate of 11%. Should the contract be accepted?

The Net Present Value Method

	Years	Cash Flows	11% Factor	Present Value
Investment in equipment	NOW	$ (160,000)	1.000	$ (160,000)
Working capital needed	NOW	(100,000)	1.000	(100,000)

Since the investments in equipment (**$160,000**) and working capital (**$100,000**) occur immediately, the discounting factor used is **1.000.**

The Net Present Value Method

	Years	Cash Flows	11% Factor	Present Value
Investment in equipment	NOW	$ (160,000)	1.000	$ (160,000)
Working capital needed	NOW	(100,000)	1.000	(100,000)
Annual net cash inflows	1	80,000	0.901	72,080
Annual net cash inflows	2	80,000	0.812	64,960
Annual net cash inflows	3	50,000	0.731	36,550
Annual net cash inflows	4	80,000	0.659	52,720
Annual net cash inflows	5	80,000	0.593	47,440
Salvage value of equipment	5	5,000	0.593	2,965
Working capital released	5	100,000	0.593	59,300

The total cash flows for years 1-5 are discounted to their present values using the discount factors.

The Net Present Value Method

For example, the total cash flows in year 1 of **$80,000** are multiplied by the discount factor of **0.901** to derive this future cash flow's present value of **$72,080.**

The Net Present Value Method

As another example, the total cash flows in year 3 of **$50,000** are multiplied by the discount factor of **0.731** to derive this future cash flow's present value of **$36,550.**

The Net Present Value Method

	Years	Cash Flows	11% Factor	Present Value
Investment in equipment	NOW	$ (160,000)	1.000	$ (160,000)
Working capital needed	NOW	(100,000)	1.000	(100,000)
Annual net cash inflows	1	80,000	0.901	72,080
Annual net cash inflows	2	80,000	0.812	64,960
Annual net cash inflows	3	50,000	0.731	36,550
Annual net cash inflows	4	80,000	0.659	52,720
Annual net cash inflows	5	80,000	0.593	47,440
Salvage value of equipment	5	5,000	0.593	2,965
Working capital released	5	100,000	0.593	59,300
Net Present Value				$ 76,015

The net present value of the investment opportunity is **$76,015**. Notice this amount equals the net present value from the earlier approach.

The Net Present Value Method

Once you have computed a net present value, you should interpret the results as follows:

1. A **positive net present value** indicates that the project's return **exceeds the discount rate**.
2. A **negative net present value** indicates that the project's return is **less than the discount rate**.

The Net Present Value Method

If the Net Present Value is…	Then the Project is…
Positive …	Acceptable because it promises a return greater than the required rate of return.
Zero …	Acceptable because it promises a return equal to the required rate of return.
Negative …	Not acceptable because it promises a return less than the required rate of return.

Choosing a Discount Rate

- A positive net present value indicates that the project's return exceeds the discount rate.
- A negative net present value indicates that the project's return is less than the discount rate.
- Therefore, a minimum required rate of return is used as the discount rate, a project with a positive net present value has a return that exceeds the minimum rate of return and is acceptable.
- The company's **cost of capital** is usually regarded as the minimum required rate of return.
- The **cost of capital** is the average return the company must pay to its long-term creditors and stockholders. If a project's rate of return is less than cost of capital, then the company does not earn enough to compensate its creditors.
- The **cost of capital** serves as a screening device.

Recovery of the Original Investment

The net present value method automatically provides for **return of the original investment**.

Recovery of the Original Investment

Carver Hospital is considering buying an attachment for its X-ray machine.

Cost	$ 3,169
Life	4 years
Salvage value	$ -
Increase in annual cash inflows	$ 1,000

No investments are to be made unless they have an annual return of at least 10%.
Will we be allowed to invest in the attachment?

Recovery of the Original Investment

Item	Year(s)	Amount of Cash Flow	10% Factor	Value of Cash Flows
Initial investment (outflows)	NOW	$ (3,169)	1.000	$ (3,169)
Annual cash inflows	1	$ 1,000	0.909	$ 909
Annual cash inflows	2	$ 1,000	0.826	$ 826
Annual cash inflows	3	$ 1,000	0.751	$ 751
Annual cash inflows	4	$ 1,000	0.683	$ 683
Net present value				-

Notice that the net present value of the investment is zero.

Recovery of the Original Investment

This implies that the cash inflows are sufficient to recover the **$3,169 initial investment** and to provide exactly a **10% return** on the investment.

Learning Objective 3

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

Internal Rate of Return Method

- The **internal rate of return** is the rate of return promised by 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

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

- 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

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

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

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

Internal Rate of Return Method

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

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

Determining Internal Rate of Return Method

Cash In Flow = Cash Out Flow

$A+B/(1+i)^n+C/(1+i)^m+\ldots\ldots\ldots\ldots\ldots=R+S/(1+i)^p+T/(1+i)^q+\ldots\ldots\ldots$

Quick Check

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

Quick Check

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

- First, NPV is simple to use. As mentioned earlier, the internal rate of return may require hunting for the discount rate that results in a net present value of zero.

- Second, the internal rate of return makes a questionable assumption. Both methods assume that cash flows generated by a project during its useful life are immediately reinvested elsewhere. The net present value method assumes that the rate of return is the discount rate, whereas the internal rate of return assumes that the rate of return is the internal rate of return itself.

Comparing the Net Present Value and Internal Rate of Return Methods

- 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.
- In short, when the net present value method and internal rate of return method do not agree concerning the attractiveness of a project, it is best to go with the net present value method. Of the two method, it makes more realistic assumption about the rate of return that can be earned on cash flows from the project.

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

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	$ 75,000
Annual cash operating costs	30,000	25,000
Annual net cash inflows	$ 60,000	$ 45,000

The Total-Cost Approach

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

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

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

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

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

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

- 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

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

Buy the New Track

	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 Track

	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

Home Furniture should purchase the new truck.

Net Present value of costs	
Associated with purchase of new track	$ (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

- 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

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

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.

Quick Check

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

Quick Check

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

Quick Check

	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	?	2.914	?
Net present value				$ (70,860)

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

- 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

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

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

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.

Behavioral Implications of the Simple Rate of Return

When investment center managers are evaluated using return on investment (ROI), a project's simple rate of return may motivate them to bypass investment opportunities that earn positive net present values.

Postaudit of Investment Projects

A **postaudit** is a follow-up after the project has been completed to see whether or not expected results were actually realized.

End of Presentation

Example

A company is planning to replace an old production line. The life of the new production line will be 20 years. The minimum rate of return that the expects from the investment is 12%. The related financial data is given below:

Initial investment for purchasing of the production facilities and equipments = Tk. 98 million
Installation cost = Tk. 1.5 million; Working capital required = Tk. 20 million
Reduction in maintenance cost per year = Tk. 3 million
Increase in profit = Tk. 8 million (From year 1 to 6); Tk. 12 million (From year 7 to 12);
Tk. 10 million (From year 13 to 15); Tk. 8 million (From year 16 to 20)
Repair cost at 6^{th} year = Tk. 4 million; Repair cost at 14^{th} year = Tk. 8 million
Salvage value = Tk. 15 million
Working capital will be released at the end of 20^{th} year.
Decide whether the company should replace the old production line.

Item	Year	Cash Flow	12% Factor	Present Value
Initial Investment	Now	(98)	1	(98)
Installation	Now	(1.5)	1	(1.5)
Working Capital	Now	(20)	1	(20)
Reduction in Maintenance Cost	1-20	3	7.369	22.407
Increase in Profit	1-6	8	4.111	32.888
Increase in Profit	7-12	12	2.084	24.576
Increase in Profit	13-15	10	0.617	6.17
Increase in Profit	16-20	8	0.660	5.28
Repair Cost	6	(4)	0.507	(2.028)
Repair Cost	14	(8)	0.205	(1.64)
Salvage Value	20	15	0.104	1.56
Working Capital Released	20	20	0.104	2.08
Net Present Value				**(28.207)**

Cash In Flow = Cash Out Flow

Cash In Flow - Cash Out Flow = 0

$$11/(1+i)^1 + 11/(1+i)^2 + 11/(1+i)^3 + 11/(1+i)^4 + 11/(1+i)^5 + 11/(1+i)^6 +$$
$$15/(1+i)^7 + 15/(1+i)^8 + 15/(1+i)^9 + 15/(1+i)^{10} + 15/(1+i)^{11} + 15/(1+i)^{12} +$$
$$13/(1+i)^{13} + 13/(1+i)^{14} + 13/(1+i)^{15} + 11/(1+i)^{16} + 11/(1+i)^{17} + 11/(1+i)^{18} +$$
$$11/(1+i)^{19} + 11/(1+i)^{20} + 35/(1+i)^{20} - 119.5/(1+i)^0 - 4/(1+i)^6 - 8/(1+i)^{14} = 0$$

For i = 12%, NPV = (28.207)

For i = 10%, NPV = (13.594)

For i = 9%, NPV = (5.121)

For i = 8.5%, NPV = (0.478)

For i = 8.45%, NPV = 0.002

So, internal rate of return will be around 8.45%.