Chapter 13

Lecture Notes

Chapter theme: The term **capital budgeting** is used to describe how managers plan significant cash outlays on projects that have long-term implications such as the purchase of new equipment and the introduction of new products. This chapter describes four methods for making these types of investment decisions—the **payback method**, the **net present value method**, the **internal rate of return method**, and the **simple rate of return method**.

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1. **Capital budgeting – an overview**
   1. **Typical capital budgeting** **decisions**
      1. Capital budgeting analysis can be used for any decision that involves an outlay now in order to obtain some future return. Typical capital budgeting decisions include:
         1. **Cost reduction decisions**. Should new equipment be purchased to reduce costs?

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* + - 1. **Expansion decisions**. Should a new plant or warehouse be purchased to increase capacity and sales?
      2. **Equipment selection decisions**. Which of several available machines should be purchased?
      3. **Lease or buy decisions**. Should new equipment be leased or purchased?
      4. **Equipment replacement decisions**. Should old equipment be replaced now or later?

#### Types of capital budgeting decisions

* + 1. There are **two main types** of capital budgeting decisions:
       1. **Screening decisions** relate to whether a proposed project passes a preset hurdle.
          1. For example,acompany may have a policy of accepting projects only if they promise a return of 20% on the investment.

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* + - 1. **Preference decisions** relate to selecting among several competing courses of action.
         1. For example, a company may be considering several different machines to replace an existing machine on the assembly line.

C. **Cash flows versus net operating income**

1. The payback method, the net present value method and the internal rate of return method all focus on analyzing the **cash flows** associated with capital investment projects, whereas the simple rate of return method focuses on **incremental net operating income**.

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1. Examples of cash outflows and cash inflows that accompany capital investment projects are as follows:

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1. **Cash outflows** include those shown on this slide. Notice the term **working capital,** which is defined as current assets less current liabilities.
2. **Cash inflows** include those shown on this slide.

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*Helpful Hint: The role of working capital in capital budgeting often confuses students. Emphasize that the initial investment in working capital at the beginning of the project for items, such as inventories, is recaptured at the end of the project when working capital is no longer required. Thus, working capital is recognized as a cash outflow at the beginning of the project and a cash inflow at the end of the project.*

#### D. The time value of money

1. The time value of money concept recognizes that **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.

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1. The capital budgeting techniques that best recognize the time value of money are those that involve **discounted cash flows** (the concepts of discounting cash flows and using present value tables are explained in greater detail in Appendix 13A).

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1. **The payback method**

*Learning Objective 1: Determine the payback period for an investment.*

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#### 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.

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* + 1. **Key concepts**
       1. The payback method analyzes cash flows; however, it does not consider the time value of money.

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* + - 1. When the annual net cash inflow is **the same every year**, the formula for computing the payback period is as shown.
    1. **The Daily Grind – an example**
       1. Assume the management of the **Daily Grind** wants to install an espresso bar in its restaurant.
          1. The cost of the espresso bar is **$140,000** and it has a **10-year life**.

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* + - * 1. The bar will generate annual net cash inflows of **$35,000**.
        2. Management requires a payback period of **five years or less**.
        3. **What is the payback period on the espresso bar**?
      1. The payback period is **4.0 years**. Therefore, management would choose to invest in the bar.

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*Quick Check – the payback method*

14-15

* + 1. **Evaluation of the payback method**
       1. **Criticisms**
          1. A shorter payback period **does not** always mean that one investment is more desirable than another.
          2. The payback method **ignores cash flows after the payback period**, thus it has no inherent mechanism for highlighting differences in useful life between investments.

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* + - * 1. As previously mentioned, the payback method **does not consider the time value of money**.

*Helpful Hint: Ask students to choose between two options that each require an initial investment of $4,000. Option A returns $1,000 at the end of each four years; option B returns $4,000 at the end of the fourth year. Under the payback method, options A and B are equally preferable. Note, however, that option A is better, since the cash flows come earlier. Now add that in year 5, option A will produce an additional cash inflow of $5,000 but that option B will never generate another dollar after the fourth year. Repeat the question of preference of option A or B using only the payback method. The payback method ignores the time value of money and does not measure profitability; it just measures the time required to recapture the original investment.*

* + - 1. **Strengths**
         1. It can serve as a **screening tool** to help identify which investment proposals are in the “ballpark.”
         2. It can aid companies that are **“cash poor”** in identifying investments that will recoup cash investments quickly.

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* + - * 1. It can help companies that compete in industries **where products become obsolete rapidly** to identify products that will recoup their initial investment quickly.
    1. **Payback and uneven cash flows**
       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**.

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* + - 1. 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**.

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1. **The net present value** **method**

*Learning Objective 2: Evaluate the acceptability of an investment project using the net present value method.*

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#### Key concepts/assumptions

* + 1. 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.**

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* + 1. **Two** **simplifying assumptions** are usually made in net present value analysis:
       1. Thefirst assumption is that all cash flows other than the initial investment occur at the **end of periods**.

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* + - 1. The second assumption is that 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: an example using discount factors from Exhibits 13B-1 and 13B-2

* + 1. Assume the information as shown with respect to **Lester Company**.

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* + - 1. Also assume that at the end of five years the **working capital will be released** and may be used elsewhere.

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* + - 1. Lester Company’s discount rate is **11%**.
      2. **Should the contract be accepted?**
    1. As a starting point, Lester’s annual net cash inflow from operations of **$80,000** is computed as shown.

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* + 1. Since the investments in equipment (**$160,000**) and working capital (**$100,000**) occur immediately, the discounting factor used is **1.000**.

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* + 1. The present value factor for an annuity of $1 for five years at 11% is **3.696**. Therefore, the present value of the annual net cash inflows is **$295,680**.

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* + 1. The present value factor of $1 for three years at 11% is **0.731**. Therefore, the present value of the cost of relining the equipment in three years is **$21,930**.

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* + 1. The present value factor of $1 for five years at 11% is **0.593**. Therefore, the present value of the release of working capital and the salvage value of the equipment is **$62,265**.

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* + 1. The net present value of the investment opportunity is **$76,015**.

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*Quick Check – net present value calculations*

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#### The net present value method: an example using discount factors from Exhibits 13B-1

* + 1. For this next example, we’ll use the same information from **Lester Company**.

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* + - 1. Also assume that at the end of five years the **working capital will be released** and may be used elsewhere.

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* + - 1. Lester Company’s discount rate is **11%**.
      2. **Should the contract be accepted?**
    1. Since the investments in equipment (**$160,000**) and working capital (**$100,000**) occur immediately, the discounting factor used is **1.000**.

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* + 1. The total cash flows for years 1-5 are discounted to their present values using the discount factors from **Exhibit 13B-1**.

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* + 1. 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**.

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* + 1. 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**.

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* + 1. The net present value of the investment opportunity is **$76,015**. Notice this amount equals the net present value from the earlier approach.

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#### The net present value method: interpreting the results

* + 1. Once you have computed a net present value, you should interpret the results as follows:

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* + - 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**.

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* + - 1. If the company’s minimum required rate of return is used as the discount rate:

a. A project with a **positive net present value** has a return that exceeds the minimum required rate of return and is therefore **acceptable**.

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b. A project with a **negative net present value** has a return that is less than the minimum required rate of return and is therefore **unacceptable**.

4. A company’s **cost of capital** is usually regarded as its minimum required rate of return. The cost of capital is the **average return** that the company must pay to its **long-term creditors** and its **shareholders**. When the cost of capital is used as the discount rate, it serves as a **screening device** in net present value analysis.

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#### Recovery of the original investment

* + 1. The net present value method automatically provides for **return of the original investment**.

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* + 1. To illustrate this fact, assume the facts as shown with respect to **Carver Hospital**.

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* + - 1. Notice that the net present value of the investment is **zero**.

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* + - 1. 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

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1. **The internal rate of return** **method**

*Learning Objective 3: Evaluate the acceptability of an investment project using the internal rate of return method.*

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#### Key concepts

* + 1. The **internal rate of return** is the rate of return promised by an investment project over its useful life. It is sometimes referred to as the **yield** on a project.
    2. The internal rate of return is the discount rate that will result in a **net present value of zero**.

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* + 1. This technique works very well if a project’s cash flows are identical every year. If the cash flows are not identical every year a **trial-and-error process** can be used to find the internal rate of return.
    2. If the internal rate of return is **equal to or greater than** the minimum **required rate of return**, then the project is **acceptable**. If it is **less than** the required rate of return, then the project is **rejected**.

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* + 1. When using internal rate of return, the cost of capital acts as a **hurdle rate** that a project must clear for acceptance.

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#### Internal rate of return – an example

* + 1. Assume the facts as shown with respect to the **Decker Company**.

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* + 1. Since the cash flows are the **same every year**, the equation shown can be used to compute the appropriate present value factor of **5.216**.

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* + 1. Using the present value of an annuity of $1 table, the internal rate of return equals **14%**.

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* + 1. If Decker’s minimum required rate of return is **equal to or greater** than 14%, then the machine should be purchased.

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*Quick Check – internal rate of return calculations*

#### Comparing the net present value and internal rate of return methods

* + 1. The net present value method offers **two important advantages** over the internal rate of return method.

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* + - 1. The net present value method is often **simpler to use**.
      2. The internal rate of return method makes a **questionable assumption**—that cash inflows can be reinvested at the internal rate of return.
         1. 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.

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1. **Expanding the net present value method**

#### We will now expand the net present value method to include two alternatives. We will analyze the alternatives using the total cost approach.

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#### Net present value analysis: an expanded example

* + 1. Assume that **White Co.** has two alternatives—**remodel** an old car wash or remove the old car wash and **replace** it with a new one.

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* + - 1. The company uses a discount rate of **10%**.
      2. The net annual cash inflows are **$60,000** for the new car wash and **$45,000** for the old car wash.
    1. In addition, assume that the information as shown relates to the **installation of a new washer**.

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* + 1. The net present value of installing a new washer is **$83,202**.

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* + 1. If White chooses to remodel the existing washer, the remodeling costs would be **$175,000** and the cost to replace the brushes at the end of six years would be **$80,000**.

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* + 1. The net present value of remodeling the old washer is **$56,405**.

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* + 1. While both projects yield a positive net present value, the net present value of the new washer alternative is **$26,797 higher** than the remodeling alternative.

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#### Least cost decisions

* + 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.

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* + 1. **Home Furniture Company – an example** (we will analyze this decision using the **total-cost approach**.
       1. Assume the following:

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* + - * 1. Home Furniture Company is trying to decide whether to **overhaul** an old delivery truck or **purchase** a new one.
        2. The company uses a discount rate of **10%**.
      1. The information pertaining to the old and new trucks is as shown.

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* + - 1. The net present value of buying a new truck is (**$32,883**). The net present value of overhauling the old truck is (**$42,255**).

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* + - * 1. Notice **both numbers are negative because there is no revenue involved** – this is a **least cost** decision.
      1. The net present value in favor of purchasing the new truck is **$9,372**.

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1. **Uncertain cash flows**

*Learning Objective 4: Evaluate an investment project that has uncertain cash flows.*

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#### Handling the complication of uncertain future cash flows – an example

* + 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.

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* + - 1. 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**.
      2. This negative net present value will be offset by the salvage value of the supertanker.
      3. **How large would the salvage value need to be to make this investment attractive**?
    1. The equation shown can be used to determine that if the salvage value of the supertanker is **at least $10 million**, the net present value of the investment would be positive and therefore acceptable.

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* + - 1. While the salvage value is not known with certainty, the $10 million dollar figure offers **a useful reference point** for making the decision.

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*Quick Check – uncertain cash flows*

1. **Preference decisions – the ranking of investment projects**

*Learning Objective 5: Rank investment projects in order of preference.*

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#### Background

* + 1. Recall that when considering investment opportunities, managers must make two types of decisions – screening decisions and preference decisions.
       1. **Screening decisions**, which come first, pertain to whether or not some proposed investment is acceptable.

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* + - 1. **Preference decisions,** which come after screening decisions, attempt to rank acceptable alternatives from the most to least appealing.
         1. Preference decisions need to be made because the number of acceptable investment alternatives usually **exceeds** the amount of available funds.

#### Internal rate of return method

* + 1. 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**.

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#### Net present value method

* + 1. The net present value of one project **cannot be directly compared** to the net present value of another project **unless the investments are equal**.

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* + 1. In the case of unequal investments, a **project** **profitability index** can be computed as shown. Notice:
       1. The project profitability indexes for investments A and B are **0.01** and 0**.20**, respectively.
       2. The higher the project profitability index, the more desirable the project. Therefore, **investment B is more desirable than investment A**.

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* + - 1. Since in this type of situation, **the constrained resource is the limited funds available for investment**, the project profitability index is similar to the contribution margin per unit of the constrained resource discussed in an earlier chapter.

1. **The simple rate of return method**

*Learning Objective 6: Compute the simple rate of return for an investment.*

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* + 1. **Key concepts**
       1. The **simple rate of return method** (also known as the **accounting rate of return** or the **unadjusted rate of return**) does not focus on cash flows, rather it focuses on **accounting net operating income**.

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* + - 1. The equation for computing the simple rate of return is as shown.
    1. **The Daily Grind – an example**
       1. Assume the management of the **Daily Grind** wants to install an espresso bar in its restaurant.
          1. The cost of the espresso bar is **$140,000** and it has a **10-year life**.

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* + - * 1. The espresso bar will generate incremental revenues of **$100,000** and incremental expenses of **$65,000** including depreciation.
        2. **What is the simple rate of return on this project?**

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* + - 1. The simple rate of return is **25%**.
    1. **Criticisms of the simple rate of return**

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* + - 1. **It does not consider the time value of money**.
      2. The simple rate of return **fluctuates from year to year** when used to evaluate projects that do not have constant annual incremental revenues and expenses.

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* + - * 1. The same project may appear desirable in some years and undesirable in others.
    1. **The behavioral implications of the simple rate of return**
       1. 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.

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1. **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.

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* + 1. The data used in a postaudit analysis should be **actual observed data** rather than estimated data.