A Look Back

Chapter 10 described several procedures useful for making and evaluating short-term managerial decisions. It also assessed the consequences of such decisions.

A Look at This Chapter

This chapter focuses on evaluating capital budgeting decisions. Several methods are described and illustrated that help managers identify projects with the greater return on investment.

A Look Ahead

Chapter 12 focuses on reporting and analyzing a company's cash flows. Special emphasis is directed at the statement of cash flows—reported under the indirect method.

Chapter 11

Capital Budgeting and Investment Analysis

Learning Objectives

CAP

Conceptual

- C1 Explain the importance of capital budgeting. *(p. 392)*
- C2 Describe the selection of a hurdle rate for an investment. *(p. 401)*

Analytical

- A1 Analyze a capital investment project using break-even time. *(p. 402)*

LP11

Procedural

- P1 Compute payback period and describe its use. *(p. 393)*
- P2 Compute accounting rate of return and explain its use. *(p. 395)*
- P3 Compute net present value and describe its use. *(p. 397)*
- P4 Compute internal rate of return and explain its use. *(p. 399)*

Decision Feature

One Man's Junk

"*1-800-GOT-JUNK brings together great people*"
—Brian Scudamore

VANCOUVER, CANADA—Brian Scudamore was waiting in a McDonald's drive-thru when he realized his future was junk. With his last $700, Brian bought a used pickup truck and began hauling junk—old couches, appliances, household clutter—any non-hazardous material that two people can lift. "With a vision of creating the 'FedEx' of junk removal, I became a full-time JUNKMAN," says Brian. "My father was not impressed in the least."

He is now. Brian's vision resulted in him starting **1-800-GOT-JUNK (1800gotjunk.com),** the world's largest junk removal service. The company's approach is simple: Use clean, shiny trucks that serve as mobile billboards, and employ professional, courteous drivers who are always on time. Develop a culture that is young, fun, and focused on employee growth, and "build a business that we can be proud of."

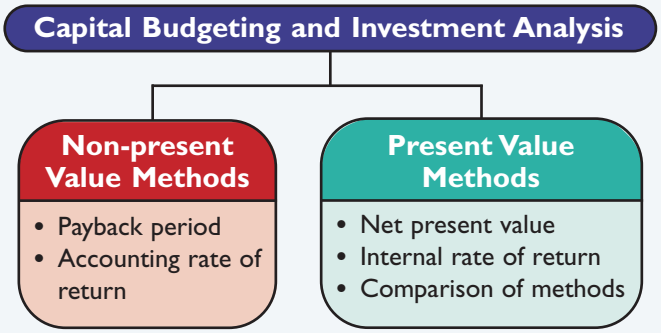
Priced at about $400 per full truckload, Brian's payback period on his initial $700 investment was brief. As his company grew, Brian bought newer trucks, with more sophisticated technology. This required Brian to use better capital budgeting techniques, like net present value and internal rate of return. These techniques enabled Brian to expand his truck capacity into the markets expected to deliver the highest returns. The company buys only a few types of trucks, and one type of dump box, to ensure reliability; added maintenance and rework costs from unreliable equipment can quickly sabotage cash flow estimates. While customers see clean trucks with courteous drivers, a high-tech backbone underlies the operation. Brian invested $500,000 in a computer software system to book and schedule jobs. This investment too had to provide a positive return.

Unlike many entrepreneurs who attempt to minimize risk by outsourcing to independent contractors, Brian took a different approach. "I hired my first employee, a good friend of mine, a week after I started. I always believed in hiring people versus contract or consultants. I felt that if I wasn't willing to make the investment then I was questioning my own faith in the business." While qualitative factors like employee morale are difficult to factor into capital budgeting decisions, they must be considered. Brian's goal is $150 million in annual revenues. Not bad for his initial investment of $700.

[Sources: *1-800-GOT-JUNK Website,* January 2009; *About.com,* December 2006; *BCBusinessMagazine.com,* December 2004; *NPR.org Morning Edition,* March 2008; *Fortune,* October 2003; *Business 2.0,* February 2007]

Chapter Preview

Management must assess alternative long-term strategies and investments, and then decide which assets to acquire or sell to achieve company objectives. This analysis process is called capital budgeting, which is one of the more challenging, risky, and important tasks that management undertakes. This task requires predictions and estimates, and management's capital budgeting decisions impact the company for years. This chapter explains and illustrates several methods to aid management in the capital budgeting decisions.



Introduction to Capital Budgeting

C1 Explain the importance of capital budgeting.

Video11.2

The capital expenditures budget is management's plan for acquiring and selling plant assets. **Capital budgeting** is the process of analyzing alternative long-term investments and deciding which assets to acquire or sell. These decisions can involve developing a new product or process, buying a new machine or a new building, or acquiring an entire company. An objective for these decisions is to earn a satisfactory return on investment.

Capital budgeting decisions require careful analysis because they are usually the most difficult and risky decisions that managers make. These decisions are difficult because they require predicting events that will not occur until well into the future. Many of these predictions are tentative and potentially unreliable. Specifically, a capital budgeting decision is risky because (1) the outcome is uncertain, (2) large amounts of money are usually involved, (3) the investment involves a long-term commitment, and (4) the decision could be difficult or impossible to reverse, no matter how poor it turns out to be. Risk is especially high for investments in technology due to innovations and uncertainty.

Managers use several methods to evaluate capital budgeting decisions. Nearly all of these methods involve predicting cash inflows and cash outflows of proposed investments, assessing the risk of and returns on those flows, and then choosing the investments to make. Management often restates future cash flows in terms of their present value. This approach applies the time value of money: A dollar today is worth more than a dollar tomorrow. Similarly, a dollar tomorrow is worth less than a dollar today. The process of restating future cash flows in terms of their present value is called *discounting.* The time value of money is important when evaluating capital investments, but managers sometimes apply evaluation methods that ignore present value. This section describes four methods for comparing alternative investments.

Point: The nature of capital spending has changed with the business environment. Budgets for information technology have increased from about 25% of corporate capital spending 20 years ago to an estimated 35% today.

Methods Not Using Time Value of Money

All investments, whether they involve the purchase of a machine or another long-term asset, are expected to produce net cash flows. *Net cash flow* is cash inflows minus cash outflows. Sometimes managers perform simple analyses of the financial feasibility of an investment's net cash flow without using the time value of money. This section explains two of the most common methods in this category: (1) payback period and (2) accounting rate of return.

Payback Period

P1 Compute payback period and describe its use.

An investment's **payback period (PBP)** is the expected time period to recover the initial investment amount. Managers prefer investing in assets with shorter payback periods to reduce the risk of an unprofitable investment over the long run. Acquiring assets with short payback periods reduces a company's risk from potentially inaccurate long-term predictions of future cash flows.

Computing Payback Period with Even Cash Flows To illustrate use of the payback period for an investment with even cash flows, we look at data from FasTrac, a manufacturer of exercise equipment and supplies. (*Even cash flows* are cash flows that are the same each and every year; *uneven cash flows* are cash flows that are not all equal in amount.) FasTrac is considering several different capital investments, one of which is to purchase a machine to use in manufacturing a new product. This machine costs $16,000 and is expected to have an eight-year life with no salvage value. Management predicts this machine will produce 1,000 units of product each year and that the new product will be sold for $30 per unit. Exhibit 11.1 shows the expected annual net cash flows for this asset over its life as well as the expected annual revenues and expenses (including depreciation and income taxes) from investing in the machine.

EXHIBIT 11.1
Cash Flow Analysis

FASTRAC Cash Flow Analysis—Machinery Investment January 15, 2009	Expected Accrual Figures	Expected Net Cash Flows
Annual sales of new product	$30,000	$30,000
Deduct annual expenses		
Cost of materials, labor, and overhead (except depreciation)	15,500	15,500
Depreciation—Machinery	2,000	
Additional selling and administrative expenses	9,500	9,500
Annual pretax accrual income	3,000	
Income taxes (30%)	900	900
Annual net income	$ 2,100	
Annual net cash flow		**$ 4,100**

The amount of net cash flow from the machinery is computed by subtracting expected cash outflows from expected cash inflows. The cash flows column of Exhibit 11.1 excludes all noncash revenues and expenses. Depreciation is FasTrac's only noncash item. Alternatively, managers can adjust the projected net income for revenue and expense items that do not affect cash flows. For FasTrac, this means taking the $2,100 net income and adding back the $2,000 depreciation.

Point: Annual net cash flow in Exhibit 11.1 equals net income plus depreciation (a noncash expense).

The formula for computing the payback period of an investment that yields even net cash flows is in Exhibit 11.2.

$$\text{Payback period} = \frac{\text{Cost of investment}}{\text{Annual net cash flow}}$$

EXHIBIT 11.2
Payback Period Formula with Even Cash Flows

The payback period reflects the amount of time for the investment to generate enough net cash flow to return (or pay back) the cash initially invested to purchase it. FasTrac's payback period for this machine is just under four years:

$$\text{Payback period} = \frac{\$16{,}000}{\$4{,}100} = 3.9 \text{ years}$$

The initial investment is fully recovered in 3.9 years, or just before reaching the halfway point of this machine's useful life of eight years.

Example: If an alternative machine (with different technology) yields a payback period of 3.5 years, which one does a manager choose? Answer: The alternative (3.5 is less than 3.9).

Decision Insight

Payback Phones Profits of telecoms have declined as too much capital investment chased too little revenue. Telecom success depends on new technology, and communications gear is evolving at a dizzying rate. Consequently, managers of telecoms often demand short payback periods and large expected net cash flows to compensate for the investment risk.

Computing Payback Period with Uneven Cash Flows

Computing the payback period in the prior section assumed even net cash flows. What happens if the net cash flows are uneven? In this case, the payback period is computed using the *cumulative total of net cash flows.* The word *cumulative* refers to the addition of each period's net cash flows as we progress through time. To illustrate, consider data for another investment that FasTrac is considering. This machine is predicted to generate uneven net cash flows over the next eight years. The relevant data and payback period computation are shown in Exhibit 11.3.

EXHIBIT 11.3

Payback Period Calculation with Uneven Cash Flows

Period*	Expected Net Cash Flows	Cumulative Net Cash Flows
Year 0	$(16,000)	$(16,000)
Year 1	3,000	(13,000)
Year 2	4,000	(9,000)
Year 3	4,000	(5,000)
Year 4	4,000	(1,000)
Year 5	5,000	4,000
Year 6	3,000	7,000
Year 7	2,000	9,000
Year 8	2,000	11,000
		Payback period = 4.2 years

* All cash inflows and outflows occur uniformly during the year.

Example: Find the payback period in Exhibit 11.3 if net cash flows for the first 4 years are:
Year 1 = $6,000; Year 2 = $5,000;
Year 3 = $4,000; Year 4 = $3,000.
Answer: 3.33 years

Year 0 refers to the period of initial investment in which the $16,000 cash outflow occurs at the end of year 0 to acquire the machinery. By the end of year 1, the cumulative net cash flow is reduced to $(13,000), computed as the $(16,000) initial cash outflow plus year 1's $3,000 cash inflow. This process continues throughout the asset's life. The cumulative net cash flow amount changes from negative to positive in year 5. Specifically, at the end of year 4, the cumulative net cash flow is $(1,000). As soon as FasTrac receives net cash inflow of $1,000 during the fifth year, it has fully recovered the investment. If we assume that cash flows are received uniformly *within* each year, receipt of the $1,000 occurs about one-fifth of the way through the year. This is computed as $1,000 divided by year 5's total net cash flow of $5,000, or 0.20. This yields a payback period of 4.2 years, computed as 4 years plus 0.20 of year 5.

"So what if I underestimated costs and overestimated revenues? It all averages out in the end."

Using the Payback Period

Companies desire a short payback period to increase return and reduce risk. The more quickly a company receives cash, the sooner it is available for other uses and the less time it is at risk of loss. A shorter payback period also improves the company's ability to respond to unanticipated changes and lowers its risk of having to keep an unprofitable investment.

Payback period should never be the only consideration in evaluating investments. This is so because it ignores at least two important factors. First, it fails to reflect differences in the timing of net cash flows within the payback period. In Exhibit 11.3, FasTrac's net cash flows in the first five years were $3,000, $4,000, $4,000, $4,000, and $5,000. If another investment had predicted cash flows of $9,000, $3,000, $2,000, $1,800, and $1,000 in these five years, its payback period would also be 4.2 years, but this second alternative could be more desirable because it provides cash more

quickly. The second important factor is that the payback period ignores *all* cash flows after the point where its costs are fully recovered. For example, one investment might pay back its cost in 3 years but stop producing cash after 4 years. A second investment might require 5 years to pay back its cost yet continue to produce net cash flows for another 15 years. A focus on only the payback period would mistakenly lead management to choose the first investment over the second.

Quick Check

Answers—p. 407

1. Capital budgeting is (*a*) concerned with analyzing alternative sources of capital, including debt and equity, (*b*) an important activity for companies when considering what assets to acquire or sell, or (*c*) best done by intuitive assessments of the value of assets and their usefulness.
2. Why are capital budgeting decisions often difficult?
3. A company is considering purchasing equipment costing $75,000. Future annual net cash flows from this equipment are $30,000, $25,000, $15,000, $10,000, and $5,000. The payback period is (*a*) 4 years, (*b*) 3.5 years, or (*c*) 3 years.
4. If depreciation is an expense, why is it added back to an investment's net income to compute the net cash flow from that investment?
5. If two investments have the same payback period, are they equally desirable? Explain.

Accounting Rate of Return

P2 Compute accounting rate of return and explain its use.

The **accounting rate of return,** also called *return on average investment,* is computed by dividing a project's after-tax net income by the average amount invested in it. To illustrate, we return to FasTrac's $16,000 machinery investment described in Exhibit 11.1. We first compute (1) the after-tax net income and (2) the average amount invested. The $2,100 after-tax net income is already available from Exhibit 11.1. To compute the average amount invested, we assume that net cash flows are received evenly throughout each year. Thus, the average investment for each year is computed as the average of its beginning and ending book values. If FasTrac's $16,000 machine is depreciated $2,000 each year, the average amount invested in the machine for each year is computed as shown in Exhibit 11.4. The average for any year is the average of the beginning and ending book values.

EXHIBIT 11.4

Computing Average Amount Invested

	Beginning Book Value	Annual Depreciation	Ending Book Value	Average Book Value
Year 1	$16,000	$2,000	$14,000	$15,000
Year 2	14,000	2,000	12,000	13,000
Year 3	12,000	2,000	10,000	11,000
Year 4	10,000	2,000	8,000	9,000
Year 5	8,000	2,000	6,000	7,000
Year 6	6,000	2,000	4,000	5,000
Year 7	4,000	2,000	2,000	3,000
Year 8	2,000	2,000	0	1,000
All years				$ 8,000

Next we need the average book value for the asset's entire life. This amount is computed by taking the average of the individual yearly averages. This average equals $8,000, computed as $64,000 (the sum of the individual years' averages) divided by eight years (see last column of Exhibit 11.4).

Point: General formula for *annual average investment* is the sum of individual years' average book values divided by the number of years of the planned investment.

If a company uses straight-line depreciation, we can find the average amount invested by using the formula in Exhibit 11.5. Because FasTrac uses straight-line depreciation, its average amount invested for the eight years equals the sum of the book value at the beginning of the asset's investment period and the book value at the end of its investment period, divided by 2, as shown in Exhibit 11.5.

EXHIBIT 11.5

Computing Average Amount Invested under Straight-Line Depreciation

$$\text{Annual average investment (straight-line case only)} = \frac{\text{Beginning book value} + \text{Ending book value}}{2}$$

$$= \frac{\$16{,}000 + \$0}{2} = \$8{,}000$$

If an investment has a salvage value, the average amount invested when using straight-line depreciation is computed as (Beginning book value + Salvage value)/2.

Once we determine the after-tax net income and the average amount invested, the accounting rate of return on the investment can be computed from the annual after-tax net income divided by the average amount invested, as shown in Exhibit 11.6.

EXHIBIT 11.6

Accounting Rate of Return Formula

$$\text{Accounting rate of return} = \frac{\text{Annual after-tax net income}}{\text{Annual average investment}}$$

This yields an accounting rate of return of 26.25% ($2,100/$8,000). FasTrac management must decide whether a 26.25% accounting rate of return is satisfactory. To make this decision, we must factor in the investment's risk. For instance, we cannot say an investment with a 26.25% return is preferred over one with a lower return unless we recognize any differences in risk. Thus, an investment's return is satisfactory or unsatisfactory only when it is related to returns from other investments with similar lives and risk.

When accounting rate of return is used to choose among capital investments, the one with the least risk, the shortest payback period, and the highest return for the longest time period is often identified as the best. However, use of accounting rate of return to evaluate investment opportunities is limited because it bases the amount invested on book values (not predicted market values) in future periods. Accounting rate of return is also limited when an asset's net incomes are expected to vary from year to year. This requires computing the rate using *average* annual net incomes, yet this accounting rate of return fails to distinguish between two investments with the same average annual net income but different amounts of income in early years versus later years or different levels of income variability.

Quick Check

Answers—p. 407

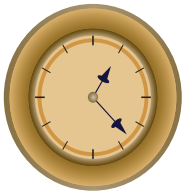
6. The following data relate to a company's decision on whether to purchase a machine:

Cost	$180,000
Salvage value	15,000
Annual after-tax net income	40,000

The machine's accounting rate of return, assuming the even receipt of its net cash flows during the year and use of straight-line depreciation, is (*a*) 22%, (*b*) 41%, or (*c*) 21%.

7. Is a 15% accounting rate of return for a machine a good rate?

Methods Using Time Value of Money



This section describes two methods that help managers with capital budgeting decisions and that use the time value of money: (1) net present value and (2) internal rate of return. *(To apply these methods, you need a basic understanding of the concept of present value. An expanded explanation of present value concepts is in Appendix B near the end of the book. You can use the present value tables at the end of Appendix B to solve many of this chapter's assignments that use the time value of money.)*

Net Present Value

P3 Compute net present value and describe its use.

Net present value analysis applies the time value of money to future cash inflows and cash outflows so management can evaluate a project's benefits and costs at one point in time. Specifically, **net present value (NPV)** is computed by discounting the future net cash flows from the investment at the project's required rate of return and then subtracting the initial amount invested. A company's required return, often called its hurdle rate, is typically its **cost of capital,** which is the rate the company must pay to its long-term creditors and shareholders.

To illustrate, let's return to FasTrac's proposed machinery purchase described in Exhibit 11.1. Does this machine provide a satisfactory return while recovering the amount invested? Recall that the machine requires a $16,000 investment and is expected to provide $4,100 annual net cash inflows for the next eight years. If we assume that net cash flows from this machine are received at each year-end and that FasTrac requires a 12% annual return, net present value can be computed as in Exhibit 11.7.

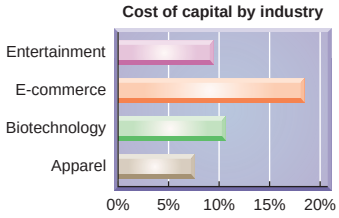


EXHIBIT 11.7

Net Present Value Calculation with Equal Cash Flows

	Net Cash Flows*	Present Value of 1 at 12%†	Present Value of Net Cash Flows
Year 1	$ 4,100	0.8929	$ 3,661
Year 2	4,100	0.7972	3,269
Year 3	4,100	0.7118	2,918
Year 4	4,100	0.6355	2,606
Year 5	4,100	0.5674	2,326
Year 6	4,100	0.5066	2,077
Year 7	4,100	0.4523	1,854
Year 8	4,100	0.4039	1,656
Totals	$32,800		$20,367
Amount invested			**(16,000)**
Net present value			**$ 4,367**

* Cash flows occur at the end of each year.

† Present value of 1 factors are taken from Table B.1 in Appendix B.

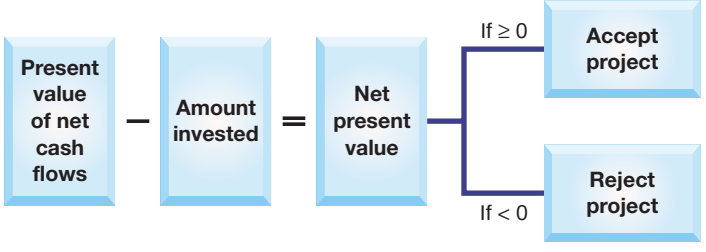
The first number column of Exhibit 11.7 shows the annual net cash flows. Present value of 1 factors, also called *discount factors,* are shown in the second column. Taken from Table B.1 in Appendix B, they assume that net cash flows are received at each year-end. *(To simplify present value computations and for assignment material at the end of this chapter, we assume that net cash flows are received at each year-end.)* Annual net cash flows from the first column of Exhibit 11.7 are multiplied by the discount factors in the second column to give present values shown in the third column. The last three lines of this exhibit show the final NPV computations. The asset's $16,000 initial cost is deducted from the $20,367 total present value of all future net cash flows to give this asset's NPV of $4,367. The machine is thus expected to (1) recover its cost, (2) provide a 12% compounded return, and (3) generate $4,367 above cost. We summarize this analysis by saying the present value of this machine's future net cash flows to FasTrac exceeds the $16,000 investment by $4,367.

Point: The assumption of end-of-year cash flows simplifies computations and is common in practice.

Point: The amount invested includes all costs that must be incurred to get the asset in its proper location and ready for use.

Example: What is the net present value in Exhibit 11.7 if a 10% return is required? *Answer:* $5,873

Net Present Value Decision Rule The decision rule in applying NPV is as follows: When an asset's expected cash flows are discounted at the required rate and yield a *positive* net present value, the asset should be acquired. This decision rule is reflected in the graphic below. When comparing several investment opportunities of about the same cost and same risk, we prefer the one with the highest positive net present value.



Example: Why does the net present value of an investment increase when a lower discount rate is used? *Answer:* The present value of net cash flows increases.

Simplifying Computations The computations in Exhibit 11.7 use separate present value of 1 factors for each of the eight years. Each year's net cash flow is multiplied by its present value of 1 factor to determine its present value. The individual present values for each of the eight net cash flows are added to give the asset's total present value. This computation can be simplified in two ways if annual net cash flows are equal in amount. One way is to add the eight annual present value of 1 factors for a total of 4.9676 and multiply this amount by the annual $4,100 net cash flow to get the $20,367 total present value of net cash flows.[1] A second simplification is to use a calculator with compound interest functions or a spreadsheet program. We show how to use Excel functions to compute net present value in this chapter's Appendix. Whatever procedure you use, it is important to understand the concepts behind these computations.

Decision Ethics

Systems Manager Top management adopts a policy requiring purchases in excess of $5,000 to be submitted with cash flow projections to the cost analyst for capital budget approval. As systems manager, you want to upgrade your computers at a $25,000 cost. You consider submitting several orders all under $5,000 to avoid the approval process. You believe the computers will increase profits and wish to avoid a delay. What do you do? [Answer—p. 406]

Uneven Cash Flows Net present value analysis can also be applied when net cash flows are uneven (unequal). To illustrate, assume that FasTrac can choose only one capital investment from among projects A, B, and C. Each project requires the same $12,000 initial investment. Future net cash flows for each project are shown in the first three number columns of Exhibit 11.8.

EXHIBIT 11.8

Net Present Value Calculation with Uneven Cash Flows

	Net Cash Flows			Present Value of 1 at 10%	Present Value of Net Cash Flows		
	A	B	C		A	B	C
Year 1	$ 5,000	$ 8,000	$ 1,000	0.9091	$ 4,546	$ 7,273	$ 909
Year 2	5,000	5,000	5,000	0.8264	4,132	4,132	4,132
Year 3	5,000	2,000	9,000	0.7513	3,757	1,503	6,762
Totals	$15,000	$15,000	$15,000		12,435	12,908	11,803
Amount invested					(12,000)	(12,000)	(12,000)
Net present value					**$ 435**	**$ 908**	**$ (197)**

Example: If 12% is the required return in Exhibit 11.8, which project is preferred? *Answer:* Project B. Net present values are: A = $10; B = $553; C = $(715).

Example: Will the rankings of Projects A, B, and C change with the use of different discount rates, assuming the same rate is used for all projects? *Answer:* No; only the NPV amounts will change.

The three projects in Exhibit 11.8 have the same expected total net cash flows of $15,000. Project A is expected to produce equal amounts of $5,000 each year. Project B is expected to produce a larger amount in the first year. Project C is expected to produce a larger amount in the third year. The fourth column of Exhibit 11.8 shows the present value of 1 factors from Table B.1 assuming 10% required return.

Computations in the right-most columns show that Project A has a $435 positive NPV. Project B has the largest NPV of $908 because it brings in cash more quickly. Project C has a $(197) *negative* NPV because its larger cash inflows are delayed. If FasTrac requires a 10% return, it should reject Project C because its NPV implies a return *under* 10%. If only one project can be accepted, project B appears best because it yields the highest NPV.

[1] We can simplify this computation using Table B.3, which gives the present value of 1 to be received periodically for a number of periods. To determine the present value of these eight annual receipts discounted at 12%, go down the 12% column of Table B.3 to the factor on the eighth line. This cumulative discount factor, also known as an *annuity* factor, is 4.9676. We then compute the $20,367 present value for these eight annual $4,100 receipts, computed as 4.9676 × $4,100.

Salvage Value and Accelerated Depreciation FasTrac predicted the $16,000 machine to have zero salvage value at the end of its useful life (recall Exhibit 11.1). In many cases, assets are expected to have salvage values. If so, this amount is an additional net cash inflow received at the end of the final year of the asset's life. All other computations remain the same.

Point: Projects with higher cash flows in earlier years generally yield higher net present values.

Depreciation computations also affect net present value analysis. FasTrac computes depreciation using the straight-line method. Accelerated depreciation is also commonly used, especially for income tax reports. Accelerated depreciation produces larger depreciation deductions in the early years of an asset's life and smaller deductions in later years. This pattern results in smaller income tax payments in early years and larger payments in later years. Accelerated depreciation does not change the basics of a present value analysis, but it can change the result. Using accelerated depreciation for tax reporting affects the NPV of an asset's cash flows because it produces larger net cash inflows in the early years of the asset's life and smaller ones in later years. Being able to use accelerated depreciation for tax reporting always makes an investment more desirable because early cash flows are more valuable than later ones.

Example: When is it appropriate to use different discount rates for different projects? *Answer:* When risk levels are different.

Point: Tax savings from depreciation is called: **depreciation tax shield.**

Use of Net Present Value In deciding whether to proceed with a capital investment project, we approve the proposal if the NPV is positive but reject it if the NPV is negative. When considering several projects of similar investment amounts and risk levels, we can compare the different projects' NPVs and rank them on the basis of their NPVs. However, if the amount invested differs substantially across projects, the NPV is of limited value for comparison purposes. One means to compare projects, especially when a company cannot fund all positive net present value projects, is to use the **profitability index,** which is computed as:

$$\text{Profitability index} = \frac{\text{Net present value of cash flows}}{\text{Investment}}$$

A higher profitability index suggests a more desirable project. To illustrate, suppose that Project X requires a $1 million investment and provides a $100,000 NPV. Project Y requires an investment of only $100,000 and returns a $75,000 NPV. Ranking on the basis of NPV puts Project X ahead of Y, yet X's profitability index is only 0.10 ($100,000/$1,000,000) whereas Y's profitability index is 0.75. We must also remember that when reviewing projects with different risks, we computed the NPV of individual projects using different discount rates. The higher the risk, the higher the discount rate.

Inflation Large price-level increases should be considered in NPV analyses. Hurdle rates already include investor's inflation forecasts. Net cash flows can be adjusted for inflation by using *future value* computations. For example, if the expected net cash inflow in year 1 is $4,100 and 5% inflation is expected, then the expected net cash inflow in year 2 is $4,305, computed as $4,100 $\times$ 1.05 (1.05 is the future value of $1 (Table B.2) for 1 period with a 5% rate).

Internal Rate of Return

P4 Compute internal rate of return and explain its use.

Another means to evaluate capital investments is to use the **internal rate of return (IRR),** which equals the rate that yields an NPV of zero for an investment. This means that if we compute the total present value of a project's net cash flows using the IRR as the discount rate and then subtract the initial investment from this total present value, we get a zero NPV.

To illustrate, we use the data for FasTrac's Project A from Exhibit 11.8 to compute its IRR. Exhibit 11.9 shows the two-step process in computing IRR.

EXHIBIT 11.9

Computing Internal Rate of Return (with even cash flows)

Step 1: Compute the present value factor for the investment project.

$$\text{Present value factor} = \frac{\text{Amount invested}}{\text{Net cash flows}} = \frac{\$12{,}000}{\$5{,}000} = 2.4000$$

Step 2: Identify the discount rate (IRR) yielding the present value factor

Search Table B.3 for a present value factor of 2.4000 in the three-year row (equaling the 3-year project duration). The 12% discount rate yields a present value factor of 2.4018. This implies that the IRR is approximately 12%.*

* Since the present value factor of 2.4000 is not exactly equal to the 12% factor of 2.4018, we can more precisely estimate the IRR as follows:

Discount rate	Present Value Factor from Table B.3
12%	2.4018
15%	2.2832
	0.1186 = difference

$$\text{Then, IRR} = 12\% + \left[(15\% - 12\%) \times \frac{2.4018 - 2.4000}{0.1186}\right] = 12.05\%$$

When cash flows are equal, as with Project A, we compute the present value factor (as shown in Exhibit 11.9) by dividing the initial investment by its annual net cash flows. We then use an annuity table to determine the discount rate equal to this present value factor. For FasTrac's Project A, we look across the three-period row of Table B.3 and find that the discount rate corresponding to the present value factor of 2.4000 roughly equals the 2.4018 value for the 12% rate. This row is reproduced here:

Present Value of an Annuity of 1 for Three Periods

	Discount Rate				
Periods	1%	5%	10%	12%	15%
3	2.9410	2.7232	2.4869	2.4018	2.2832

The 12% rate is the Project's IRR. A more precise IRR estimate can be computed following the procedure shown in the note to Exhibit 11.9. Spreadsheet software and calculators can also compute this IRR. We show how to use an Excel function to compute IRR in this chapter's Appendix.

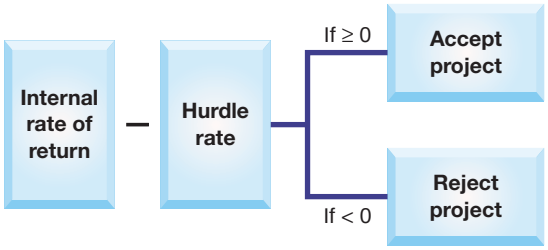
Uneven Cash Flows If net cash flows are uneven, we must use trial and error to compute the IRR. We do this by selecting any reasonable discount rate and computing the NPV. If the amount is positive (negative), we recompute the NPV using a higher (lower) discount rate. We continue these steps until we reach a point where two consecutive computations result in NPVs having different signs (positive and negative). Because the NPV is zero using IRR, we know that the IRR lies between these two discount rates. We can then estimate its value. Spreadsheet programs and calculators can do these computations for us.

Decision Insight

Fun-IRR Many theme parks use both financial and nonfinancial criteria to evaluate their investments in new rides and activities. The use of IRR is a major part of this evaluation. This requires good estimates of future cash inflows and outflows. It also requires risk assessments of the uncertainty of the future cash flows.

Use of Internal Rate of Return When we use the IRR to evaluate a project, we compare it to a predetermined **hurdle rate,** which is a minimum acceptable rate of return and is applied as follows.

C2 Describe the selection of a hurdle rate for an investment.



Top management selects the hurdle rate to use in evaluating capital investments. Financial formulas aid in this selection, but the choice of a minimum rate is subjective and left to management. For projects financed from borrowed funds, the hurdle rate must exceed the interest rate paid on these funds. The return on an investment must cover its interest and provide an additional profit to reward the company for its risk. For instance, if money is borrowed at 10%, an average risk investment often requires an after-tax return of 15% (or 5% above the borrowing rate). Remember that lower-risk investments require a lower rate of return compared with higher-risk investments.

If the project is internally financed, the hurdle rate is often based on actual returns from comparable projects. If the IRR is higher than the hurdle rate, the project is accepted. Multiple projects are often ranked by the extent to which their IRR exceeds the hurdle rate. The hurdle rate for individual projects is often different, depending on the risk involved. IRR is not subject to the limitations of NPV when comparing projects with different amounts invested because the IRR is expressed as a percent rather than as an absolute dollar value in NPV.

Example: How does management evaluate the risk of an investment? *Answer:* It must assess the uncertainty of future cash flows.

Point: A survey reports that 41% of top managers would reject a project with an internal rate of return *above* the cost of capital, *if* the project would cause the firm to miss its earnings forecast. The roles of benchmarks and manager compensation plans must be considered in capital budgeting decisions.

Decision Maker

Entrepreneur You are developing a new product and you use a 12% discount rate to compute its NPV. Your banker, from whom you hope to obtain a loan, expresses concern that your discount rate is too low. How do you respond? [Answer—p. 406]

Comparison of Capital Budgeting Methods

We explained four methods that managers use to evaluate capital investment projects. How do these methods compare with each other? Exhibit 11.10 addresses that question. Neither the payback period nor the accounting rate of return considers the time value of money. On the other hand, both the net present value and the internal rate of return do.

EXHIBIT 11.10
Comparing Capital Budgeting Methods

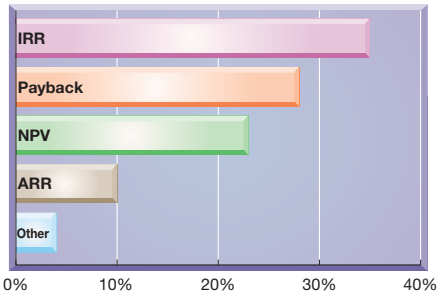
	Payback Period	Accounting Rate of Return	Net Present Value	Internal Rate of Return
Measurement basis	■ Cash flows	■ Accrual income	■ Cash flows ■ Profitability	■ Cash flows ■ Profitability
Measurement unit	■ Years	■ Percent	■ Dollars	■ Percent
Strengths	■ Easy to understand ■ Allows comparison of projects	■ Easy to understand ■ Allows comparison of projects	■ Reflects time value of money ■ Reflects varying risks over project's life	■ Reflects time value of money ■ Allows comparisons of dissimilar projects
Limitations	■ Ignores time value of money ■ Ignores cash flows after payback period	■ Ignores time value of money ■ Ignores annual rates over life of project	■ Difficult to compare dissimilar projects	■ Ignores varying risks over life of project

The payback period is probably the simplest method. It gives managers an estimate of how soon they will recover their initial investment. Managers sometimes use this method when they have limited cash to invest and a number of projects to choose from. The accounting rate of

return yields a percent measure computed using accrual income instead of cash flows. The accounting rate of return is an average rate for the entire investment period. Net present value considers all estimated net cash flows for the project's expected life. It can be applied to even and uneven cash flows and can reflect changes in the level of risk over a project's life. Since it yields a dollar measure, comparing projects of unequal sizes is more difficult. The internal rate of return considers all cash flows from a project. It is readily computed when the cash flows are even but requires some trial and error estimation when cash flows are uneven. Because the IRR is a percent measure, it is readily used to compare projects with different investment amounts. However, IRR does not reflect changes in risk over a project's life.

Decision Insight

And the Winner Is . . . How do we choose among the methods for evaluating capital investments? Management surveys consistently show the internal rate of return (IRR) as the most popular method followed by the payback period and net present value (NPV). Few companies use the accounting rate of return (ARR), but nearly all use more than one method.



Company Usage for Capital Budgeting Methods

Quick Check

Answers—p. 407

8. A company can invest in only one of two projects, A or B. Each project requires a $20,000 investment and is expected to generate end-of-period, annual cash flows as follows:

	Year 1	Year 2	Year 3	Total
Project A	$12,000	$8,500	$4,000	$24,500
Project B	4,500	8,500	13,000	26,000

Assuming a discount rate of 10%, which project has the higher net present value?

9. Two investment alternatives are expected to generate annual cash flows with the same net present value (assuming the same discount rate applied to each). Using this information, can you conclude that the two alternatives are equally desirable?

10. When two investment alternatives have the same total expected cash flows but differ in the timing of those flows, which method of evaluating those investments is superior, (*a*) accounting rate of return or (*b*) net present value?

Decision Analysis — Break-Even Time

A1 Analyze a capital investment project using break-even time.

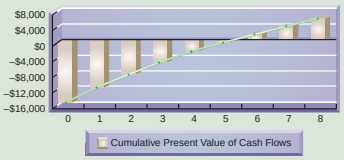
The first section of this chapter explained several methods to evaluate capital investments. Break-even time of an investment project is a variation of the payback period method that overcomes the limitation of not using the time value of money. **Break-even time (BET)** is a time-based measure used to evaluate a capital investment's acceptability. Its computation yields a measure of expected time, reflecting the time period until the *present value* of the net cash flows from an investment equals the initial cost of the investment. In basic terms, break-even time is computed by restating future cash flows in terms of present values and then determining the payback period using these present values.

To illustrate, we return to the FasTrac case described in Exhibit 11.1 involving a $16,000 investment in machinery. The annual net cash flows from this investment are projected at $4,100 for eight years. Exhibit 11.11 shows the computation of break-even time for this investment decision.

EXHIBIT 11.11

Break-Even Time Analysis*

Year	Cash Flows	Present Value of 1 at 10%	Present Value of Cash Flows	Cumulative Present Value of Cash Flows
0	$(16,000)	1.0000	$(16,000)	$(16,000)
1	4,100	0.9091	3,727	(12,273)
2	4,100	0.8264	3,388	(8,885)
3	4,100	0.7513	3,080	(5,805)
4	4,100	0.6830	2,800	(3,005)
5	4,100	0.6209	2,546	(459)
6	4,100	0.5645	2,314	1,855
7	4,100	0.5132	2,104	3,959
8	4,100	0.4665	1,913	5,872



* The time of analysis is the start of year 1 (same as end of year 0). All cash flows occur at the end of each year.

The right-most column of this exhibit shows that break-even time is between 5 and 6 years, or about 5.2 years—also see margin graph (where the line crosses the zero point). This is the time the project takes to break even after considering the time value of money (recall that the payback period computed without considering the time value of money was 3.9 years). We interpret this as cash flows earned after 5.2 years contribute to a positive net present value that, in this case, eventually amounts to $5,872.

Break-even time is a useful measure for managers because it identifies the point in time when they can expect the cash flows to begin to yield net positive returns. Managers expect a positive net present value from an investment if break-even time is less than the investment's estimated life. The method allows managers to compare and rank alternative investments, giving the project with the shortest break-even time the highest rank.

Decision Maker

Investment Manager Management asks you, the investment manager, to evaluate three alternative investments. Investment recovery time is crucial because cash is scarce. The time value of money is also important. Which capital budgeting method(s) do you use to assess the investments? [Answer—p. 406]

Demonstration Problem

White Company can invest in one of two projects, TD1 or TD2. Each project requires an initial investment of $101,250 and produces the year-end cash inflows shown in the following table.

	Net Cash Flows	
	TD1	TD2
Year 1	$ 20,000	$ 40,000
Year 2	30,000	40,000
Year 3	70,000	40,000
Totals	$120,000	$120,000

Required

1. Compute the payback period for both projects. Which project has the shortest payback period?
2. Assume that the company requires a 10% return from its investments. Compute the net present value of each project.
3. Drawing on your answers to parts 1 and 2, determine which project, if any, should be chosen.
4. Compute the internal rate of return for project TD2. Based on its internal rate of return, should project TD2 be chosen?

Planning the Solution

- Compute the payback period for the series of unequal cash flows (Project TD1) and for the series of equal cash flows (Project TD2).
- Compute White Company's net present value of each investment using a 10% discount rate.
- Use the payback and net present value rules to determine which project, if any, should be selected.
- Compute the internal rate of return for the series of equal cash flows (Project TD2) and determine whether that internal rate of return is greater than the company's 10% discount rate.

Solution to Demonstration Problem

1. The payback period for a project with a series of equal cash flows is computed as follows:

$$\text{Payback period} = \frac{\text{Cost of investment}}{\text{Annual net cash flow}}$$

For project TD2, the payback period equals 2.53 (rounded), computed as $101,250/$40,000. This means that the company expects to recover its investment in Project TD2 after approximately two and one-half years of its three-year life.

Next, determining the payback period for a series of unequal cash flows (as in Project TD1) requires us to compute the cumulative net cash flows from the project at the end of each year. Assuming the cash outflow for Project TD1 occurs at the end of year 0, and cash inflows occur continuously over years 1, 2, and 3, the payback period calculation follows.

TD1:

Period	Expected Net Cash Flows	Cumulative Net Cash Flows
0	$(101,250)	$(101,250)
1	20,000	(81,250)
2	30,000	(51,250)
3	70,000	18,750

The cumulative net cash flow for Project TD1 changes from negative to positive in year 3. As cash flows are received continuously, the point at which the company has recovered its investment into year 3 is 0.27 (rounded), computed as $18,750/$70,000. This means that the payback period for TD1 is 2.27 years, computed as 2 years plus 0.27 of year 3.

2. TD1:

	Net Cash Flows	Present Value of 1 at 10%	Present Value of Net Cash Flows
Year 1	$ 20,000	0.9091	$ 18,182
Year 2	30,000	0.8264	24,792
Year 3	70,000	0.7513	52,591
Totals	$120,000		95,565
Amount invested			(101,250)
Net present value			**$ (5,685)**

TD2:

	Net Cash Flows	Present Value of 1 at 10%	Present Value of Net Cash Flows
Year 1	$ 40,000	0.9091	$ 36,364
Year 2	40,000	0.8264	33,056
Year 3	40,000	0.7513	30,052
Totals	$120,000		99,472
Amount invested			(101,250)
Net present value			**$ (1,778)**

3. White Company should not invest in either project. Both are expected to yield a negative net present value, and it should invest only in positive net present value projects. Although the company expects to recover its investment from both projects before the end of these projects' useful lives, the projects are not acceptable after considering the time value of money.
4. To compute Project TD2's internal rate of return, we first compute a present value factor as follows:

$$\text{Present value factor} = \frac{\text{Amount invested}}{\text{Net cash flow}} = \$101{,}250/\$40{,}000 = 2.5313 \text{ (rounded)}$$

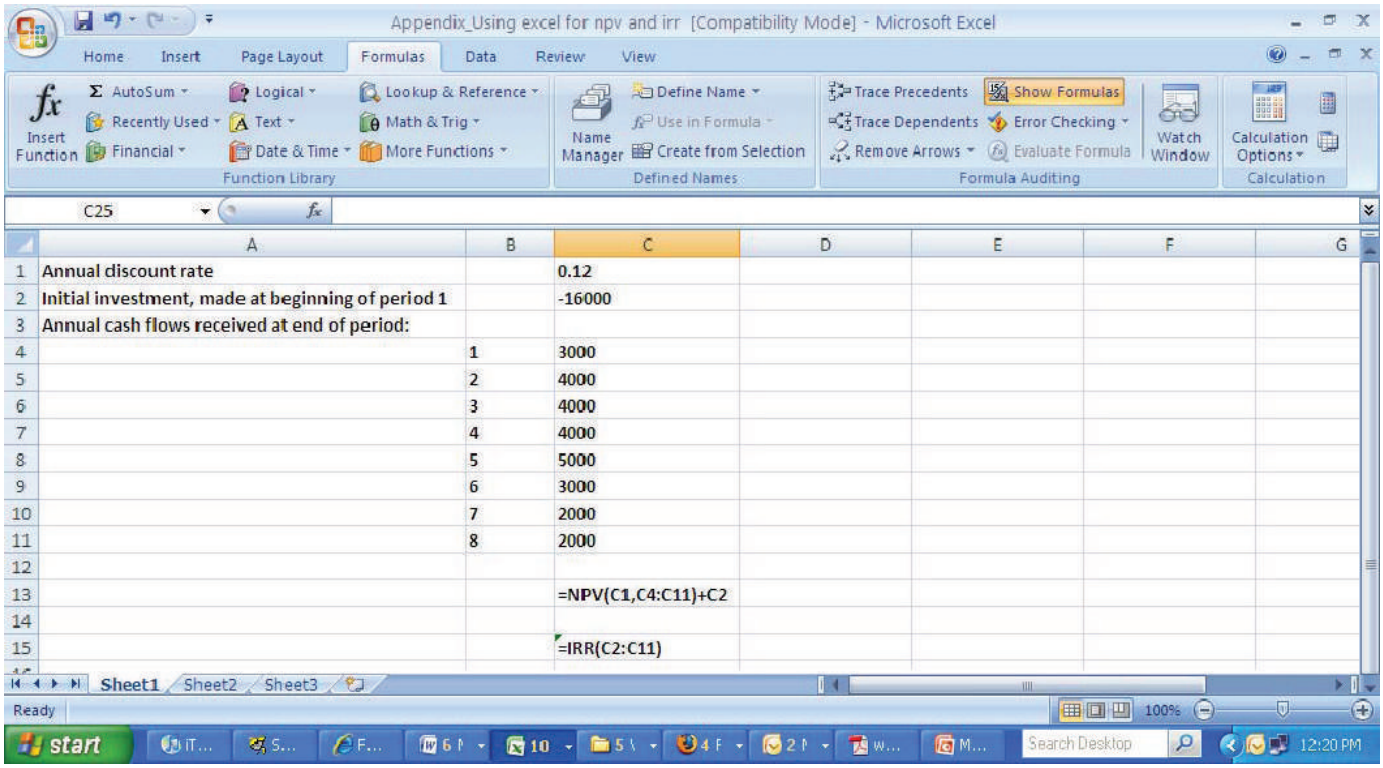
Then, we search Table B.3 for the discount rate that corresponds to the present value factor of 2.5313 for three periods. From Table B.3, this discount rate is 9%. Project TD2's internal rate of return of 9% is below this company's hurdle rate of 10%. Thus, Project TD2 should *not* be chosen.

APPENDIX

Using Excel to Compute Net Present Value and Internal Rate of Return

11A

Computing present values and internal rates of return for projects with uneven cash flows is tedious and error prone. These calculations can be performed simply and accurately by using functions built into Excel. Many calculators and other types of spreadsheet software can perform them too. To illustrate, consider Fastrac, a company that is considering investing in a new machine with the expected cash flows shown in the following spreadsheet. Cash outflows are entered as negative numbers, and cash inflows are entered as positive numbers. Assume Fastrac requires a 12% annual return, entered as 0.12 in cell C1.



To compute the net present value of this project, the following is entered into cell C13:

$$=\text{NPV(C1,C4:C11)}+\text{C2}.$$

This instructs Excel to use its NPV function to compute the present value of the cash flows in cells C4 through C11, using the discount rate in cell C1, and then add the amount of the (negative) initial investment. For this stream of cash flows and a discount rate of 12%, the net present value is $1,326.03.

To compute the internal rate of return for this project, the following is entered into cell C15:

$$=\text{IRR(C2:C11)}.$$

This instructs Excel to use its IRR function to compute the internal rate of return of the cash flows in cells C2 through C11. By default, Excel starts with a guess of 10%, and then uses trial and error to find the IRR. The IRR equals 14% for this project.

Summary

C1 **Explain the importance of capital budgeting.** Capital budgeting is the process of analyzing alternative investments and deciding which assets to acquire or sell. It involves predicting the cash flows to be received from the alternatives, evaluating their merits, and then choosing which ones to pursue.

C2 **Describe the selection of a hurdle rate for an investment.** Top management should select the hurdle (discount) rate to use in evaluating capital investments. The required hurdle rate should be at least higher than the interest rate on money borrowed because the return on an investment must cover the interest and provide an additional profit to reward the company for risk.

A1 **Analyze a capital investment project using break-even time.** Break-even time (BET) is a method for evaluating capital investments by restating future cash flows in terms of their present values (discounting the cash flows) and then calculating the payback period using these present values of cash flows.

P1 **Compute payback period and describe its use.** One way to compare potential investments is to compute and compare their payback periods. The payback period is an estimate of the expected time before the cumulative net cash inflow from the investment equals its initial cost. A payback period analysis fails to reflect risk of the cash flows, differences in the timing of cash flows within the payback period, and cash flows that occur after the payback period.

P2 **Compute accounting rate of return and explain its use.** A project's accounting rate of return is computed by dividing the expected annual after-tax net income by the average amount of investment in the project. When the net cash flows are received evenly throughout each period and straight-line depreciation is used, the average investment is computed as the average of the investment's initial book value and its salvage value.

P3 **Compute net present value and describe its use.** An investment's net present value is determined by predicting the future cash flows it is expected to generate, discounting them at a rate that represents an acceptable return, and then by subtracting the investment's initial cost from the sum of the present values. This technique can deal with any pattern of expected cash flows and applies a superior concept of return on investment.

P4 **Compute internal rate of return and explain its use.** The internal rate of return (IRR) is the discount rate that results in a zero net present value. When the cash flows are equal, we can compute the present value factor corresponding to the IRR by dividing the initial investment by the annual cash flows. We then use the annuity tables to determine the discount rate corresponding to this present value factor.

Guidance Answers to Decision Maker and Decision Ethics

Systems Manager Your dilemma is whether to abide by rules designed to prevent abuse or to bend them to acquire an investment that you believe will benefit the firm. You should not pursue the latter action because breaking up the order into small components is dishonest and there are consequences of being caught at a later stage. Develop a proposal for the entire package and then do all you can to expedite its processing, particularly by pointing out its benefits. When faced with controls that are not working, there is rarely a reason to overcome its shortcomings by dishonesty. A direct assault on those limitations is more sensible and ethical.

Entrepreneur The banker is probably concerned because new products are risky and should therefore be evaluated using a higher rate of return. You should conduct a thorough technical analysis and obtain detailed market data and information about any similar products available in the market. These factors might provide sufficient information to support the use of a lower return. You must convince yourself that the risk level is consistent with the discount rate used. You should also be confident that your company has the capacity and the resources to handle the new product.

Investment Manager You should probably focus on either the payback period or break-even time because both the time value of money and recovery time are important. Break-even time method is superior because it accounts for the time value of money, which is an important consideration in this decision.

Guidance Answers to **Quick Checks**

1. *b*

2. A capital budgeting decision is difficult because (1) the outcome is uncertain, (2) large amounts of money are usually involved, (3) a long-term commitment is required, and (4) the decision could be difficult or impossible to reverse.

3. *b*

4. Depreciation expense is subtracted from revenues in computing net income but does not use cash and should be added back to net income to compute net cash flows.

5. Not necessarily. One investment can continue to generate cash flows beyond the payback period for a longer time period than the other. The timing of their cash flows within the payback period also can differ.

6. *b*; Annual average investment = ($180,000 + $15,000)/2
= $97,500
Accounting rate of return = $40,000/$97,500 = 41%

7. For this determination, we need to compare it to the returns expected from alternative investments with similar risk.

8. Project A has the higher net present value as follows:

		Project A		Project B	
Year	Present Value of 1 at 10%	Net Cash Flows	Present Value of Net Cash Flows	Net Cash Flows	Present Value of Net Cash Flows
1	0.9091	$12,000	$10,909	$ 4,500	$ 4,091
2	0.8264	8,500	7,024	8,500	7,024
3	0.7513	4,000	3,005	13,000	9,767
Totals		$24,500	$20,938	$26,000	$20,882
Amount invested			(20,000)		(20,000)
Net present value			**$ 938**		**$ 882**

9. No, the information is too limited to draw that conclusion. For example, one investment could be riskier than the other, or one could require a substantially larger initial investment.

10. *b*

Key Terms mhhe.com/wildMA2e

Key Terms are available at the book's Website for learning and testing in an online Flashcard Format.

Accounting rate of return (p. 395)
Break-even time (BET) (p. 402)
Capital budgeting (p. 392)
Cost of capital (p. 397)
Hurdle rate (p. 332)
Internal rate of return (IRR) (p. 399)
Net present value (NPV) (p. 397)
Payback period (PBP) (p. 393)
Profitability index (p. 399)

Multiple Choice Quiz Answers on p. 420 mhhe.com/wildMA2e

Additional Quiz Questions are available at the book's Website.

Quiz11

1. The minimum acceptable rate of return for an investment decision is called the
a. Hurdle rate of return.
b. Payback rate of return.
c. Internal rate of return.
d. Average rate of return.
e. Maximum rate of return.

2. A corporation is considering the purchase of new equipment costing $90,000. The projected after-tax annual net income from the equipment is $3,600, after deducting $30,000 depreciation. Assume that revenue is to be received at each year-end, and the machine has a useful life of three years with zero salvage value. Management requires a 12% return on its investments. What is the net present value of this machine?
a. $ 60,444
b. $ 80,700
c. $(88,560)
d. $ 90,000
e. $ (9,300)

3. A disadvantage of using the payback period to compare investment alternatives is that it
a. Ignores cash flows beyond the payback period.
b. Cannot be used to compare alternatives with different initial investments.
c. Cannot be used when cash flows are not uniform.

d. Involves the time value of money.
e. Cannot be used if a company records depreciation.

4. A company is considering the purchase of equipment for $270,000. Projected annual cash inflow from this equipment is $61,200 per year. The payback period is:
a. 0.2 years
b. 5.0 years
c. 4.4 years
d. 2.3 years
e. 3.9 years

5. A company buys a machine for $180,000 that has an expected life of nine years and no salvage value. The company expects an annual net income (after taxes of 30%) of $8,550. What is the accounting rate of return?
a. 4.75%
b. 42.75%
c. 2.85%
d. 9.50%
e. 6.65%

Discussion Questions

1. What is capital budgeting?

2. Identify four reasons that capital budgeting decisions by managers are risky.

3. Capital budgeting decisions require careful analysis because they are generally the _____ _____ and _____ decisions that management faces.

4. Identify two disadvantages of using the payback period for comparing investments.

5. Why is an investment more attractive to management if it has a shorter payback period?

6. What is the average amount invested in a machine during its predicted five-year life if it costs $200,000 and has a $20,000 salvage value? Assume that net income is received evenly throughout each year and straight-line depreciation is used.

7. If the present value of the expected net cash flows from a machine, discounted at 10%, exceeds the amount to be invested, what can you say about the investment's expected rate of return? What can you say about the expected rate of return if the present value of the net cash flows, discounted at 10%, is less than the investment amount?

8. Why is the present value of $100 that you expect to receive one year from today worth less than $100 received today? What is the present value of $100 that you expect to receive one year from today, discounted at 12%?

9. Why should managers set the required rate of return higher than the rate at which money can be borrowed when making a typical capital budgeting decision?

10. Why does the use of the accelerated depreciation method (instead of straight line) for income tax reporting increase an investment's value?

11. The management of **Best Buy** is planning to invest in a new companywide computerized inventory tracking system. What makes this potential investment risky?

12. **Circuit City** is considering expanding a store. Identify three methods management can use to evaluate whether to expand.

13. The management of **Apple** is planning to acquire new equipment to manufacture some of its computer peripherals, and it intends to evaluate that investment decision using net present value. What are some of the costs and benefits that would be included in Apple's analysis?

Denotes Discussion Questions that involve decision making.

Most materials in this section are available in McGraw-Hill's Connect connect

QUICK STUDY

QS 11-1
Analyzing payback periods P1

Trek Company is considering two alternative investments. The payback period is 2.5 years for Investment A and 3 years for Investment B. (1) If management relies on the payback period, which investment is preferred? (2) Why might Trek's analysis of these two alternatives lead to the selection of B over A?

QS 11-2
Payback period P1

Foster Company is considering an investment that requires immediate payment of $360,000 and provides expected cash inflows of $120,000 annually for four years. What is the investment's payback period?

QS 11-3
Computation of net present value P3

If Kimball Company invests $100,000 today, it can expect to receive $20,000 at the end of each year for the next seven years plus an extra $12,000 at the end of the seventh year. What is the net present value of this investment assuming a required 8% return on investments?

QS 11-4
Net present value analysis
P3

Tinto Company is planning to invest in a project at a cost of $135,000. This project has the following expected cash flows over its three-year life: Year 1, $45,000; Year 2, $52,000; and Year 3, $78,000. Management requires a 10% rate of return on its investments. Compute the net present value of this investment.

QS 11-5
Computation of accounting rate of return
P2

Camino Company is considering an investment expected to generate an average net income after taxes of $3,825 for three years. The investment costs $90,000 and has an estimated $12,000 salvage value. Compute the accounting rate of return for this investment; assume the company uses straight-line depreciation. Hint: Use the formula in Exhibit 11.5 when computing the average annual investment.

QS 11-6
Computation of break-even time
A1

Fast Feet, a shoe manufacturer, is evaluating the costs and benefits of new equipment that would custom fit each pair of athletic shoes. The customer would have his or her foot scanned by digital computer equipment; this information would be used to cut the raw materials to provide the customer a perfect fit. The new equipment costs $300,000 and is expected to generate an additional $105,000 in cash flows for five years. A bank will make a $300,000 loan to the company at a 8% interest rate for this equipment's purchase. Use the following table to determine the break-even time for this equipment. (Round the present value of cash flows to the nearest dollar.)

Year	Cash Flows*	Present Value of 1 at 8%	Present Value of Cash Flows	Cumulative Present Value of Cash Flows
0	$(300,000)	1.0000		
1	105,000	0.9259		
2	105,000	0.8573		
3	105,000	0.7938		
4	105,000	0.7350		
5	105,000	0.6806		

* All cash flows occur at year-end.

QS 11-7
Profitability index
P3

Jemak Company is considering two alternative projects. Project 1 requires an initial investment of $800,000 and has a net present value of cash flows of $1,600,000. Project 2 requires an initial investment of $4,000,000 and has a net present value of cash flows of $2,000,000. Compute the profitability index for each project. Based on the profitability index, which project should the company prefer? Explain.

connect *Most materials in this section are available in McGraw-Hill's Connect*

EXERCISES

Exercise 11-1
Payback period computation; even cash flows
P1

Compute the payback period for each of these two separate investments (round the payback period to two decimals):

a. A new operating system for an existing machine is expected to cost $250,000 and have a useful life of four years. The system yields an incremental after-tax income of $72,000 each year after deducting its straight-line depreciation. The predicted salvage value of the system is $10,000.

b. A machine costs $180,000, has a $12,000 salvage value, is expected to last eight years, and will generate an after-tax income of $39,000 per year after straight-line depreciation.

Exercise 11-2
Payback period computation; uneven cash flows
P1

Walker Company is considering the purchase of an asset for $90,000. It is expected to produce the following net cash flows. The cash flows occur evenly throughout each year. Compute the payback period for this investment.

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Net cash flows	$40,000	$30,000	$40,000	$70,000	$29,000	$209,000

Check 2.5 years

Exercise 11-3
Payback period computation; declining-balance depreciation
P1

A machine can be purchased for $600,000 and used for 5 years, yielding the following net incomes. In projecting net incomes, double-declining balance depreciation is applied, using a 5-year life and a zero salvage value. Compute the machine's payback period (ignore taxes). (Round the payback period to two decimals.)

	Year 1	Year 2	Year 3	Year 4	Year 5
Net incomes	$40,000	$100,000	$200,000	$150,000	$400,000

Check 2.27 years

Exercise 11-4
Accounting rate of return
P2

A machine costs $200,000 and is expected to yield an after-tax net income of $5,040 each year. Management predicts this machine has a 12-year service life and a $40,000 salvage value, and it uses straight-line depreciation. Compute this machine's accounting rate of return.

Exercise 11-5
Payback period and accounting rate of return on investment
P1 P2

MLM Co. is considering the purchase of equipment that would allow the company to add a new product to its line. The equipment is expected to cost $324,000 with a 12-year life and no salvage value. It will be depreciated on a straight-line basis. The company expects to sell 128,000 units of the equipment's product each year. The expected annual income related to this equipment follows. Compute the (1) payback period and (2) accounting rate of return for this equipment.

Sales	$200,000
Costs	
Materials, labor, and overhead (except depreciation)	107,000
Depreciation on new equipment	27,000
Selling and administrative expenses	20,000
Total costs and expenses	154,000
Pretax income	46,000
Income taxes (30%)	13,800
Net income	$ 32,200

Check (1) 5.47 years (2) 19.88%

Exercise 11-6
Computing net present value
P3

After evaluating the risk of the investment described in Exercise 11-5, MLM Co. concludes that it must earn at least a 10% return on this investment. Compute the net present value of this investment. (Round the net present value to the nearest dollar.)

Exercise 11-7
Computation and interpretation of net present value and internal rate of return
P3 P4

Cerritos Company can invest in each of three cheese-making projects: C1, C2, and C3. Each project requires an initial investment of $438,374 and would yield the following annual cash flows.

	C1	C2	C3
Year 1	$ 24,000	$192,000	$360,000
Year 2	216,000	192,000	120,000
Year 3	336,000	192,000	96,000
Totals	$576,000	$576,000	$576,000

(1) Assuming that the company requires a 12% return from its investments, use net present value to determine which projects, if any, should be acquired. (2) Using the answer from part 1, explain whether the internal rate of return is higher or lower than 12% for project C2. (3) Compute the internal rate of return for project C2.

Check (3) IRR = 15%

Exercise 11-8
NPV and profitability index
P3

Following is information on two alternative investments being considered by Jakem Company. The company requires a 10% return from its investments.

	Project A	Project B
Initial investment	$(180,325)	$(150,960)
Expected net cash flows in year:		
1	45,000	35,000
2	50,000	52,000
3	82,295	58,000
4	86,400	75,000
5	64,000	29,000

For each alternative project compute the (a) net present value, and (b) profitability index. If the company can only select one project, which should it choose? Explain.

Exercise 11-9[A]
Using Excel to compute IRR
P4

Refer to the information in Exercise 11-8. Create an Excel spreadsheet to compute the internal rate of return for each of the projects. Round the percentage return to two decimals.

Exercise 11-10
Comparison of payback and BET
P1 A1

This chapter explained two methods to evaluate investments using recovery time, the payback period and break-even time (BET). Refer to QS 11-6 and (1) compute the recovery time for both the payback period and break-even time, (2) discuss the advantage(s) of break-even time over the payback period, and (3) list two conditions under which payback period and break-even time are similar.

connect *Most materials in this section are available in McGraw-Hill's Connect*

PROBLEM SET A

Problem 11-1A
Computation of payback period, accounting rate of return, and net present value
P1 P2 P3

eXcel
mhhe.com/wildMA2e

Burtle Company is planning to add a new product to its line. To manufacture this product, the company needs to buy a new machine at a $488,000 cost with an expected four-year life and a $15,200 salvage value. All sales are for cash, and all costs are out of pocket except for depreciation on the new machine. Additional information includes the following.

Expected annual sales of new product	$1,870,000
Expected annual costs of new product	
Direct materials	465,000
Direct labor	680,000
Overhead excluding straight-line depreciation on new machine	335,000
Selling and administrative expenses	158,000
Income taxes	40%

Required

1. Compute straight-line depreciation for each year of this new machine's life. (Round depreciation amounts to the nearest dollar.)
2. Determine expected net income and net cash flow for each year of this machine's life. (Round answers to the nearest dollar.)
3. Compute this machine's payback period, assuming that cash flows occur evenly throughout each year. (Round the payback period to two decimals.)
4. Compute this machine's accounting rate of return, assuming that income is earned evenly throughout each year. (Round the percentage return to two decimals.)
5. Compute the net present value for this machine using a discount rate of 8% and assuming that cash flows occur at each year-end. (*Hint:* Salvage value is a cash inflow at the end of the asset's life. Round the net present value to the nearest dollar.)

Check (4) 27.14%

(5) $140,794

Problem 11-2A

Analysis and computation of payback period, accounting rate of return, and net present value

P1 P2 P3

Jackson Company has an opportunity to invest in one of two new projects. Project Y requires a $360,000 investment for new machinery with a four-year life and no salvage value. Project Z requires a $360,000 investment for new machinery with a three-year life and no salvage value. The two projects yield the following predicted annual results. The company uses straight-line depreciation, and cash flows occur evenly throughout each year.

	Project Y	Project Z
Sales	$355,000	$265,000
Expenses		
Direct materials	49,700	30,125
Direct labor	71,000	36,750
Overhead including depreciation	127,800	129,250
Selling and administrative expenses	25,000	20,000
Total expenses	273,500	216,125
Pretax income	81,500	48,875
Income taxes (30%)	24,450	14,663
Net income	$ 57,050	$ 34,212

Required

1. Compute each project's annual expected net cash flows. (Round the net cash flows to the nearest dollar.)
2. Determine each project's payback period. (Round the payback period to two decimals.)
3. Compute each project's accounting rate of return. (Round the percentage return to one decimal.)
4. Determine each project's net present value using 6% as the discount rate. For part 4 only, assume that cash flows occur at each year-end. (Round the net present value to the nearest dollar.)

Check For Project Y: (2) 2.45 years, (3) 31.7%, (4) $149,543

Analysis Component

5. Identify the project you would recommend to management and explain your choice.

Problem 11-3A

Computation of cash flows and net present values with alternative depreciation methods

P3

Deandra Corporation is considering a new project requiring a $97,500 investment in test equipment with no salvage value. The project would produce $71,000 of pretax income before depreciation at the end of each of the next six years. The company's income tax rate is 32%. In compiling its tax return and computing its income tax payments, the company can choose between the two alternative depreciation schedules shown in the table.

	Straight-Line Depreciation	MACRS Depreciation
Year 1	$ 9,750	$19,500
Year 2	19,500	31,200
Year 3	19,500	18,720
Year 4	19,500	11,232
Year 5	19,500	11,232
Year 6	9,750	5,616
Totals	$97,500	$97,500

Required

1. Prepare a five-column table that reports amounts (assuming use of straight-line depreciation) for each of the following for each of the six years: (a) pretax income before depreciation, (b) straight-line depreciation expense, (c) taxable income, (d) income taxes, and (e) net cash flow. Net cash flow equals the amount of income before depreciation minus the income taxes. (Round answers to the nearest dollar.)
2. Prepare a five-column table that reports amounts (assuming use of MACRS depreciation) for each of the following for each of the six years: (a) pretax income before depreciation, (b) MACRS

depreciation expense, (c) taxable income, (d) income taxes, and (e) net cash flow. Net cash flow equals the income amount before depreciation minus the income taxes. (Round answers to the nearest dollar.)

3. Compute the net present value of the investment if straight-line depreciation is used. Use 10% as the discount rate. (Round the net present value to the nearest dollar.)

4. Compute the net present value of the investment if MACRS depreciation is used. Use 10% as the discount rate. (Round the net present value to the nearest dollar.)

Check Net present value: (3) $135,347, (4) $136,893

Analysis Component

5. Explain why the MACRS depreciation method increases this project's net present value.

Problem 11-4A

Computing net present value of alternate investments

P3

Interstate Manufacturing is considering either replacing one of its old machines with a new machine or having the old machine overhauled. Information about the two alternatives follows. Management requires a 10% rate of return on its investments.

Alternative 1: Keep the old machine and have it overhauled. If the old machine is overhauled, it will be kept for another five years and then sold for its salvage value.

Cost of old machine	$112,000
Cost of overhaul	150,000
Annual expected revenues generated	95,000
Annual cash operating costs after overhaul	42,000
Salvage value of old machine in 5 years	15,000

Alternative 2: Sell the old machine and buy a new one. The new machine is more efficient and will yield substantial operating cost savings with more product being produced and sold.

Cost of new machine	$300,000
Salvage value of old machine now	29,000
Annual expected revenues generated	100,000
Annual cash operating costs	32,000
Salvage value of new machine in 5 years	20,000

Required

1. Determine the net present value of alternative 1.

2. Determine the net present value of alternative 2.

3. Which alternative do you recommend that management select? Explain.

Check (1) Net present value of Alternative 1, $60,226

Problem 11-5A

Payback period, break-even time, and net present value

P1 A1

Sentinel Company is considering an investment in technology to improve its operations. The investment will require an initial outlay of $250,000 and will yield the following expected cash flows. Management requires investments to have a payback period of three years, and it requires a 10% return on investments.

Period	Cash Flow
1	$ 47,000
2	52,000
3	75,000
4	94,000
5	125,000

Required

1. Determine the payback period for this investment.

2. Determine the break-even time for this investment.

3. Determine the net present value for this investment.

Check (1) Payback period, 3.8 years

Analysis Component

4. Should management invest in this project? Explain.

Problem 11-6A

Payback period, break-even time, and net present value

P1 A1

Lenitnes Company is considering an investment in technology to improve its operations. The investment will require an initial outlay of $250,000 and will yield the following expected cash flows. Management requires investments to have a payback period of three years, and it requires a 10% return on its investments.

Period	Cash Flow
1	$125,000
2	94,000
3	75,000
4	52,000
5	47,000

Required

Check (1) Payback period, 2.4 years

1. Determine the payback period for this investment.

2. Determine the break-even time for this investment.

3. Determine the net present value for this investment.

Analysis component

4. Should management invest in this project? Explain.

5. Compare your answers for parts 1 through 4 with those for Problem 11-5A. What are the causes of the differences in results and your conclusions?

PROBLEM SET B

Problem 11-1B

Computation of payback period, accounting rate of return, and net present value

P1 P2 P3

Sorbo Company is planning to add a new product to its line. To manufacture this product, the company needs to buy a new machine at a $600,000 cost with an expected four-year life and a $20,000 salvage value. All sales are for cash and all costs are out of pocket, except for depreciation on the new machine. Additional information includes the following.

Expected annual sales of new product	$2,300,000
Expected annual costs of new product	
Direct materials	600,000
Direct labor	840,000
Overhead excluding straight-line depreciation on new machine	420,000
Selling and administrative expenses	200,000
Income taxes	30%

Required

1. Compute straight-line depreciation for each year of this new machine's life. (Round depreciation amounts to the nearest dollar.)

2. Determine expected net income and net cash flow for each year of this machine's life. (Round answers to the nearest dollar.)

3. Compute this machine's payback period, assuming that cash flows occur evenly throughout each year. (Round the payback period to two decimals.)

Check (4) 21.45%

4. Compute this machine's accounting rate of return, assuming that income is earned evenly throughout each year. (Round the percentage return to two decimals.)

(5) $131,650

5. Compute the net present value for this machine using a discount rate of 7% and assuming that cash flows occur at each year-end. (*Hint:* Salvage value is a cash inflow at the end of the asset's life.)

Problem 11-2B

Analysis and computation of payback period, accounting rate of return, and net present value

P1 P2 P3

Morris Company has an opportunity to invest in one of two projects. Project A requires a $480,000 investment for new machinery with a four-year life and no salvage value. Project B also requires a $480,000 investment for new machinery with a three-year life and no salvage value. The two projects yield the following predicted annual results. The company uses straight-line depreciation, and cash flows occur evenly throughout each year.

	Project A	Project B
Sales	$500,000	$400,000
Expenses		
Direct materials	70,000	50,000
Direct labor	100,000	60,000
Overhead including depreciation	180,000	180,000
Selling and administrative expenses	36,000	36,000
Total expenses	386,000	326,000
Pretax income	114,000	74,000
Income taxes (30%)	34,200	22,200
Net income	$ 79,800	$ 51,800

Required

1. Compute each project's annual expected net cash flows. (Round net cash flows to the nearest dollar.)
2. Determine each project's payback period. (Round the payback period to two decimals.)
3. Compute each project's accounting rate of return. (Round the percentage return to one decimal.)
4. Determine each project's net present value using 8% as the discount rate. For part 4 only, assume that cash flows occur at each year-end. (Round net present values to the nearest dollar.)

Check For Project A: (2) 2.4 years, (3) 33.3%, (4) $181,758

Analysis Component

5. Identify the project you would recommend to management and explain your choice.

Problem 11-3B

Computation of cash flows and net present values with alternative depreciation methods

P3

Lee Corporation is considering a new project requiring a $300,000 investment in an asset having no salvage value. The project would produce $125,000 of pretax income before depreciation at the end of each of the next six years. The company's income tax rate is 35%. In compiling its tax return and computing its income tax payments, the company can choose between two alternative depreciation schedules as shown in the table.

	Straight-Line Depreciation	MACRS Depreciation
Year 1	$ 30,000	$ 60,000
Year 2	60,000	96,000
Year 3	60,000	57,600
Year 4	60,000	34,560
Year 5	60,000	34,560
Year 6	30,000	17,280
Totals	$300,000	$300,000

Required

1. Prepare a five-column table that reports amounts (assuming use of straight-line depreciation) for each of the following items for each of the six years: (a) pretax income before depreciation, (b) straight-line depreciation expense, (c) taxable income, (d) income taxes, and (e) net cash flow. Net cash flow equals the amount of income before depreciation minus the income taxes. (Round answers to the nearest dollar.)
2. Prepare a five-column table that reports amounts (assuming use of MACRS depreciation) for each of the following items for each of the six years: (a) income before depreciation, (b) MACRS depreciation

expense, (c) taxable income, (d) income taxes, and (e) net cash flow. Net cash flow equals the amount of income before depreciation minus the income taxes. (Round answers to the nearest dollar.)

Check Net present value: (3) $129,846, (4) $135,050

3. Compute the net present value of the investment if straight-line depreciation is used. Use 10% as the discount rate. (Round the net present value to the nearest dollar.)
4. Compute the net present value of the investment if MACRS depreciation is used. Use 10% as the discount rate. (Round the net present value to the nearest dollar.)

Analysis Component

5. Explain why the MACRS depreciation method increases the net present value of this project.

Problem 11-4B

Computing net present value of alternate investments

P3

Archer Foods has a freezer that is in need of repair and is considering whether to replace the old freezer with a new freezer or have the old freezer extensively repaired. Information about the two alternatives follows. Management requires a 10% rate of return on its investments.

Alternative 1: Keep the old freezer and have it repaired. If the old freezer is repaired, it will be kept for another 8 years and then sold for its salvage value.

Cost of old freezer	$75,000
Cost of repair	50,000
Annual expected revenues generated	63,000
Annual cash operating costs after repair	55,000
Salvage value of old freezer in 8 years	3,000

Alternative 2: Sell the old freezer and buy a new one. The new freezer is larger than the old one and will allow the company to expand its product offerings, thereby generating more revenues. Also, it is more energy efficient and will yield substantial operating cost savings.

Cost of new freezer	$150,000
Salvage value of old freezer now	5,000
Annual expected revenues generated	68,000
Annual cash operating costs	30,000
Salvage value of new freezer in 8 years	8,000

Required

Check (1) Net present value of Alternative 1, $(5,921)

1. Determine the net present value of alternative 1.
2. Determine the net present value of alternative 2.
3. Which alternative do you recommend that management select? Explain.

Problem 11-5B

Payback period, break-even time, and net present value

P1 A1

Aster Company is considering an investment in technology to improve its operations. The investment will require an initial outlay of $800,000 and yield the following expected cash flows. Management requires investments to have a payback period of two years, and it requires a 10% return on its investments.

Period	Cash Flow
1	$300,000
2	350,000
3	400,000
4	450,000

Required

Check (1) Payback period, 2.4 years

1. Determine the payback period for this investment.
2. Determine the break-even time for this investment.
3. Determine the net present value for this investment.

Analysis Component

4. Should management invest in this project? Explain.

Problem 11-6B
Payback period, break-even time, and net present value
P1 A1

Retsa Company is considering an investment in technology to improve its operations. The investment will require an initial outlay of $800,000 and will yield the following expected cash flows. Management requires investments to have a payback period of two years, and it requires a 10% return on its investments.

Period	Cash Flow
1	$450,000
2	400,000
3	350,000
4	300,000

Required

1. Determine the payback period for this investment.
2. Determine the break-even time for this investment.
3. Determine the net present value for this investment.

Check (1) Payback period, 1.9 years

Analysis Component

4. Should management invest in this project? Explain.
5. Compare your answers for parts 1 through 4 with those for Problem 11-5B. What are the causes of the differences in results and your conclusions?

SERIAL PROBLEM

Success Systems

(This serial problem began in Chapter 1 and continues through most of the book. If previous chapter segments were not completed, the serial problem can begin at this point. It is helpful, but not necessary, to use the Working Papers that accompany the book.)

SP 11 Adriana Lopez is considering the purchase of equipment for Success Systems that would allow the company to add a new product to its computer furniture line. The equipment is expected to cost $300,000 and to have a six-year life and no salvage value. It will be depreciated on a straight-line basis. Success Systems expects to sell 100 units of the equipment's product each year. The expected annual income related to this equipment follows.

Sales	$375,000
Costs	
Materials, labor, and overhead (except depreciation)	200,000
Depreciation on new equipment	50,000
Selling and administrative expenses	37,500
Total costs and expenses	287,500
Pretax income	87,500
Income taxes (30%)	26,250
Net income	$ 61,250

Required

Compute the (1) payback period and (2) accounting rate of return for this equipment.

BEYOND THE NUMBERS

REPORTING IN ACTION

C1 A1 P3

BTN 11-1 In fiscal 2007, **Best Buy** invested $251 million in store-related projects that included store remodels, relocations, expansions, and various merchandising projects. Assume that these projects have a seven-year life, and that Best Buy requires a 12% internal rate of return on these projects.

Required

1. What is the amount of annual cash flows that Best Buy must earn from these projects to have a 12% internal rate of return? (*Hint:* Identify the seven-period, 12% factor from the present value of an annuity table, and then divide $251 million by this factor to get the annual cash flows necessary.)

Fast Forward

2. Access Best Buy's financial statements for fiscal years ended after March 3, 2007, from its Website (**BestBuy.com**) or the SEC's Website (**SEC.gov**).

a. Determine the amount that Best Buy invested in similar store-related projects for the most recent year.

b. Assume a seven-year life and a 12% internal rate of return. What is the amount of cash flows that Best Buy must earn on these new projects?

COMPARATIVE ANALYSIS

P3 P4

BTN 11-2 In fiscal 2007, **Circuit City** invested $242 million in capital expenditures, including $108 million related to store relocations, remodeling, and new store construction. Assume that these projects have a seven-year life and that management requires a 15% internal rate of return on those projects.

Required

1. What is the amount of annual cash flows that Circuit City must earn from those store-related projects to achieve a 15% internal rate of return? (*Hint:* Identify the 7-period, 15% factor from the present value of an annuity table and then divide $108 million by the factor to get the annual cash flows required.)

2. BTN 11-1 must be completed to answer part 2. How does your answer to part 1 compare to Best Buy's required cash flows determined in BTN 11-1? What does this imply about each company's cash flow requirements for these types of projects?

ETHICS CHALLENGE

P3

BTN 11-3 A consultant commented that "too often the numbers look good but feel bad." This comment often stems from estimation error common to capital budgeting proposals that relate to future cash flows. Three reasons for this error often exist. First, reliably predicting cash flows several years into the future is very difficult. Second, the present value of cash flows many years into the future (say, beyond 10 years) is often very small. Third, it is difficult for personal biases and expectations not to unduly influence present value computations.

Required

1. Compute the present value of $100 to be received in 10 years assuming a 12% discount rate.

2. Why is understanding the three reasons mentioned for estimation errors important when evaluating investment projects? Link this response to your answer for part 1.

COMMUNICATING IN PRACTICE

P1 P2 P3 P4

BTN 11-4 Payback period, accounting rate of return, net present value, and internal rate of return are common methods to evaluate capital investment opportunities. Assume that your manager asks you to identify the type of measurement basis and unit that each method offers and to list the advantages and disadvantages of each. Present your response in memorandum format of less than one page.

TAKING IT TO THE NET

BTN 11-5 Capital budgeting is an important topic and there are Websites designed to help people understand the methods available. Access **TeachMeFinance.com**'s capital budgeting Webpage (**teachmefinance.com/capitalbudgeting.html**). This Webpage contains an example of a capital budgeting case involving a $15,000 initial cash outflow.

Required

Compute the payback period and the net present value (assuming a 10% required rate of return) of the following investment—assume that its cash flows occur at year-end. Compared to the example case at the Website, the larger cash inflows in the example below occur in the later years of the project's life. Is this investment acceptable based on the application of these two capital budgeting methods? Explain.

Year	Cash Flow
0	$(15,000)
1	1,000
2	2,000
3	3,000
4	6,000
5	7,000

BTN 11-6 Break into teams and identify four reasons that an international airline such as **Southwest**, **Northwest**, or **American** would invest in a project when its direct analysis using both payback period and net present value indicate it to be a poor investment. (*Hint:* Think about qualitative factors.) Provide an example of an investment project supporting your answer.

TEAMWORK IN ACTION

P1 P3

BTN 11-7 Read the chapter opener about Brian Scudamore and his company, **1-800-GOT-JUNK**. Brian is considering building a new, massive warehousing center to recycle the best of other people's junk. He expects that this recycling center could double company revenues.

ENTREPRENEURIAL DECISION

A1

Required

1. What are some of the management tools that Brian can use to evaluate whether the new warehousing center will be a good investment?
2. What information does Brian need to use the tools that you identified in your answer to part 1?
3. What are some of the advantages and disadvantages of each tool identified in your answer to part 1?

BTN 11-8 Visit or call a local auto dealership and inquire about leasing a car. Ask about the down payment and the required monthly payments. You will likely find the salesperson does not discuss the cost to purchase this car but focuses on the affordability of the monthly payments. This chapter gives you the tools to compute the cost of this car using the lease payment schedule in present dollars and to estimate the profit from leasing for an auto dealership.

HITTING THE ROAD

C1 P3

Required

1. Compare the cost of leasing the car to buying it in present dollars using the information from the dealership you contact. (Assume you will make a final payment at the end of the lease and then own the car.)
2. Is it more costly to lease or buy the car? Support your answer with computations.

GLOBAL DECISION

C1

DSG

BTN 11-9 **DSG**'s annual report includes information about its debt and interest rates. One statement in its annual report reveals that DSG has floating rate borrowings of more than £200 million at 6.125%.

Required

Explain how DSG would use that 6.125% rate to evaluate its investments in capital projects.

ANSWERS TO MULTIPLE CHOICE QUIZ

1. a

2. e;

	Net Cash Flow	Present Value of an Annuity of 1 at 12%	Present Value of Cash Flows
Years 1–3	$3,600 + $30,000	2.4018	$ 80,700
Amount invested			(90,000)
Net present value			$ (9,300)

3. a

4. c; Payback = $270,000/$61,200 per year = 4.4 years.

5. d; Accounting rate of return = $8,550/[($180,000 + $0)/2] = 9.5%.