project is expected to generate after-tax cash flows equal to $26,000 per year for four years. PHFS's required rate of return is 14 percent. Compute the project's (a) net present value (NPV) and (b) internal rate of return (IRR). (c) Should the project be purchased?

9–8 Kansas Furniture Corporation (KFC) is evaluating a capital budgeting project that costs $34,000 and is expected to generate after-tax cash flows equal to $14,150 per year for three years. KFC's required rate of return is 12 percent. Compute the project's (a) net present value (NPV) and (b) internal rate of return (IRR). (c) Should the project be purchased?

9–9 Construct an NPV profile for a capital budgeting project that costs $64,000 and is expected to generate $18,200 per year for five years. Using the NPV profile, determine the project's internal rate of return (IRR) and its net present value (NPV) at required rates of return equal to 10 percent, 13 percent, and 15 percent.

9–10 Using a required rate of return equal to 12 percent, compute the modified internal rate of return (MIRR) for a project that costs $82,000 and is expected to generate $35,000, $70,000, and –$10,450, respectively, during the next three years. Should the project be purchased?

9–11 What is the internal rate of return (IRR) for a project that costs $5,500 and is expected to generate $1,800 per year for the next four years? If the firm's required rate of return is 6 percent, what is the project's modified internal rate of return (MIRR)? Should the firm purchase the project?

9–12 Rascal Clothing is evaluating a new weaving machine that costs $90,000. It is expected that the machine will generate after-tax cash flows equal to $54,000 per year for two years. Rascal's required rate of return is 9 percent. Compute the project's (a) internal rate of return (IRR) and (b) modified internal rate of return (MIRR). (c) Should the project be purchased?

9–13 Compute both the traditional payback period (PB) and the discounted payback period (DPB) for a project that costs $270,000 if it is expected to generate $75,000 per year for five years? The firm's required rate of return is 11 percent. Should the project be purchased?

9–14 Compute the traditional payback period (PB) for a project that costs $64,000 if it is expected to generate $16,000 per year for six years? If the firm's required rate of return is 12 percent, what is the project's discounted payback period (DPB)? Should the project be purchased?

9–15 Komfy Karz is evaluating a project that costs $365,000 and is expected to generate $260,000 and $175,000, respectively, during the next two years. If Komfy's required rate of return is 13 percent, what is the project's (a) net present value, (b) internal rate of return (IRR), and (c) modified internal rate of return (MIRR)?

9–16 Compute the (a) net present value, (b) internal rate of return (IRR), and (c) discounted payback period (DPB) for each of the following projects. The firm's required rate of return is 14 percent.

Year	Project Alpha	Project Beta
0	$(270,000)	$(300,000)
1	120,000	0
2	120,000	(80,000)
3	120,000	555,000

Which project(s) should be purchased if they are independent? Which project(s) should be purchased it they are mutually exclusive?

9–17 Compute the (a) net present value, (b) internal rate of return (IRR), (c) modified internal rate of return (MIRR), and (d) discounted payback period (DPB) for each of the following projects. The firm's required rate of return is 13 percent.

Year	Project AB	Project LM	Project UV
0	$(90,000)	$(100,000)	$ (96,500)
1	39,000	0	(55,000)
2	39,000	0	100,000
3	39,000	147,500	100,000

Which project(s) should be purchased if they are independent? Which project(s) should be purchased it they are mutually exclusive?

9–18 Following are the estimated after-tax cash flows for two *mutually exclusive* projects:

Year	Project S	Project T
0	($16,000)	($15,000)
1	14,000	2,000
2	6,000	18,600

The company's required rate of return is 16 percent. What is the internal rate of return (IRR) of the project(s) the company should purchase?

9–19 Following is information about two *independent* projects that a company is evaluating:

Capital Budgeting Technique	Project X	Project Y
Net present value	$5,000	$4,950
Internal rate of return	15.5%	17.0%
Discounted payback period	5.1 years	4.6 years

(a) Which project(s) should be chosen? Explain why. (b) What can be concluded about the company's required rate of return, r?

9–20 The CFO of Horatio's Hotels gave three college interns three different *independent* projects to evaluate. Following are the results of their analyses:

Intern's Name	Project's Life	NPV	IRR	Discounted Payback	Decision
Albert	7 years	$5,300	12.0%	6.8 years	Accept
Josie	6	(1,800)	8.0	5.8	Reject
Kenny	10	4,500	10.0	9.6	Accept

The CFO agrees with the final accept/reject decision that each intern made. But she spotted an error in the numbers reported by one of the interns. (a) Which intern's report has the error? (b) Does the information given here provide an indication of the firm's required rate of return? Explain your answers.

KEY CONCEPTS ABOUT PROJECT CASH FLOWS AND RISK

To conclude this chapter, we summarize some project cash flows and risk concepts (rules) that were discussed.

- In capital budgeting analysis, "relevant" cash flows include only those cash flows that are affected by the decision to purchase the project. If a cash flow does not change as a result of the purchase, it is not relevant.
- The relevant, or incremental, cash flows can be categorized as (1) the initial investment outlay, which includes cash flows that occur only at the beginning of the project's life; (2) supplemental operating cash flows, which include changes in the day-to-day operating cash flows during the life of the project; and (3) the terminal cash flow, which includes cash flows that occur only at the end of the project's life.
- Identifying the relevant cash flows for a replacement project is somewhat more complicated than for an expansion project, because the cash flows that will be generated if the new project (the replacement asset) is purchased, as well as the cash flows that will be generated if the old project (the replaced asset) is retained, must be considered.
- If the risk associated with a capital budgeting project differs substantially from the average risk of the firm's existing assets, some adjustment should be made to the firm's required rate of return when evaluating the project. If the project has substantially higher risk, a higher-than-average required rate of return should be used in the capital budgeting evaluation. If the project's risk is lower than average, a lower required rate of return should be used.
- Although the same basic principles should be applied when conducting capital budgeting analysis for multinational operations, application of these principles often is more complicated when dealing with foreign subsidiaries.

PROBLEMS

For more problems, login to CourseMate for CFIN at CengageBrain.com

For problems that refer to MACRS depreciation, see Table 10A.2 in Appendix 10A to determine the recovery allowance percentages.

10-1 Canadian Wilderness Company (CWC) just bought a machine that is expected to generate $25,000 in operating income before depreciation expenses each year. The machine, which has a depreciable basis equal to $60,000, falls into the MACRS 3-year class. What will be CWC's (a) after-tax operating income and (b) operating cash flow for both this year (Year 1) and three years from now (Year 3)? Assume that all sales and operating expenses, except depreciation, are cash. CWC's marginal tax rate is 40 percent.

10-2 Dave's Devilish Dogs (3D) expects to generate $92,000 in sales in the long term. 3D's operating costs, excluding depreciation, are 75 percent of sales. The company has only one asset, a machine that was just purchased for $150,000. The machine will be depreciated according to the MACRS 3-year class of assets. 3D's marginal tax rate is 35 percent, and it has no debt. Compute the company's (a) net income and (b) after-tax operating cash for the next four years.

10-3 Underwater Swimwear recently purchased a new machine for $350,000. It cost $20,000 to ship the machine to Underwater's facility, and it cost another $50,000 to get it installed. Purchase of the new machine will require Underwater to increase its working capital by $25,000. If the new machine falls into the MACRS 3-year class, what amount will the firm be able to depreciate during the next five years?

10-4 Xavier Corporation plans to purchase a new machine to replace an older machine on its assembly line. The new machine's purchase price is $500,000, and it will cost $75,000 to have the new machine shipped and installed. The old machine, which is fully depreciated, can be sold to another company for $45,000. The new machine falls into the MACRS 5-year class. Compute the depreciation expense associated with the new machine for the next five years?

10-5 Western Textiles is trying to determine whether to purchase a new weaving machine that costs $214,000. It would cost another $26,000 to install the machine. Western plans to use the machine for four years and then sell it for $80,000. The machine falls into the MACRS 5-year class. (a) What will be the depreciation associated with the machine each year Western uses it? (b) If its marginal tax rate is 40 percent, what after-tax net cash flow will Western receive when the machine is sold in four years?

10-6 Chiefland Campers is evaluating a project that will not affect revenues, but it will save the firm

will generate a net present value (NPV) equal to $19,800, which will occur 70 percent of the time. But, he also discovered that 10 percent of the time the NPV will be −$20,100, and 20 percent of the time the NPV will be $31,500. The firm's policy is not to invest in projects that have coefficients of variation greater than 0.8. Should Qualil recommend that the project be purchased?

10-18 After completing a scenario analysis for a prospective investment, the CFO of a company reported to the CEO that there is a 60 percent chance the investment will provide the firm with a net present value (NPV) equal to $128,300, there is a 25 percent chance the investment's NPV will be $185,400, and there is a 15 percent chance the NPV will be −$77,600. The CEO will not purchase investments that have coefficients of variation greater than 0.70. Should the CEO purchase the investment?

10-19 Following are three *independent* projects Peanut/Pecan Processing (PPP) is evaluating:

Project	IRR	Risk
P	10.0%	Low
Q	12.0	Average
R	14.5	High

PPP generally considers risk when examining projects by adjusting its average required rate of return, r, which equals 11 percent. A 4 percent adjustment is made for high-risk projects, and a 2 percent adjustment is made for low-risk projects. Which project(s) should PPP purchase?

10-20 The CFO of Bogey Golf has been given the following information about two *mutually exclusive* investments:

Project	IRR	Risk
X	14.0%	Average
Y	19.0	High

The CFO normally uses a risk-adjusted required rate of return to evaluate such investments. The firm's average required rate of return, which is 15 percent, is adjusted by 5 percent for high-risk projects, and it is adjusted by 3 percent for low-risk projects. Which project(s) should Bogey purchase?

APPENDIX 10A DEPRECIATION

Remember from your accounting course(s) that depreciation recognizes the annual effect of wear and tear, or reduction in value, for a long-term asset that is used to generate revenues over a number of years. The concept of depreciation is covered in detail in accounting courses, so in this appendix we simply summarize basic information that will help you conduct capital budgeting analysis.

1. Companies often calculate depreciation in one way when figuring taxes and in another way when reporting income to investors: many use the *straight-line* method for stockholder reporting (or book purposes), but they use the fastest rate permitted by law for tax purposes. Because we are concerned with the effect of depreciation on cash flows, not on net income, we use the same depreciation method that firms use when determining their taxes. This depreciation method is known as the Modified Accelerated Cost Recovery System (MACRS).

2. According to MACRS, each depreciable asset is classified into one of several "classes of life" according to its characteristics. The asset's depreciable basis can be written off according to the depreciation rates established by the Internal Revenue Service in each MACRS "life class." Table 10A.1 describes the types of property that fit into the different class-life categories and Table 10A.2 sets forth the MACRS recovery allowances (depreciation rates) for selected classes of investment property. Property classified as having a life equal to or greater than 27.5 years (real estate) must be depreciated by the straight-line method, but assets classified in the other categories can be depreciated either by the accelerated method using the rates shown in Table 10A.2, or by an alternate straight-line method. Most assets that qualify are depreciated using MACRS because depreciation expenses are higher in the early years of the assets' lives, and higher depreciation expenses result in lower taxes.

3. An asset's depreciable basis, which is the total amount that can be written off under MACRS, is equal to the purchase price of the asset plus any shipping and installation costs. The depreciable basis is not adjusted for salvage value when applying MACRS rates.

4. If a depreciable asset is sold, the sale price (salvage value) minus the then existing undepreciated book value is added to operating income and taxed at the firm's marginal tax rate. For example, suppose a firm