

## Chapter 16: Capital Expenditure Decisions

Instructions: The following tables are provided for use with all questions that require future- and present-value calculations.

| Future Value of \$1 |       |       |       |       |       |       |       |       |       |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Periods             | 4%    | 6%    | 8%    | 10%   | 12%   | 14%   | 16%   | 18%   | 20%   |
| 1                   | 1.040 | 1.060 | 1.080 | 1.100 | 1.120 | 1.140 | 1.160 | 1.180 | 1.200 |
| 2                   | 1.082 | 1.124 | 1.166 | 1.210 | 1.254 | 1.300 | 1.346 | 1.393 | 1.440 |
| 3                   | 1.125 | 1.191 | 1.260 | 1.331 | 1.405 | 1.482 | 1.561 | 1.643 | 1.728 |
| 4                   | 1.170 | 1.263 | 1.361 | 1.464 | 1.574 | 1.689 | 1.811 | 1.939 | 2.074 |
| 5                   | 1.217 | 1.338 | 1.469 | 1.611 | 1.762 | 1.925 | 2.101 | 2.288 | 2.488 |
| 6                   | 1.265 | 1.419 | 1.587 | 1.772 | 1.974 | 2.195 | 2.437 | 2.700 | 2.986 |
| 7                   | 1.316 | 1.504 | 1.714 | 1.949 | 2.211 | 2.502 | 2.827 | 3.186 | 3.583 |
| 8                   | 1.369 | 1.594 | 1.851 | 2.144 | 2.476 | 2.853 | 3.279 | 3.759 | 4.300 |
| 9                   | 1.423 | 1.690 | 1.999 | 2.359 | 2.773 | 3.252 | 3.803 | 4.436 | 5.160 |
| 10                  | 1.480 | 1.791 | 2.159 | 2.594 | 3.106 | 3.707 | 4.412 | 5.234 | 6.192 |

| Future Value of a Series of \$1 Cash Flows |        |        |        |        |        |        |        |        |        |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Periods                                    | 4%     | 6%     | 8%     | 10%    | 12%    | 14%    | 16%    | 18%    | 20%    |
| 1  | 1.000  | 1.000  | 1.000  | 1.000  | 1.000  | 1.000  | 1.000  | 1.000  | 1.000  |
| 2  | 2.040  | 2.060  | 2.080  | 2.100  | 2.120  | 2.140  | 2.160  | 2.180  | 2.220  |
| 3  | 3.122  | 3.184  | 3.246  | 3.310  | 3.374  | 3.440  | 3.506  | 3.572  | 3.640  |
| 4  | 4.247  | 4.375  | 4.506  | 4.641  | 4.779  | 4.921  | 5.067  | 5.215  | 5.368  |
| 5  | 5.416  | 5.637  | 5.867  | 6.105  | 6.353  | 6.610  | 6.877  | 7.154  | 7.442  |
| 6  | 6.633  | 6.975  | 7.336  | 7.716  | 8.115  | 8.536  | 8.977  | 9.442  | 9.930  |
| 7  | 7.898  | 8.394  | 8.923  | 9.487  | 10.089 | 10.730 | 11.414 | 12.142 | 12.916 |
| 8  | 9.214  | 9.898  | 10.637 | 11.436 | 12.300 | 13.233 | 14.240 | 15.327 | 16.499 |
| 9  | 10.583 | 11.491 | 12.488 | 13.580 | 14.776 | 16.085 | 17.519 | 19.086 | 20.799 |
| 10   | 12.006 | 13.181 | 14.487 | 15.938 | 17.549 | 19.337 | 21.321 | 23.521 | 25.959 |

| Present Value of \$1 |      |      |      |      |      |      |      |      |      |
|----------------------|------|------|------|------|------|------|------|------|------|
| Periods              | 4%   | 6%   | 8%   | 10%  | 12%  | 14%  | 16%  | 18%  | 20%  |
| 1                    | .962 | .943 | .926 | .909 | .893 | .877 | .862 | .847 | .833 |
| 2                    | .925 | .890 | .857 | .826 | .797 | .769 | .743 | .718 | .694 |
| 3                    | .889 | .840 | .794 | .751 | .712 | .675 | .641 | .609 | .579 |
| 4                    | .855 | .792 | .735 | .683 | .636 | .592 | .552 | .516 | .482 |
| 5                    | .822 | .747 | .681 | .621 | .567 | .519 | .476 | .437 | .402 |
| 6                    | .790 | .705 | .630 | .564 | .507 | .456 | .410 | .370 | .335 |
| 7                    | .760 | .665 | .583 | .513 | .452 | .400 | .354 | .314 | .279 |
| 8                    | .731 | .627 | .540 | .467 | .404 | .351 | .305 | .266 | .233 |
| 9                    | .703 | .592 | .500 | .424 | .361 | .308 | .263 | .225 | .194 |
| 10                   | .676 | .558 | .463 | .386 | .322 | .270 | .227 | .191 | .162 |

| <b>Present Value of a Series of \$1 Cash Flows</b> |           |           |           |            |            |            |            |            |            |
|--|-----------|-----------|-----------|------------|------------|------------|------------|------------|------------|
| <u>Periods</u>                                     | <u>4%</u> | <u>6%</u> | <u>8%</u> | <u>10%</u> | <u>12%</u> | <u>14%</u> | <u>16%</u> | <u>18%</u> | <u>20%</u> |
| 1  | 0.962     | 0.943     | 0.926     | 0.909      | 0.893      | 0.877      | 0.862      | 0.847      | 0.833      |
| 2  | 1.886     | 1.833     | 1.783     | 1.736      | 1.690      | 1.647      | 1.605      | 1.566      | 1.528      |
| 3  | 2.775     | 2.673     | 2.577     | 2.487      | 2.402      | 2.322      | 2.246      | 2.174      | 2.106      |
| 4  | 3.630     | 3.465     | 3.312     | 3.170      | 3.037      | 2.914      | 2.798      | 2.690      | 2.589      |
| 5  | 4.452     | 4.212     | 3.993     | 3.791      | 3.605      | 3.433      | 3.274      | 3.127      | 2.991      |
| 6  | 5.242     | 4.917     | 4.623     | 4.355      | 4.111      | 3.889      | 3.685      | 3.498      | 3.326      |
| 7  | 6.002     | 5.582     | 5.206     | 4.868      | 4.564      | 4.288      | 4.039      | 3.812      | 3.605      |
| 8  | 6.733     | 6.210     | 5.747     | 5.335      | 4.968      | 4.639      | 4.344      | 4.078      | 3.837      |
| 9  | 7.435     | 6.802     | 6.247     | 5.759      | 5.328      | 4.946      | 4.607      | 4.303      | 4.031      |
| 10   | 8.111     | 7.360     | 6.710     | 6.145      | 5.650      | 5.216      | 4.833      | 4.494      | 4.192      |

## MULTIPLE CHOICE QUESTIONS

1. Capital-budgeting decisions primarily involve:
  - A. emergency situations.
  - B. long-term decisions.
  - C. short-term planning situations.
  - D. cash inflows and outflows in the current year.
  - E. planning for the acquisition of capital.

Answer: B LO: 1 Type: RC

2. Which of the following would not involve a capital-budgeting analysis?
  - A. The acquisition of new equipment.
  - B. The addition of a new product line.
  - C. The adoption of a new cost driver for overhead application.
  - D. The construction of a new distribution facility.
  - E. Whether a pro football team should trade for and sign a star quarterback to a long-term contract.

Answer: C LO: 1 Type: N

3. The decision process that has managers select from among several acceptable investment proposals to make the best use of limited funds is known as:
  - A. capital rationing.
  - B. capital budgeting.
  - C. acceptance or rejection analysis (ARA).
  - D. cost analysis.
  - E. project planning.

Answer: A LO: 1 Type: RC

4. Capital budgeting tends to focus primarily on:
  - A. revenues.
  - B. costs.
  - C. cost centers.
  - D. programs and projects.
  - E. allocation tools.

Answer: D LO: 1 Type: RC

5. Discounted-cash-flow analysis focuses primarily on:
  - A. the stability of cash flows.
  - B. the timing of cash flows.
  - C. the probability of cash flows.
  - D. the sensitivity of cash flows.
  - E. whether cash flows are increasing or decreasing.

Answer: B LO: 1 Type: RC

6. In a net-present-value analysis, the discount rate is often called the:
- payback rate.
  - hurdle rate.
  - minimal value.
  - net unit rate.
  - objective rate of return.

Answer: B LO: 1 Type: RC

7. The hurdle rate that is used in a net-present-value analysis is the same as the firm's:
- discount rate.
  - internal rate of return.
  - minimum desired rate of return.
  - objective rate of return.
  - discount rate and minimum desired rate of return.

Answer: E LO: 1 Type: RC

8. Which of the following is taken into account by the net-present-value method?

|    | A Project's<br>Immediate<br><u>Cash Flows</u> | Cash Flows<br>During a<br><u>Project's Life</u> | Time Value<br><u>of Money</u> |
|----|---|---|-------------------------------|
| A. | Yes   | No  | No                            |
| B. | Yes   | Yes   | No                            |
| C. | Yes   | Yes   | Yes                           |
| D. | No  | Yes   | Yes                           |
| E. | No  | Yes   | No                            |

Answer: C LO: 1 Type: N

9. Consider the following factors related to an investment:

- The net income from the investment.
- The cash flows from the investment.
- The timing of the cash flows from the investment.

Which of the preceding factors would be important considerations in a net-present-value analysis?

- I only.
- II only.
- I and II.
- II and III.
- I, II, and III.

Answer: D LO: 1 Type: N

10. The true economic yield produced by an asset is summarized by the asset's:
- A. non-discounted cash flows.
  - B. net present value.
  - C. future value.
  - D. annuity discount factor.
  - E. internal rate of return.

Answer: E LO: 1 Type: RC

11. The internal rate of return on an asset can be calculated:
- A. if the return is greater than the hurdle rate.
  - B. if the asset's cash flows are identical to the future value of a series of cash flows.
  - C. if the future value of a series of cash flows can be arrived at by the annuity accumulation factor.
  - D. by finding a discount rate that yields a zero net present value.
  - E. by finding a discount rate that yields a positive net present value.

Answer: D LO: 1 Type: RC

12. The internal rate of return:
- A. ignores the time value of money.
  - B. equates a project's cash inflows with its cash outflows.
  - C. equates a project's cash outflows with its expenses.
  - D. equates the present value of a project's cash inflows with the present value of the cash outflows.
  - E. equates the present value of a project's cash flows with the future value of the project's cash flows.

Answer: D LO: 1 Type: RC

13. Page Company is contemplating the acquisition of a machine that costs \$50,000 and promises to reduce annual cash operating costs by \$11,000 over each of the next six years. Which of the following is a proper way to evaluate this investment if the company desires a 12% return on all investments?
- A. \$50,000 vs. \$11,000 x 6.
  - B. \$50,000 vs. \$66,000 x 0.507.
  - C. \$50,000 vs. \$66,000 x 4.111.
  - D. \$50,000 vs. \$11,000 x 4.111.
  - E. \$50,000 x 0.893 vs. \$11,000 x 4.111.

Answer: D LO: 1 Type: A

14. Adams Company can acquire a \$750,000 machine now that will benefit the firm over the next 8 years. Annual savings in cash operating costs are expected to total \$140,000. If the hurdle rate is 10%, the investment's net present value is:
- A. \$(226,960).
  - B. \$(3,100).
  - C. \$65,150.
  - D. \$370,000.
  - E. some other amount.

Answer: B LO: 1 Type: A

15. Reeder Company, which uses net present value to analyze investments, requires a 10% minimum rate of return. A staff assistant recently calculated a \$500,000 machine's net present value to be \$86,400, excluding the impact of straight-line depreciation. If Reeder ignores income taxes and the machine is expected to have a five-year service life, the correct net present value of the machine would be:
- A. \$(13,600).
  - B. \$86,400.
  - C. \$186,400.
  - D. \$292,700.
  - E. \$465,500.

Answer: B LO: 1 Type: A

16. A new asset is expected to provide service over the next four years. It will cost \$500,000, generates annual cash inflows of \$150,000, and requires cash operating expenses of \$30,000 each year. In addition, a \$10,000 overhaul will be needed in year 3. If the company requires a 10% rate of return, the net present value of this machine would be:
- A. \$(127,110), and the machine meets the company's rate-of-return requirement.
  - B. \$(127,110), and the machine does not meet the company's rate-of-return requirement.
  - C. \$(129,600), and the machine does not meet the company's rate-of-return requirement.
  - D. \$(151,700), and the machine meets the company's rate-of-return requirement.
  - E. some other amount.

Answer: B LO: 1 Type: A

17. A new machine that costs \$172,100 is expected to save annual cash operating costs of \$40,000 over each of the next nine years. The machine's internal rate of return is:
- A. approximately 14%.
  - B. approximately 16%.
  - C. approximately 18%.
  - D. approximately 20%.
  - E. some other figure not noted above.

Answer: C LO: 1 Type: A

18. Paulsen is considering the acquisition of a \$217,750 machine that is expected to produce annual savings in cash operating costs of \$50,000 over the next six years. If Paulsen uses the internal rate of return (IRR) to evaluate new investments and the firm has a hurdle rate of 12%, which of the following statements is correct?
- A. The machine's IRR is less than 4%, and the machine should not be acquired.
  - B. The machine's IRR is approximately 10%, and the machine should not be acquired.
  - C. The machine's IRR is approximately 10%, and the machine should be acquired.
  - D. The machine's IRR is approximately 12%, and the machine should be acquired.
  - E. All of the preceding statements are false.

Answer: B LO: 1 Type: A, N

Use the following to answer questions 19-20:

A machine costs \$25,000; it is expected to generate annual cash revenues of \$8,000 and annual cash expenses of \$2,000 for five years. The required rate of return is 12%.

19. The net present value of the machine is:
- A. \$(3,840).
  - B. \$(3,370).
  - C. \$0.
  - D. \$21,630.
  - E. \$28,840.

Answer: B LO: 1 Type: A

20. Which of the following statements about the machine's internal rate of return is true?
- A. The internal rate of return is greater than 12%.
  - B. The internal rate of return is between 10% and 12%.
  - C. The internal rate of return is less than 10%.
  - D. The internal rate of return must be greater than 15%.
  - E. There is insufficient information to make any judgment about the internal rate of return.

Answer: C LO: 1 Type: A

Use the following to answer questions 21-23:

The mayor of Smalltown is considering the purchase of a new computer system for the city's tax department. The system costs \$75,000 and has an expected life of five years. The mayor estimates the following savings will result if the system is purchased:

| <u>Year</u> | <u>Savings</u> |
|-------------|----------------|
| 1           | \$20,000       |
| 2           | 25,000         |
| 3           | 30,000         |
| 4           | 15,000         |
| 5           | 12,000         |

21. If Smalltown uses a 10% discount rate for capital-budgeting decisions, the net present value of the computer system would be:
- A. \$489.
  - B. \$4,057.
  - C. \$11,658.
  - D. \$63,342.
  - E. \$79,057.

Answer: B LO: 1 Type: A

22. What can be said about the computer system's internal rate of return if the net present value at 12% is positive?
- A. The internal rate of return is greater than 12%.
  - B. The internal rate of return is between 10% and 12%.
  - C. The internal rate of return is less than 10%.
  - D. The internal rate of return must be less than 5%.
  - E. There is insufficient information to make any judgment about the internal rate of return.

Answer: A LO: 1 Type: N

23. A salesperson from a different computer company claims that his machine, which costs \$85,000 and has an estimated service life of four years, will generate annual savings for the city of \$32,000. If the discount rate is 10%, the net present value of this system would be:
- A. \$16,440.
  - B. \$23,175.
  - C. \$63,512.
  - D. \$101,440.
  - E. some other amount.

Answer: A LO: 1 Type: A

24. A company that is using the internal rate of return (IRR) to evaluate projects should accept a project if the IRR:
- A. is greater than the project's net present value.
  - B. equates the present value of the project's cash inflows with the present value of the project's cash outflows.
  - C. is greater than zero.
  - D. is greater than the hurdle rate.
  - E. is less than the firm's cost of investment capital.

Answer: D LO: 2 Type: RC



25. Which of the following choices correctly states the rules for project acceptance under the net-present-value method and the internal-rate-of-return method?

|    | <u>Net Present Value</u> | <u>Internal Rate of Return</u> |
|----|--------------------------|--------------------------------|
| A. | Positive total           | Greater than hurdle rate       |
| B. | Positive total           | Less than hurdle rate          |
| C. | Negative total           | Greater than hurdle rate       |
| D. | Negative total           | Less than hurdle rate          |
| E. | Greater than hurdle rate | Positive number                |

Answer: A LO: 2 Type: RC

26. The net-present-value method assumes that project funds are reinvested at the:

- A. hurdle rate.
- B. rate of return earned on the project.
- C. cost of debt capital.
- D. cost of equity capital.
- E. internal rate of return.

Answer: A LO: 2 Type: RC

27. The internal-rate-of-return method assumes that project funds are reinvested at the:

- A. hurdle rate.
- B. rate of return earned on the project.
- C. cost of debt capital.
- D. cost of equity capital.
- E. rate of earnings growth (REG).

Answer: B LO: 2 Type: RC

28. Which of the following choices correctly states how funds are assumed to be reinvested under the net-present-value method and the internal-rate-of-return method?

|    | <u>Net Present Value</u>      | <u>Internal Rate of Return</u>      |
|----|-------------------------------|-------------------------------------|
| A. | At the hurdle rate            | At the hurdle rate                  |
| B. | At the hurdle rate            | At the return earned on the project |
| C. | At the cost of debt capital   | At the cost of debt capital         |
| D. | At the cost of debt capital   | At the cost of equity capital       |
| E. | At the cost of equity capital | At the cost of equity capital       |

Answer: B LO: 2 Type: RC

29. A company's hurdle rate is generally influenced by:

- A. the cost of capital.
- B. the firm's depreciable assets.
- C. whether management uses the net-present-value method or the internal-rate-of-return method.
- D. project risk.
- E. items "A" and "D" above.

Answer: E LO: 2 Type: RC

30. If income taxes are ignored, which of the following choices correctly notes how a project's depreciation is treated under the net-present-value method and the internal-rate-of-return method?

|    | <u>Net Present Value</u>   | <u>Internal Rate of Return</u> |
|----|--|--------------------------------|
| A. | Considered   | Considered                     |
| B. | Considered   | Ignored                        |
| C. | Ignored  | Considered                     |
| D. | Ignored  | Ignored                        |
| E. | The correct answer depends on the depreciation method (straight line or accelerated) that is used. |                                |

Answer: D LO: 2 Type: RC

31. Consider the following statements about the total-cost and the incremental-cost approaches of investment evaluation:

- I. Both approaches will yield the same conclusions.
- II. Choosing between these approaches is a matter of personal preference.
- III. The incremental approach focuses on cost differences between alternatives.

Which of the above statements is (are) true?

- A. I only.
- B. II only.
- C. III only.
- D. II and III.
- E. I, II, and III.

Answer: E LO: 3 Type: RC

32. The systematic follow-up on a capital project to see how the project actually turns out is commonly known as:

- A. capital budgeting assessment (CBA).
- B. a postaudit.
- C. control of capital expenditures (CCE).
- D. overall cost performance.
- E. the cost evaluation phase.

Answer: B LO: 3 Type: RC

33. Consider the following statements about capital budgeting postaudits:

- I. Postaudits can be used to detect desirable projects that were rejected.
- II. Postaudits can be used to detect undesirable projects that were accepted.
- III. Postaudits may reveal shortcomings in cash-flow projections, providing insights that allow a firm to improve future predictions.

Which of the above statements is (are) correct?

- A. I only.
- B. II only.
- C. III only.
- D. II and III.
- E. I, II, and III.

Answer: D LO: 3 Type: RC

34. Generally speaking, which of the following would not directly affect a company's income tax payments?

- A. Advertising expense.
- B. Gain on sale of machinery.
- C. Sales revenue.
- D. Land owned by the firm.
- E. Loss on sale of building.

Answer: D LO: 4 Type: RC

35. A company's cash flows from income taxes are normally affected by:

- A. revenues.
- B. operating expenses.
- C. gains on the sale of assets.
- D. losses on the sale of assets.
- E. all of the above.

Answer: E LO: 4 Type: RC

36. Consider the following statements about taxes and after-tax cash flows:

- I. Capital budgeting analyses should incorporate after-tax cash flows rather than before-tax cash flows.
- II. Added company revenues will result in lower taxes for a firm.
- III. Operating expenses may actually provide a tax benefit for an organization.

Which of the above statements is (are) correct?

- A. I only.
- B. II only.
- C. III only.
- D. I and II.
- E. I and III.

Answer: E LO: 4 Type: RC, N

37. When income taxes are considered in capital budgeting, the cash flows related to a company's advertising expense would be correctly figured by taking the cash paid for advertising and:
- adding the result of multiplying (advertising expense x tax rate).
  - adding the tax rate.
  - adding the result of multiplying [advertising expense x (1 - tax rate)].
  - subtracting the result of multiplying (advertising expense x tax rate).
  - subtracting the result of multiplying [advertising expense x (1 - tax rate)].

Answer: D LO: 4 Type: N

38. Of the five expenses that follow, which one is most likely treated differently than the others when income taxes are considered in a discounted-cash-flow analysis?
- Salaries expense.
  - Advertising expense.
  - Depreciation expense.
  - Utilities expense.
  - Office expense.

Answer: C LO: 4 Type: N

39. Assume that a capital project is being analyzed by a discounted-cash-flow approach, and an employee first assumes no income taxes and then later assumes a 30% income tax rate. How would depreciation expense be incorporated in the analysis?

|    | <u>No Income Taxes</u>  | <u>30% Income Tax Rate</u> |
|----|---|----------------------------|
| A. | Considered  | Considered                 |
| B. | Considered  | Ignored                    |
| C. | Ignored   | Considered                 |
| D. | Ignored   | Ignored                    |
| E. | The correct answer depends on the depreciation method that is used. |                            |

Answer: C LO: 4 Type: N

40. When a company is analyzing a capital project by a discounted-cash-flow approach and income taxes are being considered, depreciation:
- should be ignored.
  - should be considered because it results in a tax savings.
  - should be considered because it is a fixed cost.
  - should be considered because it is a cash inflow.
  - should be considered because, like other expenses, it is a cash outlay related to operations.

Answer: B LO: 4 Type: RC

41. When income taxes are considered in capital budgeting, the cash flows related to a company's depreciation expense would be correctly figured by taking the cash paid for depreciation and:
- A. adding the result of multiplying (depreciation expense x tax rate).
  - B. adding the result of multiplying [depreciation expense x (1 - tax rate)].
  - C. subtracting the result of multiplying (depreciation expense x tax rate).
  - D. subtracting the result of multiplying [depreciation expense x (1 - tax rate)].
  - E. doing none of the above because there is no cash paid for depreciation.

Answer: E LO: 4 Type: N

42. Jester plans to generate \$650,000 of sales revenue if a capital project is implemented. Assuming a 30% tax rate, the sales revenue should be reflected in the analysis by a:
- A. \$195,000 inflow.
  - B. \$195,000 outflow.
  - C. \$455,000 inflow.
  - D. \$455,000 outflow.
  - E. \$650,000 inflow.

Answer: C LO: 4 Type: A

43. Highlander Company plans to incur \$350,000 of salaries expense if a capital project is implemented. Assuming a 30% tax rate, the salaries should be reflected in the analysis by a:
- A. \$105,000 inflow.
  - B. \$105,000 outflow.
  - C. \$245,000 inflow.
  - D. \$245,000 outflow.
  - E. \$350,000 outflow.

Answer: D LO: 4 Type: A

44. Penn Company plans to incur \$180,000 of salaries expense and produce \$300,000 of additional sales revenue if a capital project is implemented. Assuming a 30% tax rate, these two items collectively should appear in a capital budgeting analysis as:
- A. a \$36,000 inflow.
  - B. a \$36,000 outflow.
  - C. an \$84,000 inflow.
  - D. an \$84,000 outflow.
  - E. some other amount.

Answer: C LO: 4 Type: A

45. Brookside Company has \$70,000 of depreciation expense and is subject to a 30% income tax rate. On an after-tax basis, depreciation results in a:
- A. \$21,000 inflow.
  - B. \$21,000 outflow.
  - C. \$49,000 inflow.
  - D. \$49,000 outflow.
  - E. neither an inflow nor an outflow because depreciation is a noncash expense.

Answer: A LO: 4 Type: A

46. Crossland Company is studying a capital project that will produce \$600,000 of added sales revenue, \$400,000 of additional cash operating expenses, and \$50,000 of depreciation. Assuming a 30% income tax rate, the company's after-tax cash inflow (outflow) is:
- A. \$105,000.
  - B. \$125,000.
  - C. \$155,000.
  - D. \$175,000.
  - E. some other amount.

Answer: C LO: 4 Type: A

47. Which of the following is the proper calculation of a company's depreciation tax shield?
- A. Depreciation  $\div$  tax rate.
  - B. Depreciation  $\div$  (1 - tax rate).
  - C. Depreciation  $\times$  tax rate.
  - D. Depreciation  $\times$  (1 - tax rate).
  - E. Depreciation deduction + income taxes.

Answer: C LO: 4 Type: RC

48. A depreciation tax shield is a(n):
- A. after-tax cash outflow.
  - B. increase in income tax.
  - C. noncash factor.
  - D. reduction in income tax.
  - E. sporadic fluctuation in income tax.

Answer: D LO: 4 Type: RC

49. Consider the following statements about depreciation tax shields:
- I. A depreciation tax shield provides distinct benefits to a business.
  - II. A depreciation tax shield should be ignored when doing a net-present-value analysis.
  - III. A depreciation tax shield can occur in more than one year.

Which of the above statements is (are) correct?

- A. I only.
- B. II only.
- C. III only.
- D. I and II.
- E. I and III.

Answer: E LO: 4 Type: RC

50. A company that uses accelerated depreciation:
- A. would write off a larger portion of an asset's cost sooner than under the straight-line method.
  - B. would find that depreciation speeds up, with a small portion taken in early years and larger amounts taken in later years.
  - C. would find that more tax benefits occur earlier than under the straight-line method.
  - D. would find itself out of compliance with generally accepted accounting principles (GAAP).
  - E. would find that choices "A" and "C" are true.

Answer: E LO: 4 Type: RC

51. David Company is considering the use of accelerated depreciation rather than straight-line depreciation for a new asset acquisition. Which of the following choices correctly shows when the majority of depreciation would be taken (early or late in the asset's life), when most of the tax savings occur (early or late in the asset's life), and which depreciation method would have the higher present value?

|    | When Majority<br>of Depreciation<br>is Taken | When Majority<br>of Tax Savings<br>Occur | Depreciation Method<br>With Higher Present<br>Value |
|----|--|--|---|
| A. | Early in life                                | Early in life                            | Accelerated   |
| B. | Early in life                                | Early in life                            | Straight-line                                       |
| C. | Early in life                                | Late in life                             | Straight-line                                       |
| D. | Late in life                                 | Late in life                             | Straight-line                                       |
| E. | Late in life                                 | Early in life                            | Accelerated   |

Answer: A LO: 4 Type: RC, N

52. Julie Company purchased a \$200,000 machine that has a four-year life and no salvage value. The company uses straight-line depreciation on all asset acquisitions and is subject to a 30% tax rate. The proper cash flow to show in a discounted-cash-flow analysis as occurring at time 0 would be:
- A. \$(200,000).
  - B. \$(140,000).
  - C. \$(35,000).
  - D. \$15,000.
  - E. \$50,000.

Answer: A LO: 4 Type: A

53. If a company desires to be in compliance with current income tax law and write off the cost of its assets rapidly, the firm would use:
- A. straight-line depreciation.
  - B. sum-of-the-years'-digits depreciation.
  - C. accelerated depreciation.
  - D. the Modified Accelerated Cost Recovery System (MACRS).
  - E. annuity depreciation.

Answer: D LO: 5 Type: RC

54. The Modified Accelerated Cost Recovery System (MACRS) assumes that, on average, assets will be placed in service:
- A. at the beginning of the tax year.
  - B. three months into the tax year.
  - C. halfway through the tax year.
  - D. at the end of the tax year.
  - E. in the next tax year.

Answer: C LO: 5 Type: RC

55. A company used the net-present-value method to analyze an investment and found the investment to be very attractive. If the firm used straight-line depreciation and changes to the Modified Accelerated Cost Recovery System (MACRS), the investment's net present value will:
- A. increase.
  - B. remain the same.
  - C. decrease.
  - D. change, but the direction cannot be determined based on the data presented.
  - E. fluctuate in an erratic manner.

Answer: A LO: 5 Type: N

56. Pick Company received \$18,000 cash from the sale of a machine that had a \$13,000 book value. If the company is subject to a 30% income tax rate, the net cash flow to use in a discounted-cash-flow analysis would be:
- A. \$3,500.
  - B. \$6,500.
  - C. \$12,600.
  - D. \$16,500.
  - E. \$19,500.

Answer: D LO: 6 Type: A

57. Ralston Company received \$7,000 cash from the sale of a machine that had an \$11,000 book value. If the company is subject to a 30% income tax rate, the net cash flow to use in a discounted-cash-flow analysis would be:
- A. \$2,100.
  - B. \$4,900.
  - C. \$5,800.
  - D. \$7,000.
  - E. \$8,200.

Answer: E LO: 6 Type: A



58. A machine was sold in December 20x3 for \$9,000. It was purchased in January 20x1 for \$15,000, and depreciation of \$12,000 was recorded from the date of purchase through the date of disposal. Assuming a 40% income tax rate, the after-tax cash inflow at the time of sale is:
- A. \$3,600.
  - B. \$6,600.
  - C. \$8,400.
  - D. \$9,000.
  - E. \$11,400.

Answer: B LO: 6 Type: A

59. Rogers Company purchased equipment for \$30,000 in December 20x1. The equipment is expected to generate \$10,000 per year of additional revenue and incur \$2,000 per year of additional cash expenses, beginning in 20x2. Under MACRS, depreciation in 20x2 will be \$3,000. If the firm's income tax rate is 40%, the after-tax cash flow in 20x2 would be:
- A. \$3,200.
  - B. \$3,600.
  - C. \$4,800.
  - D. \$6,000.
  - E. some other amount.

Answer: D LO: 6 Type: A

Use the following to answer questions 60-61:

James Company has an asset that cost \$5,000 and currently has accumulated depreciation of \$2,000. Suppose the firm sold the asset for \$2,500 and is subject to a 30% income tax rate.

60. The loss on disposal would be:
- A. \$350.
  - B. \$500.
  - C. \$650.
  - D. \$2,500.
  - E. none, because the transaction produced a gain.

Answer: B LO: 6 Type: A

61. The net after-tax cash flow of the disposal is:
- A. \$2,100.
  - B. \$2,350.
  - C. \$2,500.
  - D. \$2,650.
  - E. some other amount.

Answer: D LO: 6 Type: A

62. Wright Company is considering a five-year project that requires a typical investment in working capital, in this case, \$100,000. Consider the following statements about this situation:
- I. Wright should include a \$100,000 outflow that occurs at time 0 in a discounted-cash-flow analysis.
  - II. Wright should include separate \$100,000 outflows in each year of the project's five-year life.
  - III. Wright should include a \$100,000 recovery of its working-capital investment in year 5 of a discounted-cash-flow analysis.

Which of the above statements is (are) correct?

- A. I only.
- B. II only.
- C. III only.
- D. I and II.
- E. I and III.

Answer: E LO: 6 Type: RC

63. A machine is expected to produce annual savings in cash operating costs of \$400,000 for the next six years. If the firm has a 10% after-tax hurdle rate and is subject to a 30% income tax rate, the correct discounted net cash flow would be:
- A. \$522,600.
  - B. \$947,520.
  - C. \$1,219,400.
  - D. \$1,742,000.
  - E. some other amount.

Answer: C LO: 6 Type: A

64. A machine is expected to produce increases in cash operating costs of \$200,000 for the next six years. If the firm has a 14% after-tax hurdle rate and is subject to a 30% income tax rate, the correct discounted net cash flow would be:
- A. \$(233,340).
  - B. \$(544,460).
  - C. \$(777,800).
  - D. \$(1,011,140).
  - E. some other amount.

Answer: B LO: 6 Type: A

65. A new machine is expected to produce a MACRS deduction in three years of \$50,000. If the firm has a 12% after-tax hurdle rate and is subject to a 30% income tax rate, the correct discounted net cash flow to include in an acquisition analysis would be:
- A. \$0.
  - B. \$10,680.
  - C. \$24,920.
  - D. \$46,280.
  - E. some other amount.

Answer: B LO: 6 Type: A

66. In 10 years, Hopkins Company plans to receive \$9,000 cash from the sale of a machine that has a \$5,000 book value. If the company is subject to a 30% income tax rate and has an 8% after-tax hurdle rate, the correct discounted net cash flow would be:
- A. \$2,916.90.
  - B. \$3,611.40.
  - C. \$4,167.00.
  - D. \$4,722.60.
  - E. some other amount.

Answer: B LO: 6 Type: A

67. In eight years, Larson Company plans to receive \$11,000 cash from the sale of a machine that has a \$16,000 book value. If the company is subject to a 30% income tax rate and has a 12% after-tax hurdle rate, the correct discounted net cash flow would be:
- A. \$606.
  - B. \$1,414.
  - C. \$3,838.
  - D. \$5,050.
  - E. some other amount.

Answer: D LO: 6 Type: A

68. Which of the following tools is sometimes used to rank investment proposals?
- A. Profitability index.
  - B. Annuity index.
  - C. Project assessment guide (PAG).
  - D. Investment opportunity index.
  - E. Capital ranking index.

Answer: A LO: 7 Type: RC

69. If a proposal's profitability index is greater than one:
- A. the net present value is negative.
  - B. the net present value is positive.
  - C. the net present value is zero.
  - D. none of the above, because the net present value cannot be gauged by the profitability index.
  - E. the proposal should be rejected.

Answer: B LO: 7 Type: N

70. St. Andrews ranks investments by using the profitability index (PI). The following data relate to Project X and Project Y:

|                          | <u>Project X</u> | <u>Project Y</u> |
|--------------------------|------------------|------------------|
| Initial investment       | \$400,000        | \$1,300,000      |
| Present value of inflows | 600,000          | 1,800,000        |

Which project would be more attractive as judged by its ranking, and why?

- A. Project X because the PI is 1.50.
- B. Project Y because the PI is 1.38.
- C. Project X because the PI is 0.67.
- D. Project Y because the PI is 0.72.
- E. Both projects would be equally attractive in terms of ranking, as indicated by a positive PI.

Answer: A LO: 7 Type: A

71. Wakefield evaluates future projects by using the profitability index. The company is currently reviewing five similar projects and must choose one of the following:

| <u>Project</u> | <u>Initial Investment</u> | <u>Present Value of Cash Inflows</u> |
|----------------|---------------------------|--------------------------------------|
| 1              | \$100,000                 | \$ 97,000                            |
| 2              | 50,000                    | 80,000                               |
| 3              | 75,000                    | 110,000                              |
| 4              | 60,000                    | 100,000                              |
| 5              | 150,000                   | 200,000                              |

Which project should Wakefield select if the decision is based entirely on the profitability index?

- A. Project 1.
- B. Project 2.
- C. Project 3.
- D. Project 4.
- E. Project 5.

Answer: D LO: 7 Type: A

72. The payback period is best defined as:
- A. initial investment  $\div$  annual after-tax cash inflow.
  - B. annual after-tax cash inflow  $\div$  initial investment.
  - C. initial investment  $\div$  useful life of investment.
  - D. present value of the cash flows, exclusive of the initial investment,  $\div$  initial investment.
  - E. initial investment  $\div$  present value of the cash flows, exclusive of the initial investment.

Answer: A LO: 8 Type: RC

73. Consider the following statements about the payback period:

- I. As shown in your text, the payback period considers the time value of money.
- II. The payback period can only be used if net cash inflows are uniform throughout a project's life.
- III. The payback period ignores cash inflows that occur after the payback period is reached.

Which of the above statements is (are) correct?

- A. I only.
- B. II only.
- C. III only.
- D. I and II.
- E. I, II, and III.

Answer: C LO: 8 Type: RC

74. A piece of equipment costs \$30,000, and is expected to generate \$8,500 of annual cash revenues and \$1,500 of annual cash expenses. The disposal value at the end of the estimated 10-year life is \$3,000. Ignoring income taxes, the payback period is:
- A. 3.53 years.
  - B. 3.86 years.
  - C. 4.29 years.
  - D. 6.98 years.
  - E. some other period of time not noted above.

Answer: C LO: 8 Type: A

75. Portland is considering the acquisition of new machinery that will produce uniform benefits over the next eight years. The following information is available:

Annual savings in cash operating costs: \$350,000

Annual depreciation expense: \$250,000

If the company is subject to a 30% tax rate, what denominator should be used to compute the machinery's payback period?

- A. \$70,000.
- B. \$170,000.
- C. \$245,000.
- D. \$320,000.
- E. Some other amount.

Answer: D LO: 8 Type: A, N

76. Pinecrest is considering a \$600,000 investment in new equipment that is anticipated to produce the following net cash inflows:

| <u>Year</u> | <u>Net Cash Inflows</u> |
|-------------|-------------------------|
| 1           | \$120,000               |
| 2           | 250,000                 |
| 3           | 110,000                 |
| 4           | 80,000                  |
| 5           | 160,000                 |

If cash flows occur evenly throughout a year, the equipment's payback period is:

- A. 4 years, 2 months.
- B. 4 years, 3 months.
- C. 4 years, 4 months.
- D. 5 years.
- E. some other period of time not noted above.

Answer: B LO: 8 Type: A, N

77. Which of the following project evaluation methods focuses on accounting income rather than cash flows?

- A. Net present value.
- B. Accounting rate of return.
- C. Internal rate of return.
- D. Payback period.
- E. None of the above.

Answer: B LO: 8 Type: RC

78. The accounting rate of return focuses on the:
- A. total accounting income over a project's life.
  - B. average accounting income over a project's life.
  - C. average cash flows over a project's life.
  - D. cash inflows from a project.
  - E. tax savings from a project.

Answer: B LO: 8 Type: RC

79. Which of the following choices correctly depicts whether discounted cash flows are used by the method noted when evaluating long-term investments?

|    | <u>Net<br/>Present Value</u> | <u>Internal Rate<br/>of Return</u> | <u>Accounting<br/>Rate of Return</u> |
|----|------------------------------|------------------------------------|--------------------------------------|
| A. | No                           | No                                 | Yes                                  |
| B. | Yes                          | No                                 | Yes                                  |
| C. | Yes                          | No                                 | No                                   |
| D. | Yes                          | Yes                                | No                                   |
| E. | Yes                          | Yes                                | Yes                                  |

Answer: D LO: 8 Type: RC

80. Consider the following statements about the accounting rate of return:

- I. The accounting rate of return focuses on a project's income rather than its cash flows.
- II. Companies can figure the accounting rate of return on either the initial investment figure or an average investment figure.
- III. The accounting rate of return considers the time value of money.

Which of the above statements is (are) correct?

- A. I only.
- B. II only.
- C. III only.
- D. I and II.
- E. II and III.

Answer: D LO: 8 Type: RC

81. Mulligan Corporation, which is subject to a 30% income tax rate, is considering a \$150,000 asset that will result in the following over its seven-year life:

Total revenue: \$1,190,000

Total operating expenses (excluding depreciation): \$770,000

Total depreciation: \$150,000

The accounting rate of return on the initial investment is:

- A. 16%.
- B. 18%.
- C. 26%.
- D. 28%.
- E. some other figure.

Answer: B LO: 8 Type: A

82. San Remo has a \$4,000,000 asset investment and is subject to a 30% income tax rate. Cash inflows are expected to average \$600,000 before tax over the next few years; in contrast, average income before tax is anticipated to be \$500,000. The company's accounting rate of return is:

- A. 8.75%.
- B. 10.50%.
- C. 12.50%.
- D. 15.00%
- E. some other figure.

Answer: A LO: 8 Type: A

83. When making investment decisions that involve advanced manufacturing systems, the use of net present value:

- A. presents no special problems for the analyst.
- B. often gives rise to net-present-value figures that are negative despite a manager's belief that the investment is beneficial for the firm.
- C. is not recommended.
- D. often omits a number of factors that are difficult to quantify (e.g., greater manufacturing flexibility, improved product quality, and so forth).
- E. is characterized by choices "B" and "D" above.

Answer: E LO: 9 Type: RC



84. Hunter Corporation will evaluate a potential investment in an advanced manufacturing system by use of the net-present-value (NPV) method. Which of the following system benefits is least likely to be omitted from the NPV analysis?
- A. Savings in operating costs.
  - B. Greater flexibility in the production process.
  - C. Improved product quality.
  - D. Shorter manufacturing cycle time.
  - E. Ability to fill customer orders more quickly.

Answer: A LO: 9 Type: RC, N

85. A cash flow measured in nominal dollars is:
- A. the actual cash flow that we experience.
  - B. the adjustment for a change in the dollar's purchasing power.
  - C. the discounted cash flow.
  - D. the realistic cash flow after taxes.
  - E. none of the above.

Answer: A LO: 10 Type: RC

86. A cash flow measured in real dollars:
- A. is the actual cash flow that we experience.
  - B. is the actual cash flow adjusted for a change in the dollar's purchasing power.
  - C. is discounted to reflect the time value of money.
  - D. equals the cash flow measured in nominal dollars.
  - E. coincides with the amount of contemplated new investment.

Answer: B LO: 10 Type: RC

87. Consider the following statements about the accounting for inflation in a capital budgeting analysis:
- I. An analyst can use nominal dollars in conjunction with a nominal interest rate.
  - II. An analyst can use real dollars in conjunction with a real interest rate.
  - III. An analyst can use nominal dollars in conjunction with a real interest rate.

Which of the above statements is (are) correct?

- A. I only.
- B. II only.
- C. III only.
- D. I and II.
- E. II and III.

Answer: D LO: 10 Type: RC

## EXERCISES

### Net Present Value

88. Green is considering the replacement of some machinery that has zero book value and a current market value of \$2,800. One possible alternative is to invest in new machinery that costs \$30,000. The new equipment has a four-year service life and an estimated salvage value of \$3,500, will produce annual cash operating savings of \$9,400, and will require a \$2,200 overhaul in year 3. The company uses straight-line depreciation.

Required:

Prepare a net-present-value analysis of Green's replacement decision, assuming an 8% hurdle rate and no income taxes. Should the machinery be acquired? Note: Round calculations to the nearest dollar.

LO: 1 Type: A

Answer:

|                         |                          |                 |
|-------------------------|--------------------------|-----------------|
| Purchase of new machine | $$(30,000) \times 1.0$   | $$(30,000)$     |
| Sale of old machine     | $\$2,800 \times 1.0$     | 2,800           |
| Cash operating savings  | $\$9,400 \times 3.312$   | 31,133          |
| Overhaul                | $\$(2,200) \times 0.794$ | (1,747)         |
| Salvage value           | $\$3,500 \times 0.735$   | <u>2,573</u>    |
| Total                   |                          | <u>\$ 4,759</u> |

The machinery should be acquired because the investment has a positive net present value.

### Determination of Cash Flows; Net Present Value

89. On January 2, 20x1, Rebecca Brown purchased 800 shares of Bazooka Telecommunications common stock at \$35 per share. The company paid a \$1.50 dividend per share on December 28 of that year, and raised the amount by \$0.50 per share for a distribution on December 28, 20x2. Rebecca sold her entire investment on December 30, 20x2, generating a \$5,000 gain on the sale of stock.

Required:

- A. Prepare a dated listing of the cash inflows and outflows related to Rebecca's stock investment. Ignore income taxes.
- B. Assume that Rebecca has a 10% hurdle rate for all investments. Rounding to the nearest dollar, compute the net present value of her investment in Bazooka and determine whether she achieved her 10% goal.

LO: 1 Type: A, N

Answer:

|    |                   |                                |            |
|----|-------------------|--------------------------------|------------|
| A. | January 2, 20x1   | Purchase (800 shares x \$35)   | \$(28,000) |
|    | December 28, 20x1 | Dividend (800 shares x \$1.50) | 1,200      |
|    | December 28, 20x2 | Dividend (800 shares x \$2.00) | 1,600      |
|    | December 30, 20x2 | Sale (\$28,000 + \$5,000)      | 33,000     |

- B. Rebecca achieved her goal, as indicated by the positive net present value.

|                    |                         |                 |
|--------------------|-------------------------|-----------------|
| Purchase of shares | $$(28,000) \times 1.0$  | \$(28,000)      |
| Dividend, 20x1     | $\$1,200 \times 0.909$  | 1,091           |
| Dividend, 20x2     | $\$1,600 \times 0.826$  | 1,322           |
| Sale of shares     | $\$33,000 \times 0.826$ | <u>27,258</u>   |
| Total              |                         | <u>\$ 1,671</u> |

### Net Present Value, Outsourcing

90. Mark Industries is currently purchasing part no. 76 from an outside supplier for \$80 per unit. Because of supplier reliability problems, the company is considering producing the part internally in a currently idle manufacturing plant. Annual volume over the next six years is expected to total 300,000 units at variable manufacturing costs of \$75 per unit.

Mark must acquire \$80,000 of new equipment if it reopens the plant. The equipment has a six-year service life and a \$14,000 salvage value, and will be depreciated by the straight-line method. Repairs and maintenance are expected to average \$5,200 per year in years 4-6, and the equipment will be sold at the end of its life.

Required:

Rounding to the nearest dollar, use the net-present-value method (total-cost approach) and a 12% hurdle rate to determine whether Mark should make or buy part no. 76. Ignore income taxes.

LO: 1, 3 Type: A

Answer:

Mark is better off to make part no. 76.

Buy:

|                                 |                              |                                    |
|---------------------------------|------------------------------|------------------------------------|
| Purchase (300,000 units x \$80) | $$(24,000,000) \times 4.111$ | <u><math>\$(98,664,000)</math></u> |
|---------------------------------|------------------------------|------------------------------------|

Make:

|                              |                                   |                                    |
|------------------------------|-----------------------------------|------------------------------------|
| Variable manufacturing costs |                                   |                                    |
| (300,000 units x \$75)       | $$(22,500,000) \times 4.111$      | $$(92,497,500)$                    |
| New equipment                | $$(80,000) \times 1.0$            | (80,000)                           |
| Repairs and maintenance      | $$(5,200) \times (4.111 - 2.402)$ | (8,887)                            |
| Equipment sale               | $\$14,000 \times 0.507$           | <u>7,098</u>                       |
| Total                        |                                   | <u><math>\$(92,579,289)</math></u> |

## Evaluation of an Investment Analysis

91. The Airways Company is planning a project that is expected to last for six years and generate annual net cash inflows of \$75,000. The project will require the purchase of a \$280,000 machine, which is expected to have a salvage value of \$10,000 at the end of the six-year period. In addition to annual operating costs, the machine will require a \$50,000 overhaul at the end of the fourth year. The company presently has a 12% minimum desired rate of return.

Based on this information, an accountant prepared the following analysis:

|                                 |              |                  |
|---------------------------------|--------------|------------------|
| Annual net cash inflow          |              | \$ 75,000        |
| Annual depreciation             | \$45,000     |                  |
| Annual average cost of overhaul | <u>8,333</u> | <u>(53,333)</u>  |
| Average annual income           |              | <u>\$ 21,667</u> |

$$\text{Return on investment} = \$21,667 \div \$280,000 = 7.74\%$$

The accountant recommends that the project be rejected because it does not meet the company's minimum desired rate of return. Ignore income taxes.

Required:

- What criticism(s) would you make of the accountant's evaluation?
- Use the net-present-value method and determine whether the project should be accepted.
- Based on your answer in requirement "B," is the internal rate of return greater or less than 12%? Explain.

LO: 1 Type: A, N

Answer:

- A. The accountant is focusing on income rather than cash flows. The cash flows should be discounted to reflect the time value of money, and depreciation should be omitted because of the absence of taxes.

|                         |                          |                 |
|-------------------------|--------------------------|-----------------|
| B. Purchase price       | $$(280,000) \times 1.0$  | $$(280,000)$    |
| Annual net cash inflows | $\$75,000 \times 4.111$  | 308,325         |
| Overhaul                | $$(50,000) \times 0.636$ | (31,800)        |
| Salvage value           | $\$10,000 \times 0.507$  | <u>5,070</u>    |
| Total                   |                          | <u>\$ 1,595</u> |

The project should be accepted because the net present value is positive.

- C. The net present value is positive using a discount rate of 12%. Thus, the internal rate of return is greater than 12%.

### Net Present Value, Internal Rate of Return

92. Harrison Township is studying a 700-acre site for a new landfill. The new site will save \$70,000 in annual operating costs for 10 years, as Harrison currently uses the landfill of a neighboring municipality. Other data are:

Purchase price per acre: \$550  
Site preparation costs: \$110,000  
Hurdle rate: 6%

Ignore income taxes.

Required:

- A. Use the net-present-value method and determine whether the landfill should be acquired.  
B. Determine the landfill's approximate internal rate of return.

LO: 1 Type: A

Answer:

|                                 |                         |                  |
|---------------------------------|-------------------------|------------------|
| A. Purchase price (700 x \$550) | $$(385,000) \times 1.0$ | $$(385,000)$     |
| Site preparation                | $$(110,000) \times 1.0$ | $(110,000)$      |
| Savings in operating costs      | $\$70,000 \times 7.360$ | <u>515,200</u>   |
| Total                           |                         | <u>\$ 20,200</u> |

Yes, the landfill should be acquired because it has a positive net present value.

- B. Let  $X$  = present value factor  
 $\$70,000X = (\$385,000 + \$110,000)$   
 $X = 7.071$

A review of annuity factors for 10 years finds an internal rate of return that falls between 6% (7.360) and 8% (6.710).

### Overview of the Internal Rate of Return

93. Gotham Corporation is considering the acquisition of a new machine that costs \$149,040. The machine is expected to have a four-year service life and will produce annual savings in cash operating costs of \$45,000. Gotham evaluates investments by using the internal rate of return and ignores income taxes.

Required:

- A. Briefly define the internal rate of return.
- B. What relationship holds true at the internal rate of return with respect to discounted cash inflows and discounted cash outflows? With respect to net present value?
- C. Compute the machine's internal rate of return.

LO: 1 Type: A, N

Answer:

- A. The internal rate of return is the true economic yield on a project, taking the time value of money into consideration.
- B. At the internal rate of return, the present value of the cash inflows equals the present value of the cash outflows. Thus, the net present value is zero.
- C.  $\$149,040 \div \$45,000 = 3.312$ , which corresponds with the factor of an 8% return on a four-year project.

### Cash-Flow Determination; Tax-Free and Tax Environments

94. Simon Company is considering a \$5.4 million asset investment that has a four-year service life and a \$400,000 salvage value. The investment is expected to produce annual savings in cash operating costs of \$860,000 and will require a \$250,000 overhaul in year 3, which is fully-deductible for tax purposes.

Simon uses the net-present-value method to analyze investments. Asset investments are depreciated by the straight-line method, ignoring salvage values in related computations.

Required:

- A. Ignoring income taxes, determine the (pre-discounted) cash-flow amounts that would be used in a net-present-value analysis for (1) the asset acquisition, (2) annual savings in cash operating costs, (3) annual straight-line depreciation, (4) the overhaul in year 3, and (5) disposal of the asset in year 4. Note cash outflows in parentheses.
- B. Repeat requirement "A," assuming the company is subject to a 30% income tax rate.

LO: 2, 4, 6 Type: A

Answer:

- A. Asset acquisition: \$(5,400,000)  
Annual savings in cash operating costs: \$860,000  
Annual straight-line depreciation: \$0  
Year 3 overhaul: \$(250,000)  
Year 4 asset disposal: \$400,000
- B. Asset acquisition: \$(5,400,000)  
Annual savings in cash operating costs:  $\$860,000 \times 0.7 = \$602,000$   
Annual straight-line depreciation:  $\$5,400,000 \div 4 \text{ years} = \$1,350,000$ ;  $\$1,350,000 \times 0.3 = \$405,000$   
Year 3 overhaul:  $\$(250,000) \times 0.7 = \$(175,000)$   
Year 4 asset disposal:  $\$5,400,000 - \$5,400,000 \text{ accumulated depreciation} = \$0 \text{ book value}$ ;  
 $\$0 \text{ book value} - \$400,000 \text{ salvage value} = \$400,000 \text{ gain}$ ;  $\$400,000 \text{ gain} \times 0.3 =$   
 $\$(120,000) \text{ added tax}$ ;  $\$400,000 \text{ salvage value} - \$(120,000) \text{ added tax} = \$280,000$



### Depreciation as a Tax Shield, MACRS, Discounted Cash Flow

95. Smith Corporation recently purchased a \$1,200,000 asset that has a three-year service life and no salvage value. The company is subject to a 30% income tax rate and employs a 12% after-tax hurdle rate in capital investment decisions.

Management is studying whether to depreciate the asset by using the straight-line method or the Modified Accelerated Cost Recovery System (MACRS). Assume that the following MACRS factors are in effect: year 1, 33%; year 2, 45%; year 3, 15%; and year 4, 7%

Required:

- Calculate the total depreciation expense that will be taken by each of the methods under consideration.
- Calculate the total tax savings that will occur with each method.
- On the basis of your calculations in part "B," which of the two methods will management likely prefer? Explain your answer.
- Calculate the present value of the tax savings under each method. Round to the nearest dollar.

LO: 4, 5, 6 Type: A, N

Answer:

- A. Both methods will result in the total asset cost of \$1,200,000 being written off as depreciation expense.

- B. Straight-line:

$\$1,200,000 \div 3 \text{ years} = \$400,000 \text{ per year}$ ;  $\$400,000 \times 0.30 = \$120,000 \text{ annual tax savings}$ , or \$360,000 over the asset's entire life.

MACRS:

|   |                  |
|---|------------------|
| Year 1: $\$1,200,000 \times 0.33 \times 0.30$ | \$118,800        |
| Year 2: $\$1,200,000 \times 0.45 \times 0.30$ | 162,000          |
| Year 3: $\$1,200,000 \times 0.15 \times 0.30$ | 54,000           |
| Year 4: $\$1,200,000 \times 0.07 \times 0.30$ | <u>25,200</u>    |
|   | <u>\$360,000</u> |

- C. Although the total dollar amounts are the same, the timing differs, with MACRS producing greater savings in the earlier part of the asset's life. These dollar savings can be reinvested by the business to generate additional returns, as verified by the present value calculations in requirement "D."

- D. Straight-line:

$\$120,000 \times 2.402$  \$288,240

MACRS:

|                                  |                  |
|----------------------------------|------------------|
| Year 1: $\$118,800 \times 0.893$ | \$106,088        |
| Year 2: $\$162,000 \times 0.797$ | 129,114          |
| Year 3: $\$54,000 \times 0.712$  | 38,448           |
| Year 4: $\$25,200 \times 0.636$  | <u>16,027</u>    |
|                                  | <u>\$289,677</u> |

### Cash Flows Related to Asset Ownership, Discounted Cash Flow, Taxes

96. Morgan Corporation plans to purchase \$1.5 million of equipment in the not-too-distant future. The equipment will have a \$300,000 salvage value and will be depreciated over a six-year service life by the straight-line method. Morgan is subject to a 40% income tax rate.

The company's accountant is about to perform a net-present-value analysis, assuming a 12% after-tax hurdle rate.

Required:

- A. Determine the discounted cash flows that would be reflected in the analysis in year 0 and year 1.
- B. Determine the discounted cash flow that would be reflected in the analysis in year 6, assuming that Morgan sells the equipment for only \$250,000 because of a recent change in market conditions.

LO: 4, 6 Type: A

Answer:

- A. Year 0:  $\$(1,500,000) \times 1.0 = \$(1,500,000)$   
Year 1:  $\$(1,500,000 - \$300,000) \div 6 \text{ years} = \$200,000$ ;  $\$200,000 \times 0.40 \times 0.893 = \$71,440$

|  |                       |
|--|-----------------------|
| B. Cost  | \$1,500,000           |
| Less: Accumulated depreciation                     | <u>1,200,000</u>      |
| Book value   | \$ 300,000            |
| Selling price                                      | <u>250,000</u>        |
| Loss on sale                                       | <u>\$ 50,000</u>      |
| <br>Proceeds from sale                             | <br>\$ 250,000        |
| Tax savings on loss: $\$50,000 \times 0.40$        | <u>20,000</u>         |
| Total cash flow                                    | <u>\$ 270,000</u>     |
| <br>Discounted cash flow: $\$270,000 \times 0.507$ | <br><u>\$ 136,890</u> |

### Determination of Cash Flows; Discounting; Taxes

97. You are reviewing some material that deals with investment analysis, preparing for your first day on the job at Franklin Enterprises. Consider the cash flows that follow.

1. The immediate payment required to purchase a \$600,000 milling machine.
2. Straight-line depreciation of \$20,000 in year 2 of a long-term investment.
3. Annual savings in cash operating costs of \$50,000 over the next eight years.
4. Sale of a machine for \$35,000 at the end of its six-year service life. The machine has a book value of \$25,000.
5. A \$6,000 equipment overhaul in year 5 that is fully deductible for income tax purposes.

Required:

Calculate the discounted cash flow that is appropriate for each of the preceding items. Assume a 10% after-tax hurdle rate and a 30% income tax rate, and round to the nearest dollar.

LO: 4, 6 Type: A

Answer:

1.  $\$(600,000) \times 1.0 = \$(600,000)$
2.  $\$20,000 \times 0.30 = \$6,000$ ;  $\$6,000 \times 0.826 = \$4,956$
3.  $\$50,000 \times 0.70 = \$35,000$ ;  $\$35,000 \times 5.335 = \$186,725$
4.  $\$35,000 - \$25,000 = \$10,000$  gain;  $\$10,000 \times 0.30 = \$3,000$  tax;  $\$35,000 - \$3,000 = \$32,000$ ;  $\$32,000 \times 0.564 = \$18,048$
5.  $\$(6,000) \times 0.70 = \$(4,200)$ ;  $\$(4,200) \times 0.621 = \$2,608$

## Net Present Value, Taxes

98. The Warren Machine Tool Company is considering the addition of a computerized lathe to its equipment inventory. The initial cost of the equipment is \$600,000, and the lathe is expected to have a useful life of five years and no salvage value. The cost savings and increased capacity attributable to the machine are estimated to generate increases in the firm's annual cash inflows (before considering depreciation) of \$180,000. The machine will be depreciated as follows for tax purposes: \$200,000 in year 1, \$266,700 in year 2, \$88,860 in year 3, and \$44,440 in year 4.

Warren is currently in the 40% income tax bracket. A 10% after-tax rate of return is desired.

Required:

- A. What is the net present value of the investment? Round to the nearest dollar.  
B. Should the machine be acquired by the firm?  
C. Assume that the equipment will be sold at the end of its useful life for \$100,000. If the depreciation amounts are not revised, calculate the dollar impact of this change on the total net present value.

LO: 4, 5, 6 Type: A, N

Answer:

|   |                                      |                 |
|---|--------------------------------------|-----------------|
| A. Purchase price                         | $$(600,000) \times 1.0$              | $$(600,000)$    |
| Increases in cost savings<br>and capacity | $\$180,000 \times 0.60 \times 3.791$ | 409,428         |
| MACRS:                                    |                                      |                 |
| Year 1                                    | $\$200,000 \times 0.40 \times 0.909$ | 72,720          |
| Year 2                                    | $\$266,700 \times 0.40 \times 0.826$ | 88,118          |
| Year 3                                    | $\$88,860 \times 0.40 \times 0.751$  | 26,694          |
| Year 4                                    | $\$44,440 \times 0.40 \times 0.683$  | <u>12,141</u>   |
| Total                                     |                                      | <u>\$ 9,101</u> |

- B. Yes, the machine should be acquired because it has a positive net present value.

|   |                  |
|---|------------------|
| C. Cost                                       | $\$600,000$      |
| Less: Accumulated depreciation                | <u>600,000</u>   |
| Book value                                    | \$ --            |
| Selling price                                 | <u>100,000</u>   |
| Gain on sale                                  | <u>\$100,000</u> |
| Proceeds from sale                            | $\$100,000$      |
| Less: Tax on gain ( $\$100,000 \times 0.40$ ) | <u>40,000</u>    |
| Total cash flow                               | <u>\$ 60,000</u> |
| Discounted cash flow: $\$60,000 \times 0.621$ | <u>\$ 37,260</u> |

The net present value will increase by \$37,260.

## Net Present Value, Taxes

99. Worrell Industries is currently purchasing part no. 456 from an outside supplier for \$90 per unit. Because of supplier reliability problems, the company is considering producing the part internally in a currently idle manufacturing plant. Annual volume over the next five years is expected to total 400,000 units at variable manufacturing costs of \$88 per unit.

Worrell must acquire \$200,000 of new equipment if it reopens the plant. The equipment has a five-year service life and a \$20,000 salvage value, and will be depreciated by the straight-line method. (Note: Worrell ignores salvage values in depreciation calculations.) Normal equipment maintenance is expected to total \$12,000 in year 4, and the equipment will be sold at the end of its life.

Required:

Rounding to the nearest dollar, use the net-present-value method (total-cost approach) and a 12% after-tax hurdle rate to determine whether Worrell should make or buy part no. 456. The company is subject to a 30% income tax rate.

LO: 3, 4, 6 Type: A

Answer:

Worrell is better off to make part no. 456.

Buy:

|  |                        |                       |
|--|------------------------|-----------------------|
| Purchase (400,000 units x \$90 x 0.70) | \$(25,200,000) x 3.605 | <u>\$(90,846,000)</u> |
|--|------------------------|-----------------------|

Make:

|   |                        |                       |
|---|------------------------|-----------------------|
| Variable manufacturing costs (400,000 units x \$88 x 0.70)  | \$(24,640,000) x 3.605 | \$(88,827,200)        |
| New equipment   | \$(200,000) x 1.0      | (200,000)             |
| Depreciation (\$200,000 ÷ 5 years = \$40,000; \$40,000 x 0.30)  | \$12,000 x 3.605       | 43,260                |
| Maintenance (\$12,000 x 0.70)   | \$8,400 x 0.636        | (5,342)               |
| Equipment sale (\$20,000 - \$0 book value = \$20,000 gain; \$20,000 x 0.30 = \$6,000 tax; \$20,000 - \$6,000) | \$14,000 x 0.567       | <u>7,938</u>          |
| Total   |                        | <u>\$(88,981,344)</u> |

## Net Present Value, Internal Rate of Return, Payback, Taxes

100. Wexler Corporation is considering the acquisition of a new machine that costs \$350,000. The machine is expected to have a four-year service life and will produce annual savings in cash operating costs of \$100,000. Wexler uses straight-line depreciation, is subject to a 30% income tax rate, has an after-tax hurdle rate of 12%, and rounds calculations to the nearest dollar.

Required:

- A. Determine the annual after-tax cash flows that result from acquisition of the machine.  
B. Assuming that your answer in requirement "A" totaled \$110,410, calculate the machine's:
1. Net present value. Is the machine an attractive investment? Why?
  2. Internal rate of return. Is the machine an attractive investment? Why?
  3. Payback period.

LO: 2, 3, 4, 8 Type: RC, A

Answer:

- A. Cash operating costs:  $\$100,000 \times 0.7 = \$70,000$   
Depreciation tax savings:  $\$350,000 \div 4 \text{ years} = \$87,500$ ;  $\$87,500 \times 0.3 = \$26,250$

|    |    |                     |                          |                    |
|----|----|---------------------|--------------------------|--------------------|
| B. | 1. | Initial investment  | $\$(350,000) \times 1.0$ | $\$(350,000)$      |
|    |    | Annual cash inflows | $\$110,410 \times 3.037$ | <u>335,315</u>     |
|    |    | Net present value   |                          | <u>\$ (14,685)</u> |

The machine is not considered an attractive investment because it has a negative net present value.

2.  $\$350,000 \div \$110,410 = 3.170$ , which corresponds with the factor of a 10% return on a four-year project. Given the hurdle rate of 12%, the machine is not considered an attractive investment.
3.  $\$350,000 \div \$110,410 = 3.17 \text{ years}$

### Payback, Accounting Rate of Return, Net Present Value

101. Ivory Corporation is reviewing an investment proposal that has an initial cost of \$52,500. An estimate of the investment's end-of-year book value, the yearly after-tax net cash inflows, and the yearly net income are presented in the schedule below. The investment's salvage value at the end of each year is equal to book value, and there will be no salvage value at the end of the investment's life.

| <u>Year</u> | <u>Initial Cost<br/>and<br/>Book Value</u> | <u>Yearly After-<br/>Tax Net<br/>Cash Inflows</u> | <u>Yearly<br/>Net<br/>Income</u> |
|-------------|--|---|----------------------------------|
| 1           | \$35,000                                   | \$20,000  | \$ 2,500                         |
| 2           | 21,000                                     | 17,500  | 3,500                            |
| 3           | 10,500                                     | 15,000  | 4,500                            |
| 4           | 3,500                                      | 12,500  | 5,500                            |
| 5           | ----                                       | <u>10,000</u>                                     | <u>6,500</u>                     |
|             |  | <u>\$75,000</u>                                   | <u>\$22,500</u>                  |

Ivory uses a 14% after-tax target rate of return for new investment proposals.

Required:

- A. Calculate the project's payback period.
- B. Calculate the accounting rate of return on the initial investment.
- C. Calculate the proposal's net present value. Round to the nearest dollar.

LO: 6, 8 Type: A

Answer:

- A. The project's payback is 3 years. By the conclusion of this time period, Ivory will have recovered the investment's cost of \$52,500 ( $\$20,000 + \$17,500 + \$15,000 = \$52,500$ ).
- B. The accounting rate of return is 8.6%:  
Average income ( $\$22,500 \div 5 \text{ years} = \$4,500$ )  $\div$  initial investment ( $\$52,500$ )
- C.

|                                 |                 |
|---------------------------------|-----------------|
| Year 0: $\$(52,500) \times 1.0$ | $\$(52,500)$    |
| Year 1: $\$20,000 \times 0.877$ | 17,540          |
| Year 2: $\$17,500 \times 0.769$ | 13,458          |
| Year 3: $\$15,000 \times 0.675$ | 10,125          |
| Year 4: $\$12,500 \times 0.592$ | 7,400           |
| Year 5: $\$10,000 \times 0.519$ | <u>5,190</u>    |
|                                 | <u>\$ 1,213</u> |

### Payback, Accounting Rate of Return, Net Present Value, Cash-Flow Determination

102. Lorax Corporation is considering the acquisition of a new machine that is expected to produce annual savings in cash operating costs of \$30,000 before income taxes. The machine costs \$100,000, has a useful life of five years, and no salvage value. Lorax uses straight-line depreciation on all assets, is subject to a 30% income tax rate, and has an after-tax hurdle rate of 8%.

Required:

- A. Compute the machine's payback period.
- B. Compute the machine's accounting rate of return on the initial investment.
- C. Compute the machine's net present value.

LO: 4, 6, 8 Type: A

Answer:

- A. Depreciation:  $\$100,000 \div 5 \text{ years} = \$20,000$   
Annual after-tax cash flows:  $(\$30,000 \times 0.70) + (\$20,000 \times 0.30) = \$27,000$   
Payback:  $\$100,000 \div \$27,000 = 3.7 \text{ years}$

- B. Average income:  $(\$30,000 - \$20,000) \times 0.70 = \$7,000$   
Accounting rate of return:  $\$7,000 \div \$100,000 = 7\%$

- |                            |                          |                 |
|----------------------------|--------------------------|-----------------|
| C. Initial investment      | $\$(100,000) \times 1.0$ | $\$(100,000)$   |
| Savings in operating costs | $\$21,000 \times 3.993$  | 83,853          |
| Depreciation tax savings   | $\$6,000 \times 3.993$   | <u>23,958</u>   |
| Net present value          |                          | <u>\$ 7,811</u> |



### Payback, Accounting Rate of Return

103. Custard Treats, which sells frozen custard and sandwiches, is considering a new site that will require a \$1 million investment for land acquisition and construction costs. The following operating results are expected:

|                          |               |                  |
|--------------------------|---------------|------------------|
| Sales revenue            |               | \$620,000        |
| Less operating expenses: |               |                  |
| Food & supplies          | \$210,000     |                  |
| Wages & salaries         | 180,000       |                  |
| Insurance & taxes        | 20,000        |                  |
| Utilities                | 10,000        |                  |
| Depreciation             | <u>50,000</u> | <u>470,000</u>   |
| Operating income         |               | <u>\$150,000</u> |

Disregard income taxes.

Required:

- If management requires a payback period of four years or less, should the new site be opened? Why?
- Compute the accounting rate of return on the initial investment.
- What significant limitation of payback and the accounting rate of return is overcome by the net-present-value method?

LO: 8 Type: A, N

Answer:

- A. Annual net cash inflows:  $\$620,000 - (\$470,000 - \$50,000) = \$200,000$   
Payback:  $\$1,000,000 \div \$200,000 = 5$  years

No, because the payback fails to meet management's guideline.

- B.  $\$150,000 \div \$1,000,000 = 15\%$
- C. Payback and the accounting rate of return ignore the time value of money, which is the foundation of the net-present-value method.

## DISCUSSION QUESTIONS

### Comparisons Between Net Present Value and the Internal Rate of Return

104. Both net present value (NPV) and the internal rate of return (IRR) have a reinvestment assumption.

Required:

- A. State the assumption for each method.
- B. One of the advantages of the NPV method is that users can adjust for risk considerations. Explain how this is done.

LO: 2 Type: RC

Answer:

- A. In the NPV method, cash flows are assumed to be reinvested at the hurdle rate. With the IRR, cash flows are assumed to be reinvested at the same rate as the project's return.
- B. In the NPV method, a higher hurdle rate can be used, either for the entire analysis or for the estimated cash inflows (savings) that occur late in the project's life.

### Postaudits

105. Postaudits are an important part of capital budgeting.

Required:

- A. What is a postaudit of a capital investment project?
- B. What are the benefits of a postaudit?
- C. A manager prepared an unsuccessful proposal for a capital project, as her firm decided not to fund and pursue the project. The manager observed, "The company's postaudit process will show that this project should have been funded." Comment on the manager's understanding of the postaudit process.

LO: 3 Type: RC

Answer:

- A. A postaudit is a review of the actual cash flows generated by a project and a comparison of the actual net present value with the original, anticipated net present value (or IRR).
- B. The postaudit provides an opportunity to identify problems in the implementation of a project, changes in the project's environment, errors in the estimation of cash flows, or weaknesses in the process by which the project was developed. Hopefully, an organization will learn from the postaudit and, if appropriate, change its ways so that past errors are not repeated.
- C. The manager's understanding of the postaudit process is incorrect. The postaudit is applied to projects that are funded/implemented. It is not a mechanism to show what might have happened if a rejected project had been accepted.

## Depreciation as a Tax Shield

106. Depreciation is often described as a "tax shield."

Required:

- A. Explain how depreciation provides such a shield.
- B. MACRS is an accelerated depreciation system. Explain how an accelerated system can provide a more beneficial tax shield than, say, a straight-line depreciation system.

LO: 4, 5 Type: RC

Answer:

- A. Depreciation does not require a cash outlay. (The cash outlay occurred when the asset was acquired.) However, depreciation reduces taxable income and consequently, reduces the cash outflow for income taxes. Thus, depreciation provides a reduction in cash outflows for income taxes, or in other words, shields some of a firm's income.
- B. Under an accelerated depreciation system, the asset's cost is written off more rapidly than under the straight-line system. This leaves funds for re-investment sooner, thus allowing a firm to generate greater returns because the money is invested for a longer period of time.

## Profitability Index

107. A profitability index can be used to rank investment proposals.

Required:

- A. Define the profitability index.
- B. Two projects are under consideration. Project I has a net present value of \$20,000 whereas project II has a net present value of \$200,000. Which project is better? Explain. What weakness in a net-present-value analysis does the profitability index address?

LO: 7 Type: RC

Answer:

- A. The profitability index equals the present value of a project's cash inflows divided by the initial investment.
- B. Both projects provide a return greater than the hurdle rate and both are acceptable. It is not possible to say which one is better. The profitability index provides a ratio that is not influenced by the size of the project—a limitation of net-present-value (NPV) analysis. Thus, a project that has a greater NPV and a greater profitability index generally will be more attractive than another project.

## **The Payback Method**

108. The payback method is a popular way to analyze investment proposals.

Required:

- A. Explain how the payback period is determined. Generally speaking, from a payback perspective, which projects are viewed to be the most attractive?
- B. Does the payback method take income taxes into consideration? Explain.
- C. What are the deficiencies of the payback method?

LO: 8 Type: RC

Answer:

- A. The payback period is the time required to recover the initial investment. Projects with the shortest payback are generally viewed as being the most attractive.
- B. Yes, the payback period is based on net cash inflows to the firm (i.e., those after taxes).
- C. There are two major deficiencies. The payback method completely ignores cash flows that occur after the payback point has been reached. This method also ignores the time value of money.

## **Justification of Investments in Advanced Manufacturing Systems**

109. An increased number of companies are investing in advanced manufacturing systems.

Required:

- A. Many proposed advanced manufacturing systems have a negative net present value when discounted-cash-flow analysis is used. Explain several reasons behind this situation.
- B. Two major benefits of advanced systems are greater flexibility in the manufacturing process and improvements in product quality. Explain how these benefits can create problems when performing discounted-cash-flow analysis.

LO: 9 Type: RC, N

Answer:

- A. Negative net present values may arise from several factors: the investments are very costly; the hurdle rate may be very high to compensate for project risk; the time horizon may be too short; and a number of benefits associated with the project may have been excluded from the analysis because of related quantification problems.
- B. Greater flexibility in the manufacturing process and improvements in product quality are very difficult to quantify. As a result, these items may be excluded from a discounted-cash-flow analysis, decreasing an investment's attractiveness.