Chapter 9
Capital Budgeting Techniques

■ Learning Goals

1. Understand the role of capital budgeting techniques in the capital budgeting process.
2. Calculate, interpret, and evaluate the payback period.
3. Calculate, interpret, and evaluate the net present value (NPV).
4. Calculate, interpret, and evaluate the internal rate of return (IRR).
5. Use net present value profiles to compare NPV and IRR techniques.
6. Discuss NPV and IRR in terms of conflicting rankings and the theoretical and practical strengths of each approach.

■ True/False

1. In capital budgeting, the preferred approaches in assessing whether a project is acceptable are those that integrate time value procedures, risk and return considerations, and valuation concepts.

   Answer: TRUE
   Level of Difficulty: 1
   Learning Goal: 1
   Topic: Capital Budgeting Techniques

2. In the case of annuity cash inflows, the payback period can be found by dividing the initial investment by the annual cash inflow.

   Answer: TRUE
   Level of Difficulty: 1
   Learning Goal: 2
   Topic: Payback Method

3. The payback period is the exact amount of time required for the firm to recover the installed cost of a new asset.

   Answer: FALSE
   Level of Difficulty: 1
   Learning Goal: 2
   Topic: Payback Method

4. The payback period is generally viewed as an unsophisticated capital budgeting technique, because it does not explicitly consider the time value of money by discounting cash flows to find present value.

   Answer: TRUE
   Level of Difficulty: 2
   Learning Goal: 2
   Topic: Payback Method

5. By measuring how quickly the firm recovers its initial investment, payback period gives some implicit consideration to the timing of cash flows and therefore to the time value of money.

   Answer: TRUE
   Level of Difficulty: 2
   Learning Goal: 2
   Topic: Payback Method

6. One strength of payback period is that it takes fully into account the time factor in the value of money.

   Answer: FALSE
   Level of Difficulty: 2
   Learning Goal: 2
   Topic: Payback Method

7. One weakness of payback is its failure to recognize cash flows that occur after the payback period.

   Answer: TRUE
   Level of Difficulty: 2
   Learning Goal: 2
   Topic: Payback Method

8. A project must be rejected if its payback period is less than the maximum acceptable payback period.

   Answer: FALSE
   Level of Difficulty: 2
   Learning Goal: 2
   Topic: Payback Method

9. Since the payback period can be viewed as a measure of risk exposure, many firms use it as a decision criterion or as a supplement to sophisticated decision techniques.

   Answer: TRUE
   Level of Difficulty: 2
   Learning Goal: 2
   Topic: Payback Method

10. The major weakness of payback period in evaluating projects is that it cannot specify the appropriate payback period in light of the wealth maximization goal.

    Answer: TRUE
    Level of Difficulty: 3
    Learning Goal: 2
    Topic: Payback Method

11. Net present value is considered a sophisticated capital budgeting technique since it gives explicit consideration to the time value of money.

    Answer: TRUE
    Level of Difficulty: 1
    Learning Goal: 3
    Topic: Net Present Value

12. The discount rate, required return, cost of capital, or opportunity cost is the minimum return that must be earned on a project to leave the firm's market value unchanged.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 3
    Topic: Project Required Return

13. If net present value of a project is greater than zero, the firm will earn a return greater than its cost of capital. Such a project should enhance the wealth of the firm's owners.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 3
    Topic: Net Present Value

14. The net present value is found by subtracting a project's initial investment from the present value of its cash inflows discounted at a rate equal to the project's internal rate of return.

    Answer: FALSE
    Level of Difficulty: 3
    Learning Goal: 3
    Topic: Net Present Value

15. The internal rate of return (IRR) is defined as the discount rate that equates the net present value with the initial investment associated with a project.

    Answer: FALSE
    Level of Difficulty: 1
    Learning Goal: 4
    Topic: Internal Rate of Return

16. The IRR is the discount rate that equates the NPV of an investment opportunity with $0.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 4
    Topic: Internal Rate of Return

17. The IRR is the compound annual rate of return that the firm will earn if it invests in the project and receives the given cash inflows.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 4
    Topic: Internal Rate of Return

18. An internal rate of return greater than the cost of capital guarantees that the firm earns at least its required return. Such an outcome should enhance the market value of the firm and therefore the wealth of its owners.

    Answer: TRUE
    Level of Difficulty: 3
    Learning Goal: 4
    Topic: Internal Rate of Return

19. For conventional projects, both NPV and IRR techniques will always generate the same accept-reject decision, but differences in their underlying assumptions can cause them to rank projects differently.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 5
    Topic: NPV versus IRR

20. Conflicting rankings using NPV and IRR result from differences in the magnitude and timing of cash flows.

    Answer: TRUE
    Level of Difficulty: 1
    Learning Goal: 6
    Topic: NPV versus IRR

21. Projects having higher cash inflows in the early years tend to be preferred at higher discount rates.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 6
    Topic: NPV versus IRR

22. On a purely theoretical basis, NPV is the better approach to capital budgeting than IRR because NPV implicitly assumes that any intermediate cash inflows generated by an investment are reinvested at the firm's cost of capital.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 6
    Topic: NPV versus IRR

23. On a purely theoretical basis, NPV is the better approach to capital budgeting than IRR because IRR implicitly assumes that any intermediate cash inflows generated by an investment are reinvested at the firm's cost of capital.

    Answer: FALSE
    Level of Difficulty: 2
    Learning Goal: 6
    Topic: NPV versus IRR

24. Certain mathematical properties may cause a project with a nonconventional cash flow pattern to have zero or more than one IRR; this problem does not occur with the NPV approach.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 6
    Topic: NPV versus IRR

25. Net present value (NPV) assumes that intermediate cash inflows are reinvested at the cost of capital, whereas internal rate of return (IRR) assumes that intermediate cash inflows can be reinvested at a rate equal to the project's IRR.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 6
    Topic: NPV versus IRR

26. Since the cost of capital tends to be a reasonable estimate of the rate at which the firm could actually reinvest intermediate cash inflows, the use of NPV is in theory preferable to IRR.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 6
    Topic: NPV versus IRR

27. In general, projects with similar-sized investments and lower early-year cash inflows (lower cash inflows in the early years) tend to be preferred at higher discount rates.

    Answer: FALSE
    Level of Difficulty: 3
    Learning Goal: 6
    Topic: NPV versus IRR

28. In general, the greater the difference between the magnitude and timing of cash inflows, the greater the likelihood of conflicting ranking between NPV and IRR.

    Answer: TRUE
    Level of Difficulty: 3
    Learning Goal: 6
    Topic: NPV versus IRR

29. The internal rate of return assumes that intermediate cash inflows are invested at a rate equal to the firm's cost of capital.

    Answer: FALSE
    Level of Difficulty: 3
    Learning Goal: 6
    Topic: Internal Rate of Return

30. Although differences in the magnitude and timing of cash flows explain conflicting rankings under the NPV and IRR techniques, the underlying cause is the implicit assumption concerning the reinvestment of intermediate cash inflows—cash inflows received prior to the termination of a project.

    Answer: TRUE
    Level of Difficulty: 4
    Learning Goal: 6
    Topic: Internal Rate of Return

31. In capital budgeting, the preferred approaches in assessing whether a project is acceptable integrate time value procedures, risk and return considerations, valuation concepts, and the required payback period.

    Answer: FALSE
    Level of Difficulty: 2
    Learning Goal: 1
    Topic: Capital Budgeting Techniques

32. If the payback period is less than the maximum acceptable payback period, we would reject a project.

    Answer: FALSE
    Level of Difficulty: 2
    Learning Goal: 2
    Topic: Payback Method

33. If the payback period is less than the maximum acceptable payback period, we would accept a project.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 2
    Topic: Payback Method

34. If the payback period is greater than the maximum acceptable payback period, we would reject a project.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 2
    Topic: Payback Method

35. If the payback period is greater than the maximum acceptable payback period, we would accept a project.

    Answer: FALSE
    Level of Difficulty: 2
    Learning Goal: 2
    Topic: Payback Method

36. The payback period of a project that costs $1,000 initially and promises after-tax cash inflows of $300 for the next three years is 3.33 years.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 2
    Topic: Payback Method

37. The payback period of a project that costs $1,000 initially and promises after-tax cash inflows of $300 for the next three years is 0.333 years.

    Answer: FALSE
    Level of Difficulty: 2
    Learning Goal: 2
    Topic: Payback Method

38. The payback period of a project that costs $1,000 initially and promises after-tax cash inflows of $3,000 for the next three years is 0.333 years.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 2
    Topic: Payback Method

39. The payback period of a project that costs $1,000 initially and promises after-tax cash inflows of $3,000 for the next three years is 3.33 years.

    Answer: FALSE
    Level of Difficulty: 2
    Learning Goal: 2
    Topic: Payback Method

40. A sophisticated capital budgeting technique that can be computed by subtracting a project's initial investment from the present value of its cash inflows discounted at a rate equal to the firm's cost of capital is called net present value.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 3
    Topic: Net Present Value

41. A sophisticated capital budgeting technique that can be computed by subtracting a project's initial investment from the present value of its cash inflows discounted at a rate equal to the firm's cost of capital is called internal rate of return.

    Answer: FALSE
    Level of Difficulty: 2
    Learning Goal: 3
    Topic: Net Present Value

42. If the NPV is greater than the cost of capital, a project should be accepted.

Answer: FALSE
Level of Difficulty: 2
Learning Goal: 3
Topic: Net Present Value

43. If the NPV is greater than the initial investment, a project should be accepted.

Answer: FALSE
Level of Difficulty: 2
Learning Goal: 3
Topic: Net Present Value

44. If the NPV is greater than $0.00, a project should be accepted.

Answer: TRUE
Level of Difficulty: 2
Learning Goal: 3
Topic: Net Present Value

45. The NPV of an project with an initial investment of $1,000 that provides after-tax operating cash flows of $300 per year for four years where the firm's cost of capital is 15 percent is $856.49.

Answer: FALSE
Level of Difficulty: 3
Learning Goal: 3
Topic: Net Present Value (Equation 9.1 and Equation 9.1a)

46. The NPV of an project with an initial investment of $1,000 that provides after-tax operating cash flows of $300 per year for four years where the firm's cost of capital is 15 percent is $143.51.

Answer: FALSE
Level of Difficulty: 3
Learning Goal: 3
Topic: Net Present Value (Equation 9.1 and Equation 9.1a)

47. The NPV of an project with an initial investment of $1,000 that provides after-tax operating cash flows of $300 per year for four years where the firm's cost of capital is 15 percent is –$143.51.

Answer: TRUE
Level of Difficulty: 3
Learning Goal: 3
Topic: Net Present Value (Equation 9.1 and Equation 9.1a)

48. A sophisticated capital budgeting technique that can be computed by solving for the discount rate that equates the present value of a projects inflows with the present value of its outflows is called net present value.

Answer: FALSE
Level of Difficulty: 2
Learning Goal: 4
Topic: Internal Rate of Return

49. A sophisticated capital budgeting technique that can be computed by solving for the discount rate that equates the present value of a projects inflows with the present value of its outflows is called internal rate of return.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 4
    Topic: Internal Rate of Return

50. If its IRR is greater than $0.00, a project should be accepted.

    Answer: FALSE
    Level of Difficulty: 2
    Learning Goal: 4
    Topic: Internal Rate of Return

51. If its IRR is greater than 0 percent, a project should be accepted.

    Answer: FALSE
    Level of Difficulty: 2
    Learning Goal: 4
    Topic: Internal Rate of Return

52. If its IRR is greater than the cost of capital, a project should be accepted.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 4
    Topic: Internal Rate of Return

53. A project's net present value profile is a graph that plots a project's NPV for various discount rates.

    Answer: TRUE
    Level of Difficulty: 2
    Learning Goal: 5
    Topic: Net Present Value Profile

54. A project's net present value profile is a graph that plots a project's IRR for various discount rates.

    Answer: FALSE
    Level of Difficulty: 2
    Learning Goal: 5
    Topic: Net Present Value Profile

55. Net present value profiles are most useful when selecting among independent projects.

    Answer: FALSE
    Level of Difficulty: 2
    Learning Goal: 5
    Topic: Net Present Value Profile

56. Net present value profiles are most useful when selecting among mutually exclusive projects.

Answer: TRUE
Level of Difficulty: 2
Learning Goal: 5
Topic: Net Present Value Profile

57. On a purely theoretical basis, NPV is a better approach when selecting among two mutually exclusive projects.

Answer: TRUE
Level of Difficulty: 2
Learning Goal: 6
Topic: NPV versus IRR

58. On a purely theoretical basis, IRR is a better approach when selecting among two mutually exclusive projects.

Answer: FALSE
Level of Difficulty: 2
Learning Goal: 6
Topic: NPV versus IRR

59. In spite of the theoretical superiority of NPV, financial managers prefer to use IRR.

Answer: TRUE
Level of Difficulty: 2
Learning Goal: 6
Topic: NPV versus IRR

60. In spite of the theoretical superiority of IRR, financial managers prefer to use NPV.

Answer: FALSE
Level of Difficulty: 2
Learning Goal: 6
Topic: NPV versus IRR

■ Multiple Choice Questions

1. Examples of sophisticated capital budgeting techniques include all of the following EXCEPT
   (a) internal rate of return.
   (b) payback period.
   (c) annualized net present value.
   (d) net present value.

Answer: B
Level of Difficulty: 1
Learning Goal: 2
Topic: Capital Budgeting Techniques

2. The _____ is the exact amount of time it takes the firm to recover its initial investment.
   (a) average rate of return
   (b) internal rate of return
   (c) net present value
   (d) payback period

   Answer: D
   Level of Difficulty: 1
   Learning Goal: 2
   Topic: Payback Method

3. Unsophisticated capital budgeting techniques do not
   (a) examine the size of the initial outlay.
   (b) use net profits as a measure of return.
   (c) explicitly consider the time value of money.
   (d) take into account an unconventional cash flow pattern.

   Answer: C
   Level of Difficulty: 2
   Learning Goal: 2
   Topic: Capital Budgeting Techniques

4. All of the following are weaknesses of the payback period EXCEPT
   (a) a disregard for cash flows after the payback period.
   (b) only an implicit consideration of the timing of cash flows.
   (c) the difficulty of specifying the appropriate payback period.
   (d) it uses cash flows, not accounting profits.

   Answer: D
   Level of Difficulty: 2
   Learning Goal: 2
   Topic: Payback Method

5. Among the reasons many firms use, the payback period as a guideline in capital investment decisions are all of the following EXCEPT
   (a) it gives an implicit consideration to the timing of cash flows.
   (b) it recognizes cash flows which occur after the payback period.
   (c) it is a measure of risk exposure.
   (d) it is easy to calculate.

   Answer: B
   Level of Difficulty: 3
   Learning Goal: 2
   Topic: Payback Method

6. Payback is considered an unsophisticated capital budgeting technique, and as such
   (a) gives no consideration to the timing of cash flows and therefore the time value of money.
   (b) gives no consideration to risk exposure.
   (c) does consider the timing of cash flows and therefore gives explicit consideration to the time value of money.
   (d) gives some implicit consideration to the timing of cash flows and therefore the time value of money.

   Answer: D
   Level of Difficulty: 3
   Learning Goal: 2
   Topic: Payback Method

7. Some firms use the payback period as a decision criterion or as a supplement to sophisticated decision techniques, because
   (a) it explicitly considers the time value of money.
   (b) it can be viewed as a measure of risk exposure.
   (c) the determination of payback is an objectively determined criteria.
   (d) it can take the place of the net present value approach.

   Answer: B
   Level of Difficulty: 3
   Learning Goal: 2
   Topic: Payback Method

8. A firm is evaluating a proposal which has an initial investment of $35,000 and has cash flows of $10,000 in year 1, $20,000 in year 2, and $10,000 in year 3. The payback period of the project is
   (a) 1 year.
   (b) 2 years.
   (c) between 1 and 2 years.
   (d) between 2 and 3 years.

   Answer: D
   Level of Difficulty: 3
   Learning Goal: 2
   Topic: Payback Method

9. A firm is evaluating a proposal which has an initial investment of $50,000 and has cash flows of $15,000 per year for five years. The payback period of the project is
   (a) 1.5 years.
   (b) 2 years.
   (c) 3.3 years.
   (d) 4 years.

   Answer: C
   Level of Difficulty: 3
   Learning Goal: 2
   Topic: Payback Method

10. A firm is evaluating three capital projects. The net present values for the projects are as follows:

Project	NPV
1	$100
2	$0
3	–$100

The firm should
(a) accept Projects 1 and 2 and reject Project 3.
(b) accept Projects 1 and 3 and reject Project 2.
(c) accept Project 1 and reject Projects 2 and 3.
(d) reject all projects.
Answer: A
Level of Difficulty: 2
Learning Goal: 3
Topic: Net Present Value

11. Sophisticated capital budgeting techniques do not
(a) examine the size of the initial outlay.
(b) use net profits as a measure of return.
(c) explicitly consider the time value of money.
(d) take into account an unconventional cash flow pattern.
Answer: B
Level of Difficulty: 2
Learning Goal: 3
Topic: Capital Budgeting Techniques

12. The minimum return that must be earned on a project in order to leave the firm's value unchanged is
(a) the internal rate of return.
(b) the interest rate.
(c) the discount rate.
(d) the compound rate.
Answer: C
Level of Difficulty: 2
Learning Goal: 3
Topic: Internal Rate of Return

13. A firm would accept a project with a net present value of zero because
    (a) the project would maintain the wealth of the firm's owners.
    (b) the project would enhance the wealth of the firm's owners.
    (c) the return on the project would be positive.
    (d) the return on the project would be zero.

    Answer: A
    Level of Difficulty: 2
    Learning Goal: 3
    Topic: Net Present Value

14. A firm is evaluating an investment proposal which has an initial investment of $5,000 and cash flows presently valued at $4,000. The net present value of the investment is _____.
    (a) –$1,000
    (b) $0
    (c) $1,000
    (d) $1.25

    Answer: A
    Level of Difficulty: 2
    Learning Goal: 3
    Topic: Net Present Value (Equation 9.1 and Equation 9.1a)

15. The _____ is the discount rate that equates the present value of the cash inflows with the initial investment.
    (a) payback period
    (b) average rate of return
    (c) cost of capital
    (d) internal rate of return

    Answer: D
    Level of Difficulty: 1
    Learning Goal: 4
    Topic: Internal Rate of Return

16. The _____ is the compound annual rate of return that the firm will earn if it invests in the project and receives the given cash inflows.
    (a) discount rate
    (b) internal rate of return
    (c) opportunity cost
    (d) cost of capital

    Answer: B
    Level of Difficulty: 2
    Learning Goal: 4
    Topic: Internal Rate of Return

17. A firm with a cost of capital of 13 percent is evaluating three capital projects. The internal rates of return are as follows:

Project	Internal Rate of Return
1	12%
2	15
3	13

The firm should
(a) accept Project 2 and reject Projects 1 and 3.
(b) accept Projects 2 and 3 and reject Project 1.
(c) accept Project 1 and reject Projects 2 and 3.
(d) accept Project 3 and reject Projects 1 and 2.

Answer: B
Level of Difficulty: 2
Learning Goal: 4
Topic: Internal Rate of Return (Equation 9.2 and Equation 9.2a)

A firm is evaluating two projects that are mutually exclusive with initial investments and cash flows as follows:

Table 9.1

Project A		Project B	
Initial Investment	**End-of-Year Cash Flows**	**Initial Investment**	**End-of-Year Cash Flows**
$40,000	$20,000	$90,000	$40,000
	20,000		40,000
	20,000		80,000

18. If the firm in Table 9.1 has a required payback of two (2) years, they should
(a) accept projects A and B.
(b) accept project A and reject B.
(c) reject project A and accept B.
(d) reject both.

Answer: B
Level of Difficulty: 3
Learning Goal: 4
Topic: Payback Method

19. The new financial analyst does not like the payback approach (Table 9.1) and determines that the firm's required rate of return is 15 percent. His recommendation would be to
(a) accept projects A and B.
(b) accept project A and reject B.
(c) reject project A and accept B.
(d) reject both.

Answer: C
Level of Difficulty: 3
Learning Goal: 4
Topic: Net Present Value (Equation 9.1 and Equation 9.1a)

A firm must choose from six capital budgeting proposals outlined below. The firm is subject to capital rationing and has a capital budget of $1,000,000; the firm's cost of capital is 15 percent.

Table 9.2

Project	Initial Investment	IRR	NPV
1	$200,000	19%	$100,000
2	400,000	17	20,000
3	250,000	16	60,000
4	200,000	12	–5,000
5	150,000	20	50,000
6	400,000	15	150,000

20. Using the internal rate of return approach to ranking projects, which projects should the firm accept? (See Table 9.2)

(a) 1, 2, 3, 4, and 5
(b) 1, 2, 3, and 5
(c) 2, 3, 4, and 6
(d) 1, 3, 4, and 6

Answer: B
Level of Difficulty: 3
Learning Goal: 4
Topic: IRR and Capital Rationing

21. Using the net present value approach to ranking projects, which projects should the firm accept? (See Table 9.2)

(a) 1, 2, 3, 4, and 5
(b) 1, 2, 3, 5, and 6
(c) 2, 3, 4, and 5
(d) 1, 3, 5, and 6

Answer: D
Level of Difficulty: 3
Learning Goal: 4
Topic: NPV and Capital Rationing

22. When the net present value is negative, the internal rate of return is _____ the cost of capital.

(a) greater than
(b) greater than or equal to
(c) less than
(d) equal to

Answer: C
Level of Difficulty: 3
Learning Goal: 4
Topic: NPV and IRR

23. A firm is evaluating two independent projects utilizing the internal rate of return technique. Project X has an initial investment of $80,000 and cash inflows at the end of each of the next five years of $25,000. Project Z has a initial investment of $120,000 and cash inflows at the end of each of the next four years of $40,000. The firm should
    (a) accept both if their cost of capital is 15 percent at the maximum.
    (b) accept only Z if their cost of capital is 15 percent at the maximum.
    (c) accept only X if their cost of capital is 15 percent at the maximum.
    (d) reject both if their cost of capital is 12 percent at the maximum.

    Answer: C
    Level of Difficulty: 4
    Learning Goal: 4
    Topic: Internal Rate of Return (Equation 9.2 and Equation 9.2a)

Table 9.3

Nuff Folding Box Company, Inc. is considering purchasing a new gluing machine. The gluing machine costs $50,000 and requires installation costs of $2,500. This outlay would be partially offset by the sale of an existing gluer. The existing gluer originally cost $10,000 and is four years old. It is being depreciated under MACRS using a five-year recovery schedule and can currently be sold for $15,000. The existing gluer has a remaining useful life of five years. If held until year 5, the existing machine's market value would be zero. Over its five-year life, the new machine should reduce operating costs (excluding depreciation) by $17,000 per year. Training costs of employees who will operate the new machine will be a one-time cost of $5,000 which should be included in the initial outlay. The new machine will be depreciated under MACRS using a five-year recovery period. The firm has a 12 percent cost of capital and a 40 percent tax on ordinary income and capital gains.

24. The payback period for the project is (See Table 9.3)
    (a) 2 years.
    (b) 3 years.
    (c) between 3 and 4 years.
    (d) between 4 and 5 years.

    Answer: C
    Level of Difficulty: 4
    Learning Goal: 4
    Topic: Payback

25. The tax effect of the sale of the existing asset is (See Table 9.3)
    (a) a tax liability of $2,340.
    (b) a tax benefit of $1,500.
    (c) a tax liability of $3,320.
    (d) a tax liability of $5,320.

    Answer: D
    Level of Difficulty: 4
    Learning Goal: 4
    Topic: Depreciation and Taxes

26. The initial outlay for this project is (See Table 9.3)
    (a) $42,820.
    (b) $40,320.
    (c) $47,820.
    (d) $35,140.

    Answer: C
    Level of Difficulty: 4
    Learning Goal: 4
    Topic: Initial Outlay

27. The present value of the project's annual cash flows is (See Table 9.3)
    (a) $ 47,820.
    (b) $ 42,820.
    (c) $ 51,694.
    (d) $100,563.

    Answer: C
    Level of Difficulty: 4
    Learning Goal: 4
    Topic: Present Value of Operating Cash Flows

28. The net present value of the project is (See Table 9.3)
    (a) $3,874.
    (b) $2,445.
    (c) $5,614.
    (d) $7,500.

    Answer: A
    Level of Difficulty: 4
    Learning Goal: 4
    Topic: Net Present Value (Equation 9.1 and Equation 9.1a)

29. The internal rate of return for the project is (See Table 9.3)
    (a) between 7 and 8 percent.
    (b) between 9 and 10 percent.
    (c) greater than 12 percent.
    (d) between 10 and 11 percent.

    Answer: C
    Level of Difficulty: 4
    Learning Goal: 4
    Topic: Internal Rate of Return (Equation 9.2 and Equation 9.2a)

30. The underlying cause of conflicts in ranking for projects by internal rate of return and net present value methods is
    (a) the reinvestment rate assumption regarding intermediate cash flows.
    (b) that neither method explicitly considers the time value of money.
    (c) the assumption made by the IRR method that intermediate cash flows are reinvested at the cost of capital.
    (d) the assumption made by the NPV method that intermediate cash flows are reinvested at the internal rate of return.

    Answer: A
    Level of Difficulty: 3
    Learning Goal: 6
    Topic: NPV versus IRR

31. On a purely theoretical basis, the NPV is the better approach to capital budgeting due to all the following reasons EXCEPT
    (a) that it measures the benefits relative to the amount invested.
    (b) for the reasonableness of the reinvestment rate assumption.
    (c) that there may be multiple solutions for an IRR computation.
    (d) that it maximizes shareholder wealth.

    Answer: A
    Level of Difficulty: 3
    Learning Goal: 6
    Topic: NPV versus IRR

32. Comparing net present value and internal rate of return analysis
    (a) always results in the same ranking of projects.
    (b) always results in the same accept/reject decision.
    (c) may give different accept/reject decisions.
    (d) is only necessary on mutually exclusive projects.

    Answer: B
    Level of Difficulty: 3
    Learning Goal: 6
    Topic: NPV versus IRR

33. In comparing the internal rate of return and net present value methods of evaluation,
    (a) internal rate of return is theoretically superior, but financial managers prefer net present value.
    (b) net present value is theoretically superior, but financial managers prefer to use internal rate of return.
    (c) financial managers prefer net present value, because it is presented as a rate of return.
    (d) financial managers prefer net present value, because it measures benefits relative to the amount invested.

    Answer: B
    Level of Difficulty: 3
    Learning Goal: 6
    Topic: NPV versus IRR

34. Unlike the net present value criteria, the internal rate of return approach assumes an interest rate equal to
    (a) the relevant cost of capital.
    (b) the project's internal rate of return.
    (c) the project's opportunity cost.
    (d) the market's interest rate.

    Answer: B
    Level of Difficulty: 3
    Learning Goal: 6
    Topic: NPV versus IRR

35. When evaluating projects using internal rate of return,
    (a) projects having lower early-year cash flows tend to be preferred at higher discount rates.
    (b) projects having higher early-year cash flows tend to be preferred at higher discount rates.
    (c) projects having higher early-year cash flows tend to be preferred at lower discount rates.
    (d) the discount rate and magnitude of cash flows do not affect internal rate of return.

    Answer: B
    Level of Difficulty: 4
    Learning Goal: 6
    Topic: Internal Rate of Return

36. Which of the following capital budgeting techniques ignores the time value of money?
    (a) Payback.
    (b) Net present value.
    (c) Internal rate of return.
    (d) Two of the above.

    Answer: A
    Level of Difficulty: 2
    Learning Goal: 1
    Topic: Capital Budgeting Techniques

37. Which of the following statements is false?
    (a) If the payback period is less than the maximum acceptable payback period, accept the project.
    (b) If the payback period is greater than the maximum acceptable payback period, reject the project.
    (c) If the payback period is less than the maximum acceptable payback period, reject the project
    (d) Two of the above.

    Answer: C
    Level of Difficulty: 3
    Learning Goal: 2
    Topic: Payback Method

38. Which of the following statements is false?
    (a) If the payback period is greater than the maximum acceptable payback period, accept the project.
    (b) If the payback period is less than the maximum acceptable payback period, reject the project.
    (c) If the payback period is greater than the maximum acceptable payback period, reject the project.
    (d) Two of the above.

    Answer: D
    Level of Difficulty: 3
    Learning Goal: 2
    Topic: Payback Method

39. What is the payback period for Tangshan Mining company's new project if its initial after tax cost is $5,000,000 and it is expected to provide after-tax operating cash inflows of $1,800,000 in year 1, $1,900,000 in year 2, $700,000 in year 3 and $1,800,000 in year 4?
    (a) 4.33 years.
    (b) 3.33 years.
    (c) 2.33 years.
    (d) None of the above.

    Answer: B
    Level of Difficulty: 3
    Learning Goal: 2
    Topic: Payback Method

40. Should Tangshan Mining company accept a new project if its maximum payback is 3.5 years and its initial after tax cost is $5,000,000 and it is expected to provide after-tax operating cash inflows of $1,800,000 in year 1, $1,900,000 in year 2, $700,000 in year 3 and $1,800,000 in year 4?
    (a) Yes.
    (b) No.
    (c) It depends.
    (d) None of the above.

    Answer: A
    Level of Difficulty: 3
    Learning Goal: 2
    Topic: Payback Method

41. Should Tangshan Mining company accept a new project if its maximum payback is 3.25 years and its initial after tax cost is $5,000,000 and it is expected to provide after-tax operating cash inflows of $1,800,000 in year 1, $1,900,000 in year 2, $700,000 in year 3 and $1,800,000 in year 4?
    (a) Yes.
    (b) No.
    (c) It depends
    (d) None of the above

    Answer: B
    Level of Difficulty: 3
    Learning Goal: 2
    Topic: Payback Method

42. What is the NPV for the following project if its cost of capital is 15 percent and its initial after tax cost is $5,000,000 and it is expected to provide after-tax operating cash inflows of $1,800,000 in year 1, $1,900,000 in year 2, $1,700,000 in year 3 and $1,300,000 in year 4?

(a) $1,700,000
(b) $371,764
(c) ($137,053)
(d) None of the above

Answer: C
Level of Difficulty: 3
Learning Goal: 3
Topic: Net Present Value (Equation 9.1 and Equation 9.1a)

43. What is the NPV for the following project if its cost of capital is 0 percent and its initial after tax cost is $5,000,000 and it is expected to provide after-tax operating cash inflows of $1,800,000 in year 1, $1,900,000 in year 2, $1,700,000 in year 3 and $1,300,000 in year 4?

(a) $1,700,000.
(b) $371,764.
(c) $137,053.
(d) None of the above.

Answer: A
Level of Difficulty: 3
Learning Goal: 3
Topic: Net Present Value (Equation 9.1 and Equation 9.1a)

44. What is the NPV for the following project if its cost of capital is 12 percent and its initial after tax cost is $5,000,000 and it is expected to provide after-tax operating cash flows of $1,800,000 in year 1, $1,900,000 in year 2, $1,700,000 in year 3 and ($1,300,000) in year 4?

(a) $(1,494,336).
(b) $1,494,336.
(c) Greater than zero.
(d) Two of the above.

Answer: A
Level of Difficulty: 4
Learning Goal: 3
Topic: Net Present Value (Equation 9.1 and Equation 9.1a)

45. What is the IRR for the following project if its initial after tax cost is $5,000,000 and it is expected to provide after-tax operating cash inflows of $1,800,000 in year 1, $1,900,000 in year 2, $1,700,000 in year 3 and $1,300,000 in year 4?

(a) 15.57%.
(b) 0.00%.
(c) 13.57%.
(d) None of the above.

Answer: C
Level of Difficulty: 3
Learning Goal: 4
Topic: Internal Rate of Return (Equation 9.2 and Equation 9.2a)

46. What is the IRR for the following project if its initial after tax cost is $5,000,000 and it is expected to provide after-tax operating cash flows of ($1,800,000) in year 1, $2,900,000 in year 2, $2,700,000 in year 3 and $2,300,000 in year 4?

(a) 5.83%.
(b) 9.67%.
(c) 11.44%.
(d) None of the above.

Answer: A
Level of Difficulty: 3
Learning Goal: 4
Topic: Internal Rate of Return (Equation 9.2 and Equation 9.2a)

47. Which capital budgeting method is most useful for evaluating the following project? The project has an initial after tax cost of $5,000,000 and it is expected to provide after-tax operating cash flows of $1,800,000 in year 1, ($2,900,000) in year 2, $2,700,000 in year 3 and $2,300,000 in year 4?

(a) NPV.
(b) IRR.
(c) Payback.
(d) Two of the above.

Answer: A
Level of Difficulty: 2
Learning Goal: 6
Topic: NPV versus IRR

48. There is sometimes a ranking problem among NPV and IRR when selecting among mutually exclusive investments. This ranking problem only occurs when

(a) the NPV is greater than the crossover point.
(b) the NPV is less than the crossover point.
(c) the cost of capital is to the right of the crossover point.
(d) the cost of capital is to the left of the crossover point.

Answer: D
Level of Difficulty: 3
Learning Goal: 5
Topic: NPV versus IRR

49. Consider the following projects, X and Y, where the firm can only choose one. Project X costs $600 and has cash flows of $400 in each of the next 2 years. Project B also costs $600, and generates cash flows of $500 and $275 for the next 2 years, respectively. Which investment should the firm choose if the cost of capital is 10 percent?

(a) Project X.
(b) Project Y.
(c) Neither.
(d) Not enough information to tell.

Answer: A
Level of Difficulty: 3
Learning Goal: 5
Topic: NPV versus IRR (Equation 9.1, Equation 9.1a, Equation 9.2 and Equation 9.2a)

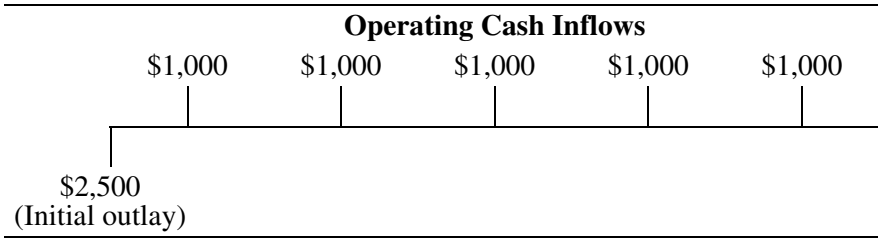
50. Consider the following projects, X and Y where the firm can only choose one. Project X costs $600 and has cash flows of $400 in each of the next 2 years. Project B also costs $600, and generates cash flows of $500 and $275 for the next 2 years, respectively. Which investment should the firm choose if the cost of capital is 25 percent?

(a) Project X.
(b) Project Y.
(c) Neither.
(d) Not enough information to tell.

Answer: C
Level of Difficulty: 3
Learning Goal: 5
Topic: NPV versus IRR (Equation 9.1, Equation 9.1a, Equation 9.2 and Equation 9.2a)

■ Essay Questions

Table 9.4



1. Given the information in Table 9.4 and 15 percent cost of capital,

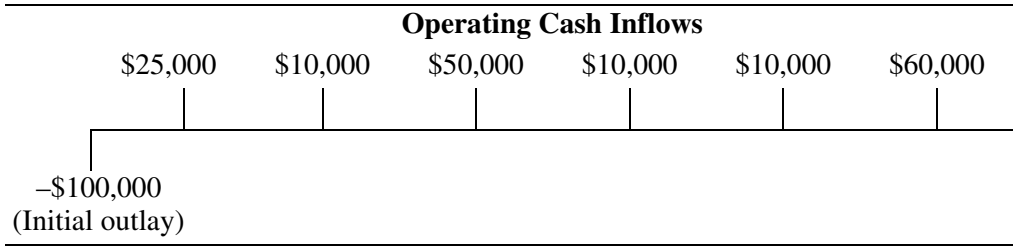
(a) compute the net present value.
(b) should the project be accepted?

Answers:

(a) NPV = 1,000 (PVIFA15%,5) – 2,500
= 1,000 (3.352) – 2,500 = $852
(b) Since NPV > 0, the project should be accepted.

Level of Difficulty: 3
Learning Goal: 3
Topic: Net Present Value

Table 9.5



2. Given the information in Table 9.5 and 15 percent cost of capital,
   (a) compute the net present value.
   (b) should the project be accepted?

Answers:

(a)

Year	CF	PVIF 15%,t	PV
1	$25,000	0.870	$21,750
2	10,000	0.756	7,560
3	50,000	0.658	32,900
4	10,000	0.572	5,720
5	10,000	0.497	4,970
6	60,000	0.432	25,920
			$98,820

NPV = 98,820 – 100,000 = –$1,180 < 0

(b) Since NPV < 0, the project should be rejected.

Level of Difficulty: 3
Learning Goal: 3
Topic: Net Present Value (Equation 9.1 and Equation 9.1a)

Degnan Dance Company, Inc., a manufacturer of dance and exercise apparel, is considering replacing an existing piece of equipment with a more sophisticated machine. The following information is given.

Table 9.6

Facts	
Existing Machine	**Proposed Machine**
Cost = $100,00	Cost = $150,000
Purchased 2 years ago	Installation = $20,000
Depreciation using MACRS over a 5-year recover schedule	Depreciation—the MACRS 5-year recovery schedule will be used
Current market value = $105,000	
Five year usable life remaining	Five year usable life expected

Earnings before Depreciation and Taxes

Existing Machine			Proposed Machine		
Year	1	$160,000	Year	1	$170,000
	2	150,000		2	170,000
	3	140,000		3	170,000
	4	140,000		4	170,000
	5	140,000		5	170,000

The firm pays 40 percent taxes on ordinary income and capital gains.

3. Given the information in Table 9.6, compute the initial investment.

Answer:

Cost of new equipment	$150,000
Installation cost	20,000
Proceeds from sale of existing equip.	–105,000
Tax effect on sale of existing equip.	22,800
Initial Investment	$87,800

Level of Difficulty: 4
Learning Goal: 3
Topic: Initial Investment

4. Given the information in Table 9.6, compute the incremental annual cash flows.

Answer:

Calculation of Operating Cash Flows

Year	Profits before Depreciation and Taxes	Depreciation	Net Profits before Taxes	Taxes	Net Profits after Taxes	Cash Flow
Existing Machine						
1	$160,000	$19,000	$141,000	$56,400	$84,600	$103,600
2	150,000	12,000	138,000	55,200	82,800	94,800
3	140,000	12,000	128,000	51,200	76,800	88,800
4	140,000	5,000	135,000	54,000	81,000	86,000
5	140,000	0	140,000	56,000	84,000	84,000
6	0	0	0	0	0	0
Proposed Machine						
1	$170,000	$34,000	$136,000	$54,400	$81,600	$115,600
2	170,000	54,400	115,600	46,240	69,360	123,760
3	170,000	32,300	137,700	55,080	82,620	114,920
4	170,000	20,400	149,600	59,840	89,760	110,160
5	170,000	20,400	149,600	59,840	89,760	110,160
6	0	8,500	–8,500	3,400	–5,100	3,400

Calculation of Incremental Cash Flows

Year	Proposed Machine	Existing Machine	Incremental Cash Flows
1	$115,600	$103,600	$12,000
2	123,760	94,800	28,960
3	114,920	88,800	26,120
4	110,160	86,000	24,160
5	110,160	84,000	26,160
6	3,400	0	3,400

Level of Difficulty: 4
Learning Goal: 3
Topic: Incremental Operating Cash Flows

5. Given the information in Table 9.6, compute the payback period.

Answer:

Year	Incremental Cash Flows	Cumulative Cash Flow
1	$12,000	$12,000
2	28,960	40,960
3	26,120	67,080
4	24,160	91,240
5	26,160	115,400
6	3,400	118,800

PP = 3 + [(87,800 – 67,080)/24,160] = 3.86 years.

Level of Difficulty: 4
Learning Goal: 3
Topic: Payback Method

6. Given the information in Table 9.6 and 15 percent cost of capital,
   (a) compute the net present value.
   (b) Should the project be accepted?

Answers:

(a)

Year	ICF	PVIF15%,t	PV
1	$12,000	0.870	$10,440
2	28,960	0.756	21,894
3	26,120	0.658	17,187
4	24,160	0.572	13,820
5	26,160	0.497	13,002
6	3,400	0.432	1.469
			$77,812

NPV = 77,812 – 87,800 = –$9,988

(b) Since NPV < 0, the project should be rejected.

Level of Difficulty: 4
Learning Goal: 3
Topic: Net Present Value (Equation 9.1 and Equation 9.1a)

Galaxy Satellite Co. is attempting to select the best group of independent projects competing for the firm's fixed capital budget of $10,000,000. Any unused portion of this budget will earn less than its 20 percent cost of capital. A summary of key data about the proposed projects follows.

Table 9.7

Project	Initial Investment	IRR	PV of Inflows at 20%
A	$3,000,000	21%	$3,050,000
B	9,000,000	25	9,320,000
C	1,000,000	24	1,060,000
D	7,000,000	23	7,350,000

7. Use the NPV approach to select the best group of projects. (See Table 9.7)

Answer: Choose Projects C and D, since this combination maximizes NPV at $410,000 and only requires $8,000,000 initial investment.

Level of Difficulty: 3
Learning Goal: 6
Topic: NPV and Capital Rationing

8. Use the IRR approach to select the best group of projects. (See Table 9.7)

Answer:

IRR Approach

Project	IRR	Initial Investment	NPV
B	25%	$9,000,000	$320,000
C	24	1,000,000	60,000
D	23	7,000,000	350,000
A	21	3,000,000	50,000

Choose Projects B and C, resulting in a NPV of $380,000.

Level of Difficulty: 3
Learning Goal: 6
Topic: IRR and Capital Rationing

9. Which projects should the firm implement? (See Table 9.7)

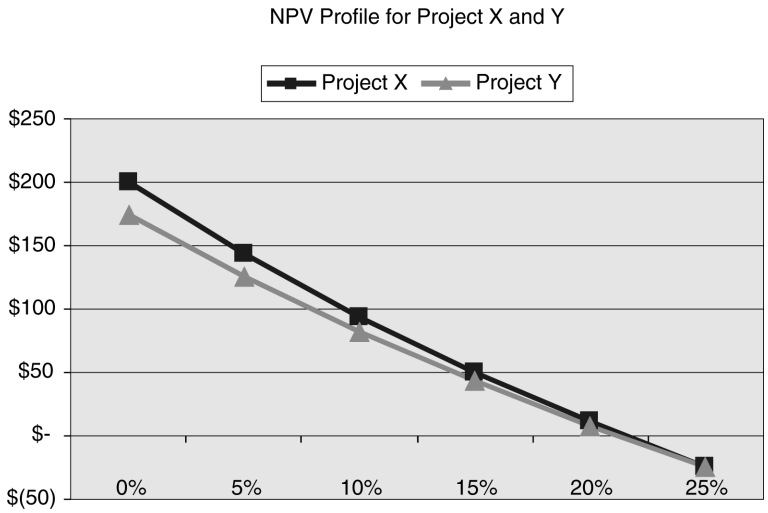
Answer: Projects C and D

Level of Difficulty: 3
Learning Goal: 6
Topic: NPV versus IRR and Capital Rationing

10. Consider the following projects, X and Y where the firm can only choose one. Project X costs $600 and has cash flows of $400 in each of the next 2 years. Project B also costs $600, and generates cash flows of $500 and $275 for the next 2 years, respectively. Sketch a net present value profile for each of these projects. Which project should the firm choose if the cost of capital is 10 percent? What if the cost of capital is 25 percent? Show all work.

Answer:

Cost of Capital	Project X	Project Y
0%	$200	$175
5%	$144	$126
10%	$94	$86
15%	$50	$43
20%	$11	$8
25%	$(24)	$(24)



At a cost of capital of 10 percent, the firm would choose Project X. At a cost of capital of 25 percent, the firm would choose neither.

Level of Difficulty: 3
Learning Goal: 6
Topic: Net Present Value Profiles (Equation 9.1 and Equation 9.1a)

11. Tangshan Mining Company is considering investing in a new mining project. The firm's cost of capital is 12 percent and the project is expected to have an initial after tax cost of $5,000,000. Furthermore, the project is expected to provide after-tax operating cash flows of $2,500,000 in year 1, $2,300,000 in year 2, $2,200,000 in year 3 and ($1,300,000) in year 4?

(a) Calculate the project's NPV.

(b) Calculate the project's IRR.

(c) Should the firm make the investment?

Answer:

Time	Cash Flow	PVIF(12%)	PV of CF
0	$(5,000,000)	1.0000	$(5,000,000)
1	$2,500,000	0.8929	$2,232,143
2	$2,300,000	0.7972	$1,833,546
3	$2,000,000	0.7118	$1,423,560
4	$(1,300,000)	0.6355	$(826,174)
		NPV	$(336,924)
		IRR	6.80%

No the firm should not accept the project.

Level of Difficulty: 3
Learning Goal: 5
Topic: NPV and IRR (Equation 9.1, Equation 9.1a, Equation 9.2 and Equation 9.2a)