

Chapter 10

Risk and Refinements In Capital Budgeting

■ Learning Goals

1. Understand the importance of recognizing risk in the analysis of capital budgeting projects.
2. Discuss breakeven cash flows, sensitivity and scenario analysis, and simulation as behavioral approaches for dealing with risk.
3. Discuss the unique risks that multinational companies face.
4. Describe the determination and use of risk-adjusted discount rates (RADRs), portfolio effects, and the practical aspects of RADRs.
5. Select the best of a group of unequal-lived mutually exclusive projects using annualized net present values (ANPVs).
6. Explain the role of real options and the objective and procedures for selecting projects under capital rationing.

■ True/False

1. The breakeven cash inflow is the minimum level of cash inflow necessary for a project to be acceptable.
Answer: TRUE
Level of Difficulty: 1
Learning Goal: 2
Topic: Breakeven Cash Inflow
2. Projects with a small chance of being acceptable and a broad range of expected cash flows are more risky than projects having a high chance of being acceptable and a narrow range of expected cash flows.
Answer: TRUE
Level of Difficulty: 2
Learning Goal: 2
Topic: Sensitivity Analysis
3. In capital budgeting, risk refers to the chance that a project has a high degree of variability of the initial investment.
Answer: FALSE
Level of Difficulty: 2
Learning Goal: 2
Topic: Recognizing Risk in Capital Budgeting

4. Sensitivity analysis is a behavioral approach that uses a number of possible values for a given variable to assess its impact on a firm's return.
Answer: TRUE
Level of Difficulty: 2
Learning Goal: 2
Topic: Sensitivity Analysis
5. Sensitivity analysis is a statistically based approach used in capital budgeting to get a feel for risk by applying predetermined probability distributions and random numbers to estimate risky outcomes.
Answer: FALSE
Level of Difficulty: 3
Learning Goal: 2
Topic: Sensitivity Analysis
6. Scenario analysis is an approach that uses a number of possible values for a given variable in order to assess its impact on a firm's return.
Answer: FALSE
Level of Difficulty: 3
Learning Goal: 2
Topic: Scenario Analysis
7. Simulation is an approach that evaluates the impact on return of simultaneous changes in a number of variables.
Answer: FALSE
Level of Difficulty: 3
Learning Goal: 2
Topic: Simulation Analysis
8. The output of simulation provides an excellent basis for decision making since it allows the decision maker to view a continuum of risk-return trade-offs rather than a single-point estimate.
Answer: TRUE
Level of Difficulty: 3
Learning Goal: 2
Topic: Simulation Analysis
9. In international trade, transfer prices are prices that subsidiaries charge each other for the goods and services traded between them.
Answer: TRUE
Level of Difficulty: 2
Learning Goal: 3
Topic: International Risk Analysis
10. The danger that an unexpected change in the exchange rate between the dollar and the currency in which a project's cash flows are denominated can increase the market value of that project's cash flow.
Answer: FALSE
Level of Difficulty: 3
Learning Goal: 3
Topic: International Risk Analysis

11. The importance and widespread use of transfer pricing in international trade makes capital budgeting in MNCs very difficult unless the transfer prices used accurately reflect actual costs and incremental cash flows.
Answer: TRUE
Level of Difficulty: 3
Learning Goal: 3
Topic: International Risk Analysis
12. The three basic types of risk associated with international cash flows are 1) business and financial risks, 2) inflation and foreign exchange risks, and 3) political risks.
Answer: TRUE
Level of Difficulty: 3
Learning Goal: 3
Topic: International Risk Analysis
13. The risk-adjusted discount rate (RADR) is the risk-adjustment factor that represents the percent of estimated cash inflows that investors would be satisfied to receive for certain rather than the cash inflows that are possible for each year.
Answer: FALSE
Level of Difficulty: 1
Learning Goal: 4
Topic: Risk-Adjusted Discount Rate
14. The risk-adjusted discount rate (RADR) is the rate of return that must be earned on a given project to compensate the firm's owners adequately, thereby resulting in the maintenance or improvement of share price.
Answer: TRUE
Level of Difficulty: 2
Learning Goal: 4
Topic: Risk-Adjusted Discount Rate
15. A market risk-return function is a graphical presentation of the discount rates associated with each level of project risk.
Answer: TRUE
Level of Difficulty: 2
Learning Goal: 4
Topic: Risk-Adjusted Discount Rate
16. The risk-adjusted discount rate (RADRs) are the risk-adjustment factors that represent the percent of estimated cash inflows that investors would be satisfied to receive for certain rather than the cash inflows that are possible for each year.
Answer: FALSE
Level of Difficulty: 3
Learning Goal: 4
Topic: Risk-Adjusted Discount Rate

17. Because of the basic mathematics of compounding and discounting, the risk-adjusted discount rate (RADR) approach implicitly assumes that risk is an increasing function of time.
Answer: TRUE
Level of Difficulty: 4
Learning Goal: 4
Topic: Risk-Adjusted Discount Rate
18. The higher the risk of a project, the higher its risk-adjusted discount rate and thus the lower the net present value for a given stream of cash inflows.
Answer: TRUE
Level of Difficulty: 4
Learning Goal: 4
Topic: Risk-Adjusted Discount Rate
19. In case of unequal-lived, mutually exclusive projects, the use of net present value to select the better project could result in an incorrect decision.
Answer: TRUE
Level of Difficulty: 1
Learning Goal: 5
Topic: Annualized Net Present Values
20. When unequal-lived projects are independent, the length of the projects' lives is not critical.
Answer: TRUE
Level of Difficulty: 2
Learning Goal: 5
Topic: Annualized Net Present Values
21. When unequal-lived projects are independent, the impact of differing lives must be considered because the projects do not provide service over comparable time periods.
Answer: FALSE
Level of Difficulty: 3
Learning Goal: 5
Topic: Annualized Net Present Values
22. The investment opportunities schedule (IOS) is the graphical presentation of IRRs in descending order against the total dollar investment.
Answer: TRUE
Level of Difficulty: 1
Learning Goal: 6
Topic: Capital Rationing
23. The firm's objective is to use its budget to generate the highest internal rate of return for its cash inflows.
Answer: FALSE
Level of Difficulty: 3
Learning Goal: 6
Topic: Capital Rationing

24. In the real world, different projects have different levels of risk and the acceptance of a project generally has an impact on the firm's overall risk, although often in a minor way.
Answer: TRUE
Level of Difficulty: 2
Learning Goal: 1
Topic: Recognizing Risk in Capital Budgeting
25. In the real world, different projects have different levels of risk and the acceptance of a single project often has an enormous impact on the firm's overall risk.
Answer: FALSE
Level of Difficulty: 2
Learning Goal: 1
Topic: Recognizing Risk in Capital Budgeting
26. Behavioral approaches for dealing with risk include sensitivity analysis, scenario analysis, and simulation.
Answer: TRUE
Level of Difficulty: 2
Learning Goal: 2
Topic: Recognizing Risk in Capital Budgeting
27. Behavioral approaches for dealing with risk include adjusted net present value and risk-adjusted discount rates.
Answer: FALSE
Level of Difficulty: 2
Learning Goal: 2
Topic: Recognizing Risk in Capital Budgeting
28. In a capital budgeting context, risk is the chance that a project will prove unacceptable or, more formally, the degree of variability of cash flows.
Answer: TRUE
Level of Difficulty: 2
Learning Goal: 1
Topic: Recognizing Risk in Capital Budgeting
29. In a capital budgeting context, risk is generally thought of as the chance that NPV and IRR will provide conflicting recommendations to management.
Answer: FALSE
Level of Difficulty: 2
Learning Goal: 1
Topic: Recognizing Risk in Capital Budgeting
30. Sensitivity analysis is a behavioral approach that uses several possible values for a given variable, such as cash inflows, to assess that a variable's impact on the firm's return.
Answer: TRUE
Level of Difficulty: 3
Learning Goal: 2
Topic: Sensitivity Analysis

31. Sensitivity analysis is an explicit (as opposed to a behavioral) approach that uses several possible values for a given variable, such as cash inflows, to assess that a variable's impact on the firm's return.
Answer: FALSE
Level of Difficulty: 3
Learning Goal: 2
Topic: Sensitivity Analysis
32. Scenario analysis is a statistics-based behavioral approach that applies predetermined probability distributions and random numbers to estimate risky outcomes.
Answer: FALSE
Level of Difficulty: 3
Learning Goal: 2
Topic: Scenario Analysis
33. Simulation is a statistics-based behavioral approach that applies predetermined probability distributions and random numbers to estimate risky outcomes.
Answer: TRUE
Level of Difficulty: 3
Learning Goal: 2
Topic: Simulation Analysis
34. Scenario analysis is a behavioral approach that evaluates the impact on the firm's return of simultaneous changes in a number of variables.
Answer: TRUE
Level of Difficulty: 3
Learning Goal: 2
Topic: Scenario Analysis
35. Simulation analysis is a behavioral approach that evaluates the impact on the firm's return of simultaneous changes in a number of variables.
Answer: FALSE
Level of Difficulty: 3
Learning Goal: 2
Topic: Simulation Analysis
36. Exchange rate risk is the danger that an unexpected change in exchange rates will reduce the market value of a project's cash flow.
Answer: TRUE
Level of Difficulty: 2
Learning Goal: 3
Topic: International Risk
37. In general, exchange rate risk is easier to protect against than political risk.
Answer: TRUE
Level of Difficulty: 2
Learning Goal: 3
Topic: International Risk

38. In general, political risk is easier to protect against than exchange rate risk.
Answer: FALSE
Level of Difficulty: 2
Learning Goal: 3
Topic: International Risk
39. The risk-adjusted discount rate is the rate of return that a project must earn to maintain or improve the firm's share price.
Answer: TRUE
Level of Difficulty: 2
Learning Goal: 4
Topic: Risk-Adjusted Discount Rate
40. The risk-adjusted net present value is the rate of return that a project must earn to maintain or improve the firm's share price.
Answer: FALSE
Level of Difficulty: 2
Learning Goal: 4
Topic: Risk-Adjusted Discount Rate
41. The risk-adjusted discount rate can be computed as the risk free rate plus the product of a project's beta and the market risk premium.
Answer: TRUE
Level of Difficulty: 3
Learning Goal: 4
Topic: Risk-Adjusted Discount Rate (Equation 10.5)
42. The risk-adjusted discount rate can be computed as the risk free rate plus the product of a project's beta and the market return.
Answer: FALSE
Level of Difficulty: 3
Learning Goal: 4
Topic: Risk-Adjusted Discount Rate (Equation 10.5)
43. In applying risk-adjusted discount rates to project selection, projects falling above the SML would have a positive NPV and those falling below the SML would have a negative NPV.
Answer: TRUE
Level of Difficulty: 3
Learning Goal: 4
Topic: Risk-Adjusted Discount Rate (Equation 10.5)
44. In applying risk-adjusted discount rates to project selection, projects falling above the SML would have a negative NPV and those falling below the SML would have a positive NPV.
Answer: FALSE
Level of Difficulty: 3
Learning Goal: 4
Topic: Risk-Adjusted Discount Rate (Equation 10.5)

45. Because a business firm can be viewed as a portfolio of assets, it is important that the firm maintain a diversified portfolio of assets.

Answer: FALSE

Level of Difficulty: 3

Learning Goal: 4

Topic: Portfolio Effects

46. Even though a business firms can be viewed as a portfolio of assets, firms are not rewarded for selecting a diversified portfolio of assets because investors can more efficiently diversify away unsystematic risk on their own.

Answer: TRUE

Level of Difficulty: 3

Learning Goal: 4

Topic: Portfolio Effects

47. In spite of their appeal to total risk, RADRs are often used in practice.

Answer: TRUE

Level of Difficulty: 2

Learning Goal: 4

Topic: RADRs in Practice

48. Because of their focus on total risk, RADRs are the best theoretical method for adjusting for project risk and are therefore used most often in practice.

Answer: FALSE

Level of Difficulty: 2

Learning Goal: 4

Topic: RADRs in Practice

49. In selecting the best group of unequal-lived projects, if the projects are independent, the length of the projects lives is not critical.

Answer: TRUE

Level of Difficulty: 2

Learning Goal: 5

Topic: Projects with Unequal Lives

50. In selecting the best group of unequal-lived projects, if the projects are mutually exclusive, the length of the projects lives is not critical.

Answer: FALSE

Level of Difficulty: 2

Learning Goal: 5

Topic: Projects with Unequal Lives

51. The annualized net present value approach to evaluating projects with unequal lives converts the net present value of unequal-lived, mutually exclusive projects into an equivalent annual amount.
Answer: TRUE
Level of Difficulty: 2
Learning Goal: 5
Topic: Annualized Net Present Values
52. The risk-adjusted discount rate approach to evaluating projects with unequal lives converts the net present value of unequal-lived, mutually exclusive projects into an equivalent annual amount.
Answer: FALSE
Level of Difficulty: 2
Learning Goal: 5
Topic: Annualized Net Present Values
53. Real options are opportunities that are embedded in capital budgeting projects that enable managers to alter their cash flows and risks in a way that affects project acceptability.
Answer: TRUE
Level of Difficulty: 2
Learning Goal: 6
Topic: Real Options
54. Adjusted net present values are opportunities that are embedded in capital budgeting projects that enable managers to alter their cash flows and risks in a way that affects project acceptability.
Answer: FALSE
Level of Difficulty: 2
Learning Goal: 6
Topic: Real Options
55. The objective of capital rationing is to select the group of projects that provides the highest overall net present value and does not require more dollars than are budgeted.
Answer: TRUE
Level of Difficulty: 2
Learning Goal: 6
Topic: Real Options
56. The objective of capital rationing is to select the group of projects that provides the quickest overall payback and does not require more dollars than are budgeted.
Answer: FALSE
Level of Difficulty: 2
Learning Goal: 6
Topic: Real Options

■ Multiple Choice Questions

1. In the context of capital budgeting, risk refers to
 - (a) the degree of variability of the cash inflows.
 - (b) the degree of variability of the initial investment.
 - (c) the chance that the net present value will be greater than zero.
 - (d) the chance that the internal rate of return will exceed the cost of capital.

Answer: A
Level of Difficulty: 1
Learning Goal: 1
Topic: Recognizing Risk in Capital Budgeting
2. Diagrams that permit the mapping of the various investment decision alternatives and payoffs as well as their probabilities of occurrence are called
 - (a) simulations.
 - (b) sensitivity analysis.
 - (c) decision trees.
 - (d) multiple regression analysis.

Answer: C
Level of Difficulty: 1
Learning Goal: 2
Topic: Decision Trees
3. _____ measure(s) the risk of a capital budgeting project by estimating the NPVs associated with the optimistic, most likely, and pessimistic cash flow estimates.
 - (a) Simulations
 - (b) Risk-adjusted discount rates
 - (c) Sensitivity analysis
 - (d) Multiple regression analysis

Answer: C
Level of Difficulty: 2
Learning Goal: 2
Topic: Sensitivity Analysis
4. The advantage of using simulation in the capital budgeting process is
 - (a) ease of calculation.
 - (b) the availability of a continuum of risk-return trade-offs which may be used as the basis for decision-making.
 - (c) dependability of predetermined probability distributions.
 - (d) that it generates a continuum of risk-return trade-offs rather than a single-point estimate.

Answer: B
Level of Difficulty: 3
Learning Goal: 2
Topic: Simulation Analysis

A corporation is assessing the risk of two capital budgeting proposals. The financial analysts have developed pessimistic, most likely, and optimistic estimates of the annual cash inflows which are given in the following table. The firm's cost of capital is 10 percent.

Table 10.1

Project A		
Initial Investment	Annual Cash Inflow	Outcome
\$20,000	\$5,000	Pessimistic
	10,000	Most likely
	15,000	Optimistic
Project B		
Initial Investment	Annual Cash Inflow	Outcome
\$100,000	\$20,000	Pessimistic
	40,000	Most likely
	100,000	Optimistic

5. The range of the annual cash inflows for Project A is (See Table 10.1.)
 - (a) \$30,000.
 - (b) \$10,000.
 - (c) \$5,000.
 - (d) \$0.

Answer: B
 Level of Difficulty: 3
 Learning Goal: 2
 Topic: Sensitivity Analysis
6. If the projects have five-year lives, the range of the net present value for Project B is approximately (See Table 10.1.)
 - (a) \$80,560.
 - (b) \$201,000.
 - (c) \$255,410.
 - (d) \$303,280.

Answer: D
 Level of Difficulty: 3
 Learning Goal: 2
 Topic: Sensitivity Analysis
7. The expected net present value of project A if the outcomes are equally probable and the project has five-year life is (See Table 10.1.)
 - (a) -\$1,045.
 - (b) \$17,910.
 - (c) \$36,865.
 - (d) \$93,730.

Answer: B
 Level of Difficulty: 3
 Learning Goal: 2
 Topic: Sensitivity Analysis

8. The amount by which the required discount rate exceeds the risk-free rate is called
- (a) the opportunity cost.
 - (b) the risk premium.
 - (c) the risk equivalent.
 - (d) the excess risk.

Answer: B

Level of Difficulty: 1

Learning Goal: 4

Topic: Risk-Adjusted Discount Rate

9. The _____ reflects the return that must be earned on the given project to compensate the firm's owners adequately according to the project's variability of cash flows.
- (a) internal rate of return
 - (b) cost of capital
 - (c) risk-adjusted discount rate
 - (d) average rate of return

Answer: C

Level of Difficulty: 2

Learning Goal: 4

Topic: Risk-Adjusted Discount Rate

10. The preferred approach for risk adjustment of capital budgeting cash flows, from a practical viewpoint, is
- (a) sensitivity analysis.
 - (b) simulation.
 - (c) certainty equivalents.
 - (d) risk-adjusted discount rates.

Answer: D

Level of Difficulty: 2

Learning Goal: 4

Topic: Risk-Adjusted Discount Rate

11. The theoretical basis from which the concept of risk-adjusted discount rates is derived is
- (a) the Gordon model.
 - (b) the capital asset pricing model.
 - (c) simulation theory.
 - (d) the basic cost of money.

Answer: B

Level of Difficulty: 3

Learning Goal: 4

Topic: Risk-Adjusted Discount Rate

A firm is considering investment in a capital project which is described below. The firm's cost of capital is 18 percent and the risk-free rate is 6 percent. The project has a risk index of 1.5. The firm uses the following equation to determine the risk adjusted discount rate, RADR, for each project: $RADR = R_f + \text{Risk Index} (\text{Cost of capital} - R_f)$

Table 10.2

Initial Investment	\$1,000,000
Year	Cash Inflow
1	\$500,000
2	500,000
3	500,000

12. The net present value without adjusting the discount rate for risk is (See Table 10.2.)
 (a) \$336,000.
 (b) \$250,000.
 (c) \$179,400.
 (d) \$87,000.
 Answer: D
 Level of Difficulty: 4
 Learning Goal: 4
 Topic: Risk-Adjusted Discount Rate
13. The discount rate that should be used in the net present value calculation to compensate for risk is (See Table 10.2.)
 (a) 6 percent.
 (b) 15 percent.
 (c) 18 percent.
 (d) 24 percent.
 Answer: D
 Level of Difficulty: 4
 Learning Goal: 4
 Topic: Risk-Adjusted Discount Rate (Equation 10.2 and Equation 10.5)
14. The net present value of the project when adjusting for risk is (See Table 10.2.)
 (a) -\$9,500.
 (b) \$0.
 (c) \$87,000.
 (d) \$105,000.
 Answer: A
 Level of Difficulty: 4
 Learning Goal: 4
 Topic: Risk-Adjusted Discount Rate (Equation 10.2)

15. It has been found that the value of the stock of corporations whose shares are traded publicly in an efficient marketplace is
- (a) generally positively affected by diversification, because of the reduction in risk.
 - (b) generally negatively affected by diversification, because of the increase in risk.
 - (c) generally not affected by diversification, unless greater returns are expected.
 - (d) generally negatively affected by diversification, because of the increase in the required rate of return.

Answer: C

Level of Difficulty: 4

Learning Goal: 4

Topic: Portfolio Effects

16. The _____ approach is used to convert the net present value of unequal-lived projects into an equivalent annual amount (in net present value terms).
- (a) internal rate of return
 - (b) investment opportunities schedule
 - (c) risk-adjusted discount rate
 - (d) annualized net present value

Answer: D

Level of Difficulty: 1

Learning Goal: 5

Topic: Annualized Net Present Values

17. The objective of _____ is to select the group of projects that provides the highest overall net present value and does not require more dollars than are budgeted.
- (a) capital rationing
 - (b) scenario analysis
 - (c) certainty equivalents
 - (d) sensitivity analysis

Answer: A

Level of Difficulty: 1

Learning Goal: 6

Topic: Capital Rationing

18. The IRR approach to capital rationing involves graphically plotting project IRRs in descending order against total dollar investment on _____ graph.
- (a) an ANPV
 - (b) an NPV
 - (c) an RADR
 - (d) an IOS

Answer: D

Level of Difficulty: 1

Learning Goal: 6

Topic: Capital Rationing

19. If a firm has a limited capital budget and too many good capital projects to fund them all, it is said to be facing the problem of
- (a) constrained capital.
 - (b) wealth optimization.
 - (c) capital rationing.
 - (d) profitability.

Answer: C

Level of Difficulty: 1

Learning Goal: 6

Topic: Capital Rationing

20. Behavioral approaches for dealing with project risk
- (a) explicitly recognize project risk.
 - (b) are used to get a feel for project risk.
 - (c) are used both to get a feel for project risk and also explicitly recognize project risk.
 - (d) none of the above.

Answer: B

Level of Difficulty: 2

Learning Goal: 2

Topic: Behavioral Approaches

21. In a capital budgeting context, risk refers to
- (a) the chance that a project will prove unacceptable.
 - (b) the degree of variability of cash flows.
 - (c) neither (a) nor (b) is correct.
 - (d) both (a) and (b) are correct.

Answer: D

Level of Difficulty: 3

Learning Goal: 1

Topic: Recognizing Risk in Capital Budgeting

22. Breakeven cash inflow refers to
- (a) the minimum level of cash inflow necessary for a project to be acceptable, that is, $NPV > \$0$.
 - (b) the minimum level of cash inflow necessary for a project to be acceptable, that is, $NPV < \$0$.
 - (c) the minimum level of cash inflow necessary for a project to be acceptable, that is, $IRR < \text{cost of capital}$.
 - (d) none of the above is correct.

Answer: A

Level of Difficulty: 3

Learning Goal: 2

Topic: Breakeven Cash Inflow

23. Tangshan Mining Company, with a cost of capital of 10 percent, is considering investing in project A, with an initial investment of \$1,000,000. Project A is expected to provide equal cash inflows over its 15 year useful life. Based on this information, the breakeven cash inflow for the project is
- (a) \$1,000,000.
 - (b) \$131,474.
 - (c) \$100,000.
 - (d) none of the above.

Answer: B

Level of Difficulty: 3

Learning Goal: 2

Topic: Breakeven Cash Inflow (Equation 10.1)

24. Two approaches for dealing with project risk to capture the variability of cash inflows and NPVs are
- (a) sensitivity analysis and simulation.
 - (b) scenario analysis and simulation.
 - (c) sensitivity analysis and scenario analysis.
 - (d) none of the above.

Answer: C

Level of Difficulty: 4

Learning Goal: 2

Topic: Sensitivity and Scenario Analysis

25. A behavioral approach for dealing with project risk that uses several possible values for a given variable such as cash inflows to assess that variable's impact on NPV is called
- (a) sensitivity analysis.
 - (b) scenario analysis.
 - (c) simulation analysis.
 - (d) none of the above.

Answer: A

Level of Difficulty: 3

Learning Goal: 2

Topic: Sensitivity Analysis

26. A behavioral approach that evaluates the impact on the firm's return of simultaneous changes in a number of project variables is called
- (a) sensitivity analysis.
 - (b) scenario analysis.
 - (c) simulation analysis.
 - (d) none of the above.

Answer: B

Level of Difficulty: 3

Learning Goal: 2

Topic: Scenario Analysis

27. One type of simulation program made popular by the widespread use of personal computers is called
- (a) Monaco Simulation.
 - (b) Lemans Simulation.
 - (c) Cannes Simulation.
 - (d) Monte Carlo Simulation.

Answer: D

Level of Difficulty: 2

Learning Goal: 2

Topic: Simulation Analysis

28. Important types of risk in an international capital budgeting context include all of the following except
- (a) exchange rate risk.
 - (b) political risk.
 - (c) appropriation risk.
 - (d) all of the above are correct.

Answer: C

Level of Difficulty: 2

Learning Goal: 3

Topic: International Risk Considerations

Tangshan Mining Company is considering investment in one of two mutually exclusive projects M and N which are described below. Tangshan Mining's overall cost of capital is 15 percent, the market return is 15 percent and the risk-free rate is 5 percent. Tangshan estimates that the beta for project M is 1.20 and the beta for project N is 1.40.

Table 10.3

	Project M	Project N
Initial Investment	\$700,000	\$780,000
Year	Cash Inflows (CF)	
1	\$300,000	\$220,000
2	300,000	320,000
3	300,000	380,000
4	300,000	460,000

29. Using the risk-adjusted discount rate method of project evaluation, the NPV for project M is (See Table 10.3.)
- (a) \$156,494.
 - (b) \$122,970.
 - (c) \$85,732.
 - (d) None of the above.

Answer: B

Level of Difficulty: 3

Learning Goal: 4

Topic: Risk-Adjusted Discount Rate (Equation 10.2 and Equation 10.5)

30. Using the risk-adjusted discount rate method of project evaluation, the NPV for project N is (See Table 10.3.)
- (a) \$166,132.
 - (b) \$122,970.
 - (c) \$85,732.
 - (d) None of the above.

Answer: C

Level of Difficulty: 3

Learning Goal: 4

Topic: Risk-Adjusted Discount Rate (Equation 10.2 and Equation 10.5)

31. Using the risk-adjusted discount rate method of project evaluation, the better investment for Tangshan Mining is (See Table 10.3.)
- (a) Project M.
 - (b) Project N.
 - (c) They are equivalent.
 - (d) None of the above.

Answer: A

Level of Difficulty: 3

Learning Goal: 4

Topic: Risk-Adjusted Discount Rate (Equation 10.2 and Equation 10.5)

32. Which project, M or N, would be preferable if both projects were of average risk as the overall firm and Tangshan Mining has a beta of 1.0? (See Table 10.3.)
- (a) Project M.
 - (b) Project N.
 - (c) They are equivalent.
 - (d) None of the above.

Answer: B

Level of Difficulty: 3

Learning Goal: 4

Topic: Risk-Adjusted Discount Rate (Equation 10.2 and Equation 10.5)

33. Which of the following statements is most correct?
- (a) Because a business firm can be viewed as a portfolio of assets, it is important that the firm maintain a diversified portfolio of investments in order to reduce firm diversifiable risk.
 - (b) Firm's are rewarded for choosing and implementing from among a diversifiable collection of projects through higher stock values.
 - (c) Firms generally are not rewarded for choosing and implementing from among a diversifiable collection of projects through higher stock prices.
 - (d) Two of the above are true.

Answer: C

Level of Difficulty: 3

Learning Goal: 4

Topic: Portfolio Effects

Yong Importers, an Asian import company, is evaluating two mutually exclusive projects, A and B. The relevant cash flows for each project are given in the table below. The cost of capital for use in evaluating each of these equally risky projects is 10 percent.

Table 10.4

	Project A	Project B
Initial Investment	\$350,000	\$425,000
Year	Cash Inflows (CF)	
1	\$140,000	\$175,000
2	165,000	150,000
3	190,000	125,000
4		100,000
5		75,000
6		50,000

34. The NPVs of projects A and B are (See Table 10.4):

(a) \$95,066 and \$56,386, respectively.
 (b) \$56,386 and \$95,066, respectively.
 (c) -\$56,386 and -\$95,066, respectively.
 (d) none of the above.

Answer: B

Level of Difficulty: 3

Learning Goal: 5

Topic: Annualized NPV (Equation 10.6)

35. The Annualized NPV of project A is (See Table 10.4)

(a) \$22,673.
 (b) \$12,947.
 (c) \$38,227.
 (d) \$21,828.

Answer: A

Level of Difficulty: 3

Learning Goal: 5

Topic: Annualized NPV (Equation 10.6)

36. The Annualized NPV of project B is (See Table 10.4)

(a) \$11,673.
 (b) \$12,947.
 (c) \$38,227.
 (d) \$21,828.

Answer: D

Level of Difficulty: 3

Learning Goal: 5

Topic: Annualized NPV (Equation 10.6)

37. Which project should be chosen on the basis of the normal NPV approach? (See Table 10.4)
- (a) Project A
 - (b) Project B
 - (c) neither
 - (d) both

Answer: B

Level of Difficulty: 3

Learning Goal: 5

Topic: Annualized NPV (Equation 10.6)

38. Which project should be chosen using the Annualized NPV approach? (See Table 10.4)
- (a) Project A
 - (b) Project B
 - (c) neither
 - (d) both

Answer: A

Level of Difficulty: 3

Learning Goal: 5

Topic: Annualized NPV (Equation 10.6)

39. Major types of real options include all of the following except the
- (a) abandonment option.
 - (b) timing option.
 - (c) conversion option.
 - (d) growth option.

Answer: C

Level of Difficulty: 3

Learning Goal: 6

Topic: Real Options

40. An approach to capital rationing that involves graphing project returns in descending order against the total dollar investment to determine the group of acceptable projects is called the
- (a) net present value approach.
 - (b) the internal rate of return approach.
 - (c) the payback approach.
 - (d) the profitability index approach.

Answer: B

Level of Difficulty: 2

Learning Goal: 6

Topic: Real Options

■ Essay Questions

Johnson Farm Implement is faced with two mutually exclusive projects, P and Q. The following are the data about the two projects.

Table 10.5

Project	P	Q
Initial Investment	\$40,000	\$50,000
Project Life	3 years	3 years
Annual Cash Flow	\$15,000	\$25,000
Risk Adjusted Discount Rate	10%	14%
Risk-Free Rate of Return	6%	6%

1. Evaluate the projects using risk-adjusted discount rates. (See Table 10.5.)

Answer: $NPV_P = 15,000 (2.487) - 40,000 = -\$2,695$

$NPV_Q = 25,000 (2.322) - 50,000 = \$8,050$

Level of Difficulty: 3

Learning Goal: 4

Topic: Risk-Adjusted Discount Rate (Equation 10.2 and Equation 10.5)

2. Which project do you recommend? (See Table 10.5.)

Answer: Project P has a negative net present value using RADRs. Project Q has a positive NPV of \$8,050 using RADRs. Project Q is recommended.

Level of Difficulty: 3

Learning Goal: 4

Topic: Risk-Adjusted Discount Rate (Equation 10.2 and Equation 10.5)

3. A firm is evaluating two mutually exclusive projects that have unequal lives. The firm must evaluate the projects using the annualized net present value approach and recommend which project they should select. The firm's cost of capital has been determined to be 18 percent, and the projects have the following initial investments and cash flows:

	Project W	Project Y
Initial investment:	\$40,000	\$58,000
Cash flows:		
1	\$20,000	\$30,000
2	20,000	35,000
3	20,000	40,000
4	20,000	
5	20,000	

Answer:

Project W: NPV = \$20,000(3.127) – \$40,000 = \$22,540	
Project Y: \$30,000(0.847)	= \$25,410
35,000(0.718)	= 25,130
40,000(0.609)	= 24,360
	<u>\$74,900</u>
	<u>58,000</u>
	NPV = \$16,900

ANPV of Project W: \$22,540/3.127 = \$7,208

ANPV of Project Y: \$16,900/2.174 = \$7,774

Select Project Y, highest ANPV.

Level of Difficulty: 4

Learning Goal: 5

Topic: Annualized Net Present Value (Equation 10.6)

Nico Manufacturing is considering investment in one of two mutually exclusive projects X and Y which are described below. Nico Manufacturing's overall cost of capital is 15 percent, the market return is 15 percent and the risk-free rate is 5 percent. Nico estimates that the beta for project X is 1.20 and the beta for project Y is 1.40.

Table 10.6

Initial Investment	Project X	Project Y
	\$3,500,000	\$3,900,000
Year	Cash Inflows (CF)	
1	\$1,500,000	\$1,100,000
2	1,500,000	1,600,000
3	1,500,000	1,900,000
4	1,500,000	2,300,000

4. Calculate the risk-adjusted discount rates for project X and project Y. (See Table 10.6)

Answer: $k_x = 5\% + 1.20 (15\% - 5\%) = 17\%$

$k_y = 5\% + 1.40 (15\% - 5\%) = 19\%$

Level of Difficulty: 2

Learning Goal: 4

Topic: Risk-Adjusted Discount Rate (Equation 10.2 and Equation 10.5)

5. Using the risk-adjusted discount rate method of project evaluation, find the NPV for projects X and Y. Which project should Nico select using this method? (See Table 10.6)

Answer:

Time	Project X	PVIF @ 17%	PV of CFs
0	\$(3,500,000)	1.0000	\$(3,500,000)
1	1,500,000	0.8547	1,282,051
2	1,500,000	0.7305	1,095,770
3	1,500,000	0.6244	936,556
4	1,500,000	0.5337	800,475
NPV _x			\$614,853

Time	Project Y	PVIF @ 19%	PV of CFs
0	\$(3,900,000)	1.0000	\$(3,900,000)
1	1,100,000	0.8403	924,370
2	1,600,000	0.7062	1,129,864
3	1,900,000	0.5934	1,127,490
4	2,300,000	0.4987	1,146,938
NPV _y			\$428,662

Level of Difficulty: 2

Learning Goal: 4

Topic: Risk-Adjusted Discount Rate (Equation 10.2 and Equation 10.5)

6. Calculate the NPV of projects X and Y assuming that the firm did not employ the RADR method and instead used the firm's overall cost of capital to evaluate projects X and Y. (See Table 10.6)

Answer:

Time	Project X	PVIF @ 16%	PV of CFs
0	\$(3,500,000)	1.0000	\$(3,500,000)
1	1,500,000	0.8696	1,304,348
2	1,500,000	0.7561	1,134,216
3	1,500,000	0.6575	986,274
4	1,500,000	0.5718	857,630
NPV _x			\$782,468

Time	Project Y	PVIF @ 15%	PV of CFs
0	\$(3,900,000)	1.0000	\$(3,900,000)
1	1,100,000	0.8696	956,522
2	1,600,000	0.7561	1,209,830
3	1,900,000	0.6575	1,249,281
4	2,300,000	0.5718	1,315,032
NPV _y			\$830,665

The NPV of X is less than the NPV of Y using the firm's overall cost of capital. Choose Project Y.

Level of Difficulty: 2

Learning Goal: 4

Topic: Risk-Adjusted Discount Rate (Equation 10.2 and Equation 10.5)

7. What potential biases exist in project selection if Nico Manufacturing did not adjust for the difference in risk between projects X and Y (See Table 10.6).

Answer: The danger of not accounting for differences in project risk is that the firm may potentially unacceptable high-risk projects (with negative NPVs) may be chosen over potentially acceptable low-risk projects (with positive NPVs).

Level of Difficulty: 3

Learning Goal: 4

Topic: Risk-Adjusted Discount Rate (Equation 10.2 and Equation 10.5)