***Business Analytics, 2e, GE* (Evans)**

**Supplementary Chapter B Optimization Models with Uncertainty**

Use the table below to answer the following question(s).

Below is a spreadsheet for Stone Age Surfboards.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | A | B | C | D |
| 1 | **Stone Age Surfboards** |  |  |  |
| 2 |  |  |  |  |
| 3 | **Data** |  |  |  |
| 4 |  | **Product** | |  |
| 5 | **Department** | Rockwell | Limestone | Limitation (hours) |
| 6 | Fabrication | 3 | 4.5 | 75 |
| 7 | Finishing | 1.5 | 2 | 25 |
| 8 |  |  |  |  |
| 9 | Profit/Unit | $60.00 | $75.00 |  |
| 10 |  |  |  |  |
| 11 |  |  |  |  |
| 12 | **Model** |  |  |  |
| 13 |  | Rockwell | Limestone |  |
| 14 | Quantity Produced |  |  | Hours Used |
| 15 | Fabrication |  |  |  |
| 16 | Finishing |  |  |  |
| 17 |  |  |  |  |
| 18 |  |  |  | Excess Limestone |
| 19 | Market Mixture |  |  |  |
| 20 |  |  |  |  |
| 21 |  |  |  | Total Profit |
| 22 | Profit Contribution |  |  |  |

Assume that the finishing time for a pair of Rockwell surfboards is triangular with a minimum value of 1.4, a most likely value of 1.5, and a maximum value of 1.8 and that finishing time for a pair of Limestone surfboards is also triangular with a minimum value of 1.8, a most likely value of 2.0, and a maximum value of 2.4. The number of trials per simulation is equal to 5000.

1) Which of the following cells is defined with a triangular distribution?

A) B6

B) D6

C) B7

D) D7

Answer: C

Diff: 1

Blooms: Understand

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

2) Which of the following cells is defined as the uncertain output cell?

A) D15

B) D16

C) D19

D) D22

Answer: B

Diff: 1

Blooms: Understand

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

3) What is the value of mean obtained from the simulation results?

A) 15.65

B) 25.91

C) 20.78

D) 30.42

Answer: B

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

4) What is the value of standard deviation obtained from the simulation results?

A) 1.20

B) 2.50

C) 3.80

D) 5.00

Answer: A

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

5) What is the mean absolute deviation obtained from the simulation results?

A) 1.25

B) 0.65

C) 0.24

D) 0.99

Answer: D

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

6) What is the coefficient of variation obtained from the simulation results?

A) 0.098

B) 0.134

C) 0.047

D) 0.020

Answer: C

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

7) How often will overtime be needed if 4.55 Rockwell and 9.09 Limestone surfboards, the optimal solution, are scheduled each day?

A) more than 60%

B) more than 87%

C) more than 75%

D) more than 52%

Answer: C

Diff: 3

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

Use the table below to answer the following question(s).

Below is the spreadsheet for an economic order quantity model.

|  |  |  |  |
| --- | --- | --- | --- |
|  | A | B | C |
| 1 | **Economic Order Quantity Model** |  |  |
| 2 |  |  |  |
| 3 | **Data** |  |  |
| 4 |  |  |  |
| 5 | **Annual Demand Rate** | 20,000 |  |
| 6 | **Ordering Cost** | $ 250.00 |  |
| 7 | **Unit Cost** | $ 25.00 |  |
| 8 | **Carrying Charge Rate** | 0.2 |  |
| 9 |  |  |  |
| 10 | **Model** |  |  |
| 11 |  |  |  |
| 12 | **Order Quantity** | 1300 |  |
| 13 | **Annual Demand Rate** |  |  |
| 14 | **Ordering Cost** |  |  |
| 15 | **Order Cost** |  |  |
| 16 | **Carrying Charge Rate** |  |  |
| 17 | **Unit Cost** |  |  |
| 18 | **Inventory Cost** |  |  |
| 19 | **Total Cost** |  |  |
| 20 |  |  |  |
| 21 | **Lead time** | 0.0245 |  |
| 22 | **Lead time demand** |  |  |
| 23 | **Reorder point** | 500 |  |

Assume that the distribution of demand is normal with a mean of 20,000 and standard deviation of 2,000.

8) Which of the following cells is defined to be normally distributed using the function = PsiNormal(20000,2000)?

A) B5

B) B6

C) B7

D) B12

Answer: A

Diff: 1

Blooms: Understand

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

9) Which of the following cells is defined as the uncertain output cell?

A) B13

B) C15

C) C19

D) B22

Answer: D

Diff: 1

Blooms: Understand

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

10) What is the value of mean obtained from the simulation results?

A) 473.0

B) 520.0

C) 456.0

D) 490.0

Answer: D

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

11) What is the value of standard deviation obtained from the simulation results?

A) 35.0

B) 49.0

C) 56.0

D) 41.0

Answer: B

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

12) What is the mean absolute deviation obtained from the simulation results?

A) 39.10

B) 24.56

C) 58.75

D) 46.36

Answer: A

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

13) What is the coefficient of variation obtained from the simulation results?

A) 0.28

B) 0.10

C) 0.45

D) 0.60

Answer: B

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

14) What is the reorder point required to attain a 95% service level?

A) 460.0

B) 750.5

C) 571.0

D) 640.5

Answer: C

Diff: 3

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

15) What is the value of safety stock at a 95% service level?

A) 45

B) 71

C) 120

D) 95

Answer: B

Diff: 3

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

16) What is the increase in total cost?

A) $ 280

B) $ 590

C) $ 353

D) $ 450

Answer: C

Diff: 3

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

Use the table below to answer the following question(s).

The Atlas Movies Theater has repriced their ticket rates to maximize revenues. They have three classes of tickets: Classic, Silver, and Gold. The table below provides information on the average ticket sales, revenue and price elasticity on demand. They have a total seating capacity of 300. The table also provides the new price for the three classes obtained using Solver.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | A | B | C | D | E | F |
| 1 | **Atlas Movie Theater Ticketing** |  |  |  |  |  |
| 2 |  |  |  |  |  |  |
| 3 | **Data** |  |  |  |  |  |
| 4 |  |  |  |  |  |  |
| 5 | **Ticket Class** | **Current Rate** | **Average Daily Sold** | **Elasticity** | **Total Seating Capacity** |  |
| 6 | **Classic** | $8.45 | 150 | -1.5 | 300 |  |
| 7 | **Silver** | $13.25 | 80 | -2 |  |  |
| 8 | **Gold** | $17.50 | 30 | -1 |  |  |
| 9 |  |  |  |  |  |  |
| 10 | **Model** |  |  |  |  |  |
| 11 |  |  |  |  |  |  |
| 12 | **Ticket Class** | **New**  **Price** | **Price Range** |  | **Projected Tickets Sold** | **Projected Revenue** |
| 13 | **Classic** | $7.50 | $6.50 | $7.50 |  |  |
| 14 | **Silver** | $12.17 | $11.50 | $12.50 |  |  |
| 15 | **Gold** | $16.50 | $15.50 | $16.50 |  |  |
| 16 |  |  |  | **Totals** |  |  |

Assume the distributions of elasticities for three classes of tickets are uniform with minimum and maximum values equal to 75% and 125% of their estimated values, respectively. Under this assumption, use Monte Carlo simulation to see what happens to the prediction of tickets sold. The model is simulated for 10,000 trials.

17) Which of the following cells are defined to be uniformly distributed?

A) B6:B8

B) C6:C8

C) D6:D8

D) B13:B15

Answer: C

Diff: 1

Blooms: Understand

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

18) Which of the following cells is defined as the output cell?

A) E16

B) E18

C) F17

D) F18

Answer: A

Diff: 1

Blooms: Understand

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

19) What is the value of mean obtained from the simulation results?

A) 450

B) 300

C) 400

D) 250

Answer: B

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

20) What is the value of standard deviation obtained from the simulation results?

A) 5

B) 4

C) 8

D) 10

Answer: B

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

21) What is the mean absolute deviation obtained from the simulation results?

A) 3

B) 6

C) 8

D) 10

Answer: A

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

22) What is the coefficient of variation obtained from the simulation results?

A) 0.086

B) 0.120

C) 0.014

D) 0.048

Answer: C

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

23) What is the probability that more than 300 tickets will be sold?

A) approximately 0.75

B) approximately 0.40

C) approximately 0.60

D) approximately 0.50

Answer: D

Diff: 3

Blooms: Apply

AACSB: Analytic Skills

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

LO2: Use a modern software tool to perform statistical calculations.

Use the table below to answer the following question(s).

Below is the spreadsheet for a newsvendor model.

|  |  |  |
| --- | --- | --- |
|  | A | B |
| 1 | **Newsvendor Model** |  |
| 2 |  |  |
| 3 | **Data** |  |
| 4 |  |  |
| 5 | Selling price | $ 20.00 |
| 6 | Cost | $ 14.00 |
| 7 | Discount price | $ 8.00 |
| 8 |  |  |
| 9 | **Model** |  |
| 10 |  |  |
| 11 | Demand | 42 |
| 12 | Purchase Quantity |  |
| 13 |  |  |
| 14 | Quantity Sold |  |
| 15 | Surplus Quantity |  |
| 16 |  |  |
| 17 | Profit |  |

Answer the following question(s) using multiple parameterized simulations. The range for the historical demandis 40-51. Assume a uniform integer distribution for demand, and run 12 simulations for different purchase quantities. Use 5,000 trials and 1 for random seed.

24) Which of the following is the best purchase quantity to maximize the expected profit if demand is 42?

A) 42

B) 45

C) 48

D) 51

Answer: A

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Optimizing Monte Carlo Simulation Models

LO1: Use multiple parameterized simulations in Risk Solver Platform to find optimal solutions in simulation models with decision variables.

LO2: Use a modern software tool to perform statistical calculations.

25) Which of the following values of purchase quantity shows the least mean profit?

A) 42

B) 45

C) 48

D) 51

Answer: D

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Optimizing Monte Carlo Simulation Models

LO1: Use multiple parameterized simulations in Risk Solver Platform to find optimal solutions in simulation models with decision variables.

LO2: Use a modern software tool to perform statistical calculations.

26) What is the value of mean profit generated by the simulation if the purchase quantity is equal to 45?

A) $ 234

B) $ 255

C) $ 216

D) $ 222.

Answer: B

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Optimizing Monte Carlo Simulation Models

LO1: Use multiple parameterized simulations in Risk Solver Platform to find optimal solutions in simulation models with decision variables.

LO2: Use a modern software tool to perform statistical calculations.

Use the table below to answer the following question(s).

Below is a spreadsheet for a hotel overbooking model.

|  |  |  |
| --- | --- | --- |
|  | A | B |
| 1 | **Hotel Overbooking Model** |  |
| 2 |  |  |
| 3 | **Data** |  |
| 4 |  |  |
| 5 | Rooms available | 400 |
| 6 | Price | $ 150 |
| 7 | Overbooking cost | $ 100 |
| 8 |  |  |
| 9 | **Model** |  |
| 10 |  |  |
| 11 | Reservation limit | 400 |
| 12 | Customer demand | 430 |
| 13 | Reservations made |  |
| 14 | Cancellations | 20 |
| 15 | Customer arrivals |  |
| 16 | Overbooked customers |  |
| 17 |  |  |
| 18 | Net revenue |  |

Answer the following question(s) using multiple parameterized simulations. The range of historical customer demandis 400-430. Assume a uniform integer distribution for customer demand, and run parameterized simulations for different reservation limits. Use 5,000 trials and 1 for random seed.

27) What is the number of reservations made that will generate a net revenue of $59,000?

A) 400

B) 410

C) 420

D) 430

Answer: D

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Optimizing Monte Carlo Simulation Models

LO1: Use multiple parameterized simulations in Risk Solver Platform to find optimal solutions in simulation models with decision variables.

LO2: Use a modern software tool to perform statistical calculations.

28) Which of the following is the best number of reservations to accept?

A) 400

B) 410

C) 420

D) 430

Answer: C

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Optimizing Monte Carlo Simulation Models

LO1: Use multiple parameterized simulations in Risk Solver Platform to find optimal solutions in simulation models with decision variables.

LO2: Use a modern software tool to perform statistical calculations.

29) What is the number of reservations that will generate the least revenue?

A) 400

B) 410

C) 420

D) 430

Answer: A

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Optimizing Monte Carlo Simulation Models

LO1: Use multiple parameterized simulations in Risk Solver Platform to find optimal solutions in simulation models with decision variables.

LO2: Use a modern software tool to perform statistical calculations.

30) If 425 reservations are made, and there are 20 cancellations, what is the mean net revenue generated by the simulation?

A) $ 58,000

B) $ 58,500

C) $ 59,000

D) $ 58,995

Answer: D

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Optimizing Monte Carlo Simulation Models

LO1: Use multiple parameterized simulations in Risk Solver Platform to find optimal solutions in simulation models with decision variables.

LO2: Use a modern software tool to perform statistical calculations.

Use the table below to answer the following question(s).

Below is the spreadsheet for a portfolio allocation model.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | A | B | C | D | E |
| 1 | **Portfolio Allocation Model** |  |  |  |  |
| 2 |  |  |  |  |  |
| 3 | **Data** |  |  |  |  |
| 4 |  |  |  |  |  |
| 5 | **Investment** | **Annual return** | **Minimum** | **Maximum** | **Risk factor per dollar** |
| 6 | Life Insurance | 4.4% | $ 3,500.00 | $ 5,500.00 | -0.5 |
| 7 | Bond mutual funds | 8.4% | $ 35,000.00 | None | 1.8 |
| 8 | Stock mutual funds | 7.1% | $ 18,000.00 | None | 2.1 |
| 9 | Savings Account | 4.0% | none | None | -0.3 |
| 10 | Total amount available | $ 100,000 |  | **Limit** | 100,000 |
| 11 |  |  |  |  |  |
| 12 | **Model** |  |  |  |  |
| 13 |  |  |  |  |  |
| 14 | **Decision Variables** | **Amount invested** |  | **Total weighted risk** |  |
| 15 | Life insurance | $ 5,500.00 |  | $ 100,000.00 |  |
| 16 | Bond mutual funds | $ 41,857.14 |  |  |  |
| 17 | Stock mutual funds | $ 18,000.00 |  | **Total**  **expected** |  |
| 18 | Savings Account | $ 34,642.86 |  | **return** |  |
| 19 | Total amount invested | $ 100,000.00 |  | $ 6,421.71 |  |

Answer the following question(s) using a model with uncertainty on type of investment return. Assume that the distributions of life insurance annual return is uniform with minimum 4% and maximum 6%, bond mutual funds annual return is normal with mean 7% and standard deviation 1%, stock mutual funds annual return is lognormal with mean 11% and standard deviation 4%. Use 10,000 trials and 1 for random seed for the simulation.

31) What is the value of the mean obtained from the simulation results that maximizesthe total expected return? [Hint: Choose the approximate value.]

A) $ 5,876.28

B) $ 6,570.76

C) $ 7,257.45

D) $ 5,178.84

Answer: B

Diff: 3

Blooms: Apply

AACSB: Analytic Skills

Topic: Simulation Optimization Using Risk Solver Platform

LO1: Use Risk Solver Platform to combine simulation modeling and optimization to maximize or minimize the expected value of a model output.

LO2: Use a modern software tool to perform statistical calculations.

32) What is the value of standard deviation obtained from the simulation results for maximizing the total expected return? [Hint: Choose the approximate value.]

A) $ 1,346.78

B) $ 1,890.25

C) $843.52

D) $ 1,578.64

Answer: C

Diff: 3

Blooms: Apply

AACSB: Analytic Skills

Topic: Simulation Optimization Using Risk Solver Platform

LO1: Use Risk Solver Platform to combine simulation modeling and optimization to maximize or minimize the expected value of a model output.

LO2: Use a modern software tool to perform statistical calculations.

33) What is the value of mode obtained from the simulation results for maximizing the total expected return? [Hint: Choose the approximate value.]

A) $ 6,378.39

B) $ 5,848.24

C) $ 5,281.79

D) $ 7,025.86

Answer: A

Diff: 3

Blooms: Apply

AACSB: Analytic Skills

Topic: Simulation Optimization Using Risk Solver Platform

LO1: Use Risk Solver Platform to combine simulation modeling and optimization to maximize or minimize the expected value of a model output.

LO2: Use a modern software tool to perform statistical calculations.

34) What is the mean absolute deviation obtained from the simulation results for maximizing the total expected return? [Hint: Choose the approximate value.]

A) $ 887.25

B) $ 735.86

C) $ 651.97

D) $ 967.36

Answer: C

Diff: 3

Blooms: Apply

AACSB: Analytic Skills

Topic: Simulation Optimization Using Risk Solver Platform

LO1: Use Risk Solver Platform to combine simulation modeling and optimization to maximize or minimize the expected value of a model output.

LO2: Use a modern software tool to perform statistical calculations.

35) What is the coefficient of variation obtained from the simulation results for maximizing the total expected return? [Hint: Choose the approximate value.]

A) 1.2451

B) 0.4865

C) 0.8917

D) 0.1284

Answer: D

Diff: 3

Blooms: Apply

AACSB: Analytic Skills

Topic: Simulation Optimization Using Risk Solver Platform

LO1: Use Risk Solver Platform to combine simulation modeling and optimization to maximize or minimize the expected value of a model output.

LO2: Use a modern software tool to perform statistical calculations.

Use the table below to answer the following question(s).

Below is the spreadsheet for a project selection model.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | A | B | C | D | E | F | G |
| 1 | **Project Selection Model** |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |
| 3 | **Data** |  |  |  |  |  |  |
| 4 |  | Project 1 | Project 2 | Project 3 | Project 4 | Project 5 | Available |
| 5 | **Mean**  **Return**  **(NPV)** | $160,000 | $240,000 | $180,000 | $120,000 | $250,000 | Resources |
| 6 | Standard Deviation | $18,000 | $24,000 | $12,000 | $12,000 | $29,000 |  |
| 7 | Probability of Success | 0.6 | 0.6 | 0.4 | 0.5 | 0.2 |  |
| 8 |  |  |  |  |  |  |  |
| 9 | Cash Requirements | $58,000 | $80,000 | $26,000 | $53,000 | $66,000 | $180,000 |
| 10 | Personnel Requirements | 6 | 4 | 3 | 4 | 5 | 14 |
| 11 |  |  |  |  |  |  |  |
| 12 | **Model** |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |
| 14 | **Project selection decisions** | 0 | 1 | 1 | 0 | 1 | **Total** |
| 15 | **Project successful?** | 0 | 1 | 0 | 0 | 0 |  |
| 16 | Return | $ - | $237,997 | $ - | $ - | $ - | $237,997 |
| 17 | Cash Used | $ - | $80,000 | $26,000 | $ - | $ 66,000 | $172,000 |
| 18 | Personnel Used | 0 | 4 | 3 | 0 | 5 | 12 |

Answer the following question(s) using a model with uncertainty on project selection. Assume that the distribution oneach project return is LogNormal. Use 10,000 trials and 1 for random seed for the simulation.

36) Which of the following cells is defined as the output cell?

A) B16

B) G16

C) G17

D) G18

Answer: B

Diff: 1

Blooms: Apply

AACSB: Analytic Skills

Topic: Simulation Optimization Using Risk Solver Platform

LO1: Incorporate uncertainty into optimization models such as project selection.

LO2: Use a modern software tool to perform statistical calculations.

37) What is the value of mean obtained from the simulation results? [Hint: Choose the approximate value.]

A) $ 405,897

B) $ 358,138

C) $ 269,406

D) $ 452,785

Answer: C

Diff: 3

Blooms: Apply

AACSB: Analytic Skills

Topic: Simulation Optimization Using Risk Solver Platform

LO1: Incorporate uncertainty into optimization models such as project selection.

LO2: Use a modern software tool to perform statistical calculations.

38) What is the value of standard deviation obtained from the simulation results? [Hint: Choose the approximate value.]

A) $ 89,236

B) $ 180,278

C) $ 236,745

D) $ 107,892

Answer: B

Diff: 3

Blooms: Apply

AACSB: Analytic Skills

Topic: Simulation Optimization Using Risk Solver Platform

LO1: Incorporate uncertainty into optimization models such as project selection.

LO2: Use a modern software tool to perform statistical calculations.

39) What is the mean absolute deviation obtained from the simulation results? [Hint: Choose the approximate value.]

A) $ 143,767

B) $ 104,786

C) $ 188,995

D) $ 232,673

Answer: A

Diff: 3

Blooms: Apply

AACSB: Analytic Skills

Topic: Simulation Optimization Using Risk Solver Platform

LO1: Incorporate uncertainty into optimization models such as project selection.

LO2: Use a modern software tool to perform statistical calculations.

40) What is the coefficient of variation obtained from the simulation results? [Hint: Choose the approximate value.]

A) 0.386

B) 0.589

C) 0.415

D) 0.669

Answer: D

Diff: 3

Blooms: Apply

AACSB: Analytic Skills

Topic: Simulation Optimization Using Risk Solver Platform

LO1: Incorporate uncertainty into optimization models such as project selection.

LO2: Use a modern software tool to perform statistical calculations.

41) A chance constraint is one that specifies the fraction of trials in a simulation that must satisfy a constraint.

Answer: TRUE

Diff: 1

Blooms: Remember

Topic: Risk Analysis in Optimization

LO1: Solve optimization models with chance constraints.

42) A value at risk measure considers the magnitude of the violation when the constraint is not satisfied.

Answer: FALSE

Diff: 1

Blooms: Remember

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LO1: Solve optimization models with chance constraints.

43) A value at risk measure is more conservative in nature than a conditional value at risk measure.

Answer: FALSE

Diff: 1

Blooms: Remember

Topic: Risk Analysis in Optimization

LO1: Solve optimization models with chance constraints.

44) A service level is a constraint that represents the probability that demand can be satisfied.

Answer: TRUE

Diff: 1

Blooms: Remember

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

45) Below is the spreadsheet for an economic order quantity model.

|  |  |  |
| --- | --- | --- |
|  | A | B |
| 1 | **Economic Order Quantity Model** |  |
| 2 |  |  |
| 3 | **Data** |  |
| 4 |  |  |
| 5 | **Annual Demand Rate** | 20,000 |
| 6 | **Ordering Cost** | $ 250.00 |
| 7 | **Unit Cost** | $ 25.00 |
| 8 | **Carrying Charge Rate** | 0.2 |
| 9 |  |  |
| 10 | **Model** |  |
| 11 |  |  |
| 12 | **Order Quantity** | 1300 |
| 13 | **Annual Demand Rate** |  |
| 14 | **Ordering Cost** |  |
| 15 | **Order Cost** |  |
| 16 | **Carrying Charge Rate** |  |
| 17 | **Unit Cost** |  |
| 18 | **Inventory Cost** |  |
| 19 | **Total Cost** |  |
| 20 |  |  |
| 21 | **Lead time** | 0.0245 |
| 22 | **Lead time demand** |  |
| 23 | **Reorder point** | 500 |

Assume that the distribution of demand is normal with a mean of 20,000 and standard deviation of 2,000.The increase in total cost is calculated by adding the holding cost and the ordering cost.

Answer: FALSE

Diff: 2

Blooms: Understand

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

46) Define a chance constraint.

Answer: A chance constraint is one that specifies the fraction of trials in a simulation that must satisfy a constraint. Suppose that a company wants to determine a daily schedule so that the probability of overtime is less than 0.1, or 10% of the time. This can be done using a chance constraint.

Diff: 1

Blooms: Remember

Topic: Risk Analysis in Optimization

LO1: Solve optimization models with chance constraints.

47) What is a value at risk constraint?

Answer: Chance constraints are defined by a percentile, or value at risk (VaR) measure. A VaR constraint with chance *p*% requires that the constraint be satisfied *p*% of the time. This does not consider the magnitude of the violation when the constraint is not satisfied.

Diff: 1

Blooms: Remember

Topic: Risk Analysis in Optimization

LO1: Solve optimization models with chance constraints.

48) What is a conditional value at risk constraint?

Answer: A conditional value at risk (CVaR) constraint places a bound on the average magnitude of all violations of the constraint that may occur (1 — *p*)% of the time and is more conservative in nature. Generally, CVaR is better to use for very large problems because of its mathematical properties.

Diff: 1

Blooms: Remember

Topic: Risk Analysis in Optimization

LO1: Solve optimization models with chance constraints.

49) What is a service level?

Answer: A service level is a constraint that represents the probability that demand can be satisfied. For example, the reorder point is calculated as the demand during the lead time, or *r = Dt*, where *D* is the annual demand and *t* is the lead time, the time from the placement of the order until it is received. If *D* is uncertain, then the demand during the lead time will also be uncertain. This impacts how the reorder point should be chosen. This can be resolved by setting a service level.

Diff: 1

Blooms: Remember

Topic: Risk Analysis in Optimization

LO1: Evaluate risk in solutions to optimization models using Monte-Carlo simulation.

50) What are multiple parameterized simulations?

Answer: In certain models, the objective is to find the best value of the decision variables to maximize either the expected profit or net revenue. Although *Risk Solver Platform* makes it easy to conduct what-if analyses by changing the decision variables and quickly running new simulations, doing so can be tedious. *Risk Solver Platform* provides the capability, called multiple parameterized simulations, to automatically run simulations for a range of values and identify the best value for the decision variables.

Diff: 1

Blooms: Remember

Topic: Optimizing Monte Carlo Simulation Models

LO1: Use multiple parameterized simulations in Risk Solver Platform to find optimal solutions in simulation models with decision variables.