

BIT 5474

I want you to do the attached problems. Use 5,000 replications in your simulations for each of the questions.

Questions

1. Lynn Price recently completed her MBA and accepted a job with an electronics manufacturing company. Although she likes her job, she is also looking forward to retiring one day. To ensure that her retirement is comfortable, Lynn intends to invest \$3,000 of her salary into a tax-sheltered retirement fund at the end of each year. Lynn is not certain what rate of return this investment will earn each year, but she expects each year's rate of return could be modeled appropriately as a normally distributed random variable with a mean of 12.5% and standard deviation of 2%.
 - a. If Lynn is 30 years old, how much money should she expect to have in her retirement fund at age 60?
 - b. What is the probability that Lynn will have more than \$1 million in her retirement fund when she reaches age 60?
 - c. How much should Lynn invest each year if she wants there to be a 90% chance of having at least \$1 million in her retirement fund at age 60?
2. Michael Abrams runs a specialty clothing store that sells collegiate sports apparel. One of his primary business opportunities involves selling custom screenprinted sweatshirts for college football bowl games. He is trying to determine how many sweatshirts to produce for the upcoming Tangerine Bowl game. During the month before the game, Michael plans to sell his sweatshirts for \$25 a piece. At this price, he believes the demand for sweatshirts will be triangularly distributed with a minimum demand of 10,000, maximum demand of 30,000 and a most likely demand of 18,000. During the month after the game, Michael plans to sell any remaining sweatshirts for \$12 a piece. At this price, he believes the demand for sweatshirts will be triangularly distributed with a minimum demand of 2,000, maximum demand of 7,000, and a most likely demand of 5,000. Two months after the game, Michael plans to sell any remaining sweatshirts to a surplus store that has agreed to buy up to 2,000 sweatshirts for a price of \$3 per shirt. Michael can order custom screenprinted sweatshirts for \$8 a piece in lot sizes of 3,000.
 - a. On average, how much profit would Michael earn if he orders 18,000 sweatshirts?
 - b. How many sweatshirts should he order if he wants to maximize his expected profit?
3. Each year, the Schriber Corporation must determine how much to contribute to the company's pension plan. The company uses a ten-year planning horizon to determine the contribution which, if made annually in each of the next ten years, would allow for only a 10% chance of the fund running short of money. The company then makes that contribution in the current year and repeats this process in each subsequent year to determine the specific amount to contribute each year. (Last year, the company contributed \$23 million to the plan.) The pension plan covers two types of employees: hourly

and salaried. In the current year, there will be 6,000 former hourly employees and 3,000 former salaried employees receiving benefits from the plan. The change in the number of retired hourly employees from one year to the next is expected to vary according to a normal distribution with a mean of 4% and standard deviation of 1%. The change in the number of retired salaried employees from one year to the next is expected to vary between 1% and 4% according to a truncated normal distribution with a mean of 2% and standard deviation of 1%. Currently, hourly retirees receive an average benefit of \$15,000 per year, whereas salaried retirees receive an average annual benefit of \$40,000. Both of these averages are expected to increase annually with the rate of inflation, which is assumed to vary between 2% and 7% according to a triangular distribution with a most likely value of 3.5%. The current balance in the company's pension fund is \$1.5 billion. Investments in this fund earn an annual return that is assumed to be normally distributed with a mean of 12% and standard deviation of 2%. Create a spreadsheet model for this problem and use simulation to determine the pension fund contribution the company should make in the current year. What is your recommendation?


