

MBA8580: Business Analytics: Assignment 4

This assignment is designed to introduce you to simulation modeling. Please read through all instructions for the assignment as they pertain to modeling issues with @Risk.

Instructions

1. Place all problems in separate Excel files.
2. You do not need to submit @Risk tables or files.
3. Submit only your final model for each problem.
4. Make sure to answer all questions that are asked.
5. On the first sheet of each workbook put the names of all group members as well as any explanations for the problem.
6. Name the file with at least one group member's name in the filename.
7. Please do not zip your files.

See course schedule for due dates.

Problem 1

- Pierre's Bakery bakes bread in batches of 12 loaves
- Daily demand for the loaves follows the following discrete distribution.

Daily Demand	
Demand	Probability
36	0.10
48	0.25
60	0.30
72	0.20
84	0.10
96	0.05

- Each loaf costs \$0.25 to make and sells for \$0.40
- Any bread left over at the end of the day is sold to a charitable kitchen for \$0.10 /loaf

- If demand exceeds supply, Pierre incurs a lost-profit cost of \$0.15 /loaf (loss of goodwill, etc.)
 - How many loaves should Pierre bake each day to maximize expected profit?
-

Problem 2

A Flexible Savings Account (FSA) plan allows you to put money into an account at the beginning of the year that can be used for medical expenses. This amount is not subject to federal tax. As you pay medical expenses during the year, you are reimbursed by the administrator of the FSA until the money is exhausted. From that point on, you must pay your medical expenses out of your own pocket. On the other hand, if you put more money into your FSA than the medical expenses you incur, this extra money is lost to you. Your annual salary is \$90,000 and your federal income tax rate is 24%.

Assume that your medical expenses in a year are normally distributed with mean \$2000 and standard deviation \$400. Build an @Risk model in which the output is the amount of money left to you after paying taxes, putting money in an FSA, and paying any extra medical expenses. What FSA contribution amount (to the nearest \$250) maximizes the expected "money left to you"?

Problem 3

A new edition of the textbook will be published next year. The publisher currently has 2000 copies on hand and is deciding whether to do another printing before the new edition comes out. A production run incurs a fixed cost of \$10,000 plus variable cost of \$15 per book printed. Books are sold for \$130 per book. Any demand that cannot be met incurs a penalty cost of \$20 per book, due to loss of goodwill. Up to 500 of leftover books can be sold to Barnes & Noble for \$35 per book.

Printing Data	
Demand	Probability
3000	0.2
4000	0.4
6000	0.1
8000	0.2
10000	0.1

What print run size between 0 and 16,000 (to the nearest 1000 units) will maximize expected profit?

Problem 4

Suppose you have put together a portfolio with four stocks. You've invested 40% of the portfolio in stock 1 and 20% in each of stocks 2, 3, and 4. The mean and standard deviation of the annual return on each stock and the correlations between the annual returns on the four stocks are shown in the tables below.

Distributions of returns (assumed normal)		
Stock	Mean	Stdev
Stock 1	10%	20%
Stock 2	13%	12%
Stock 3	8%	40%
Stock 4	17%	20%

Correlation Matrix				
	Stock 1	Stock 2	Stock 3	Stock 4
Stock 1	1.00	0.80	0.70	0.60
Stock 2	0.80	1.00	0.90	0.55
Stock 3	0.70	0.90	1.00	0.30
Stock 4	0.60	0.55	0.30	1.00

- Develop and interpret a 95% confidence interval for the portfolio's mean annual return (using 5,000 iterations).
 - What is the probability that your portfolio's annual return will exceed 30%?
 - What is the probability that your portfolio will lose money during the course of a year?
-