Assignment 4: Spreadsheet Simulation Using @Risk

Due Date: 03/06/2017 (Monday)

Name(s): _____

Make sure all your group members (no more than 3) sign here.

There are three questions (15 total points) in this assignment. All relevant Excel files can be found on Sakai. Solve these questions in Excel and fill in the solution template provided below.

For questions related to @Risk, it will probably help to review what we did in class by reading pages 561-572 in the Practical Management Science 5th Ed textbook in the text where the @Risk features are discussed. I think it will be easiest to go find a PC on campus to use @Risk. It can be found by clicking on the Start button, then All Programs, then Palisade Decision Tools, then @Risk. This will launch Excel and @Risk at the same time. You will then find the @Risk menu.

Question 1: Investing for retirement (Retirement.xlsx)

Consider a variation of the investing for retirement example we discussed in class and implement the following strategy:

- invest at mean 8%, standard deviation 25% if balance is < $700,000;
- invest at mean 5%, standard deviation 15% if balance is >= $700,000 and < $1,000,000;
- stop investing if balance is >= $1,000,000.

a. Specify the following @Risk Model in Excel:

	A	B	C	D	E
1	**Investing for retirement**				
2					
3	Initial yearly investment	$8,000	**Strategy**: invest at mean 8%, standard deviation 25% if balance is < $700,000;		
4	Annual increase in investme	3.00%	invest at mean 5%, standard deviation 15% if balance is >= $700,000 and < $1,000,000;		
5			stop investing if balance is >= $1,000,000.		
6	Annual return on investment (normal dist.)				
7	Mean	8.00%		Mean	5.00%
8	St. dev.	25.00%		St. dev.	15.00%
9					
10	Target	$700,000		Target	$1,000,000
11					
12		Amount	Beginning		Ending
13	Year	invested	balance	Return	balance
14	1				
15	2				
16	3				
17	4				
18	5				
19	6				
…					
40	27				
41	28				
42	29				
43	30				

b. Report the mean and standard deviation of the ending balance after 30 years.

Mean = _____
Standard deviation = _____

c. What is the probability that the ending balance is >= $1,000,000? (You get the probability by looking at the detailed statistics output and typing in 1,000,000 into a "target value" cell in the column corresponding to the ending balance. See page 593-594 of the text.)

Prob (the ending balance >= $1,000,000) = _____

d. Compare the strategy you analyzed in this problem to the strategy we discussed in class (Model 3: invest at 8% if balance is <$1,000,000 and stop investing if balance is >=$1,000,000). Suppose Amanda's investment target is to achieve an ending balance of $1,000,000. Which strategy would you recommend? Why?

_____
_____
_____
_____
_____
_____

Question 2: Doubling strategy in Roulette (Roulette.xlsx)

Suppose you have $100 at the beginning and you decide to bet on Red in Roulette.

Simulate the following *doubling* strategy. You begin by betting $1. Each subsequent bet is decided as follows: If you won the last bet, you again bet $1. If you lost the last bet, you bet twice the previous bet, if you have enough money. Otherwise, you return to betting $1 unless you've run out.

a. Specify the following @Risk Model in Excel:

	A	B	C	D	E	F	G	H	I	J
1	**Simulating Roulette Strategies**									
2										
3							**Doubling strategy**			
4	Outcome		Prob.		Total bank		Bet #	Bet size	Spin result	Winnings
5	1	(your chosen color)			100		0			100
6	2						1	1		
7							2			
8							3			
9							4			
10							5			
…										
95							90			
96							91			
97							92			
98							93			
99							94			
100							95			
101							96			
102							97			
103							98			
104							99			
105							100			

b. Define *Final Winning* as the winning after 100 rounds of betting. If your money runs out before 100 rounds, then the winnings remain zero.

What's the probability of losing all your initial $100?

What's the probability of getting a final winning of $150 or more?

Question 3: When to pull the goalie in hockey (Hockey.xlsx)

Consider a variation of the hockey example we discussed in class and implement the following strategy: Pull your goalie if you are behind at any point in the last *three minutes* of the game; put him back in if you tie the score.

a. Specify the following @Risk Model in Excel:

	A	B	C	D	E	F
1	**When to pull the goalie in hockey**					
2				Possible strategies (seconds left when goalie is pulled)		
3	Seconds left when goalie is pulled			60	120	180
4						
5	**Inputs**					
6	Prob of goal full-strength	0.0083				
7	Prob of our goal (our goalie pulled)	0.0133				
8	Prob of their goal (our goalie pulled)	0.02				
9						
10	Current score (ours minus theirs)	-1				
11						
12	**Simulation**					
13	Time left (seconds)	Our score minus theirs	Are we behind?	Goalie Pulled?	We score?	They score?
14	180					
15	170					
16	160					
17	150					
18	140					
19	130					
20	120					
21	110					
22	100					
23	90					
24	80					
25	70					
26	60					
27	50					
28	40					
29	30					
30	20					
31	10					
32	0					
33						
34	We win or tie?					
35						
36	**Selected summary measures from @RISK**					
37		Prob(we win or tie)				
38	Strategy	1 minute	2 minutes	3 minutes		
39	Mean					

b. What's the probability that we win or tie?

Selected summary measures from @RISK			
	Prob(we win or tie)		
Strategy	1 minute	2 minutes	3 minutes
Mean			