Homework IV (Group)

Due date: 23:59 on December 30 (Monday), 2024

Q1 (50%) Please read the attached case. Use the Hooke-Jeeves, Nelder-Mead, or stochastic search algorithms in Lecture 8 to find the best decision. Compare the algorithmic solutions to a brute-force grid search procedure based on for loops.
Consider Q_7 with a possible range in [11, 110]. Please analyze strategies (a), (b), (c) below to find Q_7 Susan needs to have in order to maximize annual expected return E.

(a) Take a Fixed-start strategy, i.e., send out $Q_{7_{fixed}}$ offers to graduates in June, who will all be on board on July 1. $Q_{7_{fixed}} = ?\ E_{fixed} = ?$

(b) Take a Flexible-start strategy, i.e., send out $Q_{7_{flexible}}$ offers to graduates in June. Half will be on board on July 1, another half will be on board on September 1. $Q_{7_{flexible}} = ?\ E_{flexible} = ?$

(c) Add a recruiting event in December and send out Q_{12} offers in [11,110], who will be on board on January 1. This event will operate with the Fixed-start strategy or the Flexible-start strategy. What will be the new $Q_{7_{fixed}} = ?\ E_{fixed} = ?$ How about $Q_{7_{flexible}} = ?\ E_{flexible} = ?$ Based on your simulation, will the December recruiting event increase expected return?

If you need to make any extra assumptions, feel free to do so and clearly explain your settings. Good luck.

Q2(50%) Go back to the To Hedge or Not to Hedge case in Lecture 4. Following the Python code and assumed problem setting, i.e., 1998 sales forecast for German is 645 million DM and 1998 sales forecast for England is 272 million BP.
I have already simulated 1,000 possible scenarios of exchange rates for DM and BP. See the "SimExRates.csv" file on WM5.
Suppose for each currency you have 500 million budget to buy put options from the table below. Use at least one *stochastic search* algorithm in Lecture 8 to find optimal decisions to minimize the probability of earning < USD$706 million in the end of 1998 (after exchanging DM and BP back to USD$).
You will have 9 decision variables for DM and 9 for BP, making of total of 18. Each variable is continuous and the sum of 9 decision variables will be 1 (100%).

Strike Price for DM (in $)	*Cost (in $)*
0.66	0.085855
0.65	0.032191
0.64	0.020795
0.63	0.017001
0.62	0.013711
0.61	0.010851
0.60	0.008388
0.59	0.006291
0.55	0.001401

Strike Price for BP (in $)	*Cost (in $)*
1.30	0.137213
1.25	0.082645
1.20	0.045060
1.15	0.028348
1.10	0.016146
1.05	0.007860
1.00	0.003277
0.95	0.001134
0.90	0.000245