=== Decision Management Community ===

Challenge July 2024 "Smart Investment"

Solution with Excel Solver

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Problem Statement

The problem was defined at https://dmcommunity.org/challenge-july-2024/ as a Challenge July-2024:

Smart Investment Solutions

A client of an investment firm has $10000 available for investment. He has instructed that his money be invested in particular stocks, so that no more than $5000 is invested in any one stock but at least $1000 be invested in each stock. He has further instructed the firm to use its current data and invest in the manner that maximizes his overall gain during a one-year period. The stocks, the current price per share and the firm's predicted stock price a year from now are summarized below:

Stock	Current Price	Projected Price 1 year
ABC	$25	$35
XYZ	$50	$60
TTT	$100	$125
LMN	$25	$40

You task is to create a decision model that can be used to make a smart investment while satisfying the client requirements for different combinations of stocks. Send your solutions to DecisionManagementCommunity@gmail.com.

I've used Excel Solver to solve a variety of optimization problems as a student at Seton Hall University through my "Quantitative Decision Making" class. This document will include my Excel Solver-based solution.

Excel Solver Solution

The client wishes to allocate their $10,000 investment between four stocks: ABC, XYZ, TTT, and LMN.

Stock	Current Price	Projected Price in 1yr
ABC	25	35
XYZ	50	60
TTT	100	125
LMN	25	40

Each stock must have at least $1,000 invested in it, and no more than $5,000 may be invested in a single stock. So, the goal here is to make investments that maximize profit over a one-year period.

Defining Decision Variables and the Objective

To solve this, we'll set up a linear programming model in Excel:

	A	B	C	D	E	F	G	H	I	J
1	**Stock**	**Current Price**	**Projected Price in 1yr**					**Results**		
2	ABC	25	35				**ABC**	**XYZ**	**TTT**	**LMN**
3	XYZ	50	60				120	20	10	200
4	TTT	100	125							
5	LMN	25	40							
6										
7	client has $10000, no more than 5k in any one stock but atleast 1000 in each									
8							**Objective**	4650		
9										
10		**ABC**	**XYZ**	**TTT**	**LMN**		Total Constraint	10000	<=	10000
11	Profit (Projected-Current)	10	10	25	15					
12							ABC	3000	<=	5000
13							XYZ	1000	<=	5000
14							TTT	1000	<=	5000
15							LMN	5000	<=	5000
16										
17							ABC	3000	>=	1000
18							XYZ	1000	>=	1000
19							TTT	1000	>=	1000
20							LMN	5000	>=	1000

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The main decision variables are defined as follows:

The amount invested in ABC is defined in cell G3.
The amount invested in XYZ is defined in H3.
The amount invested in TTT is defined in I3.
The amount invested in LMN is defined in J3.

After I define all constraints and run Excel Solver these cells will contain the Results.

The objective is defined in cell H8 using the formula =SUMPRODUCT(B11:E11,G3:J3) where profit is calculated as projected price – current price in B11:E11.

Defining Constraints

The Total Constraint "$10,000 should be invested in total" is defined in cells H10:J10, where

H10: =B2*ABC + B3*XYZ + B4*TTT + B5* LMN

Max Limit Constraints are defined in cells G12 – J15, where

H12: =B2*ABC

H13: =B3*XYZ

H14: =B4*TTT

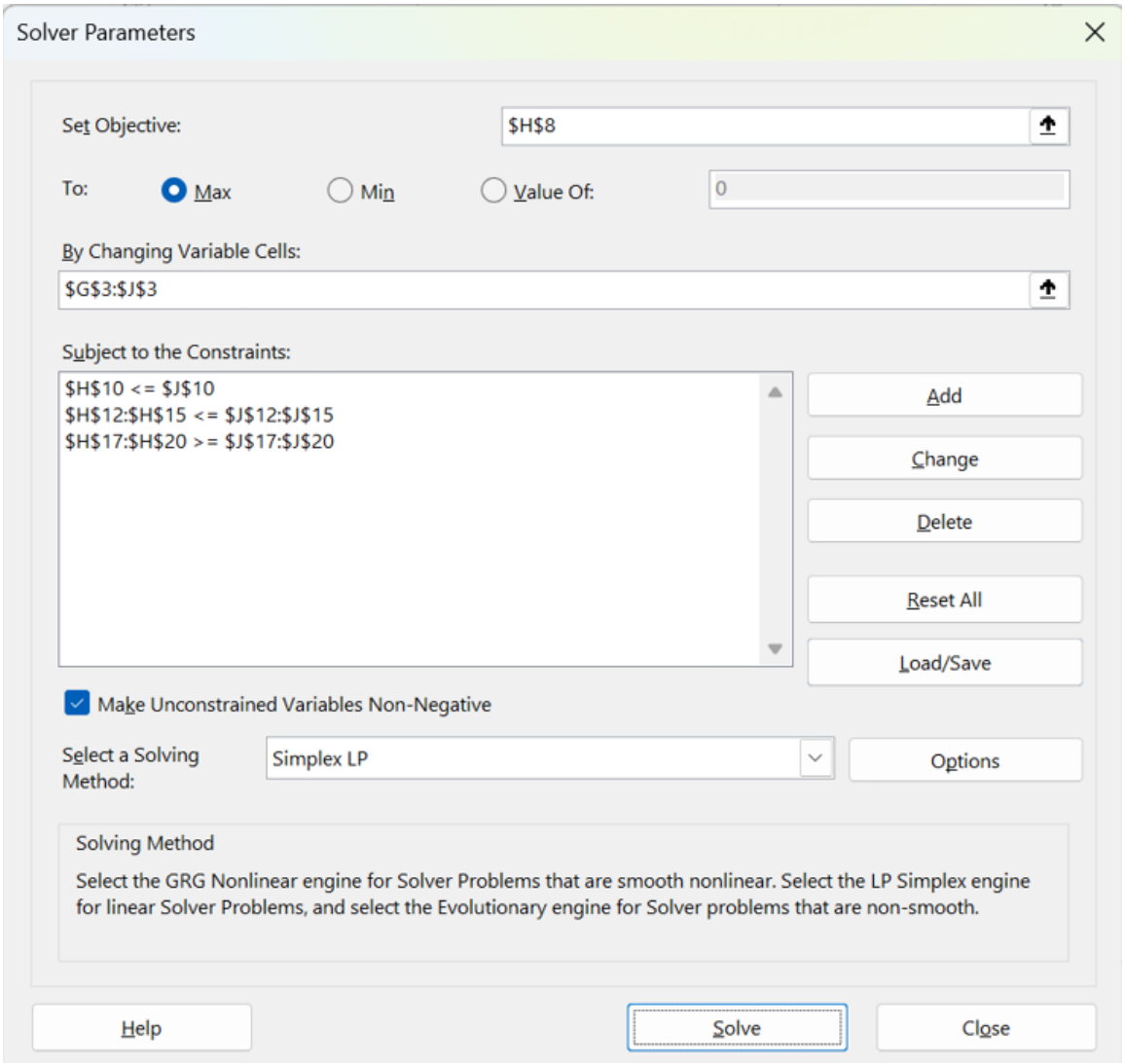
H15: =B5*LMN

Min Limit Constraints are defined similarly in cells G17-J20.

Optimal Solution

I opened Excel Solver from the Data tab. Input the objective variable as the objective function/set objective, and set the objective cell to maximize. In addition, input the changing variable cells as my decision variables and include all constraints as seen below.

It's also important to make sure the solver is using Simplex Linear Programming. Lastly, run Solver to find the optimal solution.



I clicked on "Solve" and received the following solution:

Results			
ABC	**XYZ**	**TTT**	**LMN**
120	20	10	200
Objective	4650		

The optimal investment strategy based on these findings is $120 in ABC, $20 in XYZ, $10 in TTT, and $200 in LMN. Additionally, this will generate up to $4650 in profit.