Module 04 – Multiperiod Modeling

Exploratory Data Analysis

*In this section, you should perform some data analysis on the data provided to you. Please format your findings in a visually pleasing way and please be sure to include these cuts:*

* *Make a nicely formatted table with the needed data on each investment*

Model Formulation

*Write the formulation of the model into here prior to implementing it in your Excel model. Be explicit with the definition of the decision variables, objective function, and constraints*

Objective Function:

MINIMIZE: A1+B1+C1+D1+E1  
A- Bubblegum Benchmark Fund

B-Gumball Growth Group

C-Gummy Bear Growth Fund

D-Jellybean Junction Capital

E-Sour Patch Portfolio Group

Decision Variables:

AMOUNT Column

(Values assigned to: J2:J18 by Solver)

Constraints:  
Non-negativity constraint= (Amount column) J2:J18>=0

Surplus funds must meet Required Payments, by period (pay off the required payments).

M19:U19 = M20:U20

Model Optimized for Least Cost out of Pocket

*Implement your formulation into Excel and be sure to make it neat. This section should include:*

* *A screenshot of your optimized final model (formatted nicely, of course)*
* *A text explanation of what your model is recommending*
* *Add some sort of visualization. Some ideas:*
  + *A pie chart or stacked bar chart to compare money out of pocket vs end amount*
  + *A line chart to show either current amount or cumulative amount invested in each investment*
  + *Any other solution you may have*

A screenshot of a computer

Description automatically generated*Optimized Model*

This optimization model aims to minimize money spent out of pocket, by the end of the period. We set up the variables so the decision variable (what Solver finds values for) is the Amount column, and at the bottom of that column is the Objective Function that is our final figure for what should be invested in month 1. An additional measure that had to be accounted for was that the surplus funds of each period ending had to be greater than or equal to the required payments we have for each designated month. With all pieces of the model satisfied, we were given a value of $880.61 invested in month one. Giving investors a data-driven answer to the question of where to put their money, and when.

A screenshot of a graph

Description automatically generatedFor a visual representation of my model, I chose to go on the pie chart route. My reasoning behind this is to create a visual aid for the untrained eye to decipher the reasoning behind the model. As we are focusing on minimizing out-of-pocket costs, we can compare the out-of-pocket spending vs. the ending amount. By comparing the money spent out of pocket with the end amount, you can calculate the ROI, which indicates the efficiency and profitability of the investments. Here, this was not done, but my visual aid provides investors, or curious eyes, a general statement as to what our model can do to influence investment practices. Here our initial investment of $1,393.51 grew to $2,274.12 reflecting a 163.19 percent increase.

Model with Stipulation

*Please copy the tab of your original model before continuing with the next part to avoid messing up your original solution.*

*Try one of these 2 scenarios:*

* *If we remove the midterm payments and instead pay the entirety at the end of the time period, does your model change at all? If so, why may there be a change?*
* *An investor normally tries not to be oversubscribed/overexposed to one single investment. Can you add a constraint to your model to limit the amount of exposure in any single investment and describe how the model has changed?*

Analyzing the model, it appears that the solver put a great deal of trust into the Gumball Growth Group (from here on, GGG). This means that if something negative were to happen to GGG, outside the control of investors, then we would suffer serious repercussions and things like required payments may not be fulfilled. What I decided to do was limit the investments into GGG by 30%, which was a serious step, but was demonstrative to show how much the previous model relied on GGG. After implementing this change, because of the rather large limit I imposed, the solver saw it as beneficial to not touch this investment group and the four instances of possible investment were passed up. So, the new collective total invested in GGG of $1125.68, was reduced to zero. I think it would be interesting to re-run this with something like a 5% limit to see if solver put any money in at all.

A screenshot of a computer

Description automatically generatedWhat this does is diversify the model, reducing the risk associated with a single investment, in this case GGG. The new objective function value, 881.54, increased from the previous model of 880.61. Not by much, but still requires a larger initial investment. However, the required payments are still fulfilled and the end goal is still achieved. The portfolio now looks a bit more balanced, and it was interesting to see solver used Bubblegum Benchmark Fund with the lowest return, as a crutch to make up for the lost opportunity of GGG.