

# 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*

Investment	Years To Mature	Return
A	1	2.00%
B	2	4.22%
C	3	6.47%
D	4	8.70%
E	5	10.94%

## 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*

Constraints:

Surplus funds must equal req'd funds

Month 2:  $1.02A_1 - 1A_2 - 1C_1 = 0$

Month 3:  $1.0422B_1 + 1.02A_2 - 1A_3 - 1D_1 - 1B_2 = 250$

Month 4:  $1.02A_3 - 1A_4 = 0$

Month 5:  $1.0647C_1 + 1.0422B_1 + 1.02A_4 - 1.02A_5 - 1.0422B_2 - 1.0674C_2 = 0$

Month 6:  $1.1094E_1 + 1.02A_5 - 1A_6 = 250$

Month 7:  $1.087D_1 + 1.0422B_2 + 1.02A_6 - 1.02A_7 - 1.0422B_3 = 0$

Month 8:  $1.0647C_1 + 1.02A_7 - 1A_8 = 0$

Month 9:  $1.0422B_3 + 1.02A_8 - 1A_9 = 0$

Month 10:  $1.02A_9 = 500$

Objective function is total invested in month 1

Decision variables are the amounts put into each investment with inflow in month 1

**Solver Parameters**

Set Objective:

To: ☐ Max ☒ Min ☐ Value Of:

By Changing Variable Cells:

Subject to the Constraints:

☒ Make Unconstrained Variables Non-Negative

Select a Solving Method:

Solving Method

Select the GRG Nonlinear engine for Solver Problems that are smooth nonlinear. Select the LP Simplex engine for linear Solver Problems, and select the Evolutionary engine for Solver problems that are non-smooth.

## Model Optimized for Least Cost out of Pocket

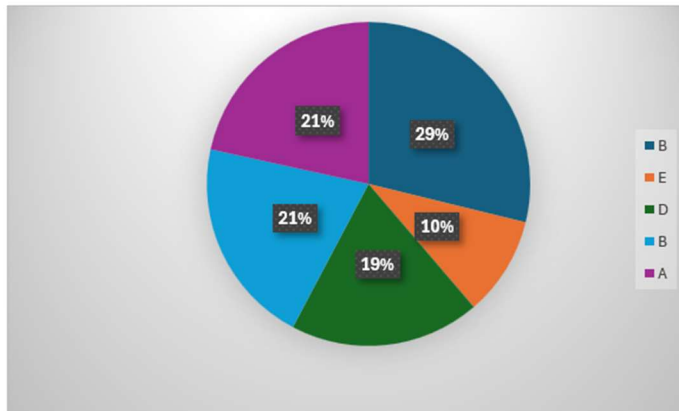
Implement your formulation into Excel and be sure to make it neat. This section should include:

- 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:
  - o A pie chart or stacked bar chart to compare money out of pocket vs end amount
  - o A line chart to show either current amount or cumulative amount invested in each investment
  - o Any other solution you may have

Month of Cashflow					Cash Flow Summary for Month									
Investment	Inflow	Outflow	Amount	Return	1	2	3	4	5	6	7	8	9	10
A	1	2	\$ -	2.00%	-1	1.02								
B	1	3	\$655.06	4.22%	-1	<--->	1.0422							
E	1	6	\$225.35	10.94%	-1	<--->	<--->	<--->		1.1094				
A	2	3	\$ -	2.00%		-1	1.02							
C	2	5	\$ -	6.47%		-1	<--->	<--->	1.0647					
A	3	4	\$ -	2.00%			-1	1.02						
B	3	5	\$ -	4.22%			-1	<--->	1.0422					
D	3	7	\$432.70	8.70%			-1	<--->	<--->	1.087				
A	4	5	\$ -	2.00%				-1	1.02					
A	5	6	\$ -	2.00%				-1	<--->	1.0422				
B	5	7	\$ -	4.22%				-1	<--->	<--->	1.0647			
C	5	8	\$ -	6.47%					-1	1.02				
A	6	7	\$ -	2.00%					-1	<--->	1.0422			
A	7	8	\$ -	2.00%						-1	1.02			
B	7	9	\$470.35	4.22%						-1	<--->	1.0422		
A	8	9	\$ -	2.00%							-1	1.02		
A	9	10	\$490.20	2.00%								-1	1.02	
Total Invested in Month 1 ->			\$880.41		Surplus Funds	\$ -	\$250.00	\$ -	\$ -	\$250.00	\$ (0.00)	\$ -	\$ -	\$500.00
					Req'd Funds	\$ -	\$250.00	\$ -	\$ -	\$250.00	\$ -	\$ -	\$ -	\$500.00

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A	1	2.00%
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My model suggests that 655.06 be put into investment B and \$223.35 be put into investment E in month 1 to get the most optimal returns for what has been given.



### 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 to not 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?*

If midterm payments are changed the model changes because it must work around those payments to find the best possible outcome for investing. When the payments change this causes the model to change how it is investing and what money needs to be put where.