

# Module 04 – Multiperiod Modeling

## Exploratory Data Analysis

| final_payment_start_of_year | first_payment_year | second_payment_year       |                  |
|-----------------------------|--------------------|---------------------------|------------------|
| 10                          | 3                  | 6                         |                  |
| 500                         | 250                | 250                       |                  |
|                             |                    |                           |                  |
| investment_name             | investment_pct     | month_can_start_investing | can_invest_every |
| CandyCrest Holdings         | 0.02               | 1                         | 1                |
| CottonCandy Capital         | 0.0423             | 1                         | 2                |
| Jellybean Junction Capital  | 0.0646             | 2                         | 3                |
| Nougat Nest Investments     | 0.087              | 3                         | 4                |
| TaffyTrend Ventures         | 0.1095             | 1                         | 5                |

## Model Formulation

MIN:  $A_1 + B_1 + C_1 + D_1 + E_1$

Subject to:

$$1.02A_1 - 1A_2 - 1C_2 = 0$$

$$1.0423B_1 + 1.02A_2 - 1A_3 - 1B_3 - 1D_3 = 250$$

$$1.02A_3 - 1A_4 = 0$$

$$1.0646C_2 + 1.0423B_3 + 1.02A_4 - 1A_5 - 1B_5 - 1C_5 = 0$$

$$1.1095E_1 + 1.02A_5 - 1A_6 = 250$$

$$1.087D_3 + 1.0423B_5 + 1.02A_6 - 1A_7 - 1B_7 = 0$$

$$1.0646C_5 + 1.02A_7 - 1A_8 = 0$$

$$1.0423B_7 + 1.02A_8 - 1A_9 = 0$$

$$1.02A_{10} = 500$$

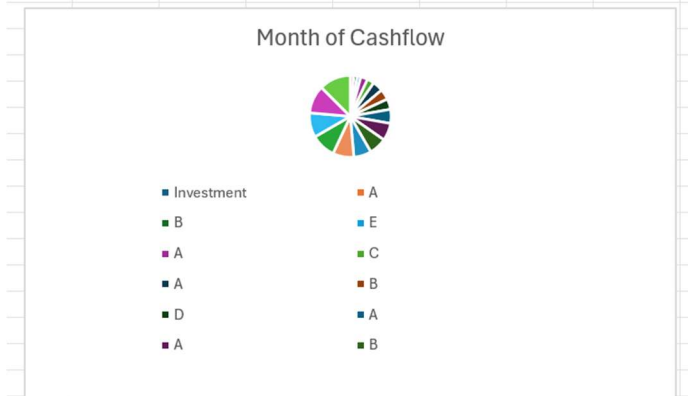
Constraints:

Surplus funds = required payments

Amount  $\geq 0$

**Model Optimized for Least Cost out of Pocket**

| Month of Cashflow            |        |         |          |                | Cash Flow Summary for Month |       |          |      |        |          |           |        |       |          |     |     |                             |                    |
|------------------------------|--------|---------|----------|----------------|-----------------------------|-------|----------|------|--------|----------|-----------|--------|-------|----------|-----|-----|-----------------------------|--------------------|
| Investment                   | Inflow | Outflow | Amount   | Return         | 1                           | 2     | 3        | 4    | 5      | 6        | 7         | 8      | 9     | 10       |     |     | Investment_name             | Investment_pct     |
| A                            | 1      | 2       | \$ -     | 2.00%          | -1                          | 1.02  |          |      |        |          |           |        |       |          |     |     | A (CCH)                     | 2.00%              |
| B                            | 1      | 3       | \$854.96 | 4.23%          | -1                          | <-->  | 1.0423   |      |        |          |           |        |       |          |     |     | B (CCC)                     | 4.23%              |
| E                            | 1      | 6       | \$225.33 | 10.95%         | -1                          | <-->  | <-->     | <--> |        | 1.1095   |           |        |       |          |     |     | C (JJC)                     | 6.46%              |
| A                            | 2      | 3       | \$ -     | 2.00%          |                             | -1    | 1.02     |      |        |          |           |        |       |          |     |     | D (NNI)                     | 8.70%              |
| C                            | 2      | 5       | \$ -     | 6.46%          |                             | -1    | <-->     | <--> | 1.0646 |          |           |        |       |          |     |     | E (TTV)                     | 10.95%             |
| A                            | 3      | 4       | \$ -     | 2.00%          |                             |       | -1       | 1.02 |        |          |           |        |       |          |     |     |                             |                    |
| B                            | 3      | 5       | \$ -     | 4.23%          |                             |       | <-->     | <--> | 1.0423 |          |           |        |       |          |     |     |                             |                    |
| D                            | 3      | 7       | \$432.66 | 8.70%          |                             |       | <-->     | <--> | <-->   | 1.087    |           |        |       |          |     |     | final_payment_start_of_year | first_payment_year |
| A                            | 4      | 5       | \$ -     | 2.00%          |                             |       |          | -1   | 1.02   |          |           |        |       |          | 10  | 3   | 6                           |                    |
| A                            | 5      | 6       | \$ -     | 2.00%          |                             |       |          |      | -1     | 1.02     |           |        |       |          | 500 | 250 | 250                         |                    |
| B                            | 5      | 7       | \$ -     | 4.23%          |                             |       |          |      | -1     | <-->     | 1.0423    |        |       |          |     |     |                             |                    |
| C                            | 5      | 8       | \$ -     | 6.46%          |                             |       |          |      | -1     | <-->     | <-->      | 1.0646 |       |          |     |     |                             |                    |
| A                            | 6      | 7       | \$ -     | 2.00%          |                             |       |          |      |        | -1       | 1.02      |        |       |          |     |     | Investment_name             | Investment_pct     |
| A                            | 7      | 8       | \$ -     | 2.00%          |                             |       |          |      |        | -1       | 1.02      |        |       |          |     |     | CandyCrest Holdings         | 0.02               |
| B                            | 7      | 9       | \$470.39 | 4.23%          |                             |       |          |      |        | <-->     | 1.0423    |        |       |          |     |     | CottonCandy Capital         | 0.0423             |
| A                            | 8      | 9       | \$ -     | 2.00%          |                             |       |          |      |        |          | -1        | 1.02   |       |          |     |     | Jellybean Junction Capital  | 0.0646             |
| A                            | 9      | 10      | \$490.28 | 2.00%          |                             |       |          |      |        |          |           | -1     | 1.02  |          |     |     | Nougat Nest Investments     | 0.087              |
| Total Invested in Month 1 -> |        |         | \$880.28 |                | Surplus Funds               | \$ -  | \$250.00 | \$ - | \$ -   | \$250.00 | \$ (0.00) | \$ -   | \$ -  | \$500.00 |     |     | TaffyTrend Ventures         | 0.1095             |
|                              |        |         |          | Req'd Payments | \$0                         | \$250 | \$0      | \$0  | \$250  | \$0      | \$0       | \$0    | \$500 |          |     |     |                             |                    |



The model is recommending that the optimal solution is \$880.28.

## Model with Stipulation

| Month of Cashflow            |        |         |          |                | Cash Flow Summary for Month |      |         |      |        |        |           |        |      |         |     |     |                             |                    |
|------------------------------|--------|---------|----------|----------------|-----------------------------|------|---------|------|--------|--------|-----------|--------|------|---------|-----|-----|-----------------------------|--------------------|
| Investment                   | Inflow | Outflow | Amount   | Return         | 1                           | 2    | 3       | 4    | 5      | 6      | 7         | 8      | 9    | 10      |     |     | Investment_name             | Investment_pct     |
| A                            | 1      | 2       | \$ -     | 2.00%          | -1                          | 1.02 |         |      |        |        |           |        |      |         |     |     | A (CCH)                     | 2.00%              |
| B                            | 1      | 3       | \$830.20 | 4.23%          | -1                          | <--> | 1.0423  |      |        |        |           |        |      |         |     |     | B (CCC)                     | 4.23%              |
| E                            | 1      | 6       | \$ -     | 10.95%         | -1                          | <--> | <-->    | <--> |        | 1.1095 |           |        |      |         |     |     | C (JJC)                     | 6.46%              |
| A                            | 2      | 3       | \$ -     | 2.00%          |                             | -1   | 1.02    |      |        |        |           |        |      |         |     |     | D (NNI)                     | 8.70%              |
| C                            | 2      | 5       | \$ -     | 6.46%          |                             | -1   | <-->    | <--> | 1.0646 |        |           |        |      |         |     |     | E (TTV)                     | 10.95%             |
| A                            | 3      | 4       | \$ -     | 2.00%          |                             |      | -1      | 1.02 |        |        |           |        |      |         |     |     |                             |                    |
| B                            | 3      | 5       | \$ -     | 4.23%          |                             |      | <-->    | <--> | 1.0423 |        |           |        |      |         |     |     |                             |                    |
| D                            | 3      | 7       | \$865.32 | 8.70%          |                             |      | -1      | <--> | <-->   | 1.087  |           |        |      |         |     |     | final_payment_start_of_year | first_payment_year |
| A                            | 4      | 5       | \$ -     | 2.00%          |                             |      |         | -1   | 1.02   |        |           |        |      |         | 10  | 3   | 6                           |                    |
| A                            | 5      | 6       | \$ -     | 2.00%          |                             |      |         |      | -1     | 1.02   |           |        |      |         | 500 | 250 | 250                         |                    |
| B                            | 5      | 7       | \$ -     | 4.23%          |                             |      |         |      | -1     | <-->   | 1.0423    |        |      |         |     |     |                             |                    |
| C                            | 5      | 8       | \$ -     | 6.46%          |                             |      |         |      | -1     | <-->   | <-->      | 1.0646 |      |         |     |     |                             |                    |
| A                            | 6      | 7       | \$ -     | 2.00%          |                             |      |         |      |        | -1     | 1.02      |        |      |         |     |     | Investment_name             | Investment_pct     |
| A                            | 7      | 8       | \$ -     | 2.00%          |                             |      |         |      |        | -1     | 1.02      |        |      |         |     |     | CandyCrest Holdings         | 0.02               |
| B                            | 7      | 9       | \$940.60 | 4.23%          |                             |      |         |      |        | <-->   | 1.0423    |        |      |         |     |     | CottonCandy Capital         | 0.0423             |
| A                            | 8      | 9       | \$ -     | 2.00%          |                             |      |         |      |        |        | -1        | 1.02   |      |         |     |     | Jellybean Junction Capital  | 0.0646             |
| A                            | 9      | 10      | \$980.39 | 2.00%          |                             |      |         |      |        |        |           | -1     | 1.02 |         |     |     | Nougat Nest Investments     | 0.087              |
| Total Invested in Month 1 -> |        |         | \$830.20 |                | Surplus Funds               | \$ - | \$ 0.00 | \$ - | \$ -   | \$ -   | \$ (0.00) | \$ -   | \$ - | #####   |     |     | TaffyTrend Ventures         | 0.1095             |
|                              |        |         |          | Req'd Payments | \$0                         | \$0  | \$0     | \$0  | \$0    | \$0    | \$0       | \$0    | \$0  | \$1,000 |     |     |                             |                    |

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?

Yes, my model does change, and there will be a change because the payment is all at last and not in midterm payments.