LINEAR PROGRAMMING FORMULATION OF THE INVESTMENT PROBLEM

Decision variables: A, B, C, where A is the money (in US dollars) we invest in A, etc. I would also introduce the *convenience variables* $M_0, \ldots, M_3$, where M_y is the amount of money we have on our money market account in year y. (The current year is year 0, and so on.)

$$\begin{aligned}
\max \quad & M_3 && (1)\\
\text{s.t.} \quad & A \le 0.30(A+B+C) && (2)\\
& B \ge 0.25(A+B+C) && (3)\\
& C \le 0.40(A+B+C) && (4)\\
& M_0 = 1000 - A - B && (5)\\
& M_1 = 1.08M_0 + 0.2A + 0.1B - C && (6)\\
& M_2 = 1.08M_1 + 1.4B && (7)\\
& M_3 = 1.08M_2 + 1.25A + 1.6C && (8)\\
& M_y \ge 0 \quad y = 0,1,2,3 && (9)\\
& A, B, C \ge 0 && (10)
\end{aligned}$$

The first four lines are obvious, and so are (9)–(10). Lines (5)–(8) are the *cash flow balance equations.*

One can do without the convenience variables, but the formulae will become cumbersome:

$$\begin{aligned}
\max \quad & 1.08\Big(1.08\big(1.08(1000 - A - B) + 0.2A + 0.1B - C\big) + 1.4B\Big) + 1.25A + 1.6C\\
\text{s.t.} \quad & A \le 0.30(A+B+C)\\
& B \ge 0.25(A+B+C)\\
& C \le 0.40(A+B+C)\\
& 1000 - A - B \ge 0\\
& 1.08(1000 - A - B) + 0.2A + 0.1B - C \ge 0\\
& 1.08\big(1.08(1000 - A - B) + 0.2A + 0.1B - C\big) + 1.4B \ge 0\\
& 1.08\Big(1.08\big(1.08(1000 - A - B) + 0.2A + 0.1B - C\big) + 1.4B\Big) + 1.25A + 1.6C \ge 0\\
& A, B, C \ge 0
\end{aligned}$$

You can see the trick easily: whenever we saw a pattern repeated several times (like $1000 - A - B$), we introduced a "shorthand" for it. It is usually the case that the best shorthands have intuitive meanings associated to them. (In this case this is our cash balance.)