IEGR 350: Engineering Economy Fall 2015 M. Salimian Quiz 4 Solution Key Find G1 and G2. (Use table for 5% interest rate provided)



Solution

Since no specific restriction is placed on the method to solve, we can select the least efficient method by identifying each payment and find the total of all of them at time 0 using (P/F, 5%, n) for years 1, 2, 3, ..., 12. Since G1 and G2 are unknown, payments would involve those terms as well. For example, payments at year 1 through year 7 are: 400, 400+G1, 400+2G1, 400+3G1, 400+4G1, 400+4G1-G2, 400+4G1-2G2. Then find the present worth of each individual paymen. For example for the payment in year 7 we have (400+4G1-2G2)(P/F, 5%, 7).

The better approach is to use the series information. Since payment at year 5 is mutual between the two series we need to make a decision of to which series to assign that payment. Here, I have chosen to assign it to the first series.

PW1=400(P/A, 5%, 5) + G1(P/G, 5%, 5) = 400(4.3295) + G1(8.2369) = 1731.8 + 8.2369G1

PW2 = [(400+4G1-G2)(P/A, 5%, 7) - G2(P/G, 5%, 7)] (P/F, 5%, 5) = [(400+4G1-G2)(5.7864)-G2(16.2321)](0.7835)

PW2 = (2314.55+23.1455G1-5.7864G2-16.2321G2)(0.7835) = 1813.45 + 18.1345G1 - 17.2515G2

PW0+PW1+PW2=0

- 3798 + 1731.8 + 8.2369G1 + 1813.45 + 18.1345G1 -17.2515G2 = 0

26.3714G1 - 17.2515G2 = 252.75

We are also told that G2 is \$25 more than G1, that is, G2 - G1 = 25

Solve the linear system of equations with two equations and 2 unknowns to find G1 and G2.

G1 = 75, G2 = 100

Note that due to use of decimals, you may get not exactly the above answers, but they should be very close.

Just in case you may have forgotten: Find G2 from second equation and plug it into the first one: G2 = G1 + 25 26.3714 G1 - 17.2515 (G1 + 25) = 252.75 9.1199 G1 - 431.2875 = 252.75 G1 = (431.2875 + 252.75)/(9.1199) = 75.00G2 = G1 + 25 = 75 + 25 = 100