MATH 373
Fall 2018
Quiz 2
September 18, 2018

1. You are given that $a(t) = \alpha + \beta t^2$ and that $\delta_{10} = 0.10$.

   Shina invests 1000 at time zero using the above accumulation function.

   How much does Shina have after 20 years?

   Solution:

   $a(0) = 1 \Longrightarrow \alpha = 1$

   $$\delta_t = \frac{a'(t)}{a(t)} = \frac{2\beta t}{1 + \beta t^2} \Longrightarrow \delta_{10} = 0.10 = \frac{2\beta(10)}{1 + \beta(10)^2} \Longrightarrow (0.10)(1 + 100\beta) = 20\beta$$

   $$\Longrightarrow 0.1 + 10\beta = 20\beta \Longrightarrow 0.1 = 10\beta \Longrightarrow \beta = 0.01$$

   $$\text{Amount after 20 years} = 1500a(20) = 1500[1 + 0.01(20)^2] = 5000$$

2. Moses invests money at an annual effective interest rate of i. Under this interest rate, based on the Rule of 72, Moses expects his money to double in 10 years.

   Amber borrows 10,000 at an annual effective interest rate of i. Amber will repay this loan with two payments of P. The first payment of P will be at the end of 2 years and the second payment of P will be at the end of 5 years.

   Determine P.

   Solution:

   $$\text{Amount of time to double} = \frac{72}{\text{Interest Rate as a Percent}} \implies \frac{72}{i} = 10 \implies i = 7.2\%$$

   Amber

   $$10,000(1.072)^5 = P(1.072)^3 + P$$

   $$P = \frac{10,000(1.072)^5}{(1.072)^3 + 1} = 6342.99$$

3. Anthony, Walker, and Lyndi enter into a business arrangement. Under this arrangement, Anthony will pay Walker 1000 at time 0 and will pay Lyndi 2000 at time 2. Also, Walker will pay Lyndi 1200 at time 2. Finally, Lyndi will pay Anthony 3600 at time 4.

   Using the bottom line approach, determine the annual effective interest rate being earned by Anthony is this arrangement.

   Solution:

   Anthony's cash flows are as follows:

   Time $0 \Longrightarrow -1000$

   Time $2 \Longrightarrow -2000$

   Time $4 \Longrightarrow +3600$

   Using the calculator:

   $\boxed{CF0 \leftarrow -1000}; \boxed{C01 \leftarrow 0}\boxed{C02 \leftarrow -2000}\boxed{C03 \leftarrow 0}\boxed{C04 \leftarrow 3600}$

   $\boxed{IRR}\boxed{CPT} \rightarrow 6.9935\%$