

FIN104 Tutorial Answers - Week 4

1. Future Values. You deposit \$1,000 in your bank account. (CH5.Q5).

- a. If the bank pays 4% simple interest, how much will you accumulate in your account after 10 years?

With simple interest, you earn 4% of \$1,000, or \$40 each year. There is no interest on interest. After 10 years, you earn total interest of \$400, and your account accumulates to \$1,400.

$$\begin{aligned} FV_{\text{Simple Interest}} &= PV + PV \times (r \times t) \\ &= \$1,000 + \$1,000 \times (.04 \times 10) \\ &= \$1,400 \end{aligned}$$

- b. How much will you accumulate if the bank pays compound interest?

$$\begin{aligned} FV &= PV \times (1 + r)^t \\ &= \$1,000 \times 1.04^{10} \\ &= \$1,480.24 \end{aligned}$$

With compound interest, each year you earn interest on the principal AND the interest accumulated in all prior years. In this case, the compound interest amounts to:

$$\text{Compound interest} = \$1,480.24 - 1,000 = \$480.24$$

2. Present Values. What is the present value of the following cash-flow stream if the interest rate is 6%? (CH5.Q14).

Year	Cash Flow
1	\$200
2	400
3	300

$$PV = C_1 / (1 + r)^1 + C_2 / (1 + r)^2 + C_3 / (1 + r)^3 = (\$200/1.06) + (\$400/1.06^2) + (\$300/1.06^3) = \$188.68 + \$356.00 + \$251.89 = \$796.57$$

Calculator computations:

$$CF0 = 0$$

$$C01 = 200 \quad F01 = 1$$

$$C02 = 400 \quad F02 = 1$$

$$C03 = 300 \quad F03 = 1$$

$$I = 6$$

$$CPT \text{ NPV} = 796.56$$

3. Annuities. Would you rather receive \$1,000 a year for 10 years or \$800 a year for 15 years if the interest rate is 5%? (CH5.Q21).

You should compare the present values of the two annuities.

$$PV = C((1 / r) - \{1 / [r(1 + r)^t]\})$$

$$PV = \$1,000 \times \left[\frac{1}{0.05} - \frac{1}{0.05 \times (1.05)^{10}} \right] = \$7,721.73$$

$$PV = \$800 \times \left[\frac{1}{0.05} - \frac{1}{0.05 \times (1.05)^{15}} \right] = \$8,303.73$$

4. Perpetuities and Effective Interest Rate. What is the value of a perpetuity that pays \$100 every 3 months forever? The interest rate quoted on an APR basis is 6%. (CH5.Q46)

The interest rate per 3 months is $6\%/4 = 1.5\%$.

Therefore, the value of the perpetuity is $\$100/0.015 = \$6,666.67$.

5. Real versus Nominal Rates. You will receive \$100 from a savings bond in 3 years. The nominal interest rate is 8%. (CH5.Q75)

a) What is the present value of the proceeds from the bond?

$$PV = \$100/(1.08)^3 = \$79.38$$

b) If the inflation rate over the next few years is expected to be 3%, what will the real value of the \$100 payoff be in terms of today's dollars?

$$\text{Real value} = \$100/(1.03)^3 = \$91.51$$

c) What is the real interest rate?

$$\text{Real interest rate} = \frac{1 + \text{nominal interest rate}}{1 + \text{inflation rate}} - 1 = 0.04854 = 4.854\%$$

d) Show that the real payoff from the bond [from part (b)] discounted at the real interest rate [from part (c)] gives the same present value for the bond as you found in part (a).

$$PV = \$91.51/(1.04854)^3 = \$79.38$$