

INTEREST, DISCOUNT

1. You have a short-term promissory note payable in 8 months. The nominal value of the note is now 20,000.00 and the interest rate guaranteed by this IOU is 8% p.a. One month later you will decide to sell the promissory note in the market at discount rate of 9% p.a. How much will you obtain from your short-term promissory note? How long must you hold the IOU if you like to sell it at least for 20,000.00?

Solution:

$$a. FV = PV \cdot (1 + 0.08 \cdot 8/12) = 21,066.667$$

$$PV \text{ (after 1m)} = 21,066.667 \cdot (1 - 0.09 \cdot 7/12) = \mathbf{19,960.67}$$

$$b. 20000 = 21,066.667 \cdot (1 - 0.09 \cdot t)$$

$$t = 0.562588077 \rightarrow 6 \text{ months and 22 days}$$

The correct answer is 240 days (8 months) – 202 days = **38 days!**

2. What will be the future value of invested 10,000.00 in 3 years, 5 months and 24 days? Use the best form of interest from the investor's perspective. The interest rate is 6% p. a. (The interest period is one quarter)

Solution:

$$FV = 10000 \cdot (1 + 0.06/4)^{(4 \cdot 3 + 1)} \cdot (1 + 0.06 \cdot (2/12 + 24/360)) =$$

$$\mathbf{12305,42}$$

Note one Interest period = 3 months, for Simple interest is remaining 2 months (of 12) and 24 days (of 360)

3. How long must you keep 12,500.00 deposited at a bank with an interest rate of 7.5% p. a., if you will obtain 21,040.544 at the end? Solve the problem with respect to the maximization of utility. Interest period is one year.

Solution:

$$21,040.544 = 12,500.00 \cdot (1 + 0.075)^t$$

$$t = \ln(21040,544/12500) / \ln(1,075) = 7.200191 \text{ years} \rightarrow \text{space for linear interest (simple interest), we know that we do have 7 whole Interest periods!}$$

$$21040,544 = 12500 \cdot (1 + 0,075)^7 \cdot (1 + 0,075 \cdot t)$$

$$t = 0,19444 \rightarrow \mathbf{7 \text{ years, 2 months and 10 days}} \quad (0,19444*12 = 2,3333/0,333*30 = 9,999)$$

4. What is the annually interest rate on your bank account if you will obtain in eleven years from interest payment 122,452.9604 (only interest). You put on your bank account 150,000.00 and the bank calculates interest semiannually. Interest period is one year.

$$FV (150,000.00+122,452.9604) = PV (150,000.00*(1+r)^{11})$$

$$r = (272452,9604/150000)^{(1/11)}-1 = 0,055756 \text{ i.e. } \mathbf{5.58 \% \text{ p. a.}}$$

5. Calculate the effective interest rate. The annually interest rate is 4% and interest will be calculated on daily basis (360 times in one year).

$$r_e = (1 + 0,04/360)^{360}-1 = \mathbf{4.081 \% \text{ p. a.}}$$

Hopefully it will help...

I am very sorry, but I do not offer other extra examples for additional points – there will be only 2 points for d(12) for next week.