Instructions:

Please attempt every problem. You must support every solution with an appropriate amount of work and/or description. Unsupported answers may receive a score of 0. Good luck!

1. (30 pts)$1000 is borrowed at 5% compounded annual interest. The loan is to be repaid with 4 equal annual payments with the <u>first payment being made 3 years</u> after receiving the $1000. Find the amount of interest payment and principal payment of each of these 4 payments.
   Solution:
   The $1000 will amount to

$$\boxed{F_2} = 1000(1 + 0.05)^2 = \underline{1102.5}$$

at $t = 2$. Hence the annual payment amount is

$$A_d = \underline{1102.5}\left[\frac{0.05(1 + 0.05)^4}{(1 + 0.05)^4 - 1}\right] = \underline{310.918}.$$

+5

For the first payment, we have

$$\underline{UB_3} = 1102.5, \ \underline{Int_3} = 1102.5 \times 0.05 = \underline{55.125}$$
$$\underline{UIB_3} = \underline{102.5} + \underline{55.125} = \underline{157.625}, \ \underline{IPmt_3} = min(\underline{157.625}, \underline{310.918}) = \boxed{157.625}$$
$$PPmt_3 = A_d - IPmt_3 = 310.918 - 157.625 = \underline{153.293}$$

+5

Continuing this process yield the following table

Year	UB	Int	UIB	AO	A_d	IPmt	UIA	PPmt
3	1102.5	55.125	157.625	1157.625	310.918	157.628	0	153.293
4	846.707	42.335	42.335	889.042	310.918	42.335	0	268.583
5	578.124	28.906	28.906	607.031	310.918	28.906	0	282.012
6	296.113	14.806	14.806	310.918	310.918	14.806	0	296.112

Note:

$$UB_t = AO_{t-1} - A_d, \ Int_t = UB_t \times IR_t, \ UIB_t = Int_t + UIA_{t-1}, \ A)_t = UB_t + Int_t,$$

$$IPmt_t = min(UIB_t, Ad), \ UIA_t = UIB_t - IPmt_t, \ PPmt_t = Ad - IPmt_t.$$

+20

2. (8 pts) Shannon purchases a bond for $952.00. The bond matures in 3 years, and Shannon will redeem it at its face value of $1,000. Coupon payments are paid annually. If Shannon will earn a yield of 12%/year compounded yearly, what is the bond coupon rate?
Solution:
Here we have

$$P = 952.00, \ V = F = 1000, \ i = 0.12, n = 3.$$

Let r be the bond coupon rate. We obtain

$$952 = 1000r \left[\frac{(1+0.12)^3 - 1}{0.12 \times (1+0.12)^3} \right] + 100(1+0.12)^{-3}.$$

Solving for r yields
$$r = 0.10.$$

Hence the bond coupon rate is 10% per year. +8

3. (8 pts) You wish to purchase a $1,000 bond from a friend who needs the money. There are 7 years remaining until the bond matures and the redemption price is the same as the face value. Assume that interest payments are quarterly. You decide to offer $750.08 for the bond because you want to earn exactly 16% per year compounded quarterly on the investment. What is the annual bond rate of interest?
Solution:
Here we have

$$P = 750.08, \ V = F = 1000, \ i = 0.16/4 = 0.04, n = 7 \times 4 = 28.$$

Let r be the quarterly bond coupon rate. We obtain

$$750.08 = 1000r \left[\frac{(1+0.04)^{28} - 1}{0.04 \times (1+0.04)^{28}} \right] + 1000(1+0.04)^{-28}.$$

Solving for r yields
$$r = 0.025.$$

Hence the annual bond coupon rate is

$$0.025 \times 4 = 0.10 = \boxed{10\%}$$

+8

Final Exam:

Time: Dec. 2nd, 2024.   10:15 am → 12:15 pm

Location: X4350

Coverage: Comprehensive.