201C-MATH177-1 Midterm 2

DHRUV SANCHETY

TOTAL POINTS

92 / 100

QUESTION 1

1 Question 1 20 / 20

✓ - **0 pts** Correct

QUESTION 2

2 Question 2 12 / 20

✓ - **8 pts** if reported 20th coupon date price as the correct price

💬 P = 87537 would provide a yield rate < 5% if bond is allowed to mature (n=30).

QUESTION 3

3 Question 3 20 / 20

✓ - **0 pts** Correct

QUESTION 4

Question 4 20 pts

4.1 Part (a) 10 / 10

✓ - **0 pts** Correct

4.2 Part (b) 10 / 10

✓ - **0 pts** Correct

QUESTION 5

5 Question 5 20 / 20

✓ - **0 pts** Correct

1.

$$P = F \cdot r \, a_{\overline{n}|} + Cv^n = Fr \, a_{\overline{n}|} + C(1 - ja_{\overline{n}|})$$

$$\Rightarrow P = C + (Fr - Cj)a_{\overline{n}|}$$

$$1357.24 = 1100 + (1000 \cdot 0.0325 - 1100 \cdot 0.02)\, a_{\overline{n}|}$$

$$24.49904162 = a_{\overline{n}|} = \frac{1 - (1+j)^{-2N}}{j}$$

$$(1+j)^{-2N} = 0.5100190476$$

$$\log_{1.02} 0.5100190476 = -2N$$

$$N = 17 \text{ years.}$$

Amortization by coupon 6: $P_{t-1} - P_t$

$$(F \cdot r - C \cdot j)(v^{n-t+1})$$

$$(1000 \cdot 0.0325 - 1100 \cdot 0.02)\left(\frac{1}{1 + \frac{3}{4} 0.02}\right)^{\overset{34}{\cancel{6+1}} \; \cancel{8}.}$$

$$= \cancel{8.2741178344} \quad 5.912679221 = \text{Answer}$$

$$\frac{1 - \cancel{j}(1 - (1+j)^{-2N})}{\cancel{j}}$$

$$\cancel{(1+j)^{-2n}}$$

1 Question 1 20 / 20

✓ - **0 pts** Correct

2. $\underset{\text{nominal}}{\underbrace{\frac{\#}{\#}}}$ $\overset{\text{yield rate}}{>} .1$, $F = 100,000$, $\$ 0.08 = \infty\alpha$, $m = 2$, $r = 0.04$, $c = 100,000$

$j = 0.05$ compounded semi-annualy.

$F.r.a_{\overline{7}} + Cv^n$

$\dfrac{100,000 . 0.08^4 . (1 - (1+j)^{-30})}{j} + 100,000 (1+j)^{-30}$

① $= 84,627 . 54877$

$\dfrac{100,000 . 0.04 (1 - (1+j)^{-20})}{j} + 100,000 (1+j)^{-20}$

② $\cancel{③}$ $= \cancel{875}$ $87,537.78966$.

The Maximum of ① and ② is

$87,537.78966 = $ Answer

S r

2 Question 2 12 / 20

✓ **- 8 pts** if reported 20th coupon date price as the correct price

💬 P = 87537 would provide a yield rate < 5% if bond is allowed to mature (n=30).

3.

$$50,000(1+i) + 24,000\left(1+\frac{8i}{12}\right)$$

$$-36,000\left(1+\frac{3i}{12}\right) = \cancel{36000}\ 44000$$

$$50,000 + 24,000 - 36,000 - 44,000 + i\left(50,000 + 24,000\left(\frac{8}{12}\right)\right.$$
$$\left.- 36,000\left(\frac{3}{12}\right)\right) = 0$$

$$-6000 + i\left(\frac{57000}{\cancel{55000}}\right) = 0, \quad i = \frac{6000}{\cancel{57000}\ 57000} = \frac{0.24}{\cancel{0.24}}\ \frac{0.1052631579}{}$$

$$\frac{\cancel{105000}}{\cancel{100000}} \quad \frac{105,000}{100,000} \quad \frac{\cancel{100,000}}{\cancel{100,000}} \cdot \frac{x}{\cancel{95,000}} - 1 = \cancel{0.24}\ 0.24 \quad 0.1052631579$$

$$\cancel{x} \cancel{\$} \checkmark \cancel{3764\ 84.17}\ 72964.66974.$$

$$x = 100,000$$

✓ **- 0 pts** Correct

gradescope

4. a) $F = 100$

$r = 5 \pm 0.05$

$F \cdot r = 5$

$C = 110$

$\text{Price} = 5\left(\dfrac{1-(1+j)^{-4}}{1-\frac{1}{1+j}}\right) + 110\,(1+j)^{-4} \quad\Big\}\; j = 0.050745$

$= 5\left(\dfrac{1-(1+j)^{-4}}{j}\right) + 110\,(1+j)^{-4}$

Answer $\approx$ # 107.94 ⁕

(b) $5 \times 1.04^{-1} + 5 \times 1.0425^{-2} + 5 \times 1.04445^{-3} + 115 \times (1+x)^{-4} = 107.94$

$\log_{1+x} 0.818642553 = -4$

$(1+x)^{-4} = 0.818642553$

$\times \log_2 (1+x)^{-4} = 0.818642$ $\dfrac{\log_2 0.818642553}{-4}$

$x = 0.05129941107$

$X = 5.129941107$

4.1 Part (a) **10 / 10**

✓ **- 0 pts** Correct

4. a) $F = 100$

   $r = 5 \pm 0.05$

   $F \cdot r = 5$

   $C = 110$

$Price = 5\left(\dfrac{1 - (1+j)^{-4}}{1 - \frac{1}{1+j}}\right) + 110\,(1+j)^{-4}$ $\left.\phantom{\dfrac{1}{1}}\right\}$ $j = 0.05074S$

$= 5\left(\dfrac{1 - (1+j)^{-4}}{j}\right) + 110\,(1+j)^{-4}$

Answer $\approx$ # 107.94 *

(b) $5 \times 1.04^{-1} + 5 \times 1.042S^{-2} + 5 \times 1.04\text{44S}^{-3} + 115 \times (1+x)^{-4} = 107.94$

$\log_{1+x} \cancel{0.818642SS3} \, = \, \cancel{4}$

$(1+x)^{-4} = 0.818642SS3$

$\cancel{\text{x}}\log_2 (1+x)^{-4} = \cancel{0.818642}$ $\dfrac{\log_2 0.818642SS3}{-4}$

$x = 0.0S12994\text{II}07$

$X = 5.1299411\text{07}$

4.2 Part (b) **10 / 10**

✓ **- 0 pts** Correct

5.

$$\left(1 + f_{[3,4]}\right)^1 = \frac{(1 + 0.1 + 0.03 \times 4)^4}{(1 + 0.1 + 0.03 \times 3)^3}$$

$\Rightarrow f_{[3,4]} = 1 + \frac{(1.22)^4}{[1.19^3]} - 1 = 0.3146145616.$

~~100, 1000~~

Since interest is always repaid, the
~~pr~~ initial money at 3 is 1,000

∴ Answer = $1000 (~~0.316~~\ 0.3146145616 - 0.2)$

= 114.6145616.

✓ **- 0 pts** Correct