



Midterm Exam #2
ADM 3351 A
Fixed Income Securities
Fall 2011
(1 Hour and 20 minutes)
Prof. C. Guo

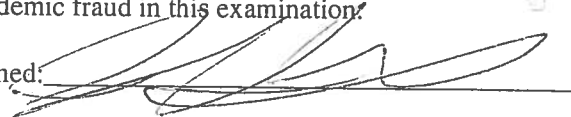
*Closed-book exam. No material of any kind is allowed. A calculator is required.
The formula page can be detached and need not submit.*

Name (print legibly) MATTHEW TANNIS

Student Number 5054086

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Statement to be signed by the student:
 I have read the text on academic integrity and I pledge not to have committed or attempted to commit academic fraud in this examination.

Signed: 

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Question	Credit	Mark
1	30	20
2	30	30
3	40	33
Total	100	83

Question 1 (30 points) Chapter 5.

The current term structure of interest rates, in terms of the yield-to-maturity (YTM), is given below. The bonds with maturities less than or equal to one year are Treasury bills, beyond one year are par-valued coupon bonds. All the quotes are expressed as BEY, i.e., APR with semiannual compounding.

10 (a) Find the missing spot rates (10 points)

Year	YTM	Spot Rate ✓
0.5	2.300	2.300 ✓
1.0	2.800	2.800 ✓
1.5	3.100	3.107 ✓
2.0	3.400	3.414 ✓

0 (b) There is an off-the-run bond carrying 6% coupon bond with \$100 principle and with 2 years left to maturity. A student argues that this bond should be selling at a price according to the 2-year YTM. What is the bond price if the student is right? (5 points)

10? (c) The bond holder can sell the cashflows of the 2-year bond in part (b) as STRIPS. What are the prices of each strip? (10 points)

0? (d) Why are the total proceeds from selling the 2-year off-the-run bond as STRIPS different from the bond price in part (b)? Explain why the student in part (b) is wrong. (5 points).

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$$y_{0.5} = 2.300\% \quad c = 0.023/2 = 0.0115$$

$$y_2 = 2.800\% \quad c = 0.028/2 = 0.014$$

$$y_{1.5} \quad c = 3.1/2 = 1.55$$

$$100 = \frac{1.55}{(1.0115)} + \frac{1.55}{(1.014)^2} + \frac{101.55}{(1+z_3)^3} = 1.532 + 1.507 + \frac{101.55}{(1+z_3)^3}$$

$$100 - 3.039 = \frac{101.55}{(1+z_3)^3} \rightarrow z_3 = \left(\frac{101.55}{96.961} \right)^{1/3} - 1 \times 2 = 0.015534 \times 2 = 3.107\%$$

$$y_2 \quad c = 3.4/2 = 1.7$$

$$100 = \frac{1.7}{(1.0115)} + \frac{1.7}{(1.014)^2} + \frac{1.7}{(1.01553)^3} + \frac{101.7}{(1+z_4)^4} = 1.681 + 1.653 + 1.623 + \frac{101.7}{(1+z_4)^4}$$

$$100 - 4.957 = \frac{101.7}{(1+z_4)^4} \rightarrow z_4 = \left(\frac{101.7}{96.743} \right)^{1/4} - 1 \times 2 = 0.01707 \times 2 = 3.414\%$$

(Extra writing space for Question 1)

c) ~~b~~ → PRICE CALC → $C = G/2 = \$3$

will assume
this is
part c

$$10 \quad \frac{3}{(1.0118)} + \frac{3}{(1.014)^2} + \frac{3}{(1.01553)^3} + \frac{103}{(1.01707)^4}$$

PRICE IS

$$2.966 + 2.918 + 2.864 + 96.28 = \underline{\underline{\$105.03}}$$

(More space for Question 1)

Question 2 (30 points) Chapter 11.

A seasoned mortgage pass-through security of 30-year conforming mortgages currently has a total outstanding balance \$500 million, with WAM=340 months, WAC = 7%, and coupon rate 6.5% coupon rate with monthly compounding. If the prepayment speed is PSA 200, calculate the cash flows for this month and the next month, and fill out the table on the next page.

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30 YR MORTGAGE

$MB_1 = 500M$ $WAC = 7\% \rightarrow 0.07/12 = 0.0058\bar{3}$ ✓

$WAM = 340$ $COUPON = 6.5\% \rightarrow 0.065/12 = 0.00541\bar{6}$

$\begin{cases} \Delta n_1 = 340 - 1 + 1 = 340 \\ \Delta n_2 = 339 \end{cases}$ $t_1 = 360 - 340 + 1 = 21$ ✓ (200 PSA) ✓
 $t_2 = 22$

$CPR = 0.06 \times 21/30 = 0.042 \times 2.0 = 0.084$ | PSA CPR

$SMM = 1 - (1 - 0.084)^{1/12} = 0.00728491$

$MP_1 = 500M \left(\frac{0.0058\bar{3} (1 - 0.0058\bar{3})^{340}}{(1 - 0.0058\bar{3})^{340} - 1} \right) = 0.006779... \times 500M$
 $= 3,385,194.63$

$COUPON INTERESTS = 500M \times 0.00541\bar{6} = 2,708,333.33$

$SCHED PMT = 3,385,194.63 - (500M \times 0.0058\bar{3})$
 $= 468,527.96$

$PRE PMT = SMM (500M - 468,527.96)$
 $= 3,639,041.82$

$TOT PRINCIPAL = 468,527.96 + 3,639,041.82 = 4,107,569.78$

$TOT CF = 4,107,569.78 + 2,708,333.33$
 $= 6,815,903.11$

NEW BAL =
 $495,892,430.02$

(Area for Question 2)

30

Month	Outstanding balance	CPR	SMM	Mortgage Payment	Interest	Scheduled Principal	Prepayment	Total Principal	Cash Flow
1	500,000,000	0.084	0.00728	3,385,195	2,708,333	468,527.96	3,639,091.82	4,107,562.78	6,815,903.11
2	495,892,430	0.088	0.00765	3,360,533.79	2,553,193	467,827.95	3,788,457.44	4,256,285.73	6,808,478.43

$N = 339$ $i_2 = 22$ $200/154$

$CPR = 0.06 \times 22/30 = 0.044 \times 2 = 0.088$

$SMM = 1 - (1 - 0.088)^{1/2} = 0.00767689$

$MP_2 = MB_2 \left(\frac{0.00583}{(1.00583)^{339}} \right) = 0.0067767 \times MB_2 = 3,360,533.79$

$\frac{\text{UNIFORM INTEREST}}{\text{SCHEDULED}} = MB_2 \times 0.005146 = 2,552,193.04$

$SCHEDULED \text{ PREPMT} = 3,360,533.79 - 2,552,193.04 = 808,340.75$

$PREPMT = SMM \times (MB_2 - 467,827.95) = 3,788,457.44$

$TOT \text{ PRINC} = 467,827.95 + 3,788,457.44 = 4,256,285.39$

$TOT \text{ CF} = 4,256,285.39 + 2,552,193.04 = 6,808,478.43$

(More space for Question 2)

Question 3 (40)

Answer the following 8 short questions, 5 points each.

3-1. What are the differences among a Treasury bill, Treasury note, and Treasury bond?

5

- TREASURY BILL HAS A MATURITY OF LESS THAN A YEAR, AND IS ISSUED BELOW PAR, OR AT A DISCOUNT
- TREASURY NOTE CAN BE A COUPON SECURITY WITH A MATURITY RANGE OF BETWEEN 1 and 10 years
- TREASURY BONDS ARE COUPON SECURITIES WITH MATURITIES OF OVER 10 years, AND COULD EVEN BE 30 years

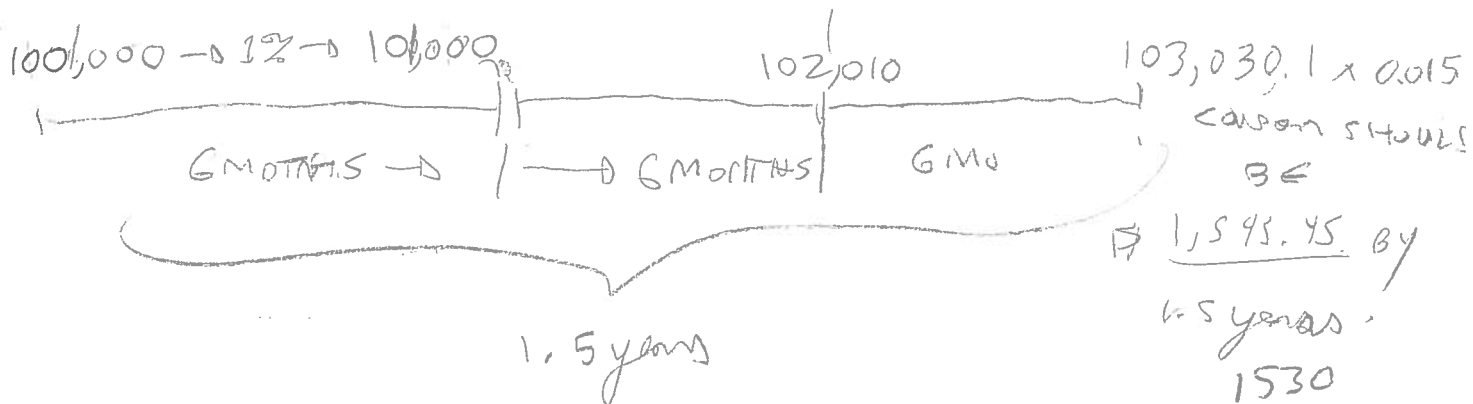
3-2. A Treasury Inflation Protection Security (TIPS) carries 3% annual coupon, payable semiannually on inflation adjusted principle. The initial principle is \$100,000. After one year, the inflation index has gone up by 2%. How much should the third coupon interest be, i.e., the coupon interest payable 1.5 years after the issuance?

3

$$\text{TIPS} = 3\% / 2 = 0.015 \text{ SEMI ANNU}$$

$$\text{FV} = 100,000$$

$$\text{INFLATION} = 2\% = 2/2 = 1\% \text{ SEMI ANNU}$$



3-3. In a Treasury auction there are ^{IN} \$1 billion Treasury bills for competitive bid. The bids are submitted as follows:

Bid (Bank Discount Rate as %)	Quantity (Million)
4.82	1100
4.93	100
4.98	200
5.01	300
5.03	400
5.06	500

What is the stop-out yield? What amount can the last successful bidder get?

3 ~~stop out~~
 IT'S THE AMOUNT TREASURIES WILL OFFER AT MOST
 STOP OUT WOULD BE A 5.032% (OR LESS) B/C 100 +
 100 + 200 + 300 = 600M, AND THERE'S ONLY 1000M QTY FOR ISSUING.
 LOWER/AT LAST SUCCESSFUL BIDDER WILL GET
 $700/1000 = 70\%$ OF THE BIDS SUBMITTED. X

3-4. Name the three major U.S. bond rating agencies. Who pays for the bond rating services? Why are the bond investors dependent so much on the bond rating?

- 5
1. STANDARD + POOR'S ✓
 2. MOODY ✓
 3. FITCH ✓

- INVESTORS ARE VERY DEPENDENT ON BOND RATING
 B/C IT ENTAILS THE RISK OF DEFAULT ASSOCIATED
 WITH THE COMPANY ISSUING THE BOND. RATINGS CAN
 BE AAA, AA, A, BBB OR BELOW

- MOST GOVERNMENTS, OR MANY FIRMS THAT ACTIVELY
ISSUE BONDS AND HAVE HIGH RATINGS, WILL FUND
 THE 3 MAJOR COMPANIES

3-5. Why are the yields on the commercial papers higher than the Treasury bills of equal maturities?

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The yield on a commercial paper could be higher for 3 reasons: (1) THERE IS RISK WITH THE COMPANY ISSUING THE PAPER OF DEFAULTING, AS OPPOSED TO ZERO RISK W/ T-BILLS; (2) COMM PAPER IS LESS LIQUID THAN T-BILLS MAKING INVESTORS DEMAND MORE HIGHER YIELD (3) MOST T-BILLS ARE TAX EXEMPTED, ~~AND~~ COMM. PAPER ARE IN SOME CASES TAXABLE, THIS MEANS INVESTORS WILL DEMAND A HIGHER YIELD.

3-6. What are the major differences between the MTNs and the corporate bonds?

- 5
- 1 - MATURITIES: MTNS ARE OFFERED ON A CONTINUOUS BASIS AND HAVE A WIDER RANGE OF MATURITIES (9M, 1Y, 18MS). HOWEVER, BONDS ARE USUALLY OVER 10 YEARS
 - 2 - CORPORATE BONDS TYPICALLY OFFER HIGHER YIELDS THAN MTN'S B/C OF MATURITY, RISK REASONS
 - 3 - DEFAULT RISK IS GREATER W/ CORPORATE BONDS

3-7. Why is the yield curve typically upward sloping according to the Liquidity Preference Theory?

5
IT IS SLOPED UPWARD B/C LIQUIDITY THEORY ASSERTS THAT INVESTORS WILL DEMAND A HIGHER YIELD WHEN MATURITIES ARE GREATER. ESSENTIALLY, IT ENTAILS THAT AT GREATER MATURITY ENTAILS A GREATER RISK OF DEFAULT, THUS INVESTORS WILL DEMAND A HIGHER YIELD

3-8. The prepayment option embedded in the U.S. housing mortgages implies risks to the investors of the Mortgage-Backed-Securities (MBS) when the mortgage rate declines and rises. Name the two risks and briefly explain.

2
1) IS THAT THE THE MORTGAGE RATE WILL EXCEED THE SOURCE OF FUNDS RATE, RESULTING IN LOSSES (PASS THRU RATE)

2) MARKET CONDITIONS WILL SHIFT LOW MORTGAGE RATE INVESTORS TO MINIMALLY EXCEPT FEDERAL AGENCY OFFERINGS
contraction, extension

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