Lancaster University

PART II (SECOND AND FINAL YEAR)

ACCOUNTING AND FINANCE

AcF304 BOND MARKETS

(2 hours + 15 minutes reading time)

Sections A and B are compulsory
Answer one question only in section C (i.e. either Question 13 or Question 14)

Financial calculators allowed

Section A (30 marks)
This section is compulsory

- You must provide the date, your **full name** and your **library card number** on the MCQ answer sheet.
- Only answers recorded on the MCQ answer sheet will be taken into consideration when marking the examination.
- Choose only one answer A, B, C, D or E, for each question
- Each correct answer gives three marks
- Absence of answer gives 0 marks.

1. You manage a government bond portfolio. Currently the interest rates are very low for short and long-term maturities. Your client believes that in the next two years long-term yields will increase substantially as a result of the Quantitative Easing (QE) tapering. Your preferred strategy would be to:

   A. Buy a ladder portfolio and sell it in two years when the long-term yields increase
   B. Buy a Bullet portfolio and sell it in two years when the long-term yields increase
   C. Buy long-term STRIPS and sell them in two years when the long-term yields increase
   D. Buy bills and reinvest them in long-term securities when long-term yields increase
   E. Buy 10-year Notes and sell them when the long-term yields increase

2. Consider bond XX, a 2-year zero-coupon bond, and bond YY, a 2-year floating rate security. Which of the following statements is generally true?

   A. Both bonds pay cashflows before maturity
   B. Bond XX has a larger duration
   C. Bond YY has a larger duration
   D. Both bonds are exposed to reinvestment risk of interim cashflows
   E. Both bonds do not pay cashflows before maturity

3. The table below gives yields, DV01s, and durations for three 15-year bonds. The three coupon rates are 0%, 4.5%, and 7%. Which coupon rate belongs to which bond?

Bond	Yield	DV01	Duration
#1	4.50%	0.1082	10.82
#2	4.50%	0.0753	14.67
#3	4.50%	0.1265	9.96

   A. #1: 4.5% coupon; #2: 7% coupon; #3: 0% coupon
   B. #1: 0% coupon; #2: 4.5% coupon; #3: 7% coupon
   C. #1: 7% coupon; #2: 0% coupon; #3: 4.5% coupon
   D. #1: 7% coupon; #2: 4.5% coupon; #3: 0% coupon

E. #1: 4.5% coupon; #2: 0% coupon; #3: 7% coupon

4. Why would anyone buy a bond selling at premium when after holding that bond to maturity it will be worth only par?

A. Because bonds at premium are more liquid than bonds at discount
B. Because its yield increases as it approaches maturity
C. Because it has larger duration than bonds at discount
D. Because it pays cashflows that can be reinvested until maturity
E. Because it protects against call risk

5. The effective convexity (textbook definition) of a perpetuity paying a 5% annual coupon and currently trading at a 4% yield is:

A. 25.06
B. 0.71
C. 626.57
D. 37.74
E. It is not possible to calculate the effective convexity of a perpetuity

6. An 1×4 FRA settles in 30 days and has the following characteristics:

Notional	$1 million
Reference rate	90-day LIBOR
Forward Rate	4%
Time to Settlement	30 days
Contract settlement	$Notional \times \dfrac{(LIBOR\ Fix - FRA\ Rate) \times \dfrac{Days\ in\ FRA\ period}{360}}{1 + LIBOR\ Fix\ \times \dfrac{Days\ in\ FRA\ period}{360}}$

If the actual 90-day LIBOR at settlement is 5%, calculate the settlement amount of the FRA:

A. $2,469
B. $1,230
C. $829
D. $2,270
E. $1,830

7. Bank A is buying credit risk protection from Bank B, and Bank B promises to pay the credit loss that a reference obligation suffers upon default. Bank A has

A. Promised to pay the Repo rate until the default event or maturity
B. Promised to pay the promised interest rate swap rate until the contract expires
C. Promised to pay the Recovery rate until the default event or maturity
D. Promised to pay the CDS spread until the default event or maturity
E. Promised to pay the CDO tranche spread

8. A corporate bond has an effective duration of 3.5 and a convexity of 68. The convexity has been measured as $(P_u+P_d-2P)/(2P(\Delta y)^2)$. Which of the following is closest to the change to the bond's price if its yield rises by 2%?

   A. 9.72 fall
   B. 3.5% fall
   C. 3.5% rise
   D. 4.28% fall
   E. 5.46% fall

9. The level of repo haircut is lower

   A. the lower the quality of the collateral
   B. the lower the credit quality of the counterparty
   C. the higher the volatility of the collateral
   D. the better the credit rating of the collateral
   E. the worse the credit rating of the counterparty

10. The difference between the on-the-run Treasury yield and the off-the-run Treasury yield is due to

   A. Sovereign risk
   B. Credit Risk
   C. Liquidity risk
   D. Call risk
   E. Reinvestment risk

Total for Section A: 30 marks

Section B (30 marks)
This section is compulsory
Answer both Question 11 and Question 12
Choose 3 parts out of the 4 parts available

Question 11

On January 2013, the Bank of Japan (BoJ) set the "price stability target" at 2% in terms of the year-on-year rate of change in the consumer price index. The commitment to the newly-introduced "price stability target" was formalized with the announcement on April 4th, 2013 to start an aggressive QE programme with the aim of doubling the monetary base over two years. This QE programme was expanded over the following years. Additionally, on January 29, 2016, the Policy Board of the Bank of Japan decided to apply a negative interest rate of minus 0.1% to current accounts that financial institutions hold at the bank.

The following graphs display the evolution of BoJ's asset size, the 10-year yield of Japanese Government bonds, the 10-year breakeven inflation, and the year-on-year inflation rate.
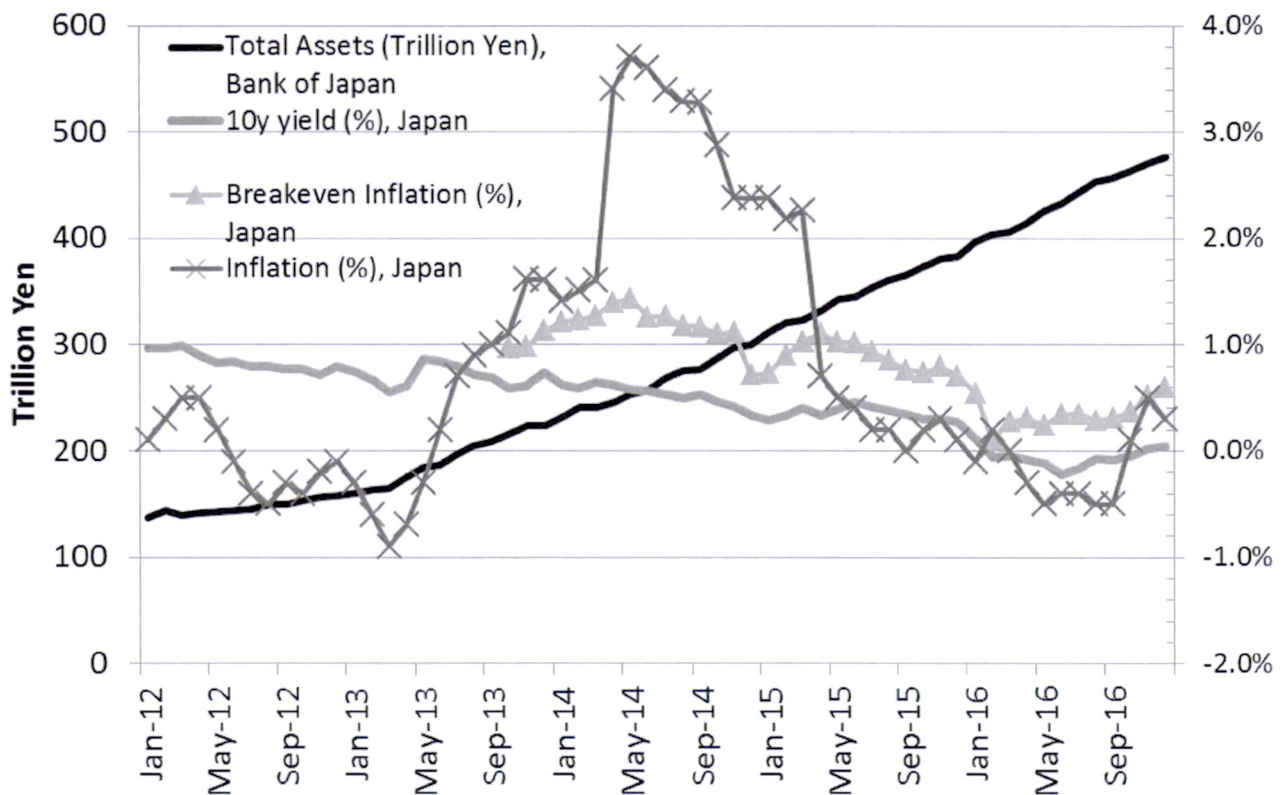
Based on the described events and the evidence provided, answer **3 of the 4 items** below:

a) Why is there a negative relationship between the Total Assets in the balance sheet of the BoJ and the 10-year Government yields?

5 marks

b) What is the breakeven inflation?

5 marks

c) Why is the breakeven rate higher than the inflation rate during 2013/14 and why is it higher during 2015/16?

5 marks

d) Why has the 10-year yield turned negative in 2016?

5 marks

Total for Question 1: 15 marks

Question 12

Give a concise *definition* and *numerical example* for **3 of the 4 parts** below.

a) Credit derivative

5 marks

b) Yield Curve Risk

5 marks

c) Arbitrage strategies between Treasuries and STRIPS

5 marks

d) Yield to first par call

5 marks

Total for Question 12: 15 marks

Total for Section B: 30 marks

Question 13:

A Senior Manager Analyst is seeking advice about how coupon payments affect bondholders. She needs advice on how coupon payments may affect the reinvestment risk, the interest rate risk, and the option risk. To understand coupon effects, she needs answers for the following questions that are related to a set of bonds issued by LUMS.

a) LUMS has two 5-year bonds outstanding with different coupon rates.

    (i)   Compute the net reinvestment income as a proportion of the total dollar return at maturity for the two 5-year bonds paying 3% and 6% semi-annual coupons. Assume the yield to maturity for each of the two bonds is 2%.

    (ii)   How does the coupon rate affect reinvestment risk? Explain your answer.

10 marks

b) Below there is information about a bond portfolio composed of seven annual coupon securities issued by LUMS.

Maturity (years)	Coupon rate	Total Face Value	Total Market Value	Total Dollar Duration
1	3.75%	$ 30,000.00	$30,514.71	$ 299.16
2	3.75%	$ 20,000.00	$20,631.45	$ 396.87
5	3.75%	$ 15,000.00	$16,003.77	$ 729.54
5	6.00%	$ 15,000.00	$17,580.02	$ 775.05
7	4.50%	$ 3,000.00	$ 2,913.20	$ 170.45
7	2.50%	$ 3,000.00	$ 2,566.02	$ 157.86
10	4.75%	$ 2,000.00	$ 1,961.39	$ 152.56
		$ 88,000.00	**$ 92,170.56**	

    (i)   Calculate the portfolio price change under three possible scenarios. The first scenario considers a decrease of 33 bps in the yield of all the securities. The second scenario considers an increase of 220 bps in the yield of all the securities. The third scenario considers a decrease of 350 bps only on the 7-year and the 10-year bonds.

    (ii)   Which scenario would be most favourable for an investor of this portfolio?

    (iii)   Which security is most exposed to interest rate risk? Explain your answers.

10 marks

c) Today, 27th May 2017, LUMS has just issued three callable bonds with a 5-year maturity and different coupon rates. The three securities have the following annual coupons each: 1%, 4%, and 8%. All the securities are trading at a 3% yield-to-maturity and also share the same call schedule provided below:

Call date	Call Price
27th May 2018	115
27th May 2019	110
27th May 2020	100

(i)   Calculate yield measures until the first call date and until the first par value date for the three securities.

(ii)   Which security offers the bondholder the worst possible performance?

(iii)   When would LUMS exercise the call option of the 1% coupon bond in order to make sure that current bond investors would obtain the highest performance? Justify your answers.

10 marks

d) The Head of the Finance department at LUMS is considering issuing a new 3-year callable bond without a coupon payment. This new security would be redeemable after one year of life at the redemption price of 100, i.e. it can be redeemed in year 1 and in year 2 after issuance. Assume that all bonds issued by LUMS are currently trading at a 2.6% OAS.

An analyst has measured the spot rate curve and has created the arbitrage-free interest rate tree shown below that can be used to value future cash flows paid by LUMS.

	Risk-free Spot rate
1-years	1.000%
2-years	0.999%
3-years	0.976%
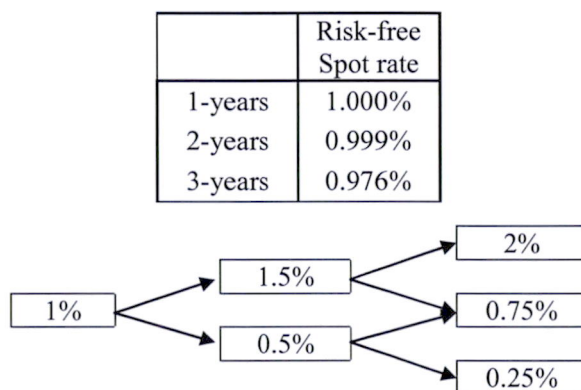
(i)   Measure the difference between the OAS and the Z-spread.

(ii)   How do coupons affect the difference between the OAS and the Z-spread?

10 marks

Total for Question 13: 40 marks

Question 14:

a) The table below provides quotes for US zero-coupon Strips from the Wall Street Journal.

Type of Strip	Maturity (years)	Ask Price (%)	Bid Price (%)
Coupon Strip	0.5	97.540	97.343
Coupon Strip	1	93.720	93.452
Coupon Strip	1.5	91.380	91.000
Principal Strip	0.5	97.210	97.025
Principal Strip	1	93.360	93.130
Principal Strip	1.5	91.170	90.824

(i)   Compute the price and compute the yield of a synthetic portfolio that replicates a selling position in a 1.5-year 4% coupon Treasury Note based on the Strips available above.

10 marks

b) JPMorgan Chase & Co is currently looking at the potential credit risk coming from one of its investments in a puttable corporate bond issued by AT&T Inc. The bond issued by AT&T is a 2-year semi-annual coupon bond, pays an annual 6% coupon, and it is currently trading at $101.22. The table below provides the US Government bond spot rates.

Horizon	Spot rate
6 months	0.5%
1-year	1%
1.5-years	1.6%
2-years	2.4%

(i)   Discuss the difference between the Z-spread and the nominal spread and why they are likely to differ.

(ii)   Calculate the Z-spread.

10 marks

c) The credit rating agency assigns three possible credit ratings. 'A' is assigned to high credit quality debt; 'B' is assigned to medium credit quality debt; and 'C' is assigned to low credit quality debt. Additionally, the credit rating agency has provided the 1-year rating transition matrix shown below. Answer the following two questions.

Initial rating	Rating at end of year			
	A	B	C	Default
A	93	4	2	1
B	2	92	3	3
C	0	3	91	6
Default	0	0	0	100

   (i)   What is the probability that a B-rated bond will not be downgraded in one year?

   (ii)   What is the probability that a B-rated bond will be downgraded at the end of the second year?

10 marks

d) The Chief Financial Officer of Tesla Inc. is analysing the embedded options in two securities. Both of these securities pay an annual coupon of 3% and have a 2-year maturity. The difference is that one contains a *Put* option, and the other contains a *Call* option. Both of these options can be exercised at the end of year 1 at a redemption price of 100.

The CFO has created the following 2-year arbitrage-free interest rate tree to price any security issued by Tesla.
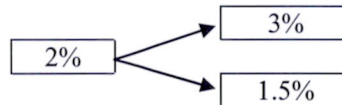
Given that the price of an option-free 2.5% semi-annual coupon bond with a 2-year maturity issued by Tesla is priced at 101.705 ;

   (i)   measure the price of the call and put options.

   (ii)   Why do these two options have different prices?

10 marks

Total for Question 14: 40 marks

END OF EXAM