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)

Only non-programmable, non text-storing calculators are allowed

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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. Consider bond XX, a 1-year zero coupon bond, and bond YY, a 5-year zero-coupon bond. You can buy or sell short both bonds. You expect that the 1-5 year segment of the yield curve will steepen (that is short-term rates will go down and long-term will go up). Which of the following strategies is likely most profitable?

    A. Selling bond XX
    B. Buying bond XX and buying bond YY
    C. Buying bond XX and selling bond YY
    D. Buying bond YY and selling bond XX
    E. Buying bond YY

2. The table below gives the prices, durations, and convexities of three bonds. Currently you hold a portfolio with a duration of 11.78 that contains two of the bonds reported in the table. Which bonds are included in your portfolio?

COUPON	MATURITY	PRICE	DURATION	CONVEXITY (TEXTBOOK DEFINITION)
2.50%	5 years	102.248	4.687	12.53
2.75%	10 years	100.000	8.691	43.07
3%	30 years	95.232	19.393	247.78

    A. The 5-year bond and the 30-year bond
    B. The 5-year bond and the 10-year bond
    C. The portfolio only contains the 5-year bond
    D. The portfolio only contains the 10-year bond
    E. The portfolio only contains the 30-year bond

3. The effective duration of a perpetuity paying a 5% annual coupon and currently trading at a 4% yield is:

    A. 25.06
    B. 7.92
    C. 4.41
    D. 0.97
    E. It is not possible to calculate the effective duration of a perpetuity

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

Notional	$1 million
Reference rate	90-day LIBOR
Forward Rate	6%
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 6.5%, calculate the settlement amount of the FRA:

    A. $230
    B. $460
    C. $1,000
    D. $1,203
    E. $1,230

5. A firm has just issued $1,000 face value bonds with a coupon rate of 7%, paid semi-annually, and a maturity of 15 years. If the issue price for this bond is $869.29, what is the yield-to-maturity?

    A. 12%
    B. 10.42%
    C. 5.2%
    D. 1.04%
    E. 8.56%

6. On January 2008 two counterparties agreed to obtain/provide protection against General Motors's bonds using a 5-year CDS contract with a $10 million notional amount. The two parties agreed on a CDS spread of 1,500 bps. Which of the following is true?

   A. The protection buyer pays an annual interest of $1,500,000 to be insured against default risk
   B. The protection seller pays an annual interest of 1,500bps to be insured against default risk
   C. The protection buyer pays $10 million to the protection seller in the event of default
   D. The protection buyer pays $10 million to the protection seller at maturity of the CDS contract
   E. The protection seller pays the Loss Given Default to the protection buyer at maturity of the CDS contract

7. A corporate bond has an effective duration of 5.5 and a convexity of 35. 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 drops by 1.5%?

   A. 8% rise
   B. 5.5% fall
   C. 5.5% rise
   D. 9.73% rise
   E. 7.46% rise

8. The accelerated sinking fund provision

   A. Allows the redemption of additional collateral in a Repo transaction
   B. Allows bondholders to delay the amortization of the principal amount
   C. Prevents issuers from refunding operations
   D. Incorporates an option granted to the issuer to redeem more securities
   E. Increases the frequency of the coupon payments

9. The TIPS outperforms the nominal Treasury when

   A. The realized inflation becomes larger than the breakeven inflation
   B. The realized inflation is larger than the TIPS rate
   C. The realized inflation becomes smaller than the breakeven inflation
   D. The breakeven inflation is 2%, as targeted by the central bank
   E. The breakeven inflation decreases

10. When interest rates increase, the duration of a 30-year zero-coupon bond:

   A. Increases
   B. Decreases
   C. Remains the same
   D. Increases at first, then declines
   E. Decreases at first, then increases

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 for each question.

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Question 11

On June 23rd 2016, the UK held a referendum to withdraw from the European Union (also known as Brexit). The majority of the votes (52%) were in favour of leaving the EU. Right after the results became known, the Prime Minister David Cameron resigned and the UK financial markets had to start considering the country's future economic life outside the European Union.

In the case of the USA and 4-yearly presidential elections, the two nominees of the main political parties (Hillary Clinton and Donald Trump), held their first presidential debate on September 26th 2016. Hillary Clinton was considered to lead in the presidential debates and the polls indicated that she would be the winning candidate in the election. It then came as a shock when Donald Trump won the presidential elections on November 8th 2016.

The following graphs display the behaviour of each country's CDS spreads during these political events.

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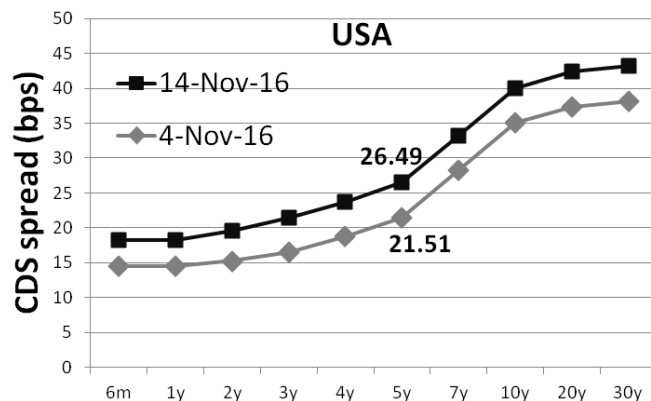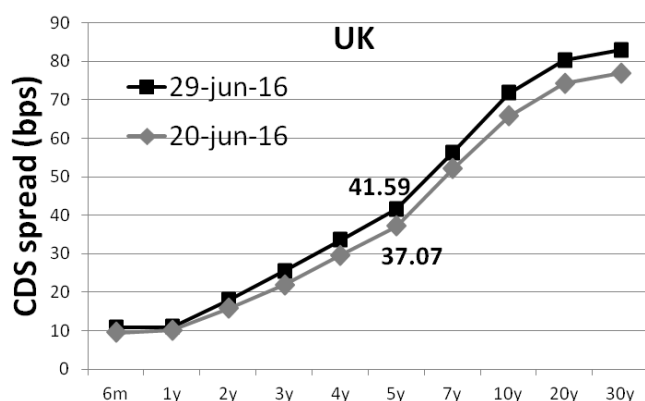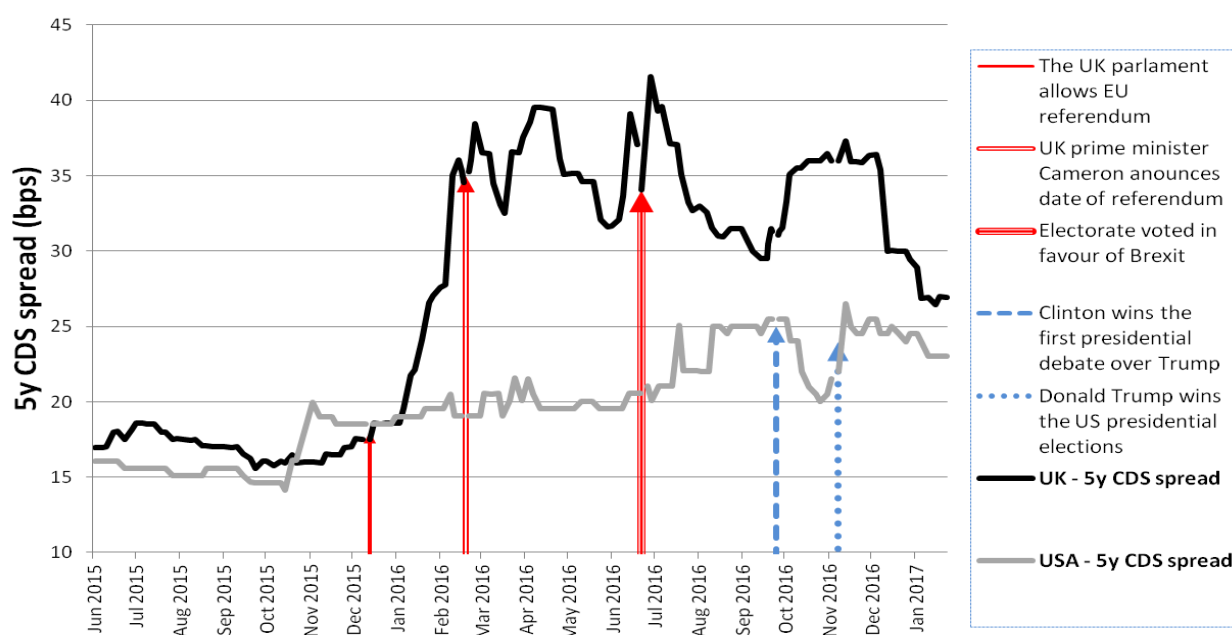
Based on the described events and the evidence provided, answer **3 of the 4 items** below:

a) What risk(s) are being priced in the CDS spreads of UK and USA? Why?

5 marks

b) Is there a parallel shift in credit spreads after the news? Why?

5 marks

c) Before the Brexit referendum, UK's debt was rated AAA by S&P. Given the behaviour of the CDS market after the announcement, what is the likely effect on the UK's credit rating?

5 marks

d) What is the annual cost in dollars of a CDS protection buyer with a €10 million debt exposure? Provide an example based on the graphs displayed above.

5 marks

Total for Question 11: 15 marks

Question 12

From a bond market perspective give a concise *definition* for **3 of the 4 terms** below.

a) Deleveraged floater

5 marks

b) Recovery rate

5 marks

c) Reconstitution

5 marks

d) Accrued interest

5 marks

Total for Question 12: 15 marks

Total for Section B: 30 marks

Section C (40 marks)

Answer either Question 13 or Question 14

Question 13:

a) Today is February 15th, 2017. The table below displays the yields of Treasury securities issued within the last two weeks.

Maturity	Issue date	Coupon	Price	yield
6 months	14/Feb/2017	0.0000	99.01	0.0200
6 months	7/Feb/2017	0.0000	99.00	0.0202
1 year	14/Feb/2017	0.0000	97.56	0.0250
1 year	7/Feb/2017	0.0000	97.20	0.0288
2 years	14/Feb/2017	0.0250	100.36	0.0231
2 years	7/Feb/2017	0.0250	100.22	0.0239
3 years	14/Feb/2017	0.0325	100.58	0.0305
3 years	7/Feb/2017	0.0325	100.38	0.0312

REQUIRED:

(i)   interpolate the on-the-run yield curve to a semi-annual frequency.

4 marks

(ii)   calculate the spot rate curve at a semi-annual frequency up to a 3-year horizon. Explain the methodology employed.

6 marks

b) The following table reports the forward rate curve of Treasuries.

$_1f_i$ forward rate curve	
$_1f_0$	0.01
$_1f_1$	0.02
$_1f_2$	0.03
$_1f_3$	0.045

REQUIRED:

(i)   Calculate all possible spot rates.

5 marks

(ii)   Calculate the 2-year forward rate curve $_2f_i$.

5 marks

c) An investor can buy any of the two 4.75% semi-annual coupon bonds A and B trading at a 6% yield. The table below provides information about the yield/price relationship for the securities A and B.

Bond A			Bond B	
Yield	Price		Yield	Price
5.75%	92.81		5.75%	92.47
6%	91.06		6%	90.47
6.25%	89.45		6.25%	88.97

REQUIRED:

(i)   Calculate the proportional sensitivity (effective duration) of these securities to changes in market interest rates.

5 marks

(ii)   If one of these bonds is option-free, which of these two bonds is most likely to be a puttable bond? Explain why.   **5 marks**

d) A BB-rated company needs to issue a 2-year 4.5% coupon bond to finance a short-term investment. The company would like to incorporate a call option in the bond to add some flexibility. However, the company is deciding whether to set a 100 redemption price or a 110 redemption price. The bond will become callable in one year. Use the following tree to price the securities issued by the company.
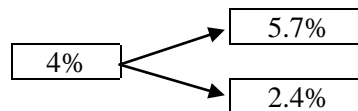
REQUIRED:

(i)   What would be the value of this callable security under the two redemption prices?

6 marks

(ii)   Explain the effect of the redemption price on the price of a callable security.

4 marks

Total for Question 13: 40 marks

Question 14:

a) Suppose the company Webinvest Inc. has assets that provide a stream of cashflows over the next 5 years. This company is planning to issue debt with the same interest rate sensitivity as the assets so that the company is protected against higher interest rates announced by the Federal Reserve. The assets consist of $500,000 par value of a 7.5% annual coupon 5-year bond. The company is planning to use as a hedging instrument a zero coupon bond maturing in 10 years with a par value of $1,000. The characteristics of the assets and the Zeros are reported in the table below.

	Maturity	Coupon	Par Value	Market Value	Modified Duration
Asset	5	7.5%	$ 500,000	$ 554,118.46	4.18
1 Hedging Instrument	10	0%	$ 1,000	$ 615.09	9.53

REQUIRED:

(i) Calculate how many units of the hedging instrument you need so that the new portfolio has zero duration.

6 marks

(ii) Why would this hedging strategy not work in practice?

4 marks

b) A bond trader is looking at his trading history on a 4-year security. This security matures in July 1st, 2017 and pays a 3.75% annual coupon each year on July 1st. Assume a 30/360 day count convention. The trading history is reported below:

Settlement date	Yield of transaction	Volume (par value)	Transaction side
15-Sep-15	0.03	10000	Buy
01-Dec-16	0.0355	10000	Buy
01-Feb-17	0.047	20000	Sell

REQUIRED:

(i) Calculate the Dirty price of every transaction assuming a 30/360 day count convention.

6 marks

(ii) Calculate the Accrued Interest and the Clean Price of each transaction

4 marks

c) The following prices and risk measures for 5 bonds with embedded options were reported in the financial press.

Bond	Maturity	Coupon	Equivalent Option-Free Bond Price	Callable/Putable Bond Price	Callable/Putable Bond Yield	Embedded Option Type	Effective Duration	Effective Convexity (textbook definition)
	(years)	(%)	($)	($)	(%)			
A	5	1.25	103.70	103.7	0.5	Put	4.85	13.19
B	5	1.25	89.08	90.19	3.4	Put	4.67	-32.78
C	10	4.75	100.79	101.99	4.8	Call	7.70	-32.45
D	10	4.75	88.29	87.95	4.6	Call	7.63	25.99
E	20	5	73.98	73.81	7.56	Call	20.1	59.38

REQUIRED:

Assume that the maturity, the coupon, and the option-free bond prices are correct.

(i)   For each of the 5 callable/puttable bonds, state whether the information for the bond is correct or incorrect.

5 marks

(ii)   For each of these bonds, state why the information is correct or incorrect.

5 marks

d) We want to assess the effect of volatility of interest rates on a callable security by looking at two possible scenarios: one scenario with low volatility, and one scenario with high volatility. The two interest rate trees are provided below for the two possible scenarios. Assume that a 2-year 2.5% coupon issue will become callable at par in one year.

REQUIRED:

(i)   What is the value of this callable security under the two scenarios?

6 marks

(ii)   Explain the effect of the volatility of interest rates on the price of a callable security.

4 marks

Total for Question 14: 40 marks

END OF EXAM