

**Birla Institute of Technology & Science, Pilani**  
**Pilani Campus – Rajasthan**

**Mid-Semester Exam – ECON-F413**  
**Financial Engineering (FinE)**  
**Session – 2022-23 (II)**  
**Closed Book**

**Maximum Marks:** 70

**Dated:** 14/March/2023

**Time Duration:** 90 Minutes (Max)

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**Instructions:**

- Do not forget to write your Name and ID number on the answer sheet
  - Read question specific instructions before giving your answers
  - **To get the full score, you need to show all the steps required to arrive at the final answer with proper interpretation**
  - **Calculator is allowed**
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**Q1. (A)**

**[15 Marks]**

Companies A and B face the following interest rates (adjusted for the differential impact of taxes):

	A	B
US Dollars (floating rate)	LIBOR+0.5%	LIBOR+1.0%
Canadian dollars (fixed rate)	5.0%	6.5%

Assume that A wants to borrow U.S. dollars at a floating rate of interest and B wants to borrow Canadian dollars at a fixed rate of interest. A financial institution is planning to arrange a swap and requires a 50-basis-point spread. If the swap is equally attractive to A and B, what rates of interest will A and B end up paying?

**(B)**

**[10 Marks]**

“Nonfinancial companies with high credit risks are the ones that cannot access fixed-rate markets directly. They are the companies that are most likely to be paying fixed and receiving floating in an interest rate swap.” Assume that this statement is true. Do you think it increases or decreases the risk of a financial institution’s swap portfolio? Assume that companies are most likely to default when interest rates are high. Explain with a hypothetical example.

**Q2: (A)**

**[10 Marks]**

Company A is able to borrow either: US dollars (USD) at a floating rate of LIBOR + 1.0%, or euros (EUR) at a fixed rate of 3.0%. Riskier Company B can borrow either: US dollars (USD) at a floating rate of LIBOR + 2.0%, or euros (EUR) at a fixed rate of 5.0%. The interest rates are already adjusted for the differential impact of taxes. Company A prefers to borrow in floating USD dollars. Company B prefers to borrow in fixed EUR euros. A financial institution will intermediate a currency swap in exchange for a 50-basis-point spread. Assume the swap is equally attractive to both companies. What swap does company B enter into with the intermediary (the swap only, not the underlying borrowing)?

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**(B)**

**[10 Marks]**

Suppose that the term structure of risk-free interest rates is flat in the United States and Australia. The USD interest rate is 7% per annum and the AUD rate is 9% per annum. The current value of the AUD is 0.62 USD. Under the terms of a swap agreement, a financial institution pays 8% per annum in AUD and receives 4% per annum in USD. The principals in the two currencies are \$12 million USD and 20 million AUD. Payments are exchanged every year, with one exchange having just taken place. The swap will last two more years. What is the value of the swap to the financial institution? (Use both the methods). Assume all interest rates are continuously compounded.

**Q3:**

**[7+8+10=25 Marks]**

(A) Explain why an FRA is equivalent to the exchange of a floating rate of interest for a fixed rate of interest?

(B) The 6-month, 12-month, 18-month, and 24-month zero rates are 4%, 4.5%, 4.75%, and 5% with semiannual compounding.

- i. What are the rates with continuous compounding?
- ii. What is the forward rate for the six-month period beginning in 18 months?
- iii. What is the two-year par yield?

(C) Portfolio A consists of a one-year zero-coupon bond with a face value of \$2,000 and a 10-year zero-coupon bond with a face value of \$6,000. Portfolio B consists of a 5.95-year zero-coupon bond with a face value of \$5,000. The current yield on all bonds is 10% per annum.

- i. Show that both portfolios have the same duration.
- ii. Show that the percentage changes in the values of the two portfolios for a 0.1% per annum increase in yields are the same.
- iii. What are the percentage changes in the values of the two portfolios for a 5% per annum increase in yields?