Problem Set 3

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Question 1: Basic Concepts on Interest Rate Swaps (1/10)

(1) Explain at least three main reasons why investors use interest rate swaps.

(2) Explain what is an interest swap curve and why it is smoother than the corresponding forward rate curve.

Question 2: Basic Concepts on Other Swaps (1/10)

(1) Define what a currency swap is.

(2) Explain the difference between currency swaps and foreign exchange swaps.

Question 3: Forward Rate Agreement (FRA) (2/10) Suppose you need to pay \$1M to finance a project in 3 months. Bank ABC will provide a one year loan with the amount of \$1M in 3 months and bank XYZ offers a 3mth×15mth FRA with notional value of \$1M and forward rate $r_{0,\ 3\text{mth},\ 15\text{mth}} = 10\%$ (simple interest rate).

(i) What should you do to hedge your borrowing cost?

(ii) Suppose the one year simple interest rate in 3 months rises to 12%. How much money do you owe Bank ABC in 15 months? When and how much money will you pay/receive from bank XYZ? What are your actual cost of borrowing?

(iii) Redo part (ii) assuming the one year simple interest rate drops to 5% in 3 months.

Question 4: Currency Forward Contracts (3/10) Assume there are no transactions costs. You currently pay 130 US-Dollars for 100 Euros. The continuously compounded US-Dollar interest rate is 1% and the continuously compounded Euro interest rate is 2%.

(i) What is the 9-month forward price for 100 Euros?

(ii) Suppose you will receive 2, 000, 000 US-Dollars and 1, 000, 000 Euros in 6 months. The current forward price of a forward contract (contract size is 125, 000 Euro) that matures in 6 months is $F_{0,6\text{mth}}$ = US-Dollar 1.2935/Euro. Suppose you short 8 forward contracts today. How much US-Dollars and how much Euros do you have in 6 months?

Question 5: Foreign Exchange Swaps (3/10) Suppose you sign a swap agreement with a large bank (LB) to buy 100, 000 Japanese-Yen each year for the next five years for X US-Dollars. Your first payment is in one year, your second payment is in two years, ..., and your fifth and last payment is in five years.

The current exchange rate is 100 Yen per Dollar; i.e. S_0 = US-Dollar 0.01/Japanese-Yen (treating the Japanese Yen as the asset). Suppose the yields on 1-year, 2-year, 3-year, 4-year, and 5-year U.S. zero discount bonds are 1%, 2%, 3%, 4%, and 5% (annualized). The yield on a 1-year zero discount Japanese bond is 1%. The yield curve on Japanese bonds is flat. Assume that all interest rates are continuously compounded.

(i) What are the forward prices in Dollar per Yen of forward contracts with maturity in one, two, three, four, and five years from now (round to the sixth decimal point)?

(ii) What is the swap price X?