

ISQ Examination (Winter-2012)
Financial Derivatives - Associateship

- Q. Calculate the price of a three month European put option on a non-dividend-paying stock with a strike price of Rs. 50 when the current stock price is Rs. 50, the risk-free interest rate is 10% per annum, and the volatility is 30% per annum.

$$\begin{aligned} \blacksquare c &= S N(d_1) - Xe^{-rT} N(d_2) \\ \blacksquare p &= Xe^{-rT} N(-d_2) - S N(-d_1) \\ d_1 &= [\ln(S/X) + (r + \sigma^2/2)T] / \sigma\sqrt{T} \\ d_2 &= d_1 - \sigma\sqrt{T} \end{aligned}$$

- Q. A stock price is currently at Rs. 50. Over each of the next two “three-month” periods, it is expected to go up by 6% or down by 5%. The risk-free interest rate is 5% per annum with continuous compounding. What is the value of a six-month European call option with a strike price of Rs. 51?

- Q. a. On August 1, a portfolio manager has a bond portfolio worth Rs. 10 million. The duration of the portfolio in October will be 7.1 years. The December Treasury Bills futures price is currently 91-12 and the cheapest to deliver bond will have a duration of 8.8 years at maturity. How should the portfolio manager immunize the portfolio against changes in interest rates over the next two months?

- Q. b. The three-month Eurodollar futures price for a contract maturing in six years is quoted as 95.20. The Standard Deviation of the change in one year interest rate is 1.1%. Estimate the forward LIBOR interest rate for the period between 6.00 and 6.25 years in the future.

- Q. a. Explain the two ways, a credit default swap can be settled.

- Q. b. Explain the difference between a forward start option and a chooser option.

- Q. a. Explain why delta hedging is easier for Asian options than for regular option.

Q. b. Distinguish between the historical data and risk-neutral approach to valuing a derivative. Under what circumstance do they give the same answer.

Q. Northrop plc is considering a £ 55 million three year interest rate swap. The company wishes to have use of floating rate funds, but because of its AA credit rating has a comparative advantage over lower rated companies when borrowing in the domestic fixed rate market. Northrop can borrow fixed rate at 6.25% or floating rate at LIBOR plus 0.75%. LIBOR is currently 5.25%, but parliamentary elections are due in six months' time and future interest rates are uncertain. A swap could be arranged using a bank as an intermediary. The bank would offset the swap risk with a counterparty BBB rated company that could borrow fixed rate at 7.25% and floating rate at LIBOR plus 1.25%. The bank would charge a fee of £ 120,000 per year to each party in the swap. Northrop would require 60% of any arbitrage savings (before the payment of fees) from the swap because of its higher credit rating. Any fees paid to the bank are tax allowable. The corporate tax rate is 30%.

Required:

- a. Discuss the risks that Northrop and a participating bank might face when undertaking an interest rate swap.
- b. Evaluate whether or not the proposed swap might be beneficial to all parties.
- c. Discuss briefly the THREE advantages and THREE disadvantages of SWAPS.

Q. TEL Limited, a television sports channel, agreed to offer financial support to a major sporting event. The event will take place in 7 months' time. TEL has agreed to lend the £ 45 million two months before the event, and expects the amount will have to be borrowed for 2 months after 5 months. At the time the event would start after 7 months. TEL expects to have sufficient cash the £ 45 million from its own resources, which will be used to pay back the borrowed amount. Interest rates have been showing a rising trend, and TEL wishes to protect itself against further interest rate rises when it takes out the loan. The company is considering using either interest rate futures or options on interest rate futures.

Assume that it is now 1 December and that futures and options contracts mature at the relevant month end.

LIBOR is currently 4%. TEL can borrow at LIBOR plus 1.25%

Euronext. LIFFE STIR £ 500,000 three month sterling futures. Tick size 0.01%, tick value £ 12.50

Months	Price
December	96.46
March	95.79
June	95.57

Euronext. LIFFE options on three month £ 500,000 sterling futures. Tick size 0.005%, tick value £ 6.25. Option premiums are in annual %.

Strike Price	Calls			Puts		
	December	March	June	December	March	June
9400	1.505	1.63	1.63	1.67	--	--
9450	1.002	1.13	1.17	--	--	--
9500	0.502	0.63	0.685	--	--	0.016
9550	0.252	0.205	0.285	0.06	0.115	0.166
9600	0.002	0.025	0.07	0.2	0.45	0.72

Required:

- Discuss the relative merits of using short-term interest rate futures and market traded options on short-term interest rates futures to hedge short-term interest rate risk.
- If LIBOR interest rates were to increase by 0.5% or to decrease by 0.5% estimate the expected outcomes from hedging using:
 - an interest rate futures hedge, and
 - options on interest rate futures.
