

Actuarial Society of India

EXAMINATIONS

15th May 2006

Subject SA5 – Finance Specialist Applications

Time allowed: Three Hours (10.15*am – 1.30 pm)

INSTRUCTIONS TO THE CANDIDATE

- 1. Do not write your name anywhere on the answer scripts. You have to write only your Candidate Number on every answer script.*
- 2. You have 15 minutes at the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only. But notes may be made. You have then three hours to complete the paper.*
- 3. Mark allocations are shown in brackets.*
- 4. You must not start writing your answers in the answer papers until instructed to do so by the Supervisor.*
- 5. Attempt all questions, beginning your answer to each question on a separate sheet.*
- 6. Fasten your answer sheets together in the numerical order of the questions.*
- 7. The answers are expected to be India Specific application for the syllabus and corresponding core reading. However, substantially the core reading material is still taken from material supplied by Actuarial Education Company which are meant for UK Fellowship examination. The core reading also contains some material which is India Specific, mostly the IRDA regulation. In view of this, it should be noted that focal point of answers is expected to be India Specific application. However if application specific to any other country is quoted in the answer the same should answer the question with reference to Indian environment.*
- 8. In addition to this paper you should have available Actuarial Tables and your own calculator.*

Professional Conduct:

“It is brought to your notice that in accordance with provisions contained in the Professional Conduct Standards, If any candidate is found copying or involved in any other form of malpractice, during or in connection with the examination, Disciplinary action will be taken against the candidate which may include expulsion or suspension from the membership of ASI.”

Candidates are advised that a reasonable standard of handwriting legibility is expected by the examiners and that candidates may be penalized if undue effort is required by the examiners to interpret scripts.

AT THE END OF THE EXAMINATION

Hand in BOTH your answer script and this question paper to the supervisor.

Q1)

- a) Define the terms: short hedge and long hedge. Under what circumstances are short hedge and long hedge appropriate? (2)
- b) Define the term Hedge Ratio. Derive an expression for calculating the minimum variance (optional) hedge ratio. Define carefully all symbols used. (5)
- c) A pension fund will be transferring a large proportion of its assets to another pension fund at the end of about 6 months as a result of the sale of a subsidiary company. The pension fund is currently invested 50% in GoI (Government of India) bonds and 50% in blue chip equity stocks listed on the National Stock Exchange (NSE). The fund has a total market value of Rs. 4.0 billion of which Rs. 2.0 billion has to be transferred to the receiving fund. This amount is not dependent on any intervening market movements over the next 6 month period.

Briefly explain the

- (i) the mismatching problem that arises as a result of the impending transfer; and
(ii) how the pension fund can reduce the extent of the problem using futures contracts. (4)
- d) The pension fund referred to in (c) wants to use futures contracts to minimize the risk caused by the impending transfer. The following information is available in this regard:
- The volatility of the pension fund's equity portfolio is 0.12 compared to the Nifty index of 0.18. The correlation between the equity portfolio and the Nifty index is 0.75. The Nifty index futures contract is designed to be Rs. 100 per index point and the Nifty index stands at 4000.
 - The volatility of the pension fund's GoI bond portfolio is 0.03 compared to that of a 10 year GOI bond of 0.04 and the correlation between the two is 0.90. A long gilt future (with a remaining term to expiration of 7 months) designed around the 10 year GoI bond stands at 124.30 and each contract represents Rs. 100,000 nominal of the 10 year GoI bonds
 - (i) Design (in detail) a hedging structure using the above two futures that would minimize the risk caused by the impending transfer. State underlying assumptions, if any.

Calculate the hedge effectiveness (7)
 - (ii) Assume that the hedge designed by you (in (i)) has been put in place. **Briefly describe** the basis risk that remains in the portfolio after the hedge has been put in place. **Discuss** the methods by which this basis risk could be removed through the derivative markets (5)
- (e) The investment managers of the above pension fund are relatively positive on the prospects for the Indian equity market over the coming 6 months. They believe that the following option strategies can be employed to profit from their outlook:
- Bull Spread
 - Strap
 - Calendar Spread

Explain how **each** of the above strategies can be carried out using call and put options on the Nifty index futures; and discuss how the pension fund might profit from such positions.

Illustrate your answer using appropriate position (pay-off) diagrams. (12)

[35]

- Q2)** You are a consulting actuary specializing in financial risk management. Your services have been sought for by MerBanc, a small sized private sector bank. Your remit is to review the bank's risk management practices and recommend improvements where necessary. As the starting point you have been provided the following accounting balance sheet as on March 31, 2006 and additional information:

Balance Sheet As on March 31, 2006

Liabilities	Rs. In Mln	Assets	Rs. In Mln
Share Capital	45	GoI long Term fixed interest bonds	450
Reserves	45	Treasury Bills	900
Subordinated 9% fixed interest loan (10 year term)	225	Corporate Bonds and Commercial loans	1350
Current Deposits	1800	Housing loans to Individuals	1350
90 day Term Deposits	1935		
Total	4050	Total	4050

In addition you have the following information on the assets and liabilities:

- The fixed interest GoI bonds are of a 4 year term
 - The housing loans are of the floating rate type; and have outstanding terms between 0 years and 20 years.
 - The corporate bonds and loans are typically 3 to 6 years in maturity and are fixed rate.
 - The Treasury Bills are on average 1 month in term
 - In theory current deposits can be withdrawn at any time. However past experience reveals that such deposits exhibit a term of about 2 months.
 - The 90 day term deposits can be withdrawn with 90 day's notice. However past experience reveals that these deposits exhibit a term of about 1 year.
 - Instruments that pay floating rate interest reset the interest rate on a quarterly (3 monthly) basis.
 - All assets and liabilities are denominated in rupees.
- (a) Calculate the Basel I ratios in respect of credit risk. Comment on the results and suggest ways by which the Bank could improve its Basel ratios. State underlying assumptions, if any (8)
- (b) You want to calculate VaR (Value at Risk) of the bank's assets less liabilities for the purpose of analyzing interest rate risk. You have chosen a 99 day period and a 0.5% tail for the calculations. Discuss how you would calculate the VaR stochastically using the "historical simulation" method. State the limitations of (12)
- (i) the historical simulation method; and
 - (ii) VaR as a measure of risk.
- (c) The Chief Risk officer of the bank (who has joined recently) wants you to assess the bank's exposure to interest rate risk based on maturity gap analysis and duration analysis. Prepare a note describing these two approaches for estimating exposure to interest rate risk. The note should include a discussion on the advantages and disadvantages of the two approaches for the purpose described.

Estimate the bank’s exposure to interest rate risk using the two approaches. Use a gap interval of 6 months. State the other underlying assumptions. (20)
[40]

Q3) Large Life (LL, hereafter) is a large life insurance company headquartered in the UK with operations in selected South East Asian Countries. LL sells unit linked savings products and pure protection products in both the domestic market and in the foreign markets where it operates.

During a recent Strategy Meeting, the Leadership Team of LL felt that the market for its product range (both locally and internationally) is shrinking as a result of lack lustre equity market performance. While the Leadership Team agreed that the current product range is still highly cash generative, it concluded that there are limited opportunities for growth in the unit linked savings market.

In an other session at the same meeting, the Leadership Team of LL decided to initiate steps for acquiring Small Life (SL, hereafter), a small domestic life insurance company in the UK market specializing only in unit linked savings products. It was estimated that post merger, SL would constitute about 5% of the combined entity. The leadership team constituted a three member task force to “value” SL before discussing a possible price for the merger.

(a) Discuss the possible motives for the merger (8)

(b) Describe an approach for valuing SL (9)

(c) During the “Due Diligence” process, the Task Force evaluated SL’s approach to appraisal of new business proposals and new products. Its evaluation revealed the following:

- SL uses a profit based analysis and not a cash flow based analysis
- SL uses a hurdle rate of 20% for many products
- SL did not have a review mechanism for reviewing the method of appraisal after a product was launched and established.
- SL often approved certain projects on the basis of “management judgment and business compulsions” even when these projects failed the basic financial tests.

Comment on SL’s approach to appraisal of new projects.

(8)

[25]
