INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

19th May 2010

Subject ST5 — Finance and Investment A

Time allowed: Three hours (14.45* – 18.00 Hrs)

Total Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. *Please read the instructions on the front page of answer booklet and instructions to examinees sent along with hall ticket carefully and follow without exception*

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 then have three hours to complete the paper.*

3. *You must not start writing your answers in the answer sheet until instructed to do so by the supervisor*

4. *The answers are not expected to be any country or jurisdiction specific. However, if Examples/illustrations are required for any answer, the country or jurisdiction from which they are drawn should be mentioned.*

5. *Attempt all questions, beginning your answer to each question on a separate sheet.*

6. *Mark allocations are shown in brackets.*

AT THE END OF THE EXAMINATION

Please return your answer book and this question paper to the supervisor separately.

Q 1) You are the investment consultant to the trustees of a defined benefit pension scheme. Most of the assets are invested in fixed interest securities, but there is a sizeable equity portfolio which is well diversified. All of the scheme's liabilities relate to pensions in payment. As a result of a global economic crisis, the trustees are looking to reduce asset and liability risks within the scheme.

a) Describe how the different types of shares within the equity portfolio will move over the economic cycle. (4)

A global investment bank has approached the trustees with a product called a longevity swap. This swap is designed to hedge longevity risk in the scheme (i.e the risk pensioners live longer than expected).

Under the swap, the scheme will make a fixed stream of payments to the bank, known as the "fixed" leg. This "fixed leg" is essentially the expected payments the scheme expects to pay to its pensioners. In return, the bank pays an "actual" leg to the scheme, which is the actual payments the scheme ends up paying to its pensioners.

The swap will have a term of 10 years and payments are exchanged every month.

b) Discuss the issues the trustees should consider before entering the longevity swap. (7)

c) Explain the other major risks in the value of the liabilities that the trustees may be looking to reduce. (2)

[13]

Q 2) Explain the rationale, impact and limitations of the following investment restrictions on pension funds by the regulatory authorities:

(a) imposing restrictions regarding admissibility of assets;
(b) imposing restrictions regarding holding of derivative instruments;
(c) imposing restrictions regarding self-investment.

[6]

Q 3)

a)

(i) Explain how a pension fund uses Asset Liability Modeling (ALM) in the context of investment strategy. (2)

(ii) Describe the key stages in an ALM exercise. (4)

b) Define the following terms:

(i) Marking to market
(ii) Arbitrage
(iii) Par Yield Curve
(iv) Reversion Interest (4)

[10]

Q 4) An investor has been given information on two option strategies:

Strategy 1: 1 long call option with strike price Rs 50 which has a premium Rs 11
1 short call option with strike price Rs 70 which has a premium Rs 3

Strategy 2: 1 long put option with strike price Rs 50 which has a premium Rs 13
1 short put option with strike price Rs 30 which has a premium Rs 5

All the options are European, have the same term to maturity, and the underlying stock is the same in each case.

a) For each strategy, draw a diagram showing the payoff at maturity. (3)

b) Explain what the current price of the underlying security might be. (2)
[5]

Q 5) To complete its ambitious target of raising money through Public Sector Undertakings's divestment, Govt of India is planning to sell 5% stake in Coal India Ltd. It has hired ABC as its merchant banker and the merchant banker has been asked to quote a price range for the IPO.

(i) Describe in detail the process ABC should follow to determine the price range.

(ii) Outline reasons why the recommended price range may be above or below the fair market value.

[8]

Q 6) A life insurance company sells unitized with profit endowment policies and the asset portfolio consists of 50% equities, 40% fixed interest govt. bonds and 10% cash. You want to determine the cost of guarantees on this portfolio.

Explain how will you do it.

[4]

Q 7) You are an investment manager of a life office which has a well diversified asset portfolio consisting of equities, bonds and property, together with a sizeable allocation to hedge funds. The company is reviewing its investment strategy. A switch is being proposed and the company is, for the first time ever, considering investing directly in CDOs (Collateralised Debt Obligations).

a) Discuss the issues the company needs to consider before making this decision. (10)

An alternative proposal is being suggested. One of your analysts has produced statistics which show how a hedge fund index has outperformed over the last year. On this basis, he is advising you to increase your allocation to hedge funds.

b) Explain the issues you would consider before accepting his analysis. (4)

The Chief Risk Officer has asked you to indicate the risk levels in the current portfolio.

c)

(i) Describe how an approximate Value at Risk (VaR) could be calculated for the current portfolio. (3)

(ii) Describe why this VaR number should not be used as the sole indicator of the portfolio risk. (3)

[20]

Q 8) **a)** Explain how the interest rate floor can be valued. (4)

A fixed interest market has the term structure below (all spot rates are continuously compounded)

Year	Spot Rate
1	2.9%
2	2.96%
3	3.03%
4	3.06%
5	3.08%

b) Calculate the value of a European swaption which can be exercised after 2 years. The holder has the right to receive a fixed rate of 3% pa in return for paying a floating LIBOR rate of interest for the next 3 years. Payments are made annually. The notional principal is USD50million. Use volatility for the forward swap rate of 15% per annum. (6)

[10]

Q 9) Suppose an index consists of two constituent companies, namely, Reliance Industries (RIL) and ICICI Bank.

The number of outstanding shares of RIL are 1,00,00,000 and that of ICICI Bank are 50,00,000. The market price at T = 0 of RIL was Rs.1,000 and that of ICICI was Rs.800. At T = 0, the value of the index was 1,000.

At T = 1, RIL came out with a bonus issue of 2 new shares for every 1 share held. At that time, RIL share price was Rs.1,200. Immediately after the bonus share issue the RIL share price became 80% of the ex-bonus share price and closed at this price at T=2.

At T= 1, ICICI Bank came out with a rights issue of 1:5 at the price of Rs. 600. At the time of rights issue, the ICICI share price was Rs. 1,000. At T=2 the price of ICICI Bank was Rs900.

a) Determine the values of the index at T=1 and T=2. (6)

b) Explain how to construct a Total Return Index. (2)

c) Describe the two main types of property index. (4)

[12]

Q10) An insurance company operates a Unitised with-profit (UWP) fund. Though assets valuations are carried out each month, actuarial valuation of liabilities are carried out at each quarter end and these quarterly valuation form the basis for the market value adjustment (MVA) factors used for adjusting the surrender values.

The Appointed Actuary is concerned that due to market volatility, there can be adverse selection against the UWP fund. You have been asked to submit a proposal to update valuations and investment performance on a more frequent basis. In particular, you have been asked to provide an update immediately after an adverse market movement.

The UWP fund has been divided into separate managed funds for each asset class as follows:

Asset Class	%age of fund
Fixed interest long term corporate bonds (AA rated)	23%
Fixed interest medium term corporate bonds (AAA rated)	10%
Fixed interest medium term GILTs	10%
Long term floating rate notes	20%
Indian Equities	15%
Non-Indian equities	5%
Property	5%
Cash	10%
Commercial Mortgages	2%

Outline the investigations you will undertake and set out the points you will make in your proposal to the Appointed Actuary

[12]

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