

# Actuarial Society of India

## EXAMINATIONS

24<sup>th</sup> May 2006

**Subject ST5 – Finance and Investment A**

**Time allowed: Three Hours (10.15\* - 1.30 pm)**

### *INSTRUCTIONS TO THE CANDIDATE*

- 1. 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.*
- 2. You must not start writing your answers until instructed to do so by the supervisor.*
- 3. 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.*
- 4. Mark allocations are shown in brackets.*
- 5. Attempt all questions, beginning your answer to each question on a separate sheet.*
- 6. Fasten your answer sheets together in numerical order of questions. This, you may complete immediately after expiry of the examination time.*

### **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.***

- 1) State the relationship between the total return on equities and the risk free rates, expected inflation and the equity risk premium [2]
- 2) Briefly describe the role of the clearing house in futures trading and the how it operates. [4]
- 3) Outline six different methods an Actuary might use to value individual investments. [6]
- 4)
- a) Two options have identical characteristics except that one is an America option and the other is a European option. Explain which option will have the higher market price. (2)
- b) Explain the differences between a futures contract and an options contract. (4)
- [6]
- 5)
- a) Explain the difference between credit risk and market risk in the context of a fixed for floating interest rate swap and describe the conditions necessary for a credit loss to occur. (3)
- b) Explain why an investment bank that has arranged two offsetting single currency interest rate swap contracts still faces credit risk. (3)
- [6]
- 6) An equity analyst is involved in the fundamental analysis of the equity shares of a company that provides professional educational services.
- a) Briefly discuss the salient features of Fundamental Analysis. (5)
- b) Outline the key factors which the equity analyst should consider while analyzing the outlook for the given company (5)
- [10]
- 7)
- a) State the formulae for calculating the total return index suitable for property performance measurement purposes. Define all symbols used. (4)
- b) Outline the problems in constructing such an index which will be published at quarterly intervals (3)
- [7]
- 8)
- a) Briefly describe how you would construct a zero coupon yield curve (4)
- b) The following data are available about the three conventional gilts:

Conventional Gilt	Outstanding Term in years	Annual Coupon per 100 nominal	Bond Price per 100 nominal	Redemption Yield (%)
A	1	6.75	102.01	
B	2	9.50		4.90%
C	3	7.75	107.42	

Assume that these gilts pay annual coupons and that a coupon has just been paid

- (i) Calculate the continuously compounded spot yields for the next three years. State underlying assumptions, if any. (4)
- (ii) Briefly explain how an interest rate collar can be used to convert a floating interest rate obligation into a fixed interest rate obligation. (3)
- (iii) Hence calculate the value of a 3 year interest rate collar with annual payments, based on a principal amount of 5 million, a fixed interest rate of 4% pa and spot rates as in (i) above (4)

[15]

9) The following table provides information about a pension fund investment portfolio:

	As on 31/12/04	As on 31/12/05	Net Contribution during 2005	Investment Income during 2005
Equities	1200	1400	- 24	30
Bonds	700	900	126	50
Cash	100	100	- 2	2

The following data are available about index values and index returns:

As on	31/12/04	31/12/05
Equity Total Return Index	1000	1115
Equity Index Yield	3.00%	3.12%
Bond Total Return Index	1220	1299.3
Bond Capital Index	275	280.5
Base Rate	3.50%	4.00%

The pension fund's investment performance is assessed against a benchmark portfolio consisting of an investment of 50% in equities and 50% in bonds. Net Contributions are spread evenly over the year.

- a) Calculate the money weighted rates of return of the fund's assets. State underlying assumptions, if any. (4)
- b) Analyze the performance of the fund in terms of stock selection and asset allocation. Comment on the results of your analysis. State assumptions, if any. (10)
- c) An actuarial student has made the following observations based on the given data about the pension fund and the index returns:
  - i) The pension fund has invested in low yielding equities
  - ii) The pension fund has invested in relatively high coupon bonds
 Commend on the validity of these observations (4)

[18]

**10)**

- a) State the formula used to incorporate liabilities in modern portfolio theory, defining all symbols used. Briefly explain how this formula can be used in practice (4)
- b) A pension scheme is considering using a stochastic asset liability model (ALM) to formulate its investment strategy.

The sponsoring employer of this scheme is in financial difficulty and the scheme trustees believe that the employer may be unable to make any abnormal contributions to the scheme in the future. Hence the trustees are particularly keen to use the stochastic ALM to evaluate the probability of the scheme becoming insolvent.

- i) Briefly discuss the key steps in the stochastic ALM exercise. (4)
- ii) Explain the key issues you would consider when using the stochastic ALM to assess the probability of insolvency (4)

**[12]**

**11)**

- a) An investor with no liabilities is considering the following type of switch:

	Price	Flat Yield (%)	Gross Redemption Yield (GRY) (%)
Sell a 20 year 9% Government Bond	116.56	7.72	7.30
Buy a 10 year 8% Government Bond	104.72	6.95	6.85

Assume that the face value of each of the above Government bonds is Rs. 100.

Explain what type of switch is being considered above and why it might be appropriate for the investor under consideration. (4)

- b) An unitized fund holds a diversified portfolio covering all major asset categories. Assume that the equity markets have recently received a severe shock. As a result, there are concerns that this unitized fund may experience a very high level of encashments. It has therefore been suggested that the fund must be protected by selling futures contracts. Evaluate this suggestion (4)

**[8]**

- 12)** Define Value at Risk (VAR). Briefly discuss the limitations of using this measure of risk. **[6]**

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