INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

15th November 2010

Subject SA6 – Investment

Time allowed: Three hours (9.45* - 13.00 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 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.***

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 actuary in a life insurance company.

a) You have been asked to assess whether the life insurance company should invest in a private placement of the first Indian motor insurance book securitisation.

i) Describe the liability characteristics of a book of motor insurance. (4)

ii) Explain (and include a diagram) how the motor insurance book securitisation might be structured. (5)

iii) Explain what features the structure might have to optimise its attraction to investors. (5)

iv) What other matters would you consider before advising whether to invest in such an investment (6)

b) The life insurance company has recently sold a large number of traditional deferred pension annuity contracts whereby premiums are paid annually during the accumulation phase and at retirement, in 10 to 15 years time, the customer has an open market option (OMO) to buy an annuity from another provider or to buy a level annuity from the company using the interest rates guaranteed (5% pa) at point of sale of the deferred pension annuity contract.

i) Explain in detail the economic nature of the option which has been sold and how it could be hedged with a derivative assuming there is a sophisticated and developed financial markets (6)

ii) What are the risks with such a derivative hedging approach (2)

iii) Value the guarantee for a deferred pension annuity, expected to be 12 crore when it vests in 10 years, and the expected life expectancy of the individual is 10 years after vesting. The forward swap rate is 4%pa; the 11 year spot rate is 5%pa and 12 year and beyond the spot rate is 5.5%pa respectively (both compounded continuously). Swap rate volatility is 0.3. You are given that $\sum_{i=13}^{20} e^{-i*s_i} = 3.2539485$ where s_i=5.5% . State other assumptions, if any. (5)

c) The insurance company has a large portfolio of immediate payment annuities. It is considering entering into a longevity swap with another insurance company in order to transfer the longevity risk. The longevity swap can be considered similar to a total return swap.

i) Explain the mechanics of an interest rate swap and indicate the risks associated with such an investment (4)

ii) Define a total return swap and indicate how such an instrument might be used to transfer longevity risk. (3)

iii) How else might such a transaction be structured and explain the advantages and disadvantages of each approach. (3)

d) The life company has recently sold a traditional with profits single premium product which has backing assets of 20% 5 year government bonds and 80% equities. The company has given a guarantee that the reversionary bonus will be 3% pa for this cohort of policies which mature in 5 years time and these policies have backing assets worth 20 crore currently. Government bonds gross redemption yield is 4%pa and equity index volatility σ is 0.4.

i) Explain in terms of Black-Scholes option pricing model how you would value the guarantee and then calculate the value of the guarantee for this cohort of policies. State any assumptions underlying your calculations. (4)

ii) What assumptions underlie the Black-Scholes approach? (3)

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Q. 2) RBI has come out with a draft paper on Introduction of Credit Default Swaps (CDS) for Corporate Bonds and has invited views from Bankers, Insurers, Mutual Funds, Primary Dealers, IRDA, SEBI etc. They are expecting to get views on many aspects related to the management of the CDS contracts.

The paper proposes to introduce plain vanilla OTC single-name CDS for corporate bonds issued by resident entities who are rated by credit rating companies or for those corporate bonds which are issued by SPV (special purpose vehicles) provided they are set up by rated infrastructure companies.

The paper mentions that credit derivatives market has seen very high growth from mid 1990s. This has happened due to the standardization of the contracts, increased number of participants and also the ability of participants to express credit views such as the credit volatility, shape of the company's credit curve, timing and pattern of defaults.

The Lehman Brothers and AIG had exposures to CDS contracts and when they failed as counterparty, it triggered a global financial crisis in which Lehman became bankrupt and AIG was bailed out by the US government. Most of the CDS contracts were written on sub-prime mortgages.

In the recent times the CDS spreads on Greek Sovereign debt had risen dramatically as a response to the fiscal problems in the country and it led to a steep increase in the cost of borrowing and rollover of the Greek Sovereign debt. In view of such corporate and sovereign troubles some countries are reconsidering the decision to introduce CDS.

The draft paper recommends two types of participants, Users and Market makers. The Users will only be allowed to hedge their exposure to corporate bonds by buying CDS but they cannot sell/write CDS to other buyers and cannot have short positions in CDS whereas the market-makers will be allowed to have both buy and sell position.

The paper also mentions that credit rating of reference entity is required but there is no requirement for the reference asset to be rated.

1.)

i) What are credit derivatives and what is their use? (4)

ii) What are the other major credit derivatives products apart from CDS? (2)

2.)

i) What are the risks in OTC derivative products? (2)

ii) What are the main risks related to CDS contracts? (3)

iii) What are the main benefits of CDS instruments? (3)

3.) Explain the features of a Credit Default Swap (CDS contract) (4)

4.) In the aftermath of the global financial crises what are the main initiatives taken by governments and the market participants to reduce risks in CDS and other OTC contracts? (4)

5.) What can be the other underlying reference assets / obligations on which CDS can be introduced? Would you recommend introducing CDS contracts on loans issued by banks to corporates for various projects? (3)

6.) What are the pros and cons of allowing entities to buy CDS without holding an underlying? (5)

7.) How does standardizing of CDS contracts help in CDS transactions? How does the centralized clearing & settlement of CDS help in reducing risks? (4)

8.) What are the various kinds of credit events which trigger CDS payments? (2)

9.) Calculate the credit spread for a CDS on a zero coupon corporate bond with default probability of 3% per annum (conditional on no earlier default). Assume the payment for the CDS (by the buyer to the seller) happens every year at the end of the year and the default happens at the middle of the year. Assume a risk free rate of 7% continuously compounded and the recovery rate (in case of default) is 30% i.e. the default is 70% of the principal amount. State assumptions, if any, underlying your calculations. (6)

10.) Explain the settlement options available for the CDS contracts? (2)

11.) What do you mean by nth to default CDS? (2)

12.) How are the risk characteristics of CDO different than the underlying portfolio of debt (corporate bonds etc)? What is an equity tranche? Please explain a synthetic CDO (where the creator of CDO sells a portfolio of CDS to third parties)? (4)

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