

INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

28th May 2012

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.*
- 7. Please check if you have received complete Question Paper and no page is missing. If so, kindly get new set of Question Paper from the Invigilator.*

AT THE END OF THE EXAMINATION

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

- Q. 1) a)** In your role as a consulting actuary to assess the investment performance of an investment fund, owned by an insurance company, which has a mandate allowing it to invest in either Indian equities or US equities (you may assume that for the purposes of this question the IRDA allows investments in well regulated overseas market). All assets are marked to market.

The value of the fund initially was Rs 5,000 crore. The fund value for the different periods is given below:

Period	Investment income India Rs crore	Investment income USA Rs crore	Net premium less expenses and claims to the fund Rs crore	Market value of fund Rs crore
1 April to 30 June	50	60	+30	5,200
1 July to 30 Sept	60	70	-500	5,100
1 Oct to 31 Dec	70	80	+78	5,300
1 Jan to 31 Mar	80	90	-28	5,500

You may assume that all investment income received is reinvested and that cashflows occur mid-way through each period.

Share index, gross dividend yield and exchange rates are as given below:

Date	US share index	US gross dividend yield	BSE share index	BSE gross dividend yield	1 US \$ =Rs X
1 April	2000	6.0%	4000	4.0%	50
15 May	2100	5.9%	4200	4.2%	52
15 Aug	2180	6.1%	4400	3.8%	53
15 Nov	2300	6.5%	4500	3.7%	48
15 Feb	2400	5.9%	4400	4.0%	46
31 Mar	2200	6.2%	4600	3.9%	45

The fund manager invests his entire assets into US equities, whilst all the liabilities are Indian Rs denominated.

- i.** Calculate the money weighted rate of return of the fund (5)
- ii.** Calculate the time weighted rate of return of the fund using a linked internal rate of return approach (5)
- iii.** Explain the difference between time weighted rate of return and money weighted rate of return and the issues with both approaches (4)

- iv. What would the value of the fund have been if it had invested solely in the BSE equity index? (5)
 - v. Using monetary amounts, how did stock selection ability attribute to the performance? (7)
 - vi. It is possible to attribute a component of sector selection to currency movements in two monetary ways. Calculate the attribution in one way. (6)
 - vii. Why are there two ways to calculate the attribution in vi) (2)
 - viii. The fund manager has commented that he has achieved a 10%pa return over five years whilst the competitors have achieved 9%pa over that period. Explain why this may not be a valid comparison (4)
 - ix. Explain the limitations of performance measurement (5)
- b) You have been asked to prepare a summary on hedging equity volatility in an investment bank.
- i. Explain how an investor might hedge their equity position against a fall in equity markets and give a formula that the investment bank might use to price a contract it could sell to the above investor if the protection was only available at one point in time (1)
 - ii. Explain what risks that the investment bank has taken on in selling such a contract to the investor (1)
 - iii. Explain what is implied volatility in an equity option (1)
 - iv. Explain what is realised volatility in equities (1)
 - v. Explain why implied equity volatility might usually be higher than realised volatility (1)
 - vi. How might the investment fund sell the volatility risk in excess of its risk appetite level to a hedge fund (2)

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- Q. 2) a) **You work for a boutique investment banking firm which specializes in creating structured products and solutions. A client has approached you to advice on issuing American Depository Receipts (ADRs). You have studied the ADR and Global Depository Receipts (GDRs) market. There is a “Instanex Skindia DR Index is made up of 15 depository receipts 8 ADRs and 7 GDRs issued by Indian companies. The Index is calculated using the free float market capitalisation as weights with some adjustments. The client has a lot of questions around the depository receipts and has requested for your guidance.**
- 1. What are depository receipts (DRs)? (2)

2. What is the purpose of issuing such DR, i.e. how does it help the issuing company? (2)
 3. Is one DR equivalent to one share? (1)
 4. Are the rights and obligations of the DR holders same as shareholders? (1)
 5. What is the difference between an ADR and a GDR? Which is more complicated / difficult to issue and why? (2)
 6. Can an Indian company issue ADRs or GDRs without issuing shares in Indian market, i.e. without getting its shares listed in Indian market can the company get its ADRs or GDRs listed on foreign exchanges like NASDAQ etc? (2)
 7. What can be the reason for any price difference between ADRs and equivalent number of shares issued by the company in domestic market? Does it present an arbitrage opportunity? (3)
 8. Can the DRs be converted into shares and vice versa? (3)
 9. How will an Indian Depository Receipt (IDR) benefit a company in USA? (2)
- b) **Your investment bank has been approached by an insurance company which wants to create a product with around 80% to 100% Equity participation and yet comes with a capital guarantee at the end of every 3 years. The current NIFTY level is 5250 and the June 2015 call options with a strike price of 5250 are available at Rs 1250. The capital guarantee is given every 3 years. Thus if Equity markets outperform and the capital of 100 grows to 115 say then 115 becomes the new floor / guaranteed amount after 3 years and if markets go down then on 3rd year the earlier guaranteed amount of 100 becomes the new floor/ guarantee.**
1. Assume that the Insurance companies are allowed to have derivatives exposure in their portfolio please create a 3 year structured product with 100% participation on Equity upside and capital protection on the downside. The interest rate yield available on 3 year debt instruments is 9.5% per annum. (3)
 2. In the same situation as above if the Option premium for strike price of 5250 drops to Rs 1050 instead of 1250, then you would want to give more than the capital guarantee. What is the return guarantee which you can provide in the above 3 year structured product. (3)
 3. Assuming the Option premium is Rs 1050 as given above. Please state what will be the return for the investor in the following situations (6)
 - if the NIFTY goes down from current levels of 5250 to 4500
 - if the NIFTY goes down from 5250 to 5000
 - if the NIFT goes up from 5250 to 6000
 - if the NIFTY goes up from 5250 to 6500

4. Assuming the Option premium is 1050 as above and all conditions remain the same, can you structure a product which has Capital guarantee on the downside and gives 110% Equity participation on the upside. With capital guarantee (no extra return guarantee) what is the maximum equity participation which you can provide in the product given the option premium of Rs 1050 (4)
- c) **One of your retails HNI clients wants to understand the Option premium and how they are calculated. He has been told by his broker that the Option Premium = Intrinsic Value + Time Value.** Can you explain the equation to him making him understand what intrinsic value and time value implies. (4)
- d) **You are approached by a company which is into Power production for advice on issue of a perpetual bond and a zero coupon bond (zero coupon bond). The company wants to deploy the proceeds raised from the issue of the bonds into long term power projects. It wants to understand the interest rate risks in the bond. As a first step please calculate the duration of the following bonds for explaining the interest rate risks.**
1. A 15 year zero coupon bond with a clause wherein the power company has an option to return the entire proceeds from the bond at the end of 10 years. (2)
 2. A perpetual bond which pays a coupon of 10% and has a YTM of 8%. (2)
 3. What are the factors which contribute to the duration and hence the interest rate risk of the bond? (2)
- e) **On 16th May 2012, one of your clients who deals in shares wants to explore hedging positions through futures. He holds large volumes of a particular company's share and wants to offload the position around July 10. He feels market may go down further in the intervening period and wants to create a hedge. Ignore share dividends, if any, during this period.**
1. He wants to sell 26th July (expiry date of the contract) futures of the company. He has been told by his colleagues that the price risk can be hedged through futures but the basis risk will still be there. Please explain what the basis risk here is. (2)
 2. Also please explain to him what is normal backwardation and contango in this context? (2)
 3. If many hedgers go short on futures and speculators hold long positions then please specify whether the market will witness normal backwardation or a contango? (2)

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