

INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

20th May 2011

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) Describe the four step process used by credit rating agencies to evaluate an entity that proposes to make a debt issue.

[10]

Q. 2) The trustees of a Trust managing the Gratuity fund of a company are very risk averse. They want to minimize market and credit risks of the asset portfolio. Outline the investments which an investment manager make in order to minimize:

a) Market risk

b) Credit risk

You may assume that the investment manager can invest funds in any asset classes.

[5]

Q. 3) Your friend is a personal investor. He has recently adjusted his portfolio, making the purchases described below:

- He bought several shares in Amco (a developer of advanced mobile phone technologies). The share price has risen from Rs10 to Rs15 per share over the last three years. Amco's market share has doubled over the past few years, but most analysts believe that its market share will fall sharply in the future due to a surge of new competitors. However, your friend has added to his shareholdings in Amco because he believes that the share price will rise by 50% again over the next three years, based on his own research and the movements he saw over the past three years. He has even ignored advice from his broker who suggested he should liquidate 20% of his existing Amco holdings and invest the proceeds in a competitor stock.
- He bought a bond with a 4% per annum guaranteed return. The alternative investment he considered was in a bond which had an expected return of 12% per annum. However, he rejected this alternative bond because his analysis revealed that there was a 1 in 3 chance of a 0% return from this alternative bond.

(i) Outline arguments from behavioural finance which may explain why your friend has taken these actions.

(3)

(ii) Explain how key behavioural biases may affect pension scheme trustees when selecting or terminating an investment manager.

(3)

[6]

Q. 4) (a) Explain the equity index which is arithmetically weighted on the free float of market capitalization of constituents? Explain the advantages of using weights based on free float of market capitalization than the full market capitalization?

(5)

NSE launches a new series of index called NIFTYTR 50. This is a total return index based on the available free float of 50 companies. Shareholding apart from promoters' holding is considered as free float.

At $T = 0$, two companies, namely Wipro and Hero Honda constitute 5% and 3% of NIFTYTR 50 respectively. At that time, Wipro has paid up capital of Rs. 10 billion (Rs. 10 each share) and Hero Honda had 150 million outstanding shares. Market price of Wipro was Rs. 600 and that of Hero Honda was Rs. 1,600. At $T = 0$, NIFTYTR 50 was 1,000.

The dividend component at $T = 0$ is nil.

At $T = 1$, Wipro share price was Rs. 650 and company came out with a public issue of 250 million shares at Rs. 500, thus diluted the promoters holding from existing 75%. Immediately after the public issue, Wipro share price increased to Rs. 550.

At $T = 1$, Hero Honda came out with a Rights issue of 1:3 (1 share for every 3 shares held) at the price of Rs 1,800 per share. At that time Hero Honda share price was Rs. 2,000. Immediately after the Rights issue, Hero Honda share price becomes 105% of the ex-Rights price.

At $T = 1$, share prices of other 48 companies remained same as was at $T = 0$ and there was no structural change in the equity structure of those companies.

From $T = 0$ till the time Hero Honda goes ex-Rights ($T = 1$), only Hero Honda out of 50 companies declare a dividend of 2% of ex-rights price.

(b) (i) Calculate free float of Hero Honda (2)

(ii) Calculate value of NIFTYTR 50 at $T = 1$ (8)

[15]

Q. 5) An investor is evaluating two years of past performance for a passive mutual fund(ABC) and an Exchange traded fund (ETF) which both track the same index.

On 1 January 2009, ABC had asset base of Rs. 1 billion. On 1 January 2010, ABC received subscription of Rs 1.5 billion from a large institution investor. On 31 December 2010, total fund size of ABC was Rs. 3.24 billion. The net asset value of ABC was the same on 1 January 2009 and 31 December 2009. There were no other investment inflows or outflows to ABC in the two year period.

The ETF tracking the index had no cash-flow between 1 January 2009 and 31 December 2010 and performed in line with the index. The index value increased from 15,000 (1 January 2009) to 20,184 (31 December 2010).

The investor preferred to invest in ABC because as per him, the ABC earned CAGR of 20% while ETF had shown an CAGR of 16%.

(i) Explain why he thought the return was 20%.

(ii) Explain which fund actually gave a better return over the two year period.

[5]

- Q. 6)** i) Describe the main investment characteristics of hedge funds (2)

A hedge fund manager believes that company A's convertible bond is undervalued. The bond is currently priced at Rs107 and pays a 4% annual coupon. Therefore, he establishes a long position in this convertible bond of Rs1,000,0000, by investing Rs 200,000 of his own funds and borrows the remainder. To hedge his long position, he sells short 25,000 equity shares underlying the convertible bond. Each share is currently priced at Rs 24.

Exactly one year later, the price of the convertible bond rose to Rs 119 and the underlying share price rose to Rs 27. The company paid a dividend of Rs 0.24 per share. The manager was able to invest money at 1.25% p.a and borrow money at 2% p.a.

- ii) Calculate the manager's return on capital if the positions are held for 1 year. Ignore any other transaction costs and state any assumptions you make. (6)
- iii) Describe how the manager can use suitable instruments to hedge the credit risk in this strategy (2)

[10]

- Q. 7)** (i) Explain what is meant by "basis risk", and describe how it arises when using a futures contract to hedge exposures on an underlying asset. (2)

MaxiLife is a large insurer in country X and sells a "home equity release" product. Under the product, Maxi Life lends the homeowners a fixed sum (typically a proportion of the property value). The homeowners pay no interest directly on the loan, but interest accumulates at a fixed rate of 3% per annum over the rest of their lives. The homeowners live rent free in the property until the last survivor dies. At this point, the property is sold and the loan is repaid from the proceeds. If the proceeds exceed the loan, then the difference passes to the homeowners' estate. However, if a shortfall arises, Maxi Life offers a guarantee to waive the shortfall.

- (ii) Describe the economic nature of the guarantee offered to policyholders, and suggest how it can be valued using a method based on financial economics. In addition, describe the problems Maxi Life may encounter when trying to hedge exposure relating to this guarantee. (3)

Maxi Life also has a portfolio of immediate annuities, and it reinsures the longevity risk in this portfolio with a reinsurer called Axel Re in the form of a longevity swap.

Under this structure, Axel Re collects periodic premiums from the ceding company based on expected annuity payments and a risk margin. Axel Re pays the ceding company the actual annuity payments (i.e.the ceding company is transferring the longevity risk). Axel Re only writes this type of business, and holds longevity swap contracts with several annuity providers.

- (iii) Outline a structure that would enable Axel Re to securitize the future cash flows of its in-force business and realize some of its' future profits immediately. Identify the parties involved and cashflows in the entire transaction (3)

[8]

Q. 8) A bank is trying to structure appropriate interest rate swaps for two companies, A and B.

Companies A and B had already been offered the following rates per annum on a Rs. 500 million five year loan.

	Fixed Rate	Floating Rate
Company A	12%	LIBOR+0.1%
Company B	13.4%	LIBOR+0.6%

Company A requires a floating rate loan whereas Company B requires a fixed rate loan.

(i) Design a swap that will net the bank, acting as an intermediary, 0.1% per annum and that will appear equally attractive to both companies. (5)

The bank also has the following portfolio of swaptions, which are valued using the Black model:

- A European swaption which has an underlying principal of Rs10,000,000 and can be exercised after 2 years into a 3 year annual LIBOR swap. The contract gives the bank the option to pay annual fixed payments of 4.2% pa in return for receiving a floating LIBOR rate. Assume the volatility of this forward swap is 17% per annum.
- A European swaption which has an underlying principal of Rs 20,000,000 and can be exercised after 3 years into a 2 year annual LIBOR swap. The contract gives the bank the option to receive annual fixed payments of 3.3% pa in return for paying a floating LIBOR rate. Assume the volatility of this forward swap is 19% per annum.

The government bond prices below can be used to derive the relevant zero coupon yield curve:

Term	Coupon %	Price (Rs)
1	5	99.876
2	5.25	99.970
3	6	101.882
4	4.75	98.072
5	4.5	96.880

All bond prices above are given per 100 nominal; coupons are paid annually and the next one is due in a year's time.

(ii) Calculate the value of the bank's swaption portfolio * (13)

(*In this valuation, you are requested to use the yield curve derived from the above table of bond prices)

[18]

- Q. 9)** (i) Explain how the delta of an option is used when implementing portfolio insurance or hedging for a fund. (2)

You have invested Rs 600 million in a stock and are concerned about its short term prospects. The current share price of the stock is Rs500. You are given the following information about options on this stock:

Strike Price	Call option price	Call option delta	Put option price	Put option Delta
520	Rs 15	0.4	Rs 30	- 0.6

- (ii) Calculate the cost of the option contracts you need to purchase in order to eliminate half of your risk to the stock. (2)

An index called the MiniSENSEX currently sells for 1000. You will be buying the index in 1 year from now, but you want to guarantee that you will be buying this index for a price of 1025 in 1 year. However, you can only trade in European call and put options with a strike price of 1025 which mature in 1 year. Assume that the annually compounded risk free rate is 5%, the index pays no dividends and the conditions for an arbitrage free market hold.

- (iii) Describe the most cost effective strategy of achieving your objective, and calculate its cost.

For a particular stock, European call & put options (with term of 1 year) are traded in three strike prices (A, B and C). Assume that any non-integer prices are allowed in this market.

The current stock price is Rs 90, and the strike price of A is Rs 100. The tables below shows how the strike prices of B&C compare to A. For each option, you have also been told how the option premium compares to its strike price. (3)

Strike Price	Strike price (compared to A)	Put option premium (in terms of option strike price)	Call option premium (in terms of option strike price)
A	-	5%	6%
B	9% higher	6%	6.2%
C	20% lower	2%	4%

You are considering investing in the option strategies below:

Strategy X: Buy 2 Put options with strike price A, and buy 3 put options with strike price C.

Strategy Y: Sell 5 put options with strike price C, buy 3 put options with strike price A, buy 2 call options with strike price A, sell 2 call options with strike price B.

You plan to hold each strategy until expiry (i.e you will not sell the options during the year).

- (iv) (a) For each strategy, deduce the maximum and minimum returns on investment that you can achieve. State any assumptions you make. (6)
- (b) Describe a minor alteration you could make to either strategy, which will ensure that both strategies give the same minimum return. (3)

[16]

- Q. 10)** (i) Define Information ratio. Explain how information ratio can be used as a measure of judging performances of two funds. (2)

The table below shows total returns index value of benchmark index, NIFTY and NAVs of two mutual funds ABC and XYZ at the end of half year periods over last 5 years. The NAVs are after considering expense charges. The expense charges are 2% pa for ABC and 2.5% pa for XYZ.

- (ii) Which fund is better for the investor and why? (5)

Date	NIFTY	ABC	XYZ
31 Dec 2005	3400	18.00	32.00
30 June 2006	3500	18.50	34.25
31 Dec 2006	3750	20.10	36.80
30 June 2007	3700	19.95	36.85
31 Dec 2007	3900	21.10	38.95
30 June 2008	4000	21.45	39.10
31 Dec 2008	4050	21.30	39.15
30 June 2009	4200	22.00	40.00
31 Dec 2009	4100	22.40	39.95
30 June 2010	4200	22.35	40.20
31 Dec 2010	4550	24.55	42.20

[7]
