

Institute of Actuaries of India

Subject SA6 – Investment

May 2011 Examination

INDICATIVE SOLUTION

Introduction

The indicative solution has been written by the Examiners with the aim of helping candidates. The solutions given are only indicative. It is realized that there could be other points as valid answers and examiner have given credit for any alternative approach or interpretation which they consider to be reasonable

Q1.]

- a) i)** Money market instrument issued by government and typically issued in 3 month (91 day), 6 month (182 days) and one year terms.

Usually issued by auction where competitive and non-competitive bids may be entered, the latter being filled at the average price of the successful competitive bids.

There is usually a deep and liquid secondary market of these virtually risk free instruments – even though they are unsecured.

- ii)** Short term issuances by near/pseudo government entities e.g. nationalised industries or local authorities in the UK or Federal Mortgage Associations, states and counties and school boards in the USA.

A liquid secondary market can exist

but there is a credit risk that the government may allow the entity to default e.g. Orange County in the USA in 1994.

- iii)** Banks and primary dealers borrow and lend funds to each other on an unsecured basis for the purposes of very short term liquidity management purposes.

The period is usually overnight, and broadly if period is more than 1 day and up to 14 days it is notice money and longer than this up to 1 year term money.

This is an over the counter market

- iv)** A certificate of deposit is issued by a bank when it is borrowing money for between 7 days and 1 year.

The CD is an unsecured bearer instrument which can be sold in the secondary market – though market may be illiquid.

- v)** Commercial paper is short-term unsecured notes issued by a (non-bank) company (so avoiding taking a loan from a bank).

Such notes are issued at a discount, for a term of a few months (7 days to 1 year), but can typically be redeemed early or sold to a dealer.

Usually bearer documents and issuer will need to have a certain credit rating. Interest rate paid should be greater than Treasury bills to reflect credit risk.

- vi)** A form of tradeable IOU, whereby a company that has supplied goods or services to a client will have the invoice accepted by a bank, who thereby guarantees payment at the due date.

The bill can then be traded in a secondary market to raise immediate cash, at a discount.

- vii)** Broadly Treasury bill<Government agency security<call/notice money market< banker's acceptance/eligible bill and Certificate of Deposit< commercial paper due to varying credit risks and time frames

- b) i)** A repo (repurchase agreement) is a form of secured lending whereby an investor buys stock, for example GSecs, from a dealer who, in turn, agrees to buy the stock back again at a later date at an agreed price. In this example, the dealer has repoed the GSec.

A reverse repo is the reverse side of this transaction, whereby the investor lends/invests excess cash with the dealer against the collateral of the GSec security.

- ii)** The difference between the initial selling price and the agreed price for repurchase is the repo rate. Overnight repos are common but other fixed terms are possible e.g. 3 months.

Internationally, open repos are possible which have no fixed maturity date and either side can withdraw after giving the specified notice.

iii) The dealer may not return the cash borrowed and during that time the value of the collateral may fall in value

To mitigate this risk a haircut can be taken e.g. if receiving collateral worth 100, only lend 95 against it

and mark to the market daily

iv) Repos are transacted with the RBI in order to manage liquidity in the market place – in fact the RBI has a repo rate (6.25% at 3 Jan 2011) for borrowing cash (and so repoing stock) and a reverse repo rate (5.25% at 3 Jan 2011) for lending collateralised cash (a large bid/offer spread).

Banks, primary dealers, mutual funds and life insurers can also transact repos between themselves (at a non-RBI market rate) where an entity has excess cash to invest but has used up its credit exposure limits with banks and other institutions.

These institutions also can trade via a tripartite repo transaction CBLO (Collateralised Borrowing and Lending Obligation) which has CCIL as counterparty and so is exchange traded.

v) GSecs and treasury bills are often repoed and occasionally state government securities

vi) Market rates on specific repos (where a particular stock, e.g. GSec, is specified) reflect the relative scarcity in the repo and stock lending markets and are usually below the normal (general collateral) rate. Where the rate is more than 5-10bp below the GC rate it is said to be trading special.

If a dealer has sold short a specific stock (e.g. either a market maker, as part of a hedge on another transaction or a speculative hedge fund) then the dealer needs to deliver that particular stock or be in breach of contractual obligations. If there is little liquidity in the stock he will need to pay an additional amount to purchase the stock than for a very similar stock (similar term, coupon payment and credit rating). This can lead to a squeeze e.g. Salomon Brothers in 1993.

vii) Primary Dealer agrees to purchase a GSec, for example GS 2020, in the secondary market from party B on day T, with cash settlement/delivery occurring on day T+1 (which implies quoted cash market price is actually a one day forward price net of accrued interest).

On T+1 the primary dealer repos the GSec 2020 for cash to party C on an overnight basis.

As the repo trade will cash settle on the same day T+1, the primary dealer receives cash from C and pays cash to B (assuming no changes in market value of GSec nor any credit haircuts)

As such the Primary Dealer has no need to use his own cash to fund the purchase (ignoring RBI capital rules)

On T+2 the primary dealer repos the GSec again to party C. On the same day he sells the GSec to party D for cash settlement on T+3.

On T+3 he receives cash from party D and pays it to party C to terminate the repo

At the end of all these transactions, the primary dealer has not needed to use his own funds to carry out the transactions and should have made a profit on the bid/offer spread in relation to the GSec (less repo costs and costs of regulatory capital)

viii) Primary dealer is exposed to interest rate movements during the period and so might sell an interest rate forward to hedge the interest risk.

c) i) LIBOR/MIBOR is the London/Mumbai Interbank Offer Rate and is the rate at which one large international/Indian bank is willing to lend money to another large international/Indian bank.

LIBOR is quoted with various terms (e.g. overnight, 3 month, 6 month) in various currencies.

It is a polled average i.e. each business day at about 11a.m., a panel of major banks is asked what it would cost them to borrow funds for various periods of time and in various currencies, and then creating an average of the individual bank's figures.

LIBOR rates are generally higher than government security rates as banks are not risk-free. Most international companies borrow money on a LIBOR+x% basis.

MIBOR is also a polled average with polling occurring at about 9.30am each day for overnight money.

ii) It is a benchmark derived from a polling methodology and banks are not contractually obliged to trade at that rate.

- d) i) An interest rate swap involves two counter parties who agree to exchange over a fixed period of time, two streams of interest payments, each based on different kinds of interest rate, for a particular notional amount.

For example, the payer could pay fixed rate and receive floating rate. A swap between 1 month floating MIBOR and 3 month floating MIBOR would be a basis swap.

ii) An overnight index swap is an interest rate swap where the floating rate is linked to the overnight interbank call money index – usually NSE overnight MIBOR. The term is negotiated between the counterparties.

The interest is computed on a notional principal amount. On the floating side, the interests rates are compounded on a daily basis based on the index, with periodic payments.

iii) Credit risk that the counterparty defaults when the market value of the swap is in your favour which is mitigated by having a standardised contract, daily mark to market and daily cash collateralisation (an ISDA (International Swaps and Derivatives Association) agreement)

For the party paying LIBOR/MIBOR – how does it generate this return – it can do so only by taking credit risk in its investments.

- e) i) The investor could purchase the GSec earning 8.47%

The investor would repo the GSec and pay 7.34% as the cost of funds borrowed.

The investor would remove his interest rate risk by entering an OIS swap receiving floating 9.06% and paying fixed 7.71%.

The investor is therefore receiving fixed payments of 8.47% and paying 7.71% and also receiving 9.06% floating and paying 7.34% floating.

The investor has make an arbitrage profit.

ii) Barriers to entry e.g. repo (CBLO) market is not open to all market participants for repo funding to take advantage of the arbitrage opportunities (and so remove them)

Lack of knowledge or skill of participants to take advantage of the situation.

Some banks/financial institutions are not allowed to take advantage of such opportunities because of risk governance policies (e.g. relating to swaps or repos – insurance companies are often allowed to use only reverse repos when credit exposure limits to banks are fully utilised) or transaction sizes would be too large for its limits.

Concerns over ability to liquidate position given GSec are only liquid at certain tenors.

MIBOR is a polled rate and so it may not be possible to actually receive this in the market in an actual transaction.

- f) i) A forward contract is an agreement between two parties to trade an asset at a certain future time for a certain price. Normally traded over the counter.

A futures contract is traded on an exchange.

Often actual date of delivery is not specified only the month of delivery and the exchange usually specifies the period during the month when the delivery should occur.

Futures are mark to market and collateralised.

Forward rate < future rate due to margining requirements on futures.

ii) The bank is concerned about the US dollar falling against the INR. As such it would enter a forward to sell US \$ in one year's time based on the capital value of its assets (and maybe also for expected dividend/coupon payments).

As it is a long term hedge, in one year's time it would roll over the forward i.e. net off cashflows on the forward (i.e. not physically deliver the US \$ but cash settle) and enter into a new forward agreement.

iii) A bank could borrow 10m US dollars for 1/3/6 month paying the related US \$ LIBOR rate.

The bank would then sell 10m US dollars for INR in the spot market.

Bank simultaneously would buy back 10m US dollars (plus the interest that needs to be paid) using the forward foreign exchange rates for 1/3/6 months.

Cost of INR is therefore is US \$ LIBOR plus forward premium between INR and USD.

This is broadly how the Mumbai Interbank Forward Offer Rate is determined.

[50 Marks]

Q.2]

Answer 1)

Value of portfolio	18270000000
Value of Index for one lot of futures contract= 6000 × 50	300000
Beta of the portfolio	0.8
Number of futures to be shorted is equal to = $0.8 * (18270000000 / 300000)$	48720
Beta * Portfolio Value / Value of index underlying one lot of futures contract	
To change the beta to 1 the portfolio needs to be long on futures	
$(\text{New Beta} - \text{Current Beta}) * \text{Portfolio Value} / \text{Value of Index}$ underlying one lot of futures contract= $(1 - 0.8) * 18270000000 / 300000$	12180

Answer 2)

Value of portfolio	18270000000	
Number of futures lot shorted	48720	
Current value of NIFTY Index	6000	

Current value of NIFTY futures	6090	
Value of Index after 2 months (end of May)	6150	5850
Value of futures after 2 months	6180	5880
Expected portfolio return $R_p = R_f + \beta * (R_m - R_f)$ (CAPM)		
When Index grows by 2.5%; $R_p = 1\% + 0.8 * (2.75\% - 1\%)$	2.40%	-1.60%
Rm=2.5% of market growth + 0.25% of dividend yield = 2.75%		
Value of Stock portfolio	18708480000	17977680000
Gain / Loss on futures	-219240000	511560000
Value of hedged position	18489240000	18489240000
(Value of portfolio + Gain / Loss on futures)		

Answer 3)

The view is to profit if the nifty remains range bound i.e. between 5800 to 6000. Two call options needs to be purchased, one with a strike price of 5800 and another with strike price of 6000. Two call options both with strike price of 5900 (closest to the current index value) needs to be sold.

This strategy will give Rs 138 upfront from sale of two 5900 strike options and would cost Rs 156.60 (Rs 121.25 for call option with strike of 5800 and Rs 35.35 for that with strike of 6000). Thus there is an upfront outlay of Rs 156.60-138=18.60.

If the NIFTY moves to below 5800 levels then all the calls would expire worthless (since all are at or above the 5800 level). Also if NIFTY moves above 6000 levels then the payoff of all the 4 calls together would be nil (The gain from buying the calls at 5800 and 6000 would be set off by the loss from the sale of two calls at 5900). Thus in both the cases i.e. when NIFTY is below 5800 or above 6000 the payoff from options is nil and there would be a loss equal to the initial outlay of Rs 18.60.

If the NIFTY remains at levels between 5800 to 6000 then the table below summarises the gains made at different levels of NIFTY .

Initial outlay = $121.25 + 35.35 - 2 * 69 = 18.6$									
Gain from each of the options in different NIFTY scenarios									
	At or below 5800 = (5800-x)	At or above 6000 = (6000+x)	5900	5850	5950	5825	5975	5875	5925
Different NIFTY scenarios									

Call option with strike of 5800	0	200+x	100	50	150	25	175	75	125
Two Call options with strike of 5900	0	200+2x	0	0	-100	0	-150	0	-50
Call option with strike of 6000	0	X	0	0	0	0	0	0	0
Total payoff from all the 4 call options	0	0	100	50	50	25	25	75	75
Total profit = Payoff + Initial outlay	-18.6	-18.6	81.4	31.4	31.4	6.4	6.4	56.4	56.4

Answer 4)

Another strategy to profit from the range bound movement can be created using 4 put options. A put option with strike price of 5800 and another with strike of 6000 can be purchased and 2 put options with the strike of 5900 can be sold to create an option spread which would give similar results as the combinations of call options in the previous question.

Initial outlay = 71.65+179.55-2*116.25=	18.7								
Gain from each of the options in different NIFTY scenarios									
Different NIFTY scenarios	At or below 5800 = (5800-x)	At or above 6000 = (6000+x)	5900	5850	5950	5825	5975	5875	5925
Put option with strike of 5800	X	0	0	0	0	0	0	0	0
Two put options with strike of 5900	(-200-2x)	0	0	-100	0	-150	0	-50	0
Put option with strike of 6000	200+x	0	100	150	50	175	25	125	75
Total payoff from all the 4 put options	0	0	100	50	50	25	25	75	75
Total profit = Payoff + Initial outlay	-18.7	-18.7	81.3	31.3	31.3	6.3	6.3	56.3	56.3

Answer 5)

Buy a Call at 5900 strike for Rs 69 and also buying a put with a strike of 5800 is a strategy which would allow for big gains in the swings of NIFTY on either side , however if market remains near the current levels then the initial outlay cost leads to a loss.

Total Initial Outlay = 69+71.65= 140.65

NIFTY Values	5500	5600	5700	5800	5850	5900	6000	6100	6200
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Payoff at different levels of NIFTY	300	200	100	0	0	0	100	200	300
Total profit = Payoff + Initial outlay	159.35	59.35	40.65	140.7	140.7	140.7	40.7	59.35	159.4

Answer 6)

Traders can profit from a trading strategy if they can take divergent views as compared to the other market participants. If all participants or a large number of them have similar views on volatility then all of them would adopt a similar approach and the price of options (initial outlay) will increase significantly thus reducing the profit which can be made if the view on high volatility turns out to be correct. On the other hand since the initial purchase cost of options goes up significantly the loss is high in case the market remains sideways (range bound) without taking any significant direction.

Answer 7)

Two simultaneous option spreads have been created one on the bearish side another on the bull side		
Bear Option spread- Buy a put option with strike of 5800 and sell two put options with strike of 5600.		
Bull option spread - Buy a call with a strike of 5900 and sell two calls with a strike of 6100		
Total outlay on the 3 options for the bear spread =	20.55	
Total outlay on the 3 options for the bull spread =	37.6	
NIFTY scenarios	5650	6050
Payoff from Bear option spread	150	0
Payoff from Bull option spread	0	150
Total profit after allowing for initial outlay	91.85	91.85
Note:		
With NIFTY at 5650 the put with strike of 5800 is worth 150 but the two puts with 5600 strike are worthless		
When NIFTY is 6050 the call with strike of 5900 is worth 150 whereas the calls at 6100 strike are worthless		

Answer 8)

Price in stock markets fluctuate daily and are regarded by some as the actual representation of true worth on that particular day. However the value investors differentiate between price and value and they are concerned with value in the long term rather than day to day price movements.

The several indicators for value have been developed over the years. All such value indicators revolve around the earnings and hence some people regard EPS as a good starting point but earnings in themselves do not indicate anything until and unless you compare the same with the price per share. Hence EPS on its own is not a value measure.

The earnings yield which is equal to earnings / price (E/P) is considered to be very important. It can be earnings in the last 12 months (trailing earnings) or projected earnings (forward earnings) for the next 12 months. It indicates the return generated on the investments made in the shares of the company. P/E ratio is the inverse of this earnings yield and is thus considered to be an important measure of value.

However if the company does not declare dividends in cash and returns are not received by investors in the form of cash dividends then there are questions raised around the quality of the earnings. The companies can manipulate the earnings numbers, however the dividends paid in cash are a real payout to investors hence many investors consider dividend /price as the most important value metric for investment purposes.

It has been seen historically that if the dividend yields have dropped then the markets have fallen in the following months. Similarly high dividend yields (amongst index stocks etc) are pointers to low stock prices and it has been seen historically that whenever yields have been very high (upwards of 6-7% the markets have shown to be bottoming out and have risen upwards in the coming months.

Price / Book Value: This is another value metric wherein the stock price is compared to the networth in the books. The book value is the total of all assets less all liabilities of the company divided by the total number of shares outstanding. It shows the value per share in the books as against the share price reflected in the market. A very high book value as compared to a low share price may give indications of the stock being priced cheaply by the market but it may also be a pointer to the fact that the assets are not utilised properly and even though the company is holding high valued assets it is not generating sufficient earnings / returns on the same to be priced properly by the market.

Replacement book value is a refinement over the book value. In normal circumstances the depreciated book value being based on the historical purchase price would be low and would not reflect the current replacement price of the asset. In inflationary situation the difference between the book value and replacement book value is quite high and needs to be allowed for to understand the difference between stock price and the book value. The price / replacement value or Q-ratio may be better in such circumstances however it still suffers from the drawback of the book value measure wherein it does not capture how good the assets are being utilised by the firm.

Amongst the given measure P/E ratio and the dividend yield are the best measures to look at for understanding the value of a stock and also to forecast future market movements.

Answer 9)

Value investment principles are given below:

- a) Invest in companies which enjoy some form of consumer monopoly, those who can differentiate their product and /or services and influence the market price of the product / services which they provide hence the competition is not in terms of price alone.
- b) High consistent return on the capital invested by shareholders (upwards of 18% return in Indian markets). Focus on return on equity and dividend yield.

- c) Focus on businesses where predictability in earnings is high, i.e. you can understand the business model of the company and hence forecast their future incomes and profits reasonably well. DCF (discounted cash flow valuation method can be applied even though very distant cash flow projections are not too reliable and need to be taken accordingly).
- d) Waiting for the right market price of the stocks /businesses which have long term potential but for some reason in the short term the prices have been pushed down (for e.g. negative news etc). Take advantage of the short term outlook of many investors including institutional investors like AMC (Mutual funds) and other financial institutions who are highly concerned with quarterly or even monthly NAV performances and comparisons.
- e) Build a portfolio of around 20-25 companies and focus on them. Do not try to have 200 stocks in your portfolio, it is not possible to track them.
- f) Focus on management quality, the managers who work for shareholders and not only for themselves are the ones to look out for.
- g) Stick to the process of identifying quality stocks/ businesses, waiting for the right price and investing for the long term and then forget about the results after you've followed the process of investment correctly. Do not worry about day to day market fluctuations in the prices of the company you've invested with. Loss or risk is not reduction in price but permanent loss in the value of the business.

Answer 10 (a) (i)

All the six indicators above are lead indicators for the economy.

Apart from money supply most of the other indicators are also good lead indicators for stock prices as well.

Money supply may be a lead indicator for economy but for stock markets it may be a concurrent or coincident indicator. It gives indication of immediate or short term trends in the market and does not talk much about future market trends.

Most of the limitations of such lead indicators however arise because they have been created after studying which factors had changed immediately before an economic upturn or downturn. Thus the forecasting abilities of the lead indicators for the economy are back tested for their efficacy in predicting economic outcomes and suffer from that bias.

Also the number economic downturns or upturns have not been too many in the past hence the statistical size for telling that the indicators are strong is too small.

Answer 10 (a) (ii)

The lead economic indicators are many a times lead indicators for stock prices as well and hence they can be used to forecast stock price movements. However apart from the usual limitations of lead indicators in forecasting economic upturns or downturns (as given in the previous question) there are a few more problems in using them to forecast stock prices.

We have to adjust for price inflation while using the lead indicators to forecast market movements.

The lag in calculation of the lead economic indicators may make them lag behind the stock price movements. Most of the lead indicators are calculated once every month and in some cases every quarter and by the time they would be reported the stock prices would have undergone changes thus limiting their value in forecasting the stock price movements.

The indicators themselves may not show a consistent trend and may go up or down in different reporting periods giving confusing signals for market movements.

Answer 10 (a) (iii)

The reserve requirements indicate money supply and a higher reserve requirement restricts money supply thereby restricting money available for productive use and increasing the interest rates. With the cost of borrowing going up for the companies it leads to a short term downward trend in stock prices. Thus if there is an expectation that monetary policy announcements would increase the reserve requirements it would lead to a decline in the stock price in the immediate short term.

Answer 10 (b)

i) Put-Call Ratio: Higher number of Puts indicates many participants are bearish whereas higher number of Calls indicates a higher number of participants are bullish. A high Put-Call ratio indicates the market participants are more bearish. But it has been seen that a high Put-Call ratio has been followed by increase in share prices rather than decline. It is perhaps the option traders / participants have been too cautious when the market is making a new trend. They have purchased more puts when the market is thinking the market would decline but the market has generally gone up in a high Put/Call ratio indicating that the option sellers / writers are more sophisticated and have taken better positions / views on the market.

ii) Advance-Decline Ratio:

This is also called overbought / oversold index. It is calculated daily by dividing the total number of stocks whose prices have increased on a day by the total number of stocks whose prices have declined on that day. It is a good indicator of market breadth. A high A/D ratio indicates an upward trend in the market. Similarly a declining A/D ratio indicates a downward trend. Many times an average of A/D over last 10-20 days is used to get smoothed results.

iii) Advance-Decline Line:

This technical indicator can be calculated weekly or even daily. It is the difference between the stocks that have advanced during the week vis-a-vis those that have declined during the week. The Advance number less the Decline number (of stocks) is calculated every week and the difference is accumulated. When the number of stocks showing increase is higher than those which have reduction in their price then the Advance less Decline line moves upward and indicates that it is a bull market.

iv) Total Shorts / Total Volume ratio: It is a measure of the views of the short sellers. A high number of shorts to total volume of trades is an indicator that short sellers are aggressive and they believe that the market would be bearish.

However as in the Put-Call ratio this indicator also has been found to give opposite signals and the market has moved upwards in most such situations when the number of shorts were

high as a percentage of the total volumes. It is perhaps because the short sellers choose to short when markets have already corrected / reduced and there is little room to move downwards.

v) Exponential Moving Average:

In a simple 20-day moving average the share price of the last 20 working days is taken to calculate the average price. Here the weights of all the 20 observed prices are equal. A weighted moving average gives more weight to recent prices. An exponential moving average is similar to weighted moving average. Thus the recent share prices are given more / higher weights in the exponential moving average, however only one weight is assigned to the most recent observation. A higher weight than 5%, for e.g. say 15% (x%) is given to the last observation and the average of the last 19 observations is given a weightage of $(1-x) = 85\%$ in the example here.

The moving averages for 10 or 20 working days or even 50 working days have been used by traders to establish price trends. For example if the current price becomes higher than the 20 day moving average then it indicates a bullish trend and traders will take long positions.

vi) Share price and Volume of shares, moving in the same direction:

Increasing share price accompanies with increase in volume of shares traded is an indicator of a bullish trend , similarly a decline in prices accompanies with fall in volumes of the share traded indicates a bear market ahead.

[50 Marks]

[Total Marks -100]
