Institute of Actuaries of India

Subject ST5 – Finance and Investment A

April 2016 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.

Solution 1:

i) Expected pro forma financial statement for 15-16

Income Statement	15-16E
Net Sales	**3245**
Other Income	39
Expenses	2,937
Operating Profit	348
Interest	73
Depreciation	18
Pre Tax Profit	256
Tax	85
Profit after tax	**172**
Deemed Dividend	816
Dividend Distribution Tax	139
Balance Sheet	
Equity	24
Total Reserves	315
Total Share holder's funds	339
Debt	816
Sources of funds	**1,155**
Gross Fixed assets	470
Less: Accumulated Depreciation	210
Net Fixed Assets	260
Net Current Assets (excl cash)	325
Cash & Cash Eq.	569
Utilization of funds	**1,155**

Assumptions:

- Sales growth of 10%
- Operating margin showing a slight improvement in line with the trends seen in the last three years.
- No extraordinary items
- Maintenance capital expenditure of 20 cr
- Working capital cycle similar to earlier years
- Other income at about 7% of cash balance at the beginning of the year

[10]

ii) The reason for adopting the strategy could be following
   a) The company's ROE is only about 17%. Bonus debenture is a way of introducing debt into the balance sheet which will significantly boost the ROE.

The pro forma income statement shows that the ROE is boosted from 17% to about 50%.

b) Company has not paid any dividend and accumulated the cash. Bonus debenture is a way to reward the shareholders

c) Lower cost of capital

d) Management may feel that their stock is currently underpriced and a higher ROE with manageable leverage in the balance sheet will lead to market rewarding the company with better valuation

e) The structure ensures that cash continues to remain in the books of the company for the time being and any opportunity for inorganic growth which may come up in the near term can still be pursued. If similar operations continue over next 5 years the cash to meet the redemption can be met from internal accruals.

f) Since the debentures will be listed, shareholders who would want immediate cash may sell out while others may continue holding the instrument.

g) Introduction of leverage may lead to more discipline and more efficiencies as the company will have to meet the interest obligations.

h) Widen the investor base as another set of investors who will be interested in the 5 year fixed income security will emerge over a period of time

i) While right now the debt has been synthetically introduced over a period of time if the Management gets used to a capital structure with a particular proportion of debt then the company can start enhancing the payouts to shareholders by maintaining a target debt equity ratio

[10]
[20 Marks]

Solution 2:

i) Exchange Traded Funds (ETFs) are the 'closed-ended' investment trust equivalents of (mutual) Index Funds. An ETF represents shares of ownership of a unit investment trust (UIT) which holds portfolios of stocks, bonds, currencies or commodities. The investor purchases the shares on a stock exchange in a process identical to the purchase or sale of any other listed stock

[1]

ii) The investor purchases ETF units from the exchange just like he buys stock. The underlying is usually 1 gram of gold which the price of each unit tracks. Authorised participants ensure that the price doesn't deviate from the underlying as otherwise there will be arbitrage opportunities.

[1]

iii) Advantages
  * Low transaction cost. Ability to take ownership at a much lower cost compared to making charges of physical gold

- If ownership is for investment purposes this will be much more efficient than using physical gold where cost of storage is high and risk of theft exists.
- Easy to convert gold to cash and back to gold
- Backed by physical gold where purity is usually guaranteed which need not always be the case in physical gold
- Tax treatment on capital gains similar to stock which is much more favourable than physical gold
- Physical gold requires VAT to be paid which is not the case here
- Ability to purchase in small quantities and accumulate over a period of time
- Discourages purchases of physical gold leading to lesser imports and hence better from a macro economic perspective

[4]

iv) Disadvantages
- ETFs come with an expense ratio that can eat into returns
- Risk of tracking error being high
- Some ETFs are pretty illiquid and bid-ask spread can eat into returns
- Gold is a hedge against political instability. But in case of severe political instability where government finances are in shambles it is easier for government to seize Gold ETF holdings compared to individual physical gold from each home

[2]

v)

a) The rationale for gold monetisation scheme could be as follows:
- The government maybe perceiving the gold held by people in the form of coins, ornaments, bars etc. as an unproductive asset
- Gold monetisation scheme is a way to bring the locked up capital back to the economy
- The gold collected from depositors is processed and lent to users like jewellers which should reduce the import bill and help reducing the country's deficit

[2]

b) **How the scheme works:**

- It is a scheme that facilitates the depositors of gold to earn interest on their metal accounts. Once the gold is deposited in metal account, it will start earning interest on the same

- When a customer brings in gold to the counter of specified agency or bank, the purity of gold is determined and exact quantity of gold is credited in the metal account
- Both principal and interest to be paid to the depositors of gold, will be 'valued' in gold. For example if a customer deposits 100 gm of gold and gets one per cent interest, then, on maturity he has a credit of 101 gram
- Customer will have the choice to take cash or gold on redemption
- His holding of gold increases over a period of time depending on the interest rate unlike the present scenario where his holding remains the same

[4]

c) **Disadvantages**

- The purity of gold has to be assessed – no standard purity tests available as of now
- Depositors have to forego their jewellery as the deposited gold will be processed into a form which will enable further lending
- If the price of gold is lower during the time of redemption his return on investment suffers
- Ability to pay higher interest rates is limited as the banks have to bear the costs of assaying, storing, transportation, insurance etc.

[4]

[18 Marks]

Solution 3:

i)

Alpha

A measure of a stock's, or fund's, outperformance, adjusted for the level of risk taken.

So, for a comparison with the market, alpha is given by:

$$(r - r_f) - \beta (r_m - r_f)$$

Where r is the stock's/ fund's rate of return, r_f is the risk free rate and r_m is the market rate of return. The risk adjustment is the same as in the CAPM model.

[2]

ii)

ISDA

The International Swaps and Derivatives Association, representing the interests of the over-the-counter derivatives marketplace, which has produced a number of Master Agreements regarding terminology, settlement procedures, counterparty risk management, *etc*.

[2]

iii)

Principal-agent problems

Where people (principals), as a result of lack of knowledge, cannot ensure that their best interests are served by their agents.

[2]

iv)

Rights issue

A rights issue is where a company issues further shares, at a given price, to existing shareholders in proportion to their existing shareholdings. For example, a 1-for-5 rights issue allows each shareholder to buy one new share for each five currently held. The purpose is for the issuing company to raise more money.

[2]

v)

Split-capital investment trust

An investment trust where the ordinary share capital consists of income shares and capital shares. Holders of income shares receive all or most of the distributed income while holders of capital shares receive little or no income but receive the residual value of the assets after income shares have been redeemed at a fixed value when the trust is wound up.

[2]

vi)

Strip

A bond strip is a tradable security consisting of one of the payments constituting a coupon paying bond. In effect it is a zero-coupon bond.

[2]

vii)

Anomaly switch

A technique used in the active management of a bond portfolio. Anomaly switching involves moving between stocks with similar volatility, thereby taking advantage of temporary anomalies in price.

[2]

viii)

Unit trust

An open-ended investment vehicle whereby investors can buy "units" in an underlying pool of assets from the trust manager. If there is demand for units, the managers can create more units for sale to investors. If there are redemptions (sales by investors), the managers will buy in units offered to them. Unit trusts are trusts in the legal sense.

[2]

[16 Marks]

Solution 4:

i)

- Investors will aim to maximise their investment return net of tax (and subject to acceptable level of risk).
- Thus, investors subject to a high rate of tax on income will prefer investments with a low running yield (and vice versa), so as to minimise their income tax liability.
- Consequently, if most investors are taxed more heavily on income than capital gains, then the prices of low income investments are bid up, resulting in lower gross redemption yields.
- Conversely the demand for investments offering a high running yield is low. Thus, they enjoy a relatively lower price and offer a higher gross redemption yield.

[2]

ii)

Value of sterling leg = $0.4 \times \exp(-0.04) + 0.4 \times \exp(-0.04 \times 2) + 0.4 \times \exp(-0.04 \times 3) + 10.4 \times \exp(-0.04 \times 4)$

$= 9.97$ million sterling

$= 100 \times 9.97 = 997$ million rupees

Value of rupees leg = $77 \times \exp(-0.08) + 77 \times \exp(-0.08 \times 2) + 77 \times \exp(-0.08 \times 3) + 1177 \times \exp(-0.08 \times 4)$ [As 110 crore = 1100 million]

$= 1051.94$ million rupees

Value of swap to the financial institution = Value of rupees leg - Value of sterling leg
$= 1051.94 - 997$
$= 54.94$ million rupees or 5.494 crore rupees

[6]

c)

cash price of the bond is = $15 \times \exp(-0.05) + 15 \times \exp(-0.05 \times 2) + 15 \times \exp(-0.05 \times 3) + 15 \times \exp(-0.05 \times 4) + 115 \times \exp(-0.05 \times 5)$

$= 142.59$

As there is no accrued interest, this is also the bond price at time 0.

The present value of the interest paid during the life of bond = $15 \times \exp(-0.05) + 15 \times \exp(-0.05 \times 2) = 27.84$

Therefore, the forward price of the bond = $(142.59 - 27.84) \times \exp(0.05 \times 2.5) = 130.03$

The duration of bond at option maturity is
$$\frac{0.5 \times 15 \times \exp(-0.05 \times .5) + 1.5 \times 15 \times \exp(-0.05 \times 1.5) + 2.5 \times 115 \times \exp(-0.05 \times 2.5)}{15 \times \exp(-0.05 \times .5) + 15 \times \exp(-0.05 \times 1.5) + 115 \times \exp(-0.05 \times 2.5)}$$

$= 2.17$

The bond price volatility = $2.17 \times 0.05 \times 20\% = 2.17\%$

Using Black's Model with $F_0 = 130.03$, Price volatility = 2.17%, K = 108, T = 2.5 years, we get

$d_1 = 0.7043$ and $d_2 = 0.6700$

Therefore, value of the put option $= \exp(-0.05 \times 2.5) \times [127 \times \Theta(-d_2) - 130.03 \times \Theta(-d_1)]$

$$= 9.63 \hspace{4cm} [10]$$

[18 Marks]

Solution 5:

i) In this case, the portfolio represents the whole of the investor's wealth hence the appropriate measure is the standard deviation. Using standard deviation to adjust the return allows us to measure how well-diversified the whole portfolio is as well as how good the manager is at individual stocks that produce an excess return relative to their betas.

[2]

ii) For overseas equity portfolio, the appropriate measure is the portfolio beta. The reason for this is that the beta of a portfolio is a measure of its risk relative to a well-diversified portfolio and adjusting the return using beta tells us how good the manager is at picking out-performing securities, given the level of systematic risk assumed. [2]

iii) Mean return for fund manager A = 6.20%
Standard deviation of return for fund manager A = 5.31%

Mean return for fund manager B = 6.20%
Standard deviation of return for fund manager B = 10.26%

Sharpe's measure for A = 0.41
Sharpe's measure for B = 0.21

The mean return for both the fund managers is same. However, Sharpe's measure for A is higher than that of B. This suggests that fund manager A is better for investor. [4]

iv) Mean relative return for fund manager A = 1.20%
Standard deviation of relative return for fund manager A = 5.64%

Mean relative return for fund manager B = 1.20%
Standard deviation of relative return for fund manager B = 9.05%

Information ratio for A = 0.21
Information ratio for B = 0.13

Here information ratio for A is higher than that of B. This suggests that fund manager A is better for investor. [4]

[12 Marks]

Solution 6:

i) For delta neutrality 30,000 AAX should be shorted.

[2]

ii) When exchange rate moves up by 0.03 USD the delta changes by -80,000*0.03 = -2400 i.e. the new delta is 27,600. [2]

iii) To maintain delta neutrality the short position of 2,400 AAX needs to be unwound. [2]

iv) Let Z be the portfolio and S be the underlying asset. The change in portfolio for a change in price of underlying is given by

$$\Delta Z = \frac{\partial Z}{\partial S} \Delta S + \theta \Delta t + \frac{1}{2} \Gamma (\Delta S)^2$$

For a delta neutral portfolio this reduces to

$$\Delta Z = \theta \Delta t + \frac{1}{2} \Gamma (\Delta S)^2$$

The change in exchange rate is about 6% which is pretty substantial considering that this has happened in a short period of time. Hence the influence of the gamma factor should be higher and since gamma is negative the position may have caused a loss. [3]

[9 Marks]

Solution 7:

i)
Management buy-outs happen when the existing management buy-out the existing owners of the company – ie buy their shares and hence a controlling interest in the company.

Similarly, a management buy in occurs when the buyer is an external management team.

Typically such a buy-out is highly leveraged (hence leveraged buy-out), as most of the money raised to buy control is obtained by the borrowing. The resulting capital structure is thus highly leveraged or geared, with the bonds issued typically having non-investment or "junk" status.

[3]

ii)

The reasons for taking private are as follows:

- There may be fewer regulatory restrictions on its activities
- It may benefit from a closer relationship with a typically smaller number of more sophisticated investors who may provide management input
- It incurs lower costs in complying with less onerous financial reporting requirements.
- The lack of a quoted market share price may enable the management to take a longer-term view when making investment decisions.

[4]
[7 Marks]

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