

Institute of Actuaries of India

Subject SA5 – Finance

October/November 2007 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.

Question Number 1 (a) (i) :**Short-term Financial Planning:**

1. Short-term financial planning revolves around the analysis of working capital requirements.
2. Short-term financial planning often takes the form of a 12-month “rolling” plan.
3. The two important factors to be considered while developing a short-term financial plan are:

[i] Stock [Inventory] Policy dealing with managing the stock of raw-materials, unfinished and finished goods.

The operational advantages of holding buffer stocks needs to be balanced against the implications for cash flow and the opportunity cost of capital tied up in the stocks. Seasonal factors that affect the demand for goods may be of considerable importance in many industries.

[ii] Credit management – the management of creditors and debtors

A key element in this planning is the translation of the sales and production plans [underlying the long-term projections] into cash-flow projections – allowing for the settlement policies adopted in respect of accounts payable and receivable

Attention needs to be paid to the non-cash elements in projected accounts such as the need to add back depreciation provisions and the timings of the tax ,interest and dividend payments .

. Short-term financial planning will allow for such factors and will seek to establish a minimum operating cash balance with which the firm wishes to operate in order to allow for unexpected eventualities.

[Max : 5 marks]

Question Number 1 (a) (ii):**Long-term Financial Planning :**

Long-term financial planning is concerned with the assessment of the firm’s requirement for capital to finance its business operations over the long-term and the raising the long-term capital from various sources like long-term loans, debentures and equity.

It is primarily a responsibility of the finance function within the organization –liaising with senior management to ensure consistency with business plans

The financial plan will have to consider non-operational issues such as the possibility of breaching the financial covenants and the impact off additional borrowing g on credit-ratings.

Long-term Financial Planning commonly looks 3 to 5 years ahead –although for capital projects 10 years and beyond would not be unusual.

The development of financial plans should begin by considering the firm’s business plans – its anticipated product development and sales objectives

These will typically need to consider the organic development of existing activities and also plans for new developments –whether expansion or retrenchment

Sensitivity analysis should begin at this stage by exploring business plans under a range of scenarios.

Once the business plans have been developed they can be converted into financial plans starting with the forecast of future cash flows.

Analysis of the anticipated need for working capital and growth in fixed assets together with considerations of tax, dividend and interest payments will enable the finance manager to plan for capital budgeting and structure – both the amount and type of capital that must be raised.

There is again a need for sensitivity analysis in order to allow for possible changes in the financial environment.

Thus Long-term Financial Planning focuses on the sources & uses of funds as well as the implications for borrowing and capital structure.

Clearly long term financial planning is an iterative process as the financial implications of the business plans are explored.

[Max: 7 marks]

Question Number 1 (b) (i) and (ii):**Steps Involved in Constructing a Numerical Credit Scoring System :**

1. Identify factors relevant for credit evaluation
2. Assign weights to these factors that reflect their relative importance.
3. Rate the customer on various factors using a suitable rating scale –for example a 7-point scale.
4. Multiply the factor rating with the factor weight to get the factor score.
5. Add all the factor scores to get the overall customer rating index.
6. Based on the rating index, classify the customer

The following example illustrates this procedure :

Factor	Factor Weight	Rating [on a 5 point scale]	Factor Score
Past Payment Track-Record	0.3	4	1.2
Net Profit margin	0.2	4	0.8
Current ratio	0.2	3	0.6
Debt-equity ratio	0.2	4	0.8
Return on equity	0.1	5	0.5
Rating Index			3.9

Suppose the decision rule is to classify all customers with a rating index above 3.75 as “Highly Credit –Worthy”, this customer will get classified under that category.

Advantages of Credit Scoring Systems :

If an effective credit scoring algorithm can be developed ,the bank will enjoy competitive advantage enabling it to identify suitable candidates for credit and reject unsuitable ones more effectively than other banks

Credit scoring systems can streamline the credit application procedure allowing decisions to be made more quickly and more cheaply

They also allow for more efficient and targeted use of human resources. For example, staff with expertise in assessing credit applications can concentrate only on border-line cases or those with special circumstances.

Note to the Examiner : If the above answer is structured in the form of a note to the Managing Director in the appropriate format , then a maximum of 2 marks can be awarded for drafting

[Max : 8 marks]

Question Number 1 (c):

Altman's Z score is given by:

$$Z = 3.3 \text{ times } [EBIT/TA] + [Sales/TA] + 1.4 \text{ times } [RE/TA] + 1.2 \text{ times } [WC/TA] \\ + 0.6 \text{ times } [MV \text{ of Equity } / BV \text{ of Debt}]$$

Where EBIT : Earnings before Interest & Taxes

TA : Total Assets

RE : Retained Earnings

WC : Working Capital

MV : Market Value

BV : Book Value

The EBIT and sales [both as a proportion of total assets] are measures of profitability of the company. The higher these figures [the more profitable the firm], the higher its credit worthiness is likely to be.

The retained earnings and working capital [again as a proportion of total assets] are measures of liquidity. Again higher these figures, the higher the firm's credit worthiness.

The ratio of equity to debt is a measure of safety provided the capital structure of the firm. The higher this ratio [the lower the level of gearing] the more stable a firm's earnings will be and higher will be its credit worthiness.

[Total : 4 marks]

Question Number 1 (d):**I. Impact of Relaxing the Credit Standards :**

A. Incremental Sales	= 50,000,000
B. Incremental Contribution	= 50,000,000 * 0.3
	= 15,000,000
C. Incremental Bad Debts	= 50,000,000 * 0.12
	= 6,000,000
D. Cost of Incremental Investment	= (20/365) * 50,000,000 * 0.12
	= 328,767
E. Impact on Net Income	= B - C - D
	= 8,671,233

II. Impact of Extending the Credit Period :

A. Incremental Sales	= 40,000,000
B. Incremental Contribution	= 40,000,000*0.3 = 12,000,000
C. Incremental Bad Debts	= 0
D. Change in Cash Discount	= (0.2*840,000,000*0.01) - (0.35*800,000,000*0.01) = (-) 1,120,000
E. Cost of Incremental Investment	= ((50-20)/365)*800,000,000*0.7*0.12 + (50/365)*40,000,000*0.12 = 6,180,822
F. Impact on Net Income	= B-C-D-E = 6,939,178

III. Impact of Relaxing the Credit Terms:

A. Incremental Sales	= 20,000,000
B. Incremental Contribution	= 20,000,000*0.3 = 6,000,000
C. Incremental Bad Debts	= 0
D. Change in Cash Discount	= (0.49*820,000,000*0.02) -(0.35*800,000,000*0.01) = 5,236,000
E. Cost of Incremental Investment [Savings]	= ((16-20)/365)*800,000,000*0.7*0.12 + (16/365)*20,000,000*0.12 = (-) 631,233
F. Impact on Net Income	= B-C-D-E = 1,395,233

Recommended Course of Action:

From the standpoint of impact on net income, the recommended course of action is to relax the credit standards as proposed because this change in credit policy results in the maximum increase in net income. This is however predicated on two key assumptions viz., the bad debt losses on the incremental sales will be contained within 12% and that the ACP [Average Collection Period] does not change from the current level of 20 days. It might be worthwhile looking at industry/competitors' collection and default experience with respect to the dealers in category 3 and category 4 provided such information is available

[Total: 12 marks]
[Grand Total : 36 marks]

Question Number 2 (a):

- (i) **A firm cost of capital is unaffected by its choice of financial (capital) structure**

Comments:

This statement is based on the MM [Modigliani & Miller] hypothesis about capital structure in a tax-free environment

If there is no corporation tax, then increasing the debt in a firm's capital structure increases the level of risk and hence the cost of the equity capital in line with the equation;

$$R[\text{Equity}] = R[\text{assets}] + [\text{Debt}/\text{Equity}] * [R(\text{assets}) - R(\text{debt})]$$

Where R[equity] denotes cost of equity capital, R[debt] denotes cost of debt capital and R[assets] denoted the average cost of capital of the firm

As a result, the average cost of capital of the firm remains unchanged [the law of conservation of value]

The MM hypothesis assumes that debt can always be borrowed at the risk-free rate of interest.

- (ii) **A firms cost of capital falls with increasing debt**

Comments :

This statement holds good in a world with corporation tax, in which case the firm can benefit from a tax shield of value $D*t$ where D is the amount of debt borrowed and t is the corporate marginal tax rate.

The Weighted Average Cost of Capital [WACC} is determined by the formula :

$$WACC = [\text{Debt}/(\text{Debt} + \text{Equity}) * R[\text{debt}] * (1-t) + [\text{Equity}/(\text{Debt} + \text{Equity})] * R[\text{equity}]$$

Where R[debt] is the gross cost of debt reduced by (1-t) to obtain the net cost of debt to the firm

And R[equity] is the cost of equity which increases in line with increasing gearing.

On an overall basis the WACC will decline with increasing gearing until the firm is entirely financed by debt

(iii) There is a level of debt at which a company can minimize its cost of capital

This statement is based on the traditionalist theory which states that

- Companies can borrow up to a moderate level without increasing borrowing
- The cost of equity capital does not increase in line with gearing for moderate levels of gearing
- Hence cost of capital falls with increasing [and moderate] gearing.

However as gearing rises above moderate levels ,the cost of both debt and equity rise more sharply than predicted by Modigliani and Miller; and thus the WACC rises sharply.

At a certain level of debt, before it becomes excessive, there will be an optimal [minimum] cost of capital.

[Max : 8 marks]

Question Number 2 (b)(i) and (ii) :

[i] Annual interest burden $= 500 \times 0.11 = 55$

Expected NCF after taking into account interest burden $= 160 - 55 = 105$
Where NCF stands for net cash flow

Standard Deviation of the NCF distribution $= 90$

Probability of NCF [netted for interest burden] being less than Zero $= \Pr [z < (0 - 105) / 90]$
 $= \Pr [z < -1.1667]$
 $= 0.1217$ or 12.17%

[ii] Given that the management is prepared to accept a 12.5% chance of cash inadequacy and the probability of facing a cash inadequacy [when the entire Rs.500 mln raised as debt] is 12.17% as computed above, the entire amount of Rs.500 mln can be raised as debt finance.

[Total : 5 marks]

Alternative Answer for [ii] : The following approach is also an acceptable approach for determining the amount of debt finance :

Given probability of 0.125, the corresponding Z value is -1.15035

Therefore $[\text{NCF} - \text{Mean (NCF)}] / \text{SD(NCF)} = -1.15035$

Where NCF here refers to the net cash flow before taking into account the interest burden

Given Mean (NCF) = 160 and SD(NCF) = 90, we get

$[\text{CF} - 160] / 90 = -1.15035$

Therefore CF = 56.47

This CF is adequate to service a debt level of Rs.513.36 mln [= 56.47/0.11] at a rate of interest of 11% pa.

Therefore we can conclude that the entire project outlay of Rs.500 million can be raised as debt finance

Question Number 2 (b)(iii) :

Limitations of the Above Approach for Assessing Debt Capacity :

Although the above cash flow approach for assessing debt capacity is simple and intuitively appealing, it suffers from the following limitations :

First ,estimating the distribution of operating cash flows is difficult particularly for firms in industries that are changing and volatile.

Second ,this approach is very conservative as it assumes that the firm will depend only on its cash balance and operating cash flows and not rely on external financing to service its debt.

Third, the tolerance limit expresses the subjective preference of management and may not reflect the interest of the shareholders. Management may not borrow at all because it wants to have a zero probability of default but this may not be in the interest of the shareholders.

[Max : 4 marks]

Note to the Examiner : Any other acceptable limitation of the above approach can be given credit.

Question Number 2 (c) :

The most common types of credit derivatives[**any three**] are :

- Credit Default Swap
- Total Return Swap
- Credit Spread Options
- Credit Linked Note

In a total return swap the total return from one asset [or group of assets] is swapped for the return on another. The total return in this context includes interest and the gain or loss on the asset over the life of the swap.

The following example illustrates the mechanics of a total return swap :
Consider a five year agreement with a notional principal amount of USD 100 million to exchange the total return on a 5% coupon bond for, say ,LIBOR +25 BP. On the coupon payment dates the payer pays the coupons earned on the USD 100 million invested in the 5% bond . The receiver pays interest at the rate of LIBOR +25 BP on the principal of USD 100 million. At the end of the life of the swap [five years in this case], there is a payment reflecting the change in the value of the bond. For example, if the bond has increased by 10% in value, the payer is required to pay USD 10 million and if the bond has decreased in value by 15%,the receiver is required to pay USD 15 million. If there is a default on the bond, the swap is usually terminated and the receiver makes a final payment equal to the excess of USD 100 million over the market value of the bond.

A total return swap can be used as a financing tool. In the above example, we can say that the receiver wants to finance the investment of USD 100 million in the 5% bond. The payer finances the receiver by investing USD 100 million in the bond charging a rate of interest of LIBOR+25BP on USD 100 million.

Also from the description of this swap it is clear that the payer[the financier] is protected from the default risk inherent in this bond.

[Total : 6 marks]

Note to the Examiner : As long as the candidate displays an understanding of the mechanics of a total return swap even without a numerical example, the 2 marks allotted for the numerical example can be awarded.

Question Number 2 (d) :

The fact that the two swaps are exactly offsetting swaps coupled with the additive property of present values leads to the statement that the total present value of the cost of defaults is the sum of the present value of the cost of defaults on the contract with X plus the present value of the cost of defaults on the contract with Y .Therefore the given statement is true.

The expected exposure in one year on both the contracts will be equal to the sum of the expected exposure on the contract with X and the expected exposure on the contract with Y because contracts X & Y are exactly offsetting swaps. Hence the given statement is true. [

[Total : 4 marks]
[Grand Total : 27 marks]

Question Number 3 (a) :**Features of the Regulatory Framework Governing Takeovers and Mergers:**

The main regulators in these circumstances are the government and the capital market regulators.

They will normally try to protect :

- Existing shareholders in both the companies involved
- Existing management of the target company
- Public interests, including monopolies [if there are such issues].

The key is to provide a level playing field such that the fittest companies survive and to allow market forces to produce a competitive market place.

During a takeover or merger there will usually be a time table for action and certain prescribed minimum disclosures :

- For example all holdings above, say, 3% or 5% must be disclosed to the market
- If a predator builds up a holding of a certain size in the open market [often 15% or 25% of the target company shares] a pause must be made before further shares can be purchased
- If a predator owns, say, 30% of the target company a full open bid must be made [to avoid taking over a company by stealth].
- If a full bid is launched the predator has a certain period [often about 60 days] to complete the acquisition.
- If a bid fails, the predator cannot bid again for the same company within a specified period of time.

[Max : 8 marks]

Question Number 3 (b)(i) :

Horizontal Merger and Reasons Therefor:

A horizontal merger occurs when two firms engaged in similar activities –for example two firms in the pharma industry – join together to form a single entity.

A horizontal merger may be undertaken for one or more of the following reasons :

- Benefit from economies of scale such as sharing core services common to both firms - e.g., management ,marketing, research &development, corporate office facilities
- Exploit complementary resources- for example two pharma companies which are intending to merge may have strong presence in two different geographical areas.

- Access opportunities only available to larger organizations – for example bidding for very large scale contracts
- Eliminate inefficiencies including managerial inefficiencies

[Total : 5 marks]

Question Number 3 (b)(ii) :

Parameter	Modern Pharma	Magnum Drugs	Exchange Ratio
Earnings per Share [Rs.]	22.5	9.5	$9.5/22.5 = 0.4222$
Book Value per Share [Rs.]	115	65	$65/115 = 0.5652$
Market Price per Share [Rs.]	160	51	$51/160 = 0.3188$

Exchange ratio that gives equal weightages to all the three parameters

$$= (0.4222 + 0.5652 + 0.3188) / 3$$

$$= 0.4354$$

Marking Guidelines :

**1 mark each for the exchange ratios calculated on the basis of EPS and BVPS;
And 1 mark for the final answer**

Question Number 3 (b)(iii) :

$$\text{Combined EPS} = (E1 + E2) / (N1 + N2 * ER)$$

Where E1 = Profit after tax of Modern Pharma
E2 = Profit after tax of Magnum Drugs
N1 = number of outstanding shares of Modern Pharma
N2 = number of outstanding shares of Modern Pharma
ER = exchange ratio

$$= (900 + 190) / (40 + 20 * 0.25)$$

$$= \text{Rs. } 24.22$$

Question Number 3 (b)(iv) :

Define MER as the maximum exchange ratio acceptable to the shareholders of Modern Pharma which will avoid initial dilution of EPS

MER is given by the equation :

$$(E1 + E2)*(1+s) / (N1+ N2*MER) = \text{Current EPS of Modern Pharma}$$

Where s denotes synergy gain

$$\begin{aligned} \text{i.e.,} & \quad (900+90)*(1.05) / (40+20*MER) = 22.5 \\ \text{i.e.,} & \quad \text{MER} = 0.5433 \end{aligned}$$

Question Number 3 (b)(v) :

Let MER be the maximum exchange ratio acceptable to the shareholders of Modern Pharma [given a projected post-merger P/E ratio of 13 ;and no synergy gains]

MER is given by the equation

$$\begin{aligned} \text{Market Price of Modern Pharma} &= \text{Projected P/E} * [(E1 + E2) / (N1+ N2*MER)] \\ \text{i.e.,} & \quad 160 = 13 * [1090 / (40 + 20 * MER)] \\ \text{i.e.,} & \quad \text{MER} = 2.4281 \end{aligned}$$

Comment : This exchange ratio is significantly higher than what have been determined on the basis of the various parameters in question 3(b)(ii) because of the fact that the post-merger projected P/E of 13 is significantly higher than the current P/E of Modern Pharma which stands at $160/22.5 = 7.11$

Question Number 3 (b)(vi) :

Let MER1 be the minimum exchange ratio acceptable to the shareholders of Magnum Drugs [given a projected post-merger P/E ratio of 12 ;and a synergy gain of 2%]

MER1 is given by the equation

$$\begin{aligned} \text{MP of Magnum} &= \text{Projected P/E} * [(E1 + E2)*(1+s) / (N1+ N2*MER1)] * \text{MER1} \\ \text{i.e.,} & \quad 51 = 12 * [(1090*1.02) / (40 + 20 * MER1)] * \text{MER1} \\ \text{i.e.,} & \quad \text{MER1} = 0.1656 \end{aligned}$$

Question Number 3 (b)(vii) :**Merits and Demerits of Using Different Bases :**

[a] Earnings per Share as a Basis :

(+) EPS reflects the current earning power of the two companies and hence can be a good basis for determining the exchange ratio.

(-) However current EPS can be influenced by certain transient factors like wind fall profit or a large tax relief.

(-) If EPS for one of the firms is negative, then it cannot be used as a basis

(-) Also an exchange ratio based on EPS fails to take into account the following

- The difference in the earnings growth rate of the two firms
- Gains in earnings arising out of the merger
- Differential risks associated with the earnings of the two companies

[b] Market Price per Share as a Basis :

(+) Market price as a basis for fixing the exchange ratio has considerable merit if the shares of the two firms are actively traded. This is so because market prices reflect current earnings, growth prospects and risk characteristics.

(-) However if trading is meager, market prices may not be very reliable. In the extreme case, market prices may not be existent if the shares are not traded- one or both the firms might be unlisted.

(-) Market prices may be manipulated by those who have a vested interest.

[c] Book Value per Share(BVPS) as a Basis:

(+) Since BVPS is a balance-sheet based metric, it provides an objective basis for fixing the exchange ratio.

(-) However the book value is influenced by accounting policies which reflect subjective judgments.

(-) Book values do not reflect changes in the purchasing power of money.

(-) Book values are often significantly different from true economic values

[Max : 7 marks]

Note to the Examiner : Credit can be given for any sensible point other than the ones mentioned above.

Recommended Basis for the Proposed Merger :

Since the two companies are traded and their market prices are available , we propose market price as the basis for fixing the exchange ratio. This is because market prices of the two companies will typically reflect their relative current earnings, growth prospects and risk characteristics.

Based on the given data we find that the P/E multiple of Modern Pharma is $7.1 (=160/22.5)$,which is higher than the P/E multiple of Magnum Drugs at $5.4 (=51/9.5)$. This is expected because of Modern Pharma has a relatively larger earnings and asset base. Thus it appears that the market valuation of the two companies is consistent with the earnings and size differentials.

Based on the market prices the recommended exchange ratio is 0.3188 i.e., 0.3188 share of Modern Pharma for every share of Magnum Drugs. This exchange ratio {ER} should be acceptable to shareholders of both the companies because it is lower than the maximum acceptable ER [from Modern Pharma's standpoint] calculated in 3(b)(v) and the minimum acceptable ER [from Magnum Drug's standpoint] calculated in 3(b) (vi) based on projected P/Es and synergy gains.

It is assumed that the shares of the two companies are actively traded.

[Max: 3 marks]

Note to the Examiner : Credit can be given for any other basis like EPS or BVPS provided the candidate has provided an appropriate rationale and has stated the underlying assumptions and/or limitations.

[Grand Total : 37 marks]
