LPCPS

LUCKNOW PUBLIC COLLEGE OF PROFESSIONAL STUDIES

# B.Com. (Hons.) Course

## Semester – V

**Paper:** Business Finance

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- Administration, information and control costs

## Required Cash Balance

The question may be designed as whether it is possible to define the amount of cash which out to be held at any time? Cash is needed for three reasons:

1. To finance transactions (which was the main theme of the previous paragraphs):
2. As a precaution - a safeguard against the inaccuracies in cash forecasts - bearing in mind that every forecast, by its very nature, will be inaccurate.
3. For speculative purposes - to take advantage of any profitable opportunities that arise.

What average cash balance then should be held to finance normal transaction, including any necessary margin of safety? The word 'normal' is important because it may be assumed that small deviation from the norm will be covered by overdraft facilities.

This is a question closely akin to one we shall be asking about stockholdings in the next unit. Attempts are sometimes made to establish a equation based on:

- The 'holding cost' of cash (i.e., the opportunity cost of keeping the cash un-invested;
- The 'procurement cost' of cash (.i.e., the transaction cost of converting securities into cash, or otherwise obtaining new funds).

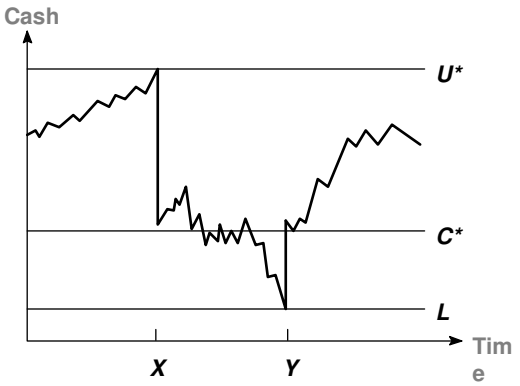
The estimates used in such calculations are likely to be suspected, and the model to which they give rise is only applicable when the demand for cash is reasonably consistent from period to period.

There are two models used. The first one is Baumol Model which works exactly on the lines of inventory model and that is its biggest shortcoming. The second one is Miller-Orr model which specifies a minimum and a maximum level of cash in the system and expects the cash levels to move between the two.

Let us look at Miller-Orr model in slightly more detail. Figure below gives you the basic functioning of Miller-Orr model. We can see that The company has established upper and lower limits within which it allows the cash levels to operate. If the cash level touches the upper level, the company converts extra cash into securities so as to bring it to the target cash balance. It follows the same procedure for the lower limit where it sells securities instead of buying it. This makes it easy for the company to manage cash as the levels of cash is difficult to predict very accurately.

Note that the target cash balance point is at one-third of the distance between the lower and upper level, from the lower level instead of half-way between the two because

the company wants to minimise the cash it is holding. Their studies have shown that this level is the optimum level.




*U** is the upper control limit. *L* is the lower control limit. The target cash balance is *C* [which is 1/3(U*-L) +L].* As long as cash is between *L* and *U**, no transaction is made.

Other mathematical models, too, have been suggested by various authors, but they tend to be mainly of academic interest only.

A simpler approach to the definition of the required cash balance is by the use of ratios.

One such measure is the ratio between the sales of a period and the opening cash balance:

$$\text{Cash turnover} = \frac{\text{Sales for period}}{\text{Initial cash balance}}$$

This is sometimes called the cash velocity. (The resemblance to the stock turnover ratio will be obvious.)

As with all management ratios one is looking for consistency period by period within the company, or a trend of improvement which, in this case, would be higher sales per unit of cash held. If, for example, the cash velocity last period was:

$$\text{Cash turnover} = \frac{\text{Rs.}18{,}000}{\text{Rs.}\,9{,}0000} = 20\text{x}$$

Then an increase of sales to Rs.2,25,000 without a change in cash holding would increase the velocity to 25x. In other words, the cash balance would have been kept to Rs.9,000 instead of rising to Rs.2,25,000/20 = Rs.11,250, so there would be saving of interest or a gain at the opportunity cost rate into Rs.2,250.

Again, like other ratios this ratio cannot be used in isolation. An increase in sales without an increase in cash balance might mean that the company had become less able to pay its debts as they fell due, possibly signifying that it was over-trading. It might be possible

to use this ratio for comparison with an average for the industry, but probably not with individual firms within the industry, since special factors might affect the balance held by a particular firm at its year-end date (especially if the businesses were seasonal, or if the firm under review were accumulating cash for a specific project).

A second ratio quite often found is that between the cash balance and the total current assets:

$$\text{Proportion of cash held} = \frac{\text{Cash balance}}{\text{Cash Assets}}$$

A wide range of figures between different industries will be found. Based on transaction analysis or past trends, the company could set a minimum proportion of cash holdings to current assets with the objective not of using this as an absolute limit but as an opportunity for reviewing the reasons for any deviation from the norm.

In general the use of simple ratios has a limited value in cash planning. There is no adequate substitute for detailed cash forecasts, possibly linked with a financial model of the business as a whole.

For an outside observer, and to some extent for the board of a company, useful information can be derived from a trend of liquidity ratios incorporating not merely cash but also those elements of working capital which are readily convertible into cash. This concept of liquidity was built into the source and application of funds statement described above.

### Investing Surplus Funds

If the cash forecast for a business shows surplus funds becoming available, then plans should be made for putting them to use. However, the surpluses may be transitory, either because they are being accumulated deliberately for some purpose such as the purchase of plant or the payment of taxes, or because the business is seasonal and the funds will eventually be required to finance off-peak activities.

It is important to schedule in detail, with frequent reviews, how much money will be available for various period of times, so that it can be put to the best possible use. Small amounts which are required to be kept liquid are probably best placed on deposit with a clearing bank or other finance house. The rate of interest will be low, but only short notice is required for withdrawal. When large sums are available there is a greater range of investment alternatives.

Loans to local authorities or merchant banks or local authority bonds, have various terms from days upto five years, so they can be matched to the availability of funds, however, they are not readily negotiable. Negotiable certificates of deposit issued by the commercial banks overcome this disadvantage, offer a higher rate of interest and can cover a wide range of maturities from three months upwards.

The purpose of this type of investment is to squeeze extra profit out of money which is normally in use in the operations of the business. It does not give full scope for portfolio planning, which is essential when funds are available for investment over a long period.

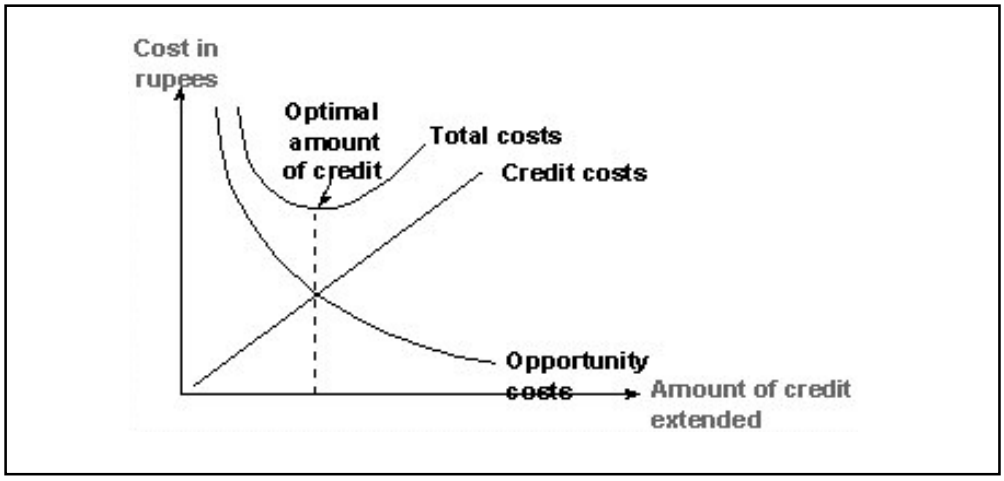
The main principle involved in planning the investment of short-term cash surpluses is to match investment maturities with cash needs. Before considering investment, therefore, it is necessary to have reliable cash movements forecast, so that one knows with reasonable certainty how much cash will be spare for what period of time.

The second principle is to invest for as long as possible, because interest rates are higher for long periods. Opposed to this principle is the need to have a margin of safety, this may be a bank overdraft facility or may take the form of slightly more liquidity in the investment portfolio than the forecast strictly requires.

The size of the fund available for investment will have an effect on how profitably it can be used, both because large funds can bear the cost of a professional investment manager and because such funds can be placed directly on the money market rather than through the company's bank.

### Cost of Holding Cash

Trading costs are increased when the firm must sell securities to establish a cash balance. Opportunity costs are increased when there is a cash balance because there is no return to cash. The tradeoff between the two results in an optimum point of holding cash, which becomes their target cash balance as depicted in figure**.**



## Cash Management in a Group of Companies

Within a group of companies it is often considered desirable for cash to be managed by a central department which will:

- Gather in all surplus funds from the various companies and redistribute them in accordance with the investment opportunities which best serve the group objectives;
- Dictate the dividend distributions of the subsidiary companies to ensure that funds are retained where they are needed within the group;
- Arrange the investment outside the business of funds which are temporarily surplus to group needs;
- Negotiate centrally any bank overdraft facilities, and the raising of new long-term capital.

With regard to internal investment it sometimes appears that priority is given to projects from those companies which are already profitable (since they are able to show better incremental returns than those which are currently less successful); and it is argued that the loss-making companies may well have the greater need for operations.

In relation to overdraft facilities, the argument for Group central negotiation is that only one banker (or a lead banker) will be involved who will be well informed on the whole of the group's activities, and that all the resources of the group will be available as security. This does, however, put the whole group at risk if credit facilities are reduced. If the various companies have a good local relationship with the banks they have used individually in the past, it can happen that the total of locally negotiated overdrafts is greater than could have been obtained centrally. While the withdrawal of one facility still leaves the other companies untouched.

The payment of creditor accounts centrally is easier to arrange, though it may involve delays in payment if involves first to be approved by local offices. Whether centralised purchasing is beneficial will depend on whether the advantages of standardised specifications and the negotiation of build discounts are offset by a loss of specialised purchasing skills for a diverse range of products and by delays in the procurement of urgently needed supplies.

The majority of the foregoing comments will apply equally to a single company having divisional profit centre in scattered locations.

# Chapter-9
# Management of Receivables

If we are getting trade credit to fund our needs, we also have to extend trade credit to our customers. A company grants trade credit to protect its sales from the competitors and to attract the potential customers to buy its products at favourable terms.

Extending trade credit creates receivables or book debts which the company expects to collect in the near future. The book debts or receivables arising out of trade credit has three characteristics:

1. **It involves an element of risk:** This should be carefully analysed. Cash sales are riskless, but not the credit sales as the cash is yet to be received.
2. **It is based on economic value:** To the buyer, the economic value in goods or services passes immediately at the time of sale, while the seller expects an equivalent amount of value to be received later on.
3. **It implies futurity:** The cash payment for the goods or services received by the buyer will be made by him in a future period. The customers from whom receivables or book debts are due are called "debtors" and represent the company's claim or asset.

Let us take up an example to illustrate the benefit of providing trade credit.

**Example**

A company is planning to extend credit to its customers. The choice is between one month and two month's credit. The first year's results under the three alternatives, of providing no credit and one & two months credit, are tabulated below.

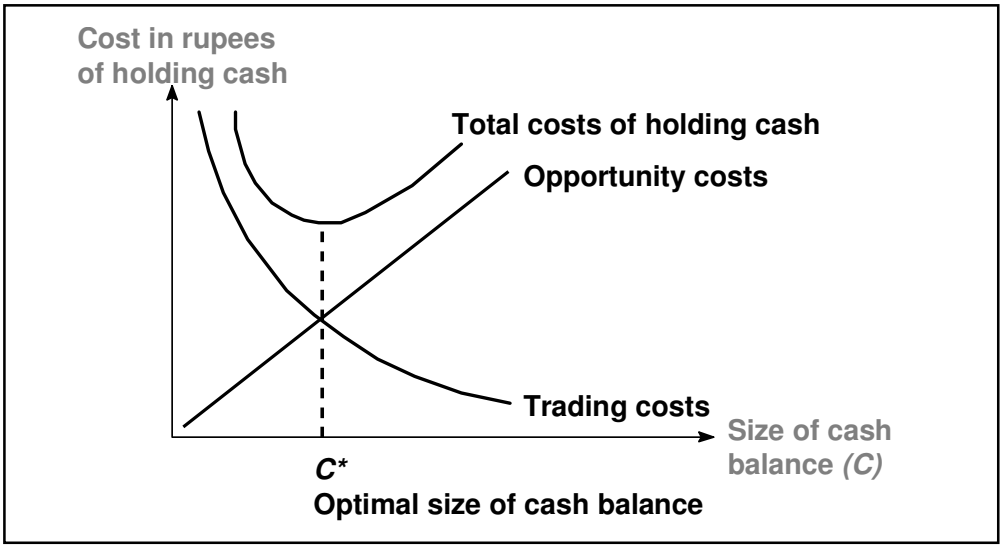
Note that we have not shown an 'interest' charge on the increased working capital because in due course the increase in stocks and debtors will in effect be financed out of the improved profits, and no specific borrowing may be needed. However, regardless of how the working capital is financed it must still produce the required rate of return.

The example makes the fairly obvious points that giving credit involves cost, including the opportunity cost of additional capital employed. In some cases these costs will cancel out or outweigh any gains from increased business like in the second alternative above. In some cases the granting of credit may not increase the sales of the business but may be justified because it will prevent a loss of sales to a competitor.

| (Rupees) | No credit | One month's credit | Two month's credit |
|---|---|---|---|
| Sales | 120,000 | 160,000 | 240,000 |
| Debtors | | 13,333 | 40,000 |
| Stocks (less creditors (Say, 1/12 of sales value) | 10,000 | 13,333 | 20,000 |
| **Total** | **10,000** | **26,666** | **60,000** |
| Increase in working capital through granting credit | | 16,666 | 50,000 |
| Marginal contribution | 30,000 | 40,000 | 60,000 |
| Less: Cost of: | | | |
| Credit control | | (6,000) | (6,000) |
| Bad debts | | (1,600) | (4,800) |
| **Relevant comparable profits** | **30,000** | **32,400** | **49,000** |
| **Increase in profits** | | **2,400** | **19,200** |
| But the company requires a return of15% on the increase in capital employed; i.e. | | 2,500 | 7,500 |
| The net advantage (or disadvantage) of the proposed changes in credit policy is therefore | | (Rs.100) | Rs.11,700 |

There are two costs that we can associate with extending credit as: i) credit costs and ii) opportunity costs. Credit costs are the cash flows that must be incurred when credit is granted. They are positively related to the amount of credit extended. Opportunity costs are the lost sales from refusing credit. These costs go down when credit is granted.

This means that there is a point where the sum total of these two costs are minimum for the company. This point depicts the optimum credit policy that the company must follow.



The above discussion will suggest three ways of management control in connection with credit policy:

(a) Debtors expressed in relationship to sales - either as a percentage or as a number of weeks sales. This provides an overall confirmation that the business is effective in carrying out its own credit policy.

With a seasonal business, however, these calculations could be misleading. Another disadvantage of averages is that they may conceal the fact that some long-overdue debts are being compensated by quicker collections from other customers. For management control there is no substitute for a complete listing of debtor accounts, analysed by age, compiled every month.

(b) Bad debts as a percentage of sales value, or reported otherwise in detail.

(c) Credit control costs.

This means that credit control involves three types of action:

(a) deciding the normal credit period to be allowed;

(b) establishing credit limits for individual customers;

(c) implementing the system (that is to say, ensuring that credit limits and the credit period are not exceeded).

(a) **Deciding the Credit Period:** If a business is offering a unique product or service, or one for which demand exceeds supply, there may be no need to offer credit terms at all. In other cases the starting point in deciding credit policy is a review of the credit terms offered by competitors, and from this basis the credit terms of the particular business will be developed.

Other factors that affect the length of the credit period are the following:

- Buyer's inventory and operating cycle
- Perishability and collateral value
- Consumer demand
- Cost, profitability and standardisation
- Credit risk
- The size of the account
- Competition
- Customer type

Long credit period may be offered to the customers if this will enable the business to capture a larger share of the available market, or the break into a new market. The

initial effect of granting long credit periods may be adverse because of the extra costs involved but profits from increased volumes should more than offset the losses. If it does not there is no use in extending longer credit periods. Even otherwise it is necessary to look to the longer term where, among other possibilities, selling prices may be increased because smaller competitors have been eliminated in the 'credit war'.

Shorter credit may be imposed if demand is inelastic, so that the quantity sold will not be affected simply by changes in credit terms.

### Influence of Credit Policy

Credit policy will directly influence sales, investment levels, bad-debt losses, and collection costs.

**Sales:** Sales vary directly with the extent to which credit terms are liberalised. The demand for a firm's product is greatly influenced by the ease with which the products can be purchased on credit. Sales will be at their lowest level if they are strictly for cash. Those who want to buy on credit will patronise other manufacturers who extend credit. Sales will start increasing as credit terms are liberalised. Sales will be at their maximum level when the firm does not screen buyers for credit worthiness. Rather, credit is extended to all who want to buy the firm's products.

**Investment Levels:** Sales on credit result in accounts receivable. As discussed above, sales are directly related to the liberality of credit terms. As credit terms are liberalised, sales increase and to service this increased level of sales properly, the firm needs to increase its investments in cash and inventories. Finally, if sales increase sufficiently, the firm may have to increase its productive capacity. As credit terms are made more liberal, the firm's investment in cash accounts receivable, inventories, and perhaps physical equipment increases in a complimentary fashion.

**Bad-Debt Losses:** Without credit sales the firm will not incur any bad-debt losses. With a very conservative credit policy, bed-debt losses will be nonexistent or minimal. As credit terms are liberalised, the firm begins to give credit to marginally less-credit-worthy clients. The liberalisation of credit terms result in increases in bad-debt losses.

**Collection Costs:** Collection costs are the clerical and administrative costs associated with granting credit and managing accounts receivable. When credit is not granted, collection costs are minimal. As credit terms liberalised, the firm's volume of accounts receivable increases. The clerical and administrative costs of invoicing, collecting, and book keeping also increase as credit terms are liberalised. A second type of collection cost is the one related to efforts to collect on delinquent accounts. As credit terms are liberalised, delinquent accounts increase and the costs of efforts to collect on these accounts also increases.

## Credit Terms

As discussed previously, credit policy has a direct influence on sales, investment levels, bad-debt losses, and collection costs. From a managerial view-point and looking strictly at the relationship between credit policy and sales, one could conclude that a very liberal credit policy is highly desirable. However, the relationship between credit policy and investment levels, bad-debt losses, and collection costs implies that a very conservative credit policy is desirable. An appropriate credit policy balances profits from increased sales due to more liberal credit terms with increased costs due to increased investments, bad-debt losses, and collection costs. The ideal credit policy allows for the liberalisation of credit terms to the point where the marginal revenues from a new category of credit accounts is exactly equal to the marginal costs of selling and servicing accounts.

In practice it is not feasible to establish the ideal credit policy. However, firms do consider alternative credit terms to see what influence they have on profits. Our focus here will be to look at certain specific credit terms and see how they might affect profits and what guidelines a firm could use to enhance its profitability. The three specific components of credit terms are credit period, credit discount, and discount period.

**Credit Period:** The credit terms are specified on the invoices sent out by firms. A typical credit term may state: 2/10, net 30. The first number "2" is the credit discount and indicates that a 2 per cent discount may be taken if the invoice is paid within the number of days specified by the second term, or 10 days. The second term "10" is the discount period and indicates the number of days during which the credit discount can be taken. The last number "30" indicates the credit period. The credit period specifies the number of days that a firm can take to pay the invoice without being considered to be delinquent. With terms of 2/10, net 30 the credit period is 30 days and the full amount of the invoice is due within 30 days.

One way to liberalise credit terms is to increase the credit period. Conversely, credit terms can be tightened by shortening the credit period. Mitsui Corporation is currently selling on credit terms of 2/10, net 30. Its annual gross sales are at the Rs 36 crore level currently. All sales are for credit. Fifty per cent of its clients take the 2 per cent discount and pay on the tenth day. The other 50 per cent, who do not take the discount, on the average pay after 30 days. The sales volume between discount takers and non-discount takers is evenly divided. The company's management is considering two alternative credit plans: plan A would change the credit terms 2/10, net 45; plan B would extend the credit period even further, making the terms 2/10, net 60. plan A is expected to increase sales by 5 per cent from current levels, whereas plan B would increase sales by 7 per cent. Mitsui's margins on sales before credit-related costs and taxes are 20 per cent. Investments in accounts receivable carry a 12 per cent before tax cost.

In trying to decide whether to keep the present credit plan or switch to either of plans A or B, management recognises that an occasional result of extending the credit period

will be that more customers will take the discount. However, they feel that with the present plans there will be no change in the rupee volume of sales on which the discount is taken. That is, all incremental sales will be paid for after the 10-day discount period. In addition, management feels that 1 per cent of all incremental sales under plan A and 2 per cent under plan B will prove to be uncollectible. No additional credit costs will be involved in clerical or administrative functions. Which credit period policy appears to be the most desirable?

The variables to be considered in deciding between the present credit terms and plans A and B are profits on increased sales, increases in accounts receivables, increases in the cost of financing the additional receivables, and increased in bad-debt losses. The effects of the three credit terms on these variables are summarized in Table 1. The analytical approach is incremental. that is, given the existing credit terms we focus on the incremental profits and costs of plans A and B. Under plan A sales increase by 5 per cent or 0.05 per cent × Rs 36 crore = Rs 1.8 crore. Sales would increase by Rs 2.52 crore under plan B. Marginal profits before taxes and credit-related expenses are 0.2%. × Rs 1.8 crore = Rs 3,60,000 for plan A and Rs 504,000 for plan B.

Increases in accounts receivable cannot be calculated by just looking at incremental sales. The reason is that when the credit period is extended, the existing buyers who are not taking the discount and are paying after 30 days will also take advantage of the extended credit period and not pay for 45 days. Incremental investment in receivables is estimated by calculating total receivables first. For present credit terms, 50 per cent of sales are paid for in 10 days, the other 50 per cent in 30 days. The average sale is outstanding for 0.5(10) + 0.5(30) = 20 days. Daily sales are Rs 36 crore / 360 days = Rs 100,000. Total accounts receivable equal 20 days × Rs 100,000 = Rs 2 crore.[1]

| | | Present | Plan A | Plan B |
|---|---|---|---|---|
| (d) | Increase in sales (%) | 0 % | 5 % | 7 % |
| (e) | Increase in sales (Rs=1×Rs 36 crore) | Rs 0 | Rs 1,800,000 | Rs 2,520,000 |
| (f) | Margin on sales (%) | 20% | 20% | 20% |
| (g) | Marginal profits (Rs = 2 × 3)[a] | Rs 0 | Rs 360,000 | Rs 504,000 |
| (h) | Average sales outstanding | 20 days | 28.34 days | 36.65 days |
| (i) | Daily sales | Rs 100,000 | Rs 105,000 | Rs 107,000 |
| (j) | Total receivables (5 × 6) | Rs 2,000,000 | Rs 2,975,000 | Rs 3,921,600 |
| (k) | Increase in receivables | 0 | 975,700 | 1,921,600 |
| (l) | Increase in investment costs (8×12 %) | 0 | 117,084 | 230,592 |
| (m) | Increase in bad debt losses (2 × x%) | 0 | 18,000 | 50,400 |
| (n) | Increase in costs (9+10) | 0 | 135,084 | 280,992 |
| (o) | Increase in profits (4 – 11) | 0 | 224,916 | 223,008 |

Under plan A total sales are Rs 36 crore + 1.8 crore = Rs 37.8 crore. The rupee amount subject to payment by the tenth day remains at Rs 18 crore or Rs 18 crore / Rs 37.8 crore = 47.6 per cent. The other 52.4 per cent now take 45 days to pay. The average sale will be outstanding for 0.476 (10 days) + 0.524 (45 days) = 28.34 days. Daily sales are Rs 37.8 crore/360 days = Rs 105,000. Total receivables are Rs 105,000 × 28.34 days = Rs 2,975,700.

Under plan B total sales Rs 38.52 crore. The percentage of discount takers is Rs 18 crore Rs 38.52 crore= 46.7 per cent. The average sales is outstanding for 0.467 (10 days) + 0.533 (60 days) = 36.65 days. Daily sales are Rs 38.52 crore / 360 days = Rs 107,000 and receivables are Rs 107,000 × 36.65 days = Rs 3,921,600.

Incremental receivables for plan A are Rs 2,975,700 - Rs 2,000,000 = Rs 975,700 and are Rs 1,921,600 for plan B. The before-tax cost of financing these receivables is 12 per cent. Therefore, the increase in investment costs for plan A is Rs 975,700 × 0.12 = Rs 117,084 and is Rs 1,921,600 × 0.12 = Rs 230,000 for plan A and 0.02 × Rs 2.52 crore = Rs 50,400 for plan B.

The total incremental credit associated costs for plan A are Rs 117,084 + Rs 18,000 = Rs 135,084 and are Rs 280,992 for plan B. The incremental profits after adjusting for credit costs are Rs 224,916 for plan A and Rs 223,008 for plan B. Both plans are superior to the present plan. However, plan A is slightly preferable to plan B.

Credit Discount: The credit discount is offered as an inducement for the credit buyer to pay promptly. The credit buyer's opportunity cost of not taking the discount is given by:

$$\frac{360 \text{ days} \times \text{credit discount}}{\text{credit period} \quad \text{discount period}}$$

For terms of 2/10, net 30 the opportunity cost of not taking the discount is 360 days × 2 per cent / (30 10) = 36 per cent. Obviously, this opportunity cost has to be high enough to motivate a financially strong credit buyer to take the discount. For example, terms of 1/10, net 70 imply an opportunity cost of 6 per cent. At this cost firms will prefer to use trade credit rather than borrow from banks and the credit discount is no longer a viable credit policy instrument.

Although changing the credit discount has some influence on demand, its most visible impact is on reducing the average collection period and the level of accounts receivable. Assume that Mitsui is considering changing its credit terms from 2/10, net 30 to 2.5/10, net 30 in plan C or 3/10, net 30 in plan D. Either of the new plans would not affect the sales volume. However, under plan C, 70 per cent of the credit buyers would take the credit discount and, under plan D, 90 per cent would take the discount.

Should Mitsui switch to either plan C or D if the previously given information on investments cost is applicable here?

The analysis here would be similar to the one done for the credit period. Gross sales volume under either the present credit terms or plan C or D remain at Rs 36 crore. Sales for which discounts are taken are 50 per cent or Rs 18 crore for the present plan, and Rs 25.2 crore and Rs 32.4 crore for plan C and D, respectively (see Table 2). The credit discount for the present plan is 2 per cent or 0.02 × Rs 18 crore = Rs 360.000. For plan C it is 0.025 × Rs 25.2 crore = Rs 630,000 and is Rs 972,000 for plan D. The incremental cost of going to a more liberal credit discount under plan C is Rs 630,000 - Rs 360,000 = Rs 270,000 and is Rs 612,000 for plan D.

The increase in credit costs due to giving a larger credit discount reduces the level of investments in accounts receivable. Total receivables under the present plan were calculated to be Rs 2 crore in Table 1. Under plan C the average collection period is 0.7 (10 days) + 0.3 (30 days) = 16 days. Since daily sales are Rs 100,000, total receivables are Rs 1.6 crore. Under plan D total receivables are [0.9 (10 days)] × Rs 100,000 = Rs 1.2 crore. Under plan C, receivables decrease by Rs 2.0 crore - Rs 1.6 crore = Rs 400,000. The decrease in investments under plan D is Rs 2.0 crore - Rs 1.2 crore = Rs 800,000.

The cost of investments in receivables is 12 per cent. Cost savings are Rs 400,000 × 0.12 = Rs 48,000 for plan C and Rs 96,000 for plan D. Cost savings less increase in discount costs give increase in profits before taxes. As Table 2 shows, neither plan C nor plan D results in increasing profits over the present levels. Consequently, Mitsui should not implement either plan C or plan D.

[a] Before credit related costs and taxes.

[1] Sales are assumed to be reasonably equally distributed among buyers. Also, it is assumed that the daily sales volume is constant.

Discount Period: The analysis of changing discount periods is very similar to the analysis for changing credit discounts. As the discount period is increased, the opportunity cost of not taking a discount increases. Therefore, it becomes more attractive for a credit buyer to take the discount. However, as the discount period is extended the existing discount takers take advantage of the liberalised credit terms and delay making their payments until the end of the new discount period. Whether extending the discount period is desirable is dependent on whether total receivables increase or decrease.

Continuing the Mitsui example, the firm can change credit terms to 2/12, net 30 or 2/15, net 30 under plans E and F, respectively. The per cent of sales subject to the discount would be 60 per cent in plan E and 80 per cent in plan F. Should Mitsui switch to either plan E or plan F? Gross sales would not be affected by these alternative plans.

| | | Present | Plan E | Plan F |
|---|---|---|---|---|
| (d) | Gross sales volume | Rs 36,000,000 | Rs 36,000,000 | Rs 36,000,000 |
| (e) | Sales with discounts (%) | 50% | 60% | 80% |
| (f) | Sales with discounts (1×2) | Rs 18,000,000 | Rs 21,600,000 | Rs 28,800,000 |
| (g) | Credit discounts (Rs = 3×2%) | Rs 360,000 | Rs 432,000 | Rs 576,000 |
| (h) | Increase in discounts | 0 | Rs 72,000 | Rs 216,000 |
| (i) | Total receivables | Rs 2,000,000 | Rs 1,800,000 | Rs 1,400,000 |
| (j) | Decrease in receivables | 0 | Rs 200,000 | Rs 600,000 |
| (k) | Decrease in investment costs (7×12%) | 0 | Rs 24,000 | Rs 72,000 |
| (l) | Increase in profits (8–5) | 0 | (Rs 48,000) | (Rs 144,000) |

Sales subject to discounts would be Rs 18 crore, Rs 21.6 crore, and Rs 28.8 crore, for the present terms, plan E, and plan F, respectively. Credit discount at 2 per cent would be Rs 360,000 for the present plan and Rs 432,000 and Rs 576,000 for plans E and F, respectively. The increase in discounts for plan E would be Rs 72,000 and would be Rs 216,000 for plan F (Table 3).

The total receivables under plan E would be [0.6 (10 days) + 0.4 (30 days)] × Rs 100,000 = 1.8 crore. The same entry would be [0.8 (10 days) + 0.2 (30 days)] × Rs 100,000 Rs 1.4 crore for plan F. A decrease in investment costs due to a decrease in receivables is Rs 24,000 for plan E and Rs 72,000 for plan F. Taking into consideration the increased discounts being given, we find that neither of the two new plans is acceptable.

## Simultaneous Changes in Credit Terms

Most firms, from a practical standpoint, will consider changes in all credit terms

simultaneously. For example, the Mitsui Corporation may seek to evaluate new credit terms in which the credit period, credit discount, and discount period all change simultaneously. As we have seen previously, extending the credit period influences sales most strongly, whereas changing the other two credit terms has a strong impact on the level of receivables outstanding. A firm considering changing all credit terms needs to carefully examine the potential impact of the changes on incremental profits. Assume that Mitsui is considering changing from terms of 2/10, net 30 either to 2/15, net 45 in plan G or 2.5/15, net 60 in plan H. Under plan G sales are expected to increases by 5 per cent, whereas with plan H sales would have a potential of increasing by 10 per cent. Marginal returns before credit-adjusted costs and taxes would be 20 per cent of sales.

Under the present credit terms, the average collection period is 20 days (as shown in Table 1). Under plan G, 45 per cent of sales would involve the discount. Those who take the discount would pay at the end of the discount would, on the average, pay by the end of the credit period. Bad-debt losses would increase by 1 per cent of incremental sales for plan G and 2 per cent of incremental sales for plan H. Collection costs would increase by Rs 10,000 and Rs 30,000 under plans G and H, respectively which credit term plan appears to be best for Mitsui.

Under plan G sales and marginal profits would increase by Rs 1.8 crore and Rs 360,000, respectively. For plan H sales would increase by Rs 3.6 crore and profits by Rs 720,000. These marginal profits are before credit adjusted costs and need to be adjusted for changes in the investment levels in receivables and in discount taken.

Given credit terms of 2/15, net 45, average collection period for plan G is 0.45 (15 days) + 0.55 (45 days) = 31.5 days. Since daily sales are Rs 37.8 crore/360 days = Rs 105,000. Total receivables for plan G would be 31.5 days × Rs 105,000 = Rs 3,307,500. Similarly, total receivables for plan H would be [0.40 (15 days) + 0.6 (60 days)] = 42 days × 39.6 crore/360 = Rs 4,620,000 (see Table 4).

For plan G bad debt losses would be Rs 1.8 crore × 0.01 = Rs 15,000 and Rs 72,000 for plan H. Cost of giving discounts and increased collection costs are shown in Table 4. Given the total credit related cost increases of Rs 165,100 for plan G, its profitability before taxes is Rs 360,000 – Rs 165,000 = Rs 194,900. Similarly, plan H would increase pretax profits by Rs 267,600. Of these two plans, H is the better one. Plan H is also the best plan among all eight plans discussed in this section.

From total receivables we can calculate incremental receivables and the cost of increased investments in receivables, as shown in Table 4.

| | | Present | Plan G | Plan H |
|---|---|---|---|---|
| (d) | Increase in sales (%) | 0% | 5% | 10% |
| (e) | Increase in sales (Rs = 1 × Rs 36 crore) | 0 | Rs 1,800,000 | Rs 3,600,000 |
| (f) | Margin on sales (%) | 20% | 20% | 20% |
| (g) | Marginal profits (Rs = 2×3)[a] | 0 | Rs 3,60,000 | Rs 720,000 |
| (h) | Average collection period | 20 days | 31.5 days | 42 days |
| (i) | Daily sales | Rs 100,000 | Rs 105,000 | Rs 110,000 |
| (j) | Total receivable | Rs 2,000,000 | Rs 3,307,500 | Rs 4,620,000 |
| (k) | Increase in receivable | 0 | Rs 1,307,500 | Rs 2,620,000 |
| (l) | Increase in investment costs (8×12%) | 0 | Rs 156,900 | Rs 314,400 |
| (m) | Increase in bad debt losses (2 × x%) | 0 | Rs 18,000 | Rs 72,000 |
| (n) | Sales with discount (Rs) | 18,000,000 | 17,010,000 | 15,840,000 |
| (o) | Credit discounts (%) | 2% | 2.5% | 2.5% |
| (p) | Credit discounts (Rs = 11 × 12) | 360,000 | 340,000 | 396,000 |
| (q) | Increase in discounts | 0 | 19,800 | 36,000 |
| (r) | Increase in collection costs | 0 | 10,000 | 30,000 |
| (s) | Increase in credit costs (9 + 10 + 14 + 15) | 0 | 165,100 | 452,400 |
| (t) | Increase in profit (4 – 16) | 0 | 194,900 | 267,600 |

[a] Before credit-related costs and taxes.

## Collection Policy

When an account becomes delinquent, a firm can resort to a series of actions to try to collect on the account. These actions include writing a letter, calling on the phone, calling in person, using a collection agency, and legal action. The particular collection procedures followed have a direct impact on bad-debt losses and the average collection period. The firm has an obvious interest in reducing both bad-debt losses and the average collection period, which lower total receivables and average collection period, which lower total receivables and investment in receivables. In general, the more the firm spends on collection, the lower its delinquency costs (bad-debt losses) and the cost of maintaining excess receivables. However, the marginal productivity of collection expenditures decline as the firm expends more and more.

The discussion on collection policy has assumed that sales are independent of collection policy. Most firms recognise that instituting a very aggressive collection policy may be very irritating for some customers who are frequently slow in paying. An aggressive collection policy may therefore adversely affect sales. A second result of an aggressive collection policy may be to force more customers to prefer taking the discounts. These

two factors need to be recognised before a firm implements a collection policy that equates marginal collection expenditures with marginal reductions in delinquency costs.

## Establishing Credit Limits

The fact that the business has a credit policy does not mean that credit terms will be granted to every customer. It is not always easy to decide whether a particular customer is 'credit worthy' in the sense that he has both the ability and the inclination to pay at the due date. Many companies require cash with order from new customers until their creditworthiness have been established.

Five Cs of Credit that a bank looks at are the ones that you should also look at while granting credit:

- **Character:** Willingness to pay back the credit
- **Capacity:** Ability to pay back
- **Capital:** Financial reserves including cash
- **Collateral:** What assets could be pledged or are pledged to others that hinder payments
- **Conditions:** Relevant economic conditions

**That means that in assessing the creditworthiness of a customer two things are absolutely necessary:**

(a) Facts about his business, in particular whether it is profitable, whether it is generating or has access to sufficient cash to met its liabilities, and whether it has suitable assets available to cover the claims of unsecured creditors in the event of winding up. In brief, it is necessary to analyse the accounts of the business. It is helpful also if the customer will supplement these with the sort of information they do not give; e.g., the current order book, any plans for future development, and the condition and market value of the assets owned by his business.

(b) Opinions about the business and the people running it, formed from either personal contacts (director level, or at any reliable and knowlegeable level) or obtained from third parties such as business associates, mutual acquaintances or employees changing jobs.

**There are other sources from which we can have information about the company as well as the industry that it is operating in:**

(a) Reports from the relevant trade protection association, if one exists;

(b) Trade references from other companies with which the customer does business;

(c) Bank references - these may not give a lot of information but they tend to use a series of standardised replies, and experience of these will indicate the relative credit grading of the customer in question;

(d) Reports published in trade journals or the financial press dealing either with the customer company or with the type of business in which it is engaged.

In assessing the creditworthiness of overseas customers, reports from bankers are an important source of information. It is also necessary to weigh up the risks of the customer being prevented from paying either through political or exchange control restrictions. On all these matters the Export Credits Guarantee Department can usually give guidance.

If the customer's creditworthiness appears to be established, the next stage is to decide the amount of credit to be given.

**Theoretically there are three possible ways of doing this:**

(a) The income or cash flow method, which requires knowledge of the amounts of cash becoming available to the customer, and how he proposes spending them, thus indicating his ability to pay the supplier's invoices - this method is possible between a bank manager and his client seeking an overdraft or loan, but seldom in business life;

(b) The capital structure method, under which the value of uncharged assets in the customer's last balance sheet is established, and the credit limit will be a percentage of this value. This is a necessary calculation when the proposed value of future transactions will involve a major increase in the customer's total indebtedness, but it is not an indicator of liquidity, and is not particularly relevant to small transactions in the ordinary course of trade;

(c) The requirement method, which is almost always used in practice. If the customer is creditworthy then we should be able to rely on him to pay any amounts arising from the ordinary course of business. The amount of credit granted, therefore, is based on the value of business which the customer expects to place with the supplier each month. The forecast monthly sales to the customer are multiplied by a number of months' credit laid down as company policy to give that customer's credit limit. If, for example, a customer proposed placing orders totalling Rs.1,500 per month with a supplier whose credit terms required payment by the end of the month following the date of invoice (say, two month's credit) the credit limit granted him might be 2xRs.1,500 = Rs.3,000 outstanding on the ledger accounts at any time.

For customers of international repute it may be decided that no limitation of credit is necessary, but the financial difficulties faced by several major companies in recent

years must be a warning against the automatic granting of unlimited credit.

### Vetting Incoming Orders

The amount appearing on the customer's ledger account at any time will, of course, result from invoicing the orders he has placed, so that if the value of orders in any period were to exceed the original forecast this might not become apparent until after invoicing. At that time the outstanding balance on the ledger would suddenly be found to be in excess of the agreed limit.

To safeguard against this possibility an order register may be kept for each customer, showing the value of orders placed for delivery in particular months. Each incoming order will then be checked against the register to confirm that it will not cause the credit limit to be exceeded. This could be a cumbersome procedure, and normally it would only be used in respect of:

(a) New customers' whose compliance with credit limits has not been established;

(b) Customers who had consistently failed to adhere to their credit limits in the past. (It might be better in such cases to withdraw credit facilities completely).

All incoming orders should be checked to ensure that are placed on the customer's official order form and authorised by somebody purporting to have the power to place that type of order. Computerisation has made this task very easy.

### Sales Invoicing

So far as the customer is concerned, the company's credit period does not begin until he receives an invoice. Even then his accounting procedures probably involve a monthly cut off date for the receipt of invoices, so that any invoice received after, say, the 28th day of the month will be treated as belonging to the succeeding month.

It is important, therefore, that delays in invoicing be kept to a minimum. The causes of delay are nearly all within the control of the company, and may include:

(a) An inflexible routine in the sales invoicing department (perhaps invoices are issued only on certain days in the month);

(b) A requirement for approval or signature of sales invoices by members of the sales staff who are often away from the office;

(c) Failure to agree prices for special work; and

(d) For job work, and in other cases where prices are linked with costs, excessively slow procedures for calculating costs.

## Debt Collection

There must be no slackness in pursuing the collection of debts. In most business purely formal reminders are ineffective, and therefore a waste of money, when an account has passed its due date there should be early personal contact with the customer either by telephone or a salesman's visit or by a letter addressed to a named person in the customer company. If necessary, there may be a follow up at the higher level of authority. And this should be followed by a threat to cut off supplies.

The value of legal action against debtors needs to be assessed. When this stage is reached, the likelihood of the customer's paying is sharply reduced, and additional legal costs may never be recouped. On the other hand, the action may deter potential future defaulters.

From the point of view of the salesman every customer is valuable. From the financial director's standpoint the marginal contribution from goods sold to a late payer will be more profitable without sales to that particular customer.

Overdue debts should be the subject of formal discussion between the sales and financial managers. The reasons for delayed payment should be noted, and decisions should be minuted on the action to be taken in each case and the people responsible for taking it.

Although the salesman's job is not complete until his customer has paid the money due, it is often advantageous for the more rigorous collection procedures to be handled by finance staff, leaving the salesman free to exercise his persuasive influence with the customer's buying department.

### Credit and Collection Procedures

In the previous section we considered the firm's overall credit and collection policies. In this section we shall discuss how these policies can be applied to individual accounts. In this section we shall first discuss sources of information and then the decision to grant credit. Finally, we shall look at specific procedures that could be utilised to collect delinquent accounts.

### Sources of Information

An individual or firm is requesting credit. What sources of information are available to judge the credit worthiness of the applicant? Sources that can be utilised are financing statements, bank references, and credit bureaus.

***Financial Statements*:** A vital source of information is the applicant's financial statements. An applicant who is in a financially sound position would have no hesitation in making available his or her financial statements. Interim reports, if available, are more desirable than annual reports. Audited and CPA certified reports are preferred to

unaudited reports. The financial statements are useful for calculating various liquidity, leverage, efficiency, and profitability ratios that may be used in evaluating credit risk. If the firm is using a credit scoring model (discussed later) or if the applicant is requesting a large amount of credit, financial statements are essential.

***Credit Bureaus*:** Credit bureaus specialise in consolidating the experiences of other firms with the applicant. Credit bureaus compile a history of the applicant's credit payment performance as reported by the credit-granted firms. Financial information on a credit applicant may be obtained by credit bureau member firms who agree to provide credit bureaus with information on their clients.

In addition to these information sources, a firm may try to compile its own information. It may have its sales personnel prepare a report on the credit applicant. Alternatively, if the credit request is large enough, it may send a credit department employee to visit personally with the credit applicant and garner as much financial information as possible.

## Credit Analysis and Credit Limit

A firm reviewing a request for credit needs to judge the credit applicant's willingness and ability to pay. If either of these two factors is missing, the firm would increase its chances of suffering losses on credit extended to the applicant. Willingness to pay is judged by the firm's past financial performance. Its ability to pay is judged by the strength of its financial statements in relation to the amount of credit desired. Either heuristic or statistical procedures could be utilised in credit analysis.

***Heuristic Approach*:** The heuristic approach described here is based on a manufacturing company's actual experience. The formula or procedure described here has the weight of managerial experience and intuition behind it and therefore is heuristic in nature. There are eight factors that need to be considered in the decision to establish a credit limit and grant credit. The credit limit is the maximum amount of credit purchases allowed the credit applicant at any one time and is stated as a per cent of tangible net worth. The lower limit is minus 15 per cent and is tantamount to denying new credit to the applicant. The upper limit is 80 per cent and is equivalent to the sum of the maximum percentage points on the eight credit-granting factors.

***Credit Requirements;*** The first factors is applicant credit requirements, (C). This factor is a measure of the applicant's dependency on the creditor. If the applicant plans to buy less than 25 per cent of his requirements from the creditor, he gets 0 perm cent toward his credit line. If he plans to buy between 25 and 50 per cent, he gets a 5 per cent allowance. If the plans to buy over 50 per cent he gets a 10 per cent allowance (see Table 5).

***Pay Habits:*** The second factor is pay habits (P) and is a measure of the willingness

and ability to pay. Payments during the discount period rate 10 per cent. Payments during the credit period are worth 5 per cent. Habitually late payments rate minus 5 per cent.

***Years in Business:*** The third factor is years in business (Y) and is a measure of the ability of the firm to pay. Being in business less than 3 years has no effect on increasing the limits. If Y is between 3 and 10 years, the limit is increased by 5 per cent. If the firm has been in existence for more than 10 years, it rates 10 per cent.

[illegible]

| CONTRIBUTING FACTOR | Rating | Contribution to Credit Limit : Per cent of Net Worth |
|---|---|---|
| Applicant credit requirements (C) | C < 25% | 0 |
| | 25 < C < 50% | 5 |
| | C > 50% | 10 |
| Pay habits (P) | Take discount | 10 |
| | Pays on time | 5 |
| | Pays late | -5 |
| Years in Business (Y) | Y < 3 years | 0 |
| | 3 < Y < 10 | 5 |
| | Y > 10 | 10 |
| Profit Margin (M) | M < 5% | 0 |
| | 5% < M < 14% | 5 |
| | M > 14% | 10 |
| Current Ratio (R) | R > 2.2:1 | 10 |
| | 1.5 < R < 2.2 | 5 |
| | R < 1.5 | 0 |
| Total debt total assets (T) | T < 0.3 | 10 |
| | 0.5 < T < 0.3 | 5 |
| | T < 0.5 | -5 |
| Inventory Turnover (I) | I < 10 | 10 |
| | 5 < I < 10 | 5 |
| | I > 5 | 0 |
| Qualitative (Q) | Q = high | 10 |
| | Q = average | 5 |
| | Q = low | -5 |

Profit Margin. The fourth measures is the profit margin (M). If margins are less than 5 per cent, 0 per cent is contributed to the credit limit. Margins in excess of 14 per cent contribute 10 per cent to the credit limit.

Current Ratios. The fifth measure is the current ratio (R). A current ratio of over 2.2 to 1 is considered to be a good indication of ability to pay and helps contribute 10 per cent toward the credit limit. A current ratio of less than 1.5:1 is considered to be relatively weak and does not help increase the credit limit.

Total Debt to Asset Ratio. The sixth measure is the ratio of total debt to total assets (T) and represents the ability to pay. If T is less than 30 per cent, the applicant is viewed to be conservatively leveraged and adds 10 per cent to the credit limit.

On the other hand, a T of over 50 per cent implies increased financial riskiness and rates a minus 5 per cent toward the credit limit.

Inventory Turnover. The seventh factor is the inventory turnover (I). A higher inventory turnover implies high efficiency; I can help contribute anywhere from 0 per cent to 10 per cent toward the credit limit, as shown in Table 5.

Qualitative Factor. The last factor is a qualitative factor (Q) and lets the credit manager use discretion in subjective evaluation of the credit applicant's willingness and ability to pay.

It should be kept in mind that the factors mentioned here and their contribution to the credit limit are based on a particular firm's actual experience. The factors and their contributions to the credit limit may vary from accounts payable, and the economic environment would also be considered in developing a heuristic credit evaluation decision model.

As an example we an apply the heuristic model presented here to evaluate Kartik Metal. Assume that Kartik is requesting a credit line to buy less than 25 per cent of its raw materials requirements. What is the maximum credit line to establish for Kartik? The contributions of the various factors to the credit limit are shown in Table 6. The last factor, Q, is rated average.

| Factor | Kartik's Rating | Contribution to Credit Limit (per cent) |
|---|---|---|
| 1. Kartik's requirement (C) | C < 25 % | 0 |
| 2. Pay habits (P) | Takes discount | 10 |
| 3. Years in business (Y) | Y > 10 | 10 |
| 4. Profit margins (M) | M = 4.6 % < 5 % | 0 |
| 5. Current ratio (R) | R = 2.89 > 2.5 | 10 |
| 6. Total debt to total assets (T) | T = 0.28 < 0.3 | 10 |
| 7. Inventory turnover (I) a | I = 12 > 10 | 10 |
| 8. Quantitative (Q) | Average | 5 |
| Total Contribution | | 55 |

[a] Based on sales; Rs 177, 250/Rs14, 619 = 12

Kartik's credit limit = Rs 42,961 0.55 = Rs 23,600.

Additional credit for Kartik = Rs 23,00 – Rs 7500 = Rs 16,100.

because of Kartik's dependence on only 12 customers. Total contribution of the eight factors to the credit limit is 55 per cent of tangible net worth, or Rs 42,961 × 0.55 = Rs 23,600. Since the existing credit lines total Rs 3,000 + Rs 2,500 = Rs 7,500. Kartik can be extended additional credit up to Rs 23,600 – Rs 7,500 = Rs 16,100.

***Statistical Approach.*** In quantitative approaches to credit analysis, the firm relies on financial information as well as on the payment records of firms it granted credit in the

past. Past customers can be readily classified into good risk and bad risk categories. The financial information on customers is used in conjunction with a statistical procedure called multiple discriminant analysis to develop a statistical credit scoring model. Discriminant analysis first of all provides an indication of those measures which are most important in distinguishing between good risk and bad risk customers. That is, the firm may start out by using 30 ratios and variables in its analysis. Discriminant analysis might indicate that only five of these ratios and variables are important in characterising good risk and bad risk customers.

Second, discriminant analysis will develop weights for each ratio or variable to form a discriminant function that may look like:

discriminant score = 3.5 (current ratio) + 1.7 (profit margins) + 7.1 (debt to assets) + 0.3 (inventory turnover) + 1.9 (quick ratio)

The 3.5, 1.7, and so forth, are weights developed by discriminant analysis. Current ratio, profit margins, and so forth, are discriminant variables identified as important by the model. The sum of the products of the weights and the variables is the discriminant score. The analysis selects weights such that discrimination between good risk and bad risk accounts is maximised. A perfect set of weights would create a discriminant score such that all bad risk firms would have scores on one side of the discriminant score. Once the discriminant credit scoring model has been developed, it can be applied to credit applicants. The weights can be used to calculate a score for the credit applicant. The credit applicant's score can be compared with the discriminant score to see whether the applicant falls in the good risk or bad risk category. If the applicant falls in the good risk category, a similar type of procedure to that described here can be used to establish a credit limit for the applicant.

A variety of collection procedures can be utilised by the firm in its efforts to collect on delinquent accounts. The initial efforts should be very low key and should become more strict as per the response from debtors. If payment is not received within a few days, one or more follow up letters should be sent demanding payment.

***Telephone Call.*** If letters are unsuccessful, a credit department employee, preferably the manager, should call the delinquent debtor and ask for prompt payment. The credit manager may also wish to communicate that legal action may be taken if payment is not forthcoming.

***Personal Call.*** Some firms have either collection personnel or sales representatives visit delinquent debtors. The firms feel that a face-to-face confrontation with a delinquent debtor provides them with an edge over other creditors.

***Collection Agency.*** If the preceding measures are unsuccessful, the firm may consider the services of a collection agency. The collection agency fee is typically high-usually

50 per cent of the amount collected. For small delinquent accounts this may be the only feasible alternative.

*Legal Action*. Legal action is usually costly and there is no guarantee of a payment. If a firm is in a very weak financial position, legal action will force it into bankruptcy. The firm may choose to use legal action as a negotiating tool to deal with large delinquent accounts. With a very large delinquent account, the firm may use the threat of legal action to appoint more competent management.

## Cost of Credit Control

**The costs of credit control include the cost of:**

- assessing and reviewing creditworthiness;
- checking incoming orders;
- sales ledger keeping, and invoicing
- debt collection.

These costs may occur in various departments of the business, but there should be some means of identifying them and collecting the total cost, which will have to be taken into account in reviewing the benefits of the credit policy.

### Cash Discount

An alternative or supplement of a formal credit policy is to offer discount for prompt payment. In considering this possibility it is important to bear in mind that:

(a) customers who normally pay promptly will now become entitled to discount, although there will be no improvement in the timing of their payments'.

(b) some late payers will nevertheless deduct discount from their settlements, and there may be some practical difficulty in recovering these incorrect deductions.

There are various other ways in which a business can speed up its collection of cash without requiring the customer to pay any earlier. The most common examples are by using bills discounting or factoring both of which have been mentioned earlier.

### Personal Guarantees

An alternative form of protection against bad debts is to take a personal guarantee in support of the customer's account. The value of personal guarantees varies considerably and they are likely to present two problems.

- it may be more difficult to assess the creditworthiness of an individual guarantor than of the trade customer;

- the guarantor does not normally expect to be called upon to pay, and there may be difficulties in obtaining money from him when the need arises.

These problems do not occur to the same extent when the guarantor is another company, often the parent company in the customer's group.

So the objective of the receivables management remains as the most effective way to receive the cash back without sacrificing the sales and future prospects of the company.

## Factors affecting policies for managing accounts receivables

There are several affects of extending credit to the customers on various operating parameters of the company. These include:

1. **Revenue effects:** As the customers are extended credit, payment for goods is received later giving the customers time to generate sales from the goods and pay back the company. This may allow the company to charge a higher price and also the quantity sold may increase.
2. **Cost effects:** Extending credit means that the company has to maintain a credit department. This involves costs. Also collecting receivables has its own costs associated with it.
3. **The cost of debt:** If the company has to extend credit it must finance these receivables from its own money or from borrowings. Both of these methods involve costs.
4. **The probability of nonpayment:** The company always gets paid if it sells for cash but if it extends credit there is a probability that the customer may not pay. This means that the company may not get its payments resulting in a loss to the company.
5. **The cash discount:** The cash discount affects payment patterns and amounts that the company recieves early. If the cash discount is high then there is higher probability that the company will get more cash upfront and vice versa.

# Chapter-10
# Inventory Management

The financial decisions relating to stockholding have certain special features, but looking first at saleable stocks (finished goods) we can postulate that the object of holding stocks is to increase sales, and that the object of increasing sales is to increase profit. We can then create a simple model similar to that for debtors.

**Example**

The Retail Company Ltd makes cash sales from stock and obtains an average rate of marginal contribution of 25% on sales value. When it holds stocks equivalent to one month's cost of sales it achieves sales of Rs.10,000 per annum.

It is estimated that by doubling the stock available an increase of 25% in sales value could be achieved; alternatively, if three months' stocks were held then sales could be increased by 35% from the present level. The effect on profits of these two alternatives, including any relevant changes in costs, is illustrated on the following page.

This somewhat exaggerated example draws attention to three points which are relevant to any further discussion of the financial implications of stockholding policy:

| **Rs.** | **No credit** | **One month's Credit** | **Two month's Credit** |
|---|---|---|---|
| | | | |
| Sales | 120,000 | 160,000 | 240,000 |
| Debtors | 13,333 | 40,000 | |
| Stocks (less creditors (Say, 1/12 of sales value) | 10,000 | 13,333 | 20,000 |
| **Total** | **10,000** | **26,666** | **60,000** |
| Increase in working capital through granting credit | | 16,666 | 50,000 |
| Marginal contribution | 30,000 | 40,000 | 60,000 |
| Less: Cost of: | | | |
| Credit control | | (6,000) | (6,000) |
| Bad debts | | (1,600) | (4,800) |
| Relevant comparable profits | 30,000 | 32,400 | 49,000 |
| **Increase in profits** | | **2,400** | **19,200** |
| | | | |
| But the company requires a return of 15% on the increase in capital employed; i.e. | | 2,500 | 7,500 |
| | | | |
| The net advantage (or disadvantage) of the proposed changes in credit policy is therefore | | (Rs.100) | Rs.11,700 |
| | | | |

There are some points that you need to note here:

- There may be a point beyond which further increase in stock will not give rise to sufficient additional sales and gross profit to justify the additional costs involved.

- Purchase order processing costs per unit or Rs. value of purchases ( and possibly even in total as shown) are likely to diminish as stock holdings are increased, because instead of having to frequent orders for the renewal of stocks, the company is now placing less frequent bulk orders i.e. one negotiation, one order and one progress action cover a large quantity of any particular item;
- Stock holding costs naturally increase with the size of stockholdings because:

1. stocks occupy space which has to be purchased, rented or converted from some other use - that space has to be equipped with racks or containers;
2. people are required to put the stocks into the warehouse, to withdraw them when needed (picking and packing), to record them, check their conditions and ensure they are not lost;
3. stocks lose value if they deteriorate, are wasted in handling, pilfered, destroyed or allowed to become obsolete - it may be desirable to insure against some of these risks;
4. stocks tie up money, involving interest charges or opportunity costs.

Why should increased stocks give rise to increased sales? One reason would be that the business may offer a wider range of goods and it diversifies its range. Another could be that with the existing range the business was offering a better level of service; i.e. it was less frequently out of stock of an item when it was required.

## Stock Service Levels

In deciding on an inventory policy it is necessary to define the level of service to be offered to the customer, in the sense of the percentage of order which can be satisfied immediately from stock. This will depend on the nature of the business.

In some cases the company may be the monopoly supplier of certain goods, or may offer particular advantages of quality, reputation., reliability or after-sales services. Where such distinguishing features exist, it is possible that the customers will be prepared to endure occasional delays in meeting their requirements, and it would not be necessary to hold sufficient stocks to ensure immediate delivery.

In other cases quick delivery may be an essential feature of success in achieving sales. This would be the case, for example, if there was strong competition for a limited market, or if the failure to supply a spare part for installed equipment would cause significant loss to the customer while the equipment was out of use.

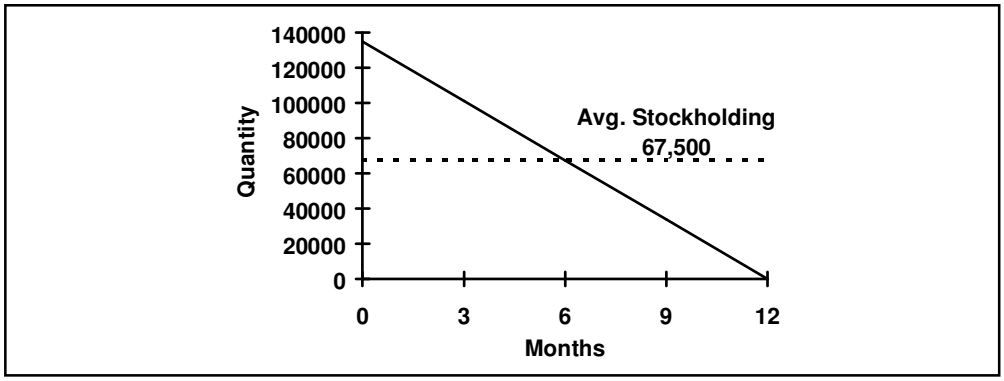
When the required level of service has been defined, the next problem is to decide how much stock is needed to meet that requirement. This will be the minimum holding, and

not the average holding which will be influenced by the stockholding costs illustrated in the previous paragraph.

## Pattern of Procurement and Stockholding

Assuming that an item is in constant demand there are no difficulties in obtaining supplies, it would be normal to take a supply into stock and then use it up steadily until it was exhausted, when a new supply would be obtained. Taking the example from the paragraph on control of stock where sales were to be Rs.1,35,000 per annum, assume, that this represents 1,35,000 units of an item of stock at Rs.1 each. If demand is steady, the monthly usage of this item would be 11,250 units.

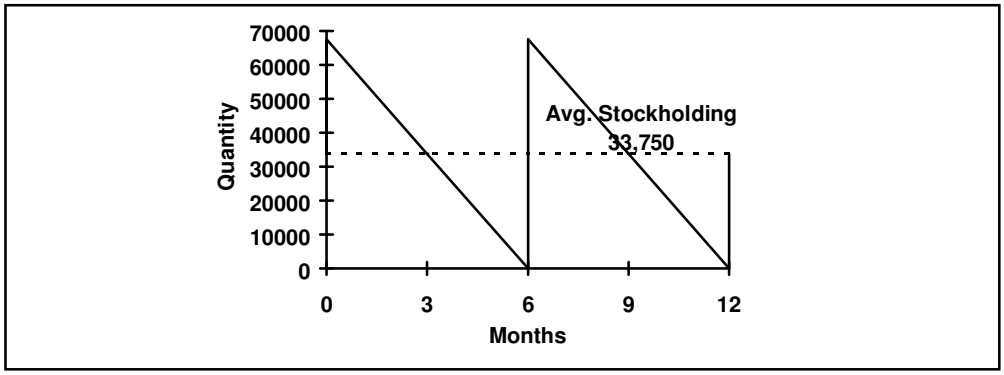
Now it would be possible to buy all 1,35,000 units at the beginning of the year and to use them progressively as shown in the following diagram:



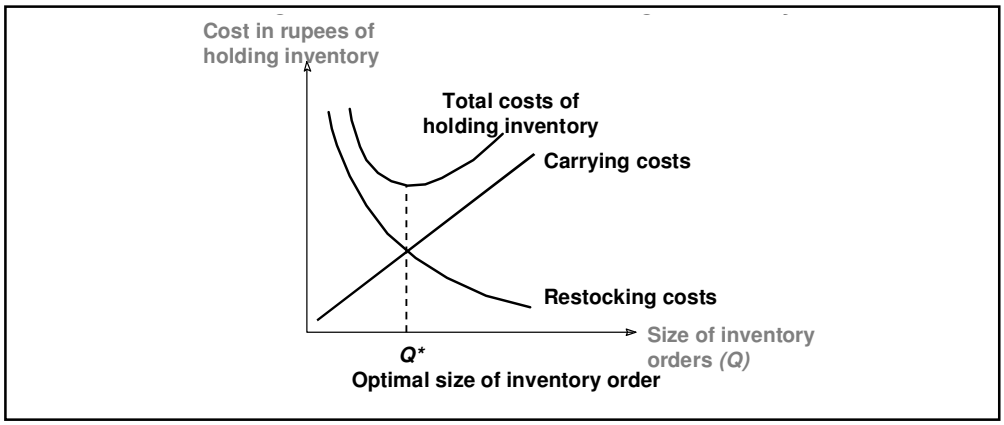

If this was done then:

- there would be only one purchase, so the related costs in the buying department would be low;
- the average stock holding would be 62,500 units, so there would be 62,500x12 = 7,50,000 unit-months to influence the costs of stock-holding.

An alternative action would be to buy twice during the year, as shown in the next diagram. This would double the procurement costs, but would reduce the average stockholding to 31,250 units so that stockholding costs would be determined by only half the previous number of unit-months.



There is obviously a very large choice of procurement and stockholding patterns; what is needed is to find that pattern which keeps total procurement and holding costs at the lowest possible level.




This means that carrying costs increase with the quantity of inventory on hand and as the inventory go down the carrying costs also go down. But with the declining amount of inventory held restocking costs go up as there are more number of orders and more number of receipts of orders. As total costs are the sum of the carrying and restocking costs we need to find a level where it is minimum. This is depicted graphically in the figure above.

Total Restocking Costs = Fixed Costs per order × Number of restocking times

Mathematically speaking carrying costs are given by:

$$TRC = FC \times \frac{S}{Q}$$

$$\text{Total Carrying Costs} = \text{Interest Costs} \times \text{Cost per unit} \times \text{Average Inventory}$$

$$TCC = I \times P \times \frac{Q}{2}$$

Here Q/2 is the average inventory, I the interest rate and P the price per unit.

Similarly Restocking Costs are given by

Here S = total quantity consumed in a year.

As we know that total costs are a sum of these two individual costs. We can say

$$\text{Total Costs} = \text{Carrying Costs} \times \text{Restocking Costs}$$

$$TC = TOC + TRC$$

$$TC = I \times P \times \frac{Q}{2} + FC \times \frac{S}{Q}$$

But this doesn't give us the optimum size of the inventory order. For finding the minimum costs we need to find the 'economic order quantity' for the particular item of stock under review. The effect of the combination of the various items of stock into the total business inventory will be discussed later.

## Inventory Management Techniques

### Economic Order Quantity (EOQ)

The economic order quantity is defined as a point where the total costs of restocking and carrying costs are the lowest.

EOQ is usually calculated by a formula based on differential calculus. Though we will not derive the formula we need to understand its working.

$$EOQ = \sqrt{\frac{2 \times FC \times S}{I \times P}}$$

There are four assumptions that we make in the EOQ model:

1. Sales can be forecasted perfectly,
2. Sales are evenly distributed throughout the year, and
3. Orders are received as soon as they are placed.

This set of assumptions mean is pretty restrictive and we will relax these assumptions slowly. Before we relax these assumptions there are two important things to note about the EOQ:

1. Although a mathematically precise EOQ can be calculated, in practice there is likely to be a range of order quantities within which total costs remain at a low level. The choice of order quantity within this low-cost range may not significantly affect the overall financial plan.
2. The key factor in the calculations is usually the cost of capital (interest on stockholdings). In times of high interest rates this is likely to outweigh all the other variables. The inventory holding costs will go up very steeply, and one's conclusion will be that stockholdings should be kept to the lowest figure possible having regard to any practical difficulties in obtaining frequent replacement supplies.

### Optimum Order Quantity (OOQ)

The last comment above is a reminder that suppliers do not like handling small orders. The purchase price per unit, therefore, may vary with the size of the purchase order, and this will require a modification to our EOQ calculation.

The supplier might, for example, impose a 'minimum order value' so that for quantities below this limit the cost per unit would, in effect, be higher than normal. This would either impose a lower cut-off limit on the size of order placed, or would introduce an upward curve at the lower end of the holding cost line on the EOQ chart, since insurance and interest charges per unit would be relatively high until the small order limit was reached. For larger orders, on the contrary, there might be quantity discounts, and these would cause one or more downward steps at those points on the holding cost line where they began to operate.

This possibility can result in minimum total cost which differs from the position of the EOQ as originally calculated. This point is sometimes distinguished as the 'optimum order quantity'.

## Safety Margins in Stockholding

So far we have assumed that a company will he placing purchase orders at regular intervals of time for a fixed quantity (the economic or optimal order quantity) of any particular item. The possibility of doing this depends on demand remaining constant from period to period and on supplies being available as and when required.

Sales demand, however, could show fluctuations around the normal level, so that in a period of high demand the available stock could be used up before fresh supplies are due. Similarly, in some periods deliveries from suppliers could be delayed so that even the normal sales demand could not be satisfied.

Against both these contingencies, it is necessary to hold a safety margin of stock. If it were necessary to hold a safety margin sufficiently large to cover the simultaneous occurrence of a peak in demand and a delay in supplies, then the minimum stockholding would form the greater part of the total stockholding.

Very little can be done to correct for random delays in supply, but it may be possible to anticipate changes in the trend of demand and to modify the purchasing procedure to meet them in one of the following ways:

- to order in economic order quantities but at varying time intervals according to the rate of demand currently being experienced, or anticipated in the near future - this is known as the fixed order quantity or re-order level system (for reasons which will be explained below);
- to order at regular intervals but in varying quantities determined by the current rate of demand - this is the fixed interval, or periodic review system.

## Modified Ordering Systems

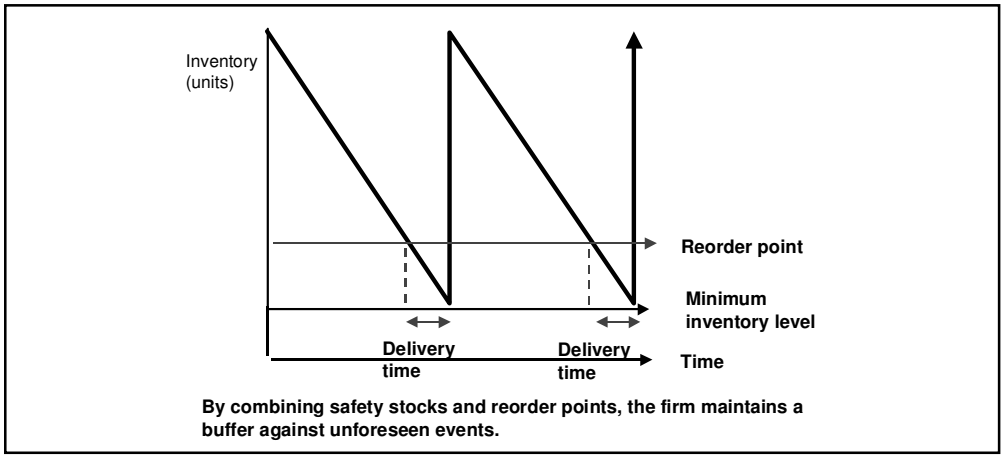
The re-order level system involves deciding a level of stockholding at which new purchase orders shall be placed. This will be decided in relation to the normal rate of issues during the normal purchasing lead time. The quantity to be ordered is constant, and an order for that quantity will be placed whenever stock falls to the pre-determined order level. The system thus responds quickly to variations in demand though there is a danger that in doing so it may reflect purely short term or random fluctuations in sales.

The operation of re-order level system include the use of:

- A maximum stock level. This would correspond to the normal peak holding under stable conditions. If the stockholding exceeds the peak level this provides a warning that demand has been running below the rate expected when the EOQ was fixed. The stock controller should then review the correctness of his standard purchase order quantity
- a minimum stock level which, as suggested above, is probably the amount of the safety margin.

The minimum stock level provides a warning of a potential out-of-stock position. When a stockholding falls to that level the stock controller will review his outstanding purchase orders and their due dates, and also the current trend of demand, and can then decide whether additional emergency procurement is necessary.

Under the periodic review system purchase orders are placed at fixed intervals of time but the quantity ordered can be modified to meet the rate of demand indicated by current experience. This gives an opportunity for analysing the trend of demand, and various techniques such as 'exponential smoothing' can be used in forecasting this trend. The system does not respond rapidly to immediate needs, and it may therefore necessitate a larger safety margin than the re-order level system.




**By combining safety stocks and reorder points, the firm maintains a buffer against unforeseen events.**

It is, in fact, a common experience that the re-order level system gives slightly lower average stock levels, and it is sometimes thought to be the cheaper system to operate because reordering is triggered automatically at the re-order levels, however, requires reviewing in the light of changes in the rate of demand. Any system can appear cheap in the short run if it is operated in a slovenly manner.

## Infrequent and Seasonal Demand

In most inventories it will be necessary to carry items which are slow moving in the sense that units of demand are separated by significant intervals of time. These items may have high individual value but because they are demanded infrequently they will probably contribute only a small percentage of the total annual value of sales. The normal distribution of stockholdings would show that about 20% of the line items carried would contribute 80% of the total annual usage, though this relationship will vary between different types of business.

It may be decided not to hold stocks of some slow-moving items, but to procure them as and when they are required. If a stock is needed however the amount held will probably be limited to the quantity most likely to be next demanded, the occurrence of the demand being the signal for further procurement action. The quantity held may, however, be increased if the purchase price per unit is sufficiently lower for large quantities so as to offset any increase in holding costs for a larger stock holding. This could occur for example when the supplier imposed a minimum order value.

There should be a regular review of slow-moving items to identify stocks which have become technically obsolete or for which the demand has diminished to the point where stock holding is no longer justified.

In some businesses (for example, ladies fashion wear), it is necessary to place orders for the full seasonal requirement well in advance of the demand occurring, with a high probability that repeat orders will not be obtainable. In such instances the purchase and sale of each batch will be a separate project or venture dependent heavily on accurate forecasting of demand quantities and selling prices. In this case, the evaluation procedure applicable to stock holding for continuous demand will not apply.

Of a similar nature will be decisions like the following:

- to purchase goods in bulk in advance of demand arising in order to protect the business against anticipated price rises or shortages of supply;
- to purchase commodities forward at a fixed price for future delivery;
- to combine forward purchase options with forward sales options, so as to limit losses arising from price changes (including changes in currency exchange rates);

- to purchase foreign currency forward against specific overseas purchases, so as to minimise the effect of changes in exchange rates.

These are financial decisions quite separate from the routine problems of inventory control, and would be evaluated as investment projects.

### The Total Inventory

The techniques described in the foregoing paragraphs all relate to single line items of stock; the assumption has been made that if each item is held at its own economic level then the overall holding of stock will be correctly balanced. This would be true provided that two conditions were satisfied.

- that there was enough space available to hold all the stocks required; and
- that enough money could be found to finance them.

Neither condition is likely to be fulfilled in practice, so some form of mathematical programme might be used to constrain the ideal unit quantities within the limiting factors. There are, however, a number of simple pragmatic approaches to inventory reduction, and these include:

- modifying the service level offered, either generally or in relation to selected items;
- letting the company's suppliers act as stockholders (possibly by placing bulk orders with schedules of call-off dates linked to sales demand);
- discontinuing those items which are the least profitable having regard to their marginal contribution and relevant fixed costs per unit of the limiting factor.

### Raw Material Stocks and Work-In-Progress

So far, in considering inventory control we have been discussing saleable stocks, but the same principles apply to stocks of raw materials. The main difference is that demand for raw materials is not direct from the outside customers but indirect through the production plans of the factory using the raw materials.

In considering the scheduling of production the 'Economic Batch Quantity' (EBQ) corresponds to the EOQ for purchased items. Manufacture in small batches will be more costly than in larger batches because there will be greater repetition of planning and progress actions and of the setting up and breaking-down of machine tooling, and also because there will be less opportunity for an efficient momentum of work to be established. However, these batch processing costs (like procurement costs of stocks) will change inversely to the holding costs of the work-in-progress (floor space, insurance, interest on capital, etc.).

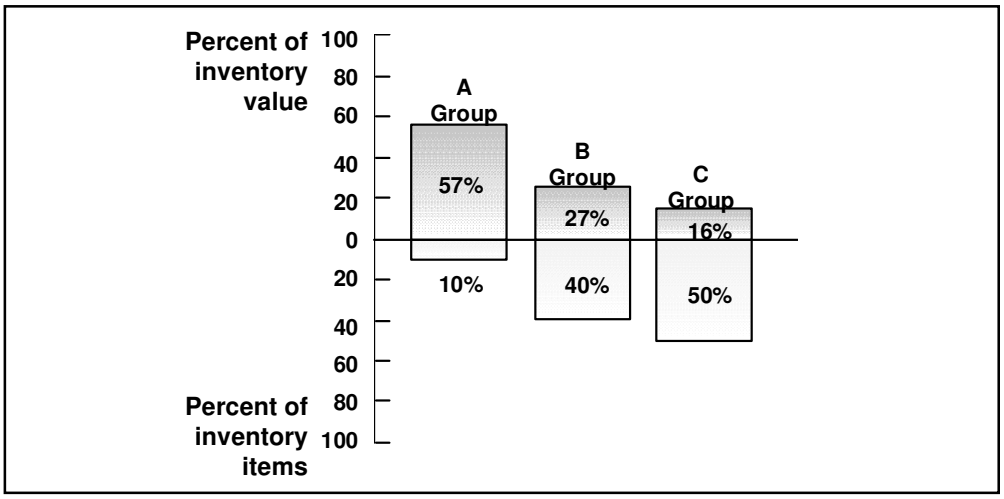
A big problem with work-in-progress is that work passes in sequence through a series of operations. What is an economic batch for lathe work may not be economic for drilling, milling or assembly operations. Applying EBQ calculation to one operation in isolation can cause bottlenecks in the flow or production - creating excessive holdings of partly-completed work because it could be produced cheaply in a large batch, even though there will be no demand for that work for some time ahead.

A similar problem is that of keeping skilled work people steadily occupied, since their wages are basically fixed in relation to time, even though outside customer demand may be seasonal or erratic.

Because these problems are concerned with the uneven timing of cash flows they are best solved by the use of discounted cash flow techniques. If, however, there is a capability of a rate of production which is in excess of a steady rate of demand (internal or external) then the problem is to decide what is the economic length of a production run, the facilities then being switched to other work until the next run is required.

As the number of items could be very large in case of raw materials it is necessary to find ways to selectively pay attention to those items that represent the highest value. A categorisation method known as ABC analysis is used for the same purpose. The idea behind ABC analysis is that attention is focussed on the highest value items that are usually small in number categorised as A-category items and the lowest value items are categorised as C and are ordered in more quantities so that less attention is required there.

For example in the figure 3.6 below, the A category items represent only 10 % of total inventory items but represent 57 % of the total value. While C category items represent 50 % of the total items but only 16 % of the value. By concentrating more on the A category items the company is able to manage its raw material inventory better.



# Integrated Working Capital Planning

Short-term financial planning is concerned with the management of the company's short-term, or current assets and liabilities. The most important current assets are cash, marketable securities, inventories and accounts receivable. The most important current liabilities are bank loans and accounts payable.

Current assets and liabilities are turned over much more rapidly than the other items on the balance sheet. Short-term financing and investment decisions are more quickly and easily reversed than long term decisions. Consequently, the financial manager does not need to look too far into the future when making them.

The nature of company's short term financial planning problem is determined by the amount of long term capital it raises. A company that issues large amounts of long term debt or equity, or which retains a large part of its earnings, may find that it has permanent excess cash. In such cases there is never any problem paying bills, and short term financial planning consists of managing the company's portfolio of marketable securities. Companies with permanent excess cash should look at the cost of funds and pay them out to the shareholders if they are earning less than the cost of funds.

Other companies raise relatively little long term capital and end up as permanent short term debtors. Most companies attempt to find a golden mean by financing all fixed assets and part of current assets with equity and long term debt. This may even be required by the bank to be so. Such companies may invest cash surpluses during part of the year and borrow during the rest of the year.

The starting point for short term financial planning is an understanding of sources and uses of cash. Companies forecast their net cash requirements by forecasting collections on accounts receivable, adding other cash inflows, and subtracting all forecasted cash outlays.

If the forecasted cash balance is insufficient to cover day-to-day operations and to provide a buffer against contingencies, you will need to find additional finance. It may make sense to raise long term finance if the deficiency is permanent and large. Otherwise you may choose from a variety of sources of short term finance.

In addition to the explicit costs of short term financing, there are often implicit costs. The financial manager must choose the financing package that has lowest total cost (explicit and implicit costs combined) and yet leaves the company with sufficient flexibility to cover contingencies.

## Short Term Financial Planning Model

Working out a consistent short term plan requires burdensome calculations. Fortunately much of the arithmetic can be delegated to a computer. Many large companies have

built models to do this. Smaller companies do not face so much detail and complexity and find it easier to work with a spreadsheet programme on a personal computer.

In either case the financial manager specifies forecasted cash requirements or surpluses, interest rates, credit limits, etc. and the model grinds out a plan. The computer also produces balance sheets, income statements, and whatever special reports the financial manager may require.

Smaller companies that do not want custom built models can buy general purpose models offered by accounting companies, management consultants or specialised computer software companies.

Most of these models are simulation programmes. They simply work out the consequences of the assumptions and policies specified by the financial manager. Optimisation models for short term financial planning are also available. These models are usually linear programming models. They search for the best plan from a range of alternative policies identified by the financial manager.

Optimisation helps when the company faces complex problems with many interdependent alternatives and restrictions for which trial and error might never identify the best combination of alternatives.

Of course the best plan for one set of assumptions may prove disastrous if the assumptions are wrong. Thus, the financial manager has to explore the implications of alternative assumptions about future cash flows, interest rates and so on. Linear programming can help identify good strategies, but even with an optimisation model the financial plan is still sought by trial and error.

## Solved Problems

1. The Classic Company offers trade credit to its customers of net 30. Credit sales average Rs 620,000 per day on which the company earns a contribution margin of 20 percent. The average accounts receivable collection period is 50 days. The appropriate after-tax discount rate for evaluating accounts receivable policy changes is 9 percent and the company's marginal tax rate is 40 percent.

    a. What is the average balance in accounts receivable? What is the average investment in accounts receivable? What are the annual financing costs associated with the investment in receivables?

    b. The sales manager believes she can implement a credit policy change that will reduce the average collection period by four days without affecting the level of sales. If this policy works as expected, what will be the company's investment in accounts receivable? What will be the net annual after-tax advantage to the company of adopting this policy?

c. Suppose the credit policy change will also reduce sales by Rs 5,000 per day. What would be the company's investment in accounts receivable? What will be the expected effect of this policy change on the company's after-tax net income?

**Solution**

a. The average balance of accounts receivable is:

Average A/R balance = (Rs 620,000/day) (50 days) = Rs 31,000,000

Average investment in A/R =(Rs 31,000,000) (0.80) = Rs 24,800,000

The cost of financing the investment in receivables is:

Cost of financing A/R = (Rs 24,800,000) (.09) = Rs 2,232,000

**Note:** The financing cost of carrying receivables is based on the cost of sales since the cost of sales represents the cash paid out in advance of collections. The cash paid out creates a financing need.

b. Reducing the collection period by 4 days will free up:

Cash freed up = (4days) (Rs 620,000 per day) (0.80) = Rs 1,984,000

The net advantage is reduced financing cost of the cash freed up:

Reduced financing cost = (Rs 1,984,000) (0.09) = Rs 178,560 per year

c. If sales decrease and the average collection period is reduced,

New investment in A/R=(Rs 615,000)(0.80)(46) Rs 22,632,000

New financing cost of A/R=(Rs 22,632,000)(0.09) = Rs 2,036,880

There are two effects on sales:

Δ Financing cost of A/R=(Rs 2,232,000-Rs 2,036,880) Rs 195,120

Δ Net Profit from lower sales=(-Rs 5,000/day)(365)(0.20)(0.60) 219,000

Δ NIAT -Rs 23,880

**Note:** Here D means additional

Given the expected effects, the policy change would not be profitable.

2. Rupesh Goel, credit manager of Kalpana Company, is considering a change in the company's credit terms from net 60 to net 30. Kalpana has daily credit sales of Rs 50,000 and its variable cost ratio is 15 percent. Tightening credit standards would reduce the average collection period from 75 days to 40 days, reduce daily sales by Rs 2,000, and lower bad debts from 5 percent of sales to 3 percent of sales. The company's marginal tax rate is 40 percent and it uses an after-tax

discount rate of 12 percent to evaluate accounts receivable policy changes. How would the change in credit terms affect Kalpana's after-tax income?

**Solution**

To answer, first calculate the new and old investment in A/R

| | |
|---|---|
| Old investment in A/R=(75 days)(Rs 50,000/day)(0.85) = | Rs 3,187,500 |
| New investment in A/R=(40 days)(Rs 48,000/day)(0.85) | 1,632,000 |
| Δ Investment in A/R | Rs 1,555,500 |

There are three expected changes in after-tax net income:

| | |
|---|---|
| Δ Financing cost of A/R investment = (Rs 1,555,500)(0.20) | Rs 186,660 |
| Δ Bad debt expense | |
| [(0.05)(Rs 50,000)(365)-(0.03)(Rs 48,000)(365)](0.60) | 232,140 |
| Δ Profit on sales = (Rs 2000)(365)(0.15)(0.60) | (65,700) |
| Δ Net Profit | Rs 353,100 |

3. The Dryden Company currently offers trade credit to its customers on terms of net 30. Daily credit sales average Rs 250,000 on which the company earns a contribution margin of 25 percent. The average collection period of 45 days. The company's marginal tax rate is 30 percent and its after-tax discount rate for analyzing credit policy changes is 8 percent.

   a. Under the current policies, what is the company's investment in accounts receivable? What is the annual after-tax financing cost associated with the investment in account receivable?

   b. The company is considering offering credit terms of 2/10, net 30. If the discount is offered, an estimated 85 percent of the company's customers will choose to take the discount and the average collection period will fall to 18 days. Assuming the change in credit policy has no effect on daily sales, what will be the effects on the company's after-tax net income?

   c. Suppose the change in credit terms also reduces daily sales by Rs 4,000, lowers bad debt expenses from 5 percent to 2 percent of sales, and saves Rs 60,000 per year in credit department expenses. Will it be profitable to change the credit terms?

**Solution**

a. Under current policies:

| | |
|---|---|
| Investment in A/R=(Rs 250,000)(0.75)(45 days) = | Rs 8,437,500 |
| Cost of financing A/R = (Rs 8,437,500)(0.08) = | Rs 675,000 |

b. The new investment in accounts receivable will be

| | |
|---|---|
| Δ Investment in A/R = (Rs 250,000)(0.75)(45-18) = | Rs 5,062,500 |
| The changes in after-tax income are: | |
| Δ Cost of financing A/R=(Rs 5,062,500)(0.08) | Rs 405,000 |
| Discounts accepted (0.02)(Rs 250,000)(0.85)(365)(0.60) | (930,750) |
| Δ NIAT | (Rs 525,750) |

The proposed policy changes would be unprofitable.

c. The change in the investment in A/R is:

| | |
|---|---|
| New investment in A/R=(18)(Rs 246,000)(0.75) | Rs 3,321,000 |
| ΔInvestment in A/R = (Rs 3,321,000 - 8,437,500) - | Rs 5,116,500 |
| The changes in after-tax income are: | |
| Δ Cost of financing A/R = (-5,116,500)(0.08) | Rs 409,320 |
| Lower profit on sales = (Rs 4000)(365)(0.25)(0.60) | (219,000) |
| Discounts accepted = (0.02)(246,000)(365)(0.60) | (1,077,480) |
| Δ Bad debt expense | |
| =[(0.05)(250,000)(365)-(0.02)(246,000)(365)](0.60) | 1,660,020 |
| Δ Credit department expenses = (0.60)(Rs 60,000) | 36,000 |
| Δ Net Profit | Rs 808,860 |

The change in credit policies would be profitable.

4. The Superb Company is evaluating its credit standards. The company's variable cost ratio is 78 percent of sales and its marginal tax rate is 40 percent. The appropriate after-tax discount rate for evaluating credit policies is 9 percent. Superb classifies customers into several credit classes depending on the risk of default. Based on the information given in the table, would Superb be better off not granting credit to the two customers in risk classes 4 and 5? (Evaluate the profitability of granting credit to each risk class separately.)

| Risk Class | Average Collection period | Annual sales | Bad debts as percentage of sales | Additional annual credit department expenses |
|---|---|---|---|---|
| 4 | 50 days | 730,000 | 7% | Rs 35,000 |
| 5 | 65 days | 580,000 | 12 | 62,000 |

**Solution**

For each risk class, the net advantage of granting credit is:

**Risk class 4:**

| | |
|---|---|
| Profit on sales = (Rs 730,000)(0.22)(0.60) | Rs 96,360 |
| Bad debt expense = (Rs 730,000)(0.07)(0.60) | (30,660) |
| Cost of financing A/R=(Rs 730,000/365)(50 days)(0.09) | (9,000) |
| Extra credit department costs (Rs 35,000)(0.60) | (21,000) |
| Δ NIAT | Rs 35,700 |

**Risk class 5 :**

| | |
|---|---|
| Δ Profit on sales = (Rs 580.000)(0.22)(0.60) | Rs 76,560 |
| Δ Bad debt expense = (Rs 580,000)(0.12)(0.60) | (41,760) |
| Cost of financing A/R=(Rs 580,000/365)(65 days)(0.09) | (9,296) |
| Extra credit department costs (Rs 62,000)(0.60) | (37,200) |
| Δ Net Profit | -Rs 11,696 |

Extending credit to risk class 5 appears unprofitable.

5. The Sunit Company currently carries Rs 12 million of inventory. The finance manager proposes a reduction in inventory to Rs 10 million. The sales and production managers estimate that the policy change will increase stockouts, costing the company sales of Rs 600,000 per year. Storage and spoilage costs should decrease by Rs 25,000 per year and the company's investment in accounts receivable will decrease by Rs 120,000. The variable cost ratio is 75 percent of sales. The company's marginal corporate tax rate is 30 percent and the appropriate after-tax discount rate for evaluating inventory policy changes if 8 percent.

   a. What are the financing costs to the company of its current inventory policies?

   b. If the new policy is adopted, what will be the annual change in after-tax income?

**Solution**

a. Financing cost of inventory = (12 million)(0.08)=Rs 960,000 per year.

b. The policy changes will have the following effects on annual income.

| | |
|---|---|
| Δ Financing of inventory = (Rs 2,000,000)(0.08) | Rs 160,000 |
| Δ Stockout and spoiling cost = (Rs 25,000)(0.60) | 15,000 |
| Δ Financing of A/R = (Rs 120,000)(0.08) | 9,600 |
| Δ Profit on sales = (Rs 600,000)(0.25)(0.60) | (90,000) |
| Δ Net Profit | Rs 94,600 |

6. The Storage Corporation currently carries Rs 25 million of inventory. The finance manager is considering whether to recommend a reduction in inventory costs at the following information about inventory costs at various levels. The company's after-tax discount rate that is used to evaluate current asset policies is 6 percent. The company earns a contribution margin of 20 percent on sales.

| | Rs 25 million | Rs 23 million | Rs 21 million |
|---|---|---|---|
| Storage costs | 750,000 | 725,000 | 710,000 |
| Spoilage costs | 400,000 | 375,000 | 367,000 |
| Daily sales | 120,000 | 119,000 | 114,500 |

a. Would it be profitable for the company to reduce its inventory from Rs 25 million to Rs 23 million? (Calculate the change in after-tax income.)

b. Would it be profitable for the company to reduce its inventory to Rs 21 million? (Calculate the change in after-tax income.)

**Solution**

a. Reducing inventory from Rs 25 to Rs 23 million causes net income to:

| | |
|---|---|
| Δ Storage cost = (Rs 750,000 - Rs 725,000)(0.60) | Rs 15,000 |
| Δ Spoilage cost = (Rs 400,000 - Rs 375,000)(0.60) | 15,000 |
| Δ Financing cost = (Rs 2,000,000)(0.06) | 120,000 |
| Δ Profit on sales = (Rs 120,000-119,000)(365)(0.20)(0.60) | (43,800) |
| Δ Net Profit | Rs 106,200 |

b. To determine if it is profitable to reduce inventory to Rs 21 million, determine the change in profits associated with reducing from Rs 23 million. That is, you know that Rs 23 million is better than Rs 25 million and the decision is now whether to reduce further to Rs 21 million. Remember that decisions depend on incremental costs and benefits.

Reducing inventory from Rs 23 to Rs 21 million causes net income to:

| | |
|---|---|
| Δ Storage cost = (Rs 725,000 - Rs 710,000)(0.60) | Rs 9,000 |
| Δ Spoilage cost = (Rs 375,000 - Rs 367,000)(0.60) | 4,800 |
| Δ Financing cost = (Rs 2,000,000)(0.06) | 120,000 |
| Δ Profit on sales = (Rs 119,000 - 114,500)(365)(0.20)(0.60) | (197,100) |
| Δ Net Profit | (Rs 63,300) |

Given the choices, Rs 23 million is the most profitable level of inventory.

7. The Phil Company expects to sell 30,000 lamps per month or 360,000 lamps per year. The carrying cost is Rs 1.20 per lamp and the fixed reorder cost is Rs 375.

a. What is the annual before-tax cost of the current inventory policy?

b. What is the optimal reorder quantity according to the EOQ model?

c. If the company changes its reorder policy to conform with the EOQ model, what will be the net savings? (Round the number of reorders to the nearest integer.)

**Solution**

a. The annual before-tax cost of the current policy are :

$$\begin{aligned}\text{Annual cost} &= \text{Ordering cost} + \text{Carrying cost}\\ &= (12)(\text{Rs } 375) + (30{,}000)(1.20)/2\\ &= \text{Rs } 4{,}500 + \text{Rs } 18{,}000 = \text{Rs } 22{,}500\end{aligned}$$

b. The optimal reorder quantity according to the EOQ model is:

$$Q^* = \sqrt{\left(\frac{2(375)(360{,}000)}{1.20}\right)} = 15{,}000$$

c. To conform with the EOQ model, the company will place 24 orders per year [=(360,000)/15,000)]. The average level of inventory will be 7,500 [=15,000/2] Thus the annual inventory costs will be:

$$\begin{aligned}\text{Annual cost} &= \text{Ordering cost} + \text{Carrying cost}\\ &= (24)(\text{Rs } 375) + (7{,}500)(1.20)\\ &= \text{Rs } 9{,}000 + \text{Rs } 9{,}000 = \text{Rs } 18{,}000\end{aligned}$$

The annual before-tax saving of following the EOQ model is Rs 4,500 [=Rs 22,500 - 18,000].

# Chapter-11
# Capital Structure Theories

There are basically three approaches to capital structure decision:

- Net income Approach
- Net Operating Income approach
- Modigliani Miller Approach

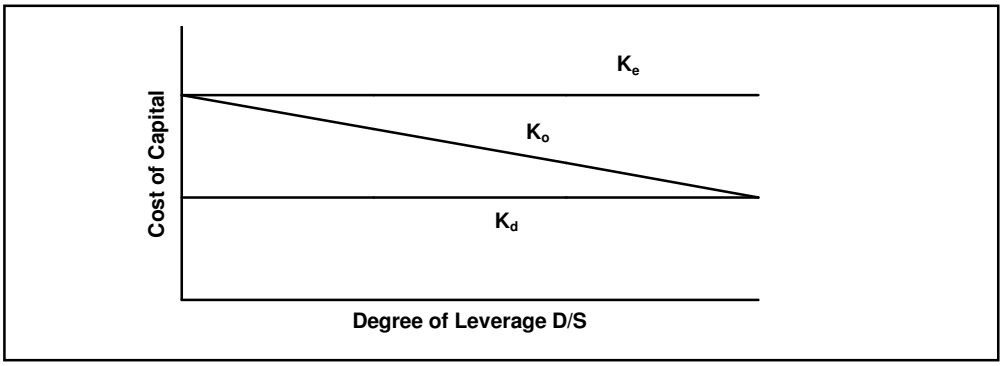
### Net Income Approach

According to this approach, the cost of debt capital, Kd and the cost of equity capital Ke remains unchanged when D/S, the degree of leverage, varies. Here S stands for total capital employed = D+E). The constancy of Kd and Ke with respect to the degree of leverage means that Ko, the average cost of capital, measured by the following formula declines as the degree of leverage increases.

$$K_o = k_d * \frac{D}{(D+E)} + k_e * \frac{E}{(D+E)}$$

This happens because when the degree of leverage increases, Kd which is lower than Ke, receives a higher weight in the calculation of Ko.

This can also be illustrated by a graph shown in Figure 11.1.



As our assumption is that the cost of debt and equity capital would not change with the change in the level of leverage, Ko is seen to go down with the increasing proportion of debt in the capital.

Note that we are talking about the market value of debt and the market value of equity. Many times we confuse it with the book values of debt and equity, a measure that always leads to problems in measuring the true costs of debt and equity.

Let us take a company that has an investment of Rs 1,00,000 and an net operating income of Rs 10,000. It is considering two scenarios: 1) no debt and 2) equal levels of debt and equity of Rs 50,000 each. Let us say that the company finds out that the cost of equity is 10% and the cost of debt is 6%.

Calculations show that equity earnings would be Rs 10,000 and Rs 7,000 respectively in the two scenarios as shown below. As the return expected on equity is 10%, we can say that this profit is 10% and therefore the market value of equity would be such that this return becomes 10% on the same. This means that the market value of equity would be Rs 1,00,000 and Rs 70,000 respectively in the two scenarios. Adding the market value of debt and the market value of equity gives us the total value of the firm in the market.

| | **Scenario A** | **Scenario B** |
|---|---|---|
| Equity | 1,00,000 | 50,000 |
| Debt | 0 | 50,000 |
| Cost of equity | 10% | 10% |
| Cost of debt | 6% | 6% |
| | | |
| Net operating income | 10,000 | 10,000 |
| Interest on debt | 0 | 3,000 |
| Equity earnings | 10,000 | 7,000 |
| | | |
| Market value of equity | 1,00,000 | 70,000 |
| Market value of debt | 0 | 50,000 |
| Total value of firm | 1,00,000 | 1,20,000 |

**Average cost of capital:**

**Scenario A:** 6% * (0 / 100000) + 10% *(100000 / 100000) = 10 %

**Scenario B:** 6% * (50000/120000) + 10% * (70000 / 100000) = 8.33%

There are three points to be noted here.

1. As the cost of capital decreases the value of the firm would go up as it is dependent upon the return expected and the cost of capital. Inverse relationship exists between the value of the firm and cost of capital for any given level of return.

2. This means that as we increase the level of debt in the company, the value of the firm would go up even further. This would mean that the companies would like to employ as much debt as possible. Something that doesn't happen in the real world.

3. Note that we have not considered the effect of taxes. If we consider the same, the value of the firm would go up even further because of the interest tax shield, an effect that we consider later.

### Net Operating Income Approach

Taking an opposite view from the view taken in the net income approach, this approach states that the cost of capital for the whole firm remains constant, irrespective of the leverage employed in the firm. With the cost of debt and the cost of capital constant, we can say that the cost of equity capital changes with the leverage to compensate for the additional level of risk.

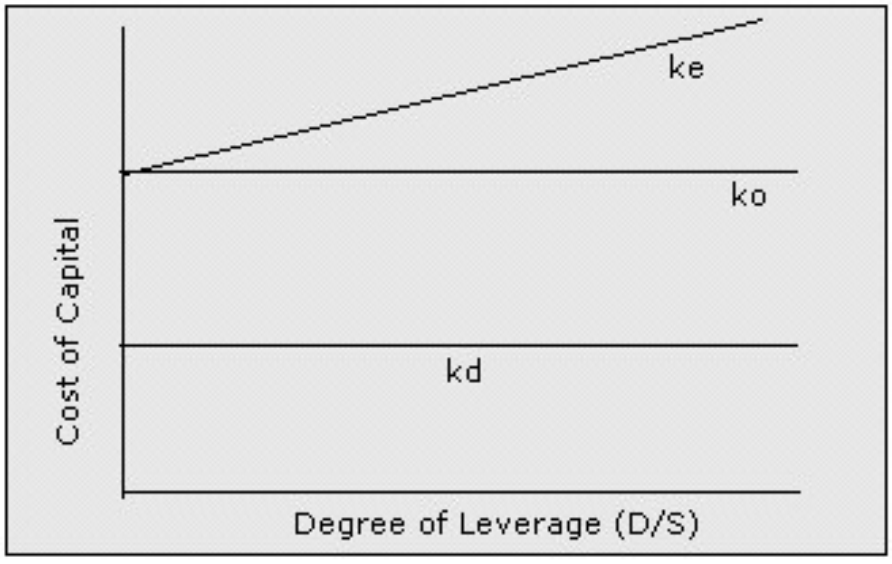
Putting it simply, according to the net operating income approach; for all degrees of leverage,

- Overall capitalisation rate remains constant
- The cost of debt remains same

Given this, and manipulating the equation of the firm's total cost of capital, we can express the cost of equity as:

$$K_e = K_o + \frac{(K_o - k_d) * D}{(D + E)}$$

This is illustrated below in Figure 11.2.



Let us repeat the example we discussed earlier in net income approach. Let us take a company that has an investment of Rs 1,00,000 and an net operating income of Rs 10,000. It is considering two scenarios: 1) no debt and 2) equal levels of debt and equity of Rs 50,000 each. Let us say that the company finds out that the overall cost of capital is 8% and the cost of debt is 6%.

Calculations show that equity earnings would be Rs 10,000 and Rs 7,000 respectively in the two scenarios as shown below. As the return expected on total capital is 8 per cent, therefore the market value of total capital would be such that this return becomes 8 per cent on the same. This means that the market value of capital would be Rs 1,25,000 in both the scenarios as our assumption in this case is that the total market value remains constant. Also the value of debt would also remain constant as the cost of debt remains constant. This means that the equity capitalisation can be calculated by subtracting the market value of debt from the total market value of the firm. Then the return on equity divided by the market capitalisation of equity would give us the cost of equity.

| | **Scenario A** | **Scenario B** |
|---|---|---|
| Equity | 1,00,000 | 50,000 |
| Debt | 0 | 50,000 |
| Cost of debt | 6% | 6% |
| | | |
| Net Operating income | 10,000 | 10,000 |
| Overall capitalisation rate | 8 % | 8 % |
| *Total market value* | *1,25,000* | *1,25,000* |
| Interest on debt | 0 | 3000 |
| Debt capitalisation rate | 0.06 | 0.06 |
| The equity capitalisation rates of scenario A and B are as follows : | | |
| Market value of debt | 0 | 50,000 |
| Market value of equity | *1,25,000* | *75,000* |
| Degree of leverage | 0.0 | |

Scenario A : Equity earnings / Market value of equity = 10,000 / 1,25,000 = 0.08 = 8 %

Scenario B : Equity earnings / Market value of equity = 7,000 / 75,000 = 0.0933 = 9.33%

There are three points to be noted here.

1. As the cost of total capital and debt is constant, the cost of equity would go up or down with increasing or decreasing leverage, i.e., the amount of debt in the equity.
2. This means that as we increase the level of debt in the company, the value of the firm doesn't change and the company does not benefit by taking on debt. This would mean that the companies would like to employ as much equity as possible so as to reduce the risk of the company. Something that doesn't happen in the real world again, companies do benefit from taking on debt.
3. Note that we have still not considered the effect of taxes.

With these two scenarios in mind let us look at what one of the most surprising theories of finance say about the capital structure.

### Modigliani Miller Approach

In 1958, Franco Modigliani and Merton Miller (MM) published one of the most surprising theories of the modern financial management - they concluded that the value of a firm depends solely on its future earnings stream, and hence its value is unaffected by its debt / equity mix. In short, they concluded that a firm's value stems from its assets, regardless of how those assets are financed. In other words, a variant of the net operating income approach discussed above. This finding had such widespread implications that the article was judged by the members of the Financial Management Association to have had more impact on financial management than any other published work.

In their paper, MM began with a very restrictive set of assumptions, including perfect capital markets (which implies zero taxes). And then they used an arbitrage proof to demonstrate that capital structure is irrelevant. Under their assumptions, if debt financing resulted in a higher value for the firm than equity financing, then investors who owned shares in a leveraged (debt-financed) firm could increase their income by selling those shares and using the proceeds, plus borrowed funds, to buy shares in an unleveraged (all equity-financed) firm. The simultaneous selling of shares in the leveraged firm and buying of shares in the unleveraged firm would drive the prices of the stocks to the point where the values of the two firms would be identical. Thus, according to MM Hypothesis, a firm's stock price is not related to its mix of debt and equity financing.

Modigliani and Miller have restated and amplified the net operating income position in terms of three basic propositions. These are as follows:

### Proposition I

The total market value of a firm is equal to its expected operating income (EBIT when Tax = 0) divided by the discount rate appropriate to its risk class. It is independent of the degree of leverage.

$$V_L = V_U = \frac{EBIT}{k_{o,L}} = \frac{EBIT}{k_{e,L}}$$

Here the subscript L is used to denote Leveraged firm and subscript U is used to denote Unleveraged firm.

Since the V (Value of the firm) as established by the above equation is a constant, then under the MM model, when there are no taxes, the value of the firm is independent of its leverage. This implies that the weighted average cost of capital to any firm is completely independent of its capital structure and the WACC for any firm, regardless of the amount of debt it uses, is equal to the cost of equity of unleveraged firm employing no debt.

**Proposition II**

The expected yield on equity, Ke is equal to Ko plus a premium. This premium is equal to the debt-equity ratio times the difference between Ko and the yield on debt, Kd.

This means that as the firm's use of debt increases, its cost of equity also rises, and in a mathematically precise manner.

**Proposition III**

The cut-off rate for investment decision making for a firm in a given risk class is not affected by the manner in which the investment is financed. It emphasises the point that investment and financing decisions are independent because the average cost of capital is not affected by the financing decision.

**Example**

Let us take the case of two firms X and Y, similar in all respects except in their capital structure. Firm X is financed by equity only; firm Y is financed by a mixture of equity and debt. The financial parameters of the two firms are as follows :

**Financial particulars of Firms X and Y**

| | Firm X | Firm Y |
|---|---|---|
| Total Capital Employed(Rs.) | 1,000,000 | 1,000,000 |
| Equity Capital(Rs.) | 1,000,000 | 600,000 |
| Debt (Rs.) | nil | 400,000 |
| Net operating Income (Rs.) | 100,000 | 100,000 |
| Debt Interest (Rs.) | 0 | 20,000 |
| Market Value of Debt (Rs.)<br>(Debt Capitalisation is 5%) | 0 | 400,000 |

| | Firm X | Firm Y |
|---|---|---|
| Debt Interest (Rs.) | 0 | 20,000 |
| Market Value of debt (Rs.)<br>(Debt capitalisation rate is 5%) | 0 | 400,000 |
| Equity earnings (Rs.) | 100,000 | 80,000 |
| Equity capitalisation rate | 8% | 12% |
| Market value of equity (Rs.) | 1,250,000 | 666,667 |
| Total Market value (Rs.) | 1,200,000 | 1,066,667 |

From the above particulars, it can be seen that the value of leveraged firm Y is higher than that of the unleveraged firm. According to Modigliani Miller approach, such a situation cannot persist because equity investors would do well to sell their equity investment in firm Y and invest in the equity of firm X with personal leverage. For example, an equity investor who owns 1 % equity in firm Y would do well to:

- Sell his equity in firm Y for Rs. 6,667
- Borrow Rs. 4,000 at 5% interest on personal account and
- Buy 1.0667% of the equity of firm X with the amount of Rs 10,667 that he has.

Such an action will result in the following income :

| | (Rs.) |
|---|---|
| Income on investment in firm X | 1066.7 |
| Less Interest (4000 x 0.5) | 200.0 |
| Net Income | 866.7 |

This net income of Rs. 866.7 is higher than a net income of Rs.800 foregone by selling 1 percent equity of firm Y and the leverage ratio is the same in both the cases.

When investors sell their equity in firm Y and buy the equity in firm X with personal leverage, the market value of equity of firm Y tends to decline and the market value of equity of firm X tends to rise. This process continues until the net market values of both the firms become equal because only then the possibility of earning a higher income for a given level of investment and leverage by arbitraging is eliminated. As a result of this the cost of capital for both the firms is the same.

The above example explained that due to the arbitrage mechanism the value of a leveraged firm cannot be higher than that of an unleveraged firm, other things being equal. It can also be proved that the value of an unleveraged firm cannot be higher than that of leveraged firm, other things being equal.

Let us assume the valuation of the two firms X and Y is the other way around and is as follows:

| | Firm X | Firm Y |
|---|---|---|
| Debt Interest (Rs.) | 0 | 20,000 |
| Market Value of debt (Rs.)<br>(Debt capitalisation rate is 5%) | 0 | 400,000 |
| Equity earnings (Rs.) | 100,000 | 80,000 |
| Equity capitalisation rate | 8% | 12% |
| Market value of equity (Rs.) | 1,250,000 | 666,667 |
| Total Market value (Rs.) | 1,200,000 | 1,066,667 |

If a situation like this arises, equity investors in firm X would do well to sell the equity in firm X and use the proceeds partly for investment in the equity of firm Y and partly for investment in the debt of firm Y. For example, an equity investor who owns 1 percent equity in firm X would do well to :

- Sell his 1 % equity in firm X for Rs 12,500
- Buy 1.01 % of equity and debt in firm Y involving an outlay of Rs 12,500.

Such an action will result in an increase of income by Rs 172 without changing the risk shouldered by the investor. When investors resort to such a change, the market value of the equity of firm X tends to decline and the market value of the equity of firm Y tends to rise. This process continues until the total market value of both the firms becomes equal.

## Criticism of MM Hypothesis

The arbitrage process is the behavioural foundation for the M-M thesis. The shortcomings of this thesis lie in the assumption of perfect capital market in which arbitrage is expected to work. Due to the existence of imperfections in the capital market, arbitrage may fail to work and may give rise to discrepancy between the market values of levered and unlevered firms. The arbitrage process may fail to bring equilibrium in the capital market for the following reasons:

**Lending and borrowing rates discrepancy** The assumption that firms and individuals can borrow and lend at the same rate of interest does not hold good in practice. Because of the substantial holding of fixed assets, firms have a higher credit standing. As a result, they are able to borrow at lower rates of interest than individuals. If the cost of borrowings to an investor is more than the firm's borrowing rate, then the equalisation process will fall short of completion. If the cost of debt paid by the firm is less than that paid by the investor, then the value of the levered firm, $V_t$, must exceed

the value of the unlevered firm, V1, for total return to be equal. For example, if the investors can borrow at 9 per cent, his returns after switching will be only Rs 550. Consequently, it does not follow that market opportunities and forces will lead $V_t$ into equality with $V_u$.

**Non-substitutability of personal and corporate leverages** It is incorrect to assume that "personal (home-made) leverage" is a perfect substitute for "corporate leverage." The existence of limited liability of firms in contrast with unlimited liability of individuals clearly places individuals and firms on a different footing in the capital markets. If a levered firm goes bankrupt, all investors stand to lose to the extent of the amount of the purchase price of their shares. But, if an investor creates personal leverage, then in the event of the firm's insolvency, he would lose not only his principal in the shares of the unlevered company, but will also be liable to return the amount of his personal loan. Thus, if the investor keeps his investment in the levered firm, his loss in the event of bankruptcy will be Rs 6,000. But if he engages in the arbitrage transactions and invests in the unlevered firm, he can lose his principal investment of Rs 5,000 and will also be liable to return Rs 5,000 borrowed by him on the personal account. Thus, it is more risky to create personal leverage and invest in the unlevered firm than investing directly in the levered firm.

**Transaction costs** The existence of transaction costs also interferes with the working of arbitrage. Because of the costs involved in the buying and selling securities, it would become necessary to invest a greater amount in order to earn the same return. As a result, the levered firm will have a higher market value.

**Institutional restrictions** Institutional restrictions also impede the working of arbitrage. Durand points out that "home-made" leverage is not practically feasible as a number of institutional investors would not be able to substitute personal leverage for corporate leverage, simply because they are not allowed to engage in the "home-made" leverage.

**Existence of corporate tax** 'The incorporation of the corporate income taxes will also frustrate M-M's conclusions. Interest charges are tax deductible. This, in fact, means that the cost of borrowing funds to the firm is less than the contractual rate of interest. The very existence of interest charges gives the firm a tax advantage, which allows it to return to its equity and debt holders a larger stream of income than it otherwise could have. For example, suppose X = Rs 10,000, $k_d$ = 0.06 and $D_t$ = Rs 20,000. Let the corporate income tax rate equal 50 per cent. Thus, the unlevered firm will have Rs 5000 [= Rs 10,000 (1 – 0.50)] for distribution to its equity share-holders. The levered firm must pay a total tax of Rs 4,400 [= 0.50 (10,000 - Rs 1,200)] which leaves it Rs 5,600 to distribute to its equity and debt-holders (i.e., Rs 4,400 to equity-holders and Rs 1,200 to debt-holders). Thus, the total returns to debt and equity-holders from the unlevered firm are less than that of levered firm. Hence, the total market

value of a levered firm should tend to exceed that of the unlevered firm for this very reason. This point is elaborated further in the following section.

## Relevance of Capital Structure: The MM-Hypothesis under corporate Taxes

M-M's hypothesis that the value of the firm is independent of its debt policy is based on the critical assumption that corporate income taxes do not exist. In reality, corporate income taxes exist, and interest paid to debt holders is treated as a deductible expense. Dividends paid to shareholders; on the other hand, are not tax-deductible. Thus, unlike dividends, the return to debt-holders is not subject to the taxation at the corporate level. This makes debt financing advantageous. In their 1963 article, M-M show that the value of the firm will increase with debt due to the deductibility of interest charges for tax computation, and the value of the levered firm will be higher than of the unlevered firm. Consider an example.

**Illusration 6:** Suppose two firms L and U are identical in all respects except the use of debt—firm U is an all-equity financed firm with Rs 10,000 equity capital while firm L employs Rs 5,000 equity and Rs 5,000 debt at a 14 per cent rate of interest. Both firms have an expected earning before interest and taxes of Rs 2,500, pay corporate tax at 50 per cent and distribute 100 per cent earnings as dividends to shareholders. The; after-tax earnings accruing to investors is shown in Table given below.

Note in Table that the liability of firm L is Rs 350 less than that of firm U. The total income of investors of' firm L is more by that amount. This amount is the interest tax shield provided by the debt of firm L: $0.5 \times 0.14 \times 5{,}000 = 0.5 \times 700 =$ Rs 350. Thus

$\bar{X}$

Interest tax shield = Tax rate × Interest

$$INTS = T \times INT = T \times (k_d D) \qquad ...(11)$$

where k, is the cost of debt and D is the amount of debt.

**Table: Income of investors of levered and Unlevered firm's under corporate income tax**

| *Income* | *Firm U* | *Firm L* |
|---|---|---|
| 1. EBIT, X | 2,500 | 2,500 |
| 2. Interest, INT = $k_d D$ | 0 | 700 |
| 3. Profit before tax, ( $\bar{X}$ -$k_d$ D) | 2,500 | 1,800 |
| 4. Tax, T= 0.5, T( -$k_d$, D) | 1,250 | 900 |
| 5. Profit after tax, ( - k, D) - T ( - $k_d$D) = ( -$k_d$D) (I - T) | 1,250 | 900 |
| 6. Dividends to shareholders, ( - $k_d$ D) (I - T) | 1,250 | 900 |
| 7. Interest to debt holders, $k_d$ D | 0 | 700 |
| 8. Total income to investors, ( $k_d$ D) (I - T) + $k_d$D | | |
| = (1-T) + T$k_d$D | 1,250 | 1,600 |
| 9. Interest tax shield. T$k_d$D | 0 | 350 |

Interest tax shield (INTS) is an inflow to the firm and therefore, it is valuable. Suppose that firm L will employ debt of Rs 5,000 forever. If firm L's debt of Rs 5,000 is permanent, then the interest tax shield of Rs 350 is a perpetuity. What is the value of this perpetuity? For this, we need a discount rate which reflects the riskiness of those cash flows. The levered firm's after-tax earnings consist of operating income and interest tax shield as given below:

After-tax earnings of all investors = After-tax operating income + Intemst tax shield

$$= \quad (1 - T) + Tk_dD$$

In case of the unlevered firm, the after-tax earnings are simply: (1-T)

The cash flows arising on account of interest tax shield are less risky than the operating income which is subject to business risk. Interest tax shield depends on the corporate tax rate and the firm's ability to earn enough profit to cover the interest payments. The corporate tax rates do not change very frequently, Firm L can be assumed to earn at least equal to the interest payable otherwise it would not like to borrow, Thus the cash inflows from interest tax shield can be considered less risky, and they should be discounted at a lower discount rate. It will be reasonable to assume that the risk of interest tax shield is the same as that of the interest payments generating them. Thus, the discount rate is 14 per cent, the rate of return required by debt-holders. The present value of firm L's perpetual interest tax shield of Rs 350 is:

PV of interest tax shield = = Rs 2,500

Note that the government, through its fiscal policy, assumes 50 per cent (the corporate tax rate) of 0.14 firm L's Rs 5,000 debt obligation.

Under the assumption of the permanent debt, we can determine the present value of the interest tax shield as follows:

PV of interest tax shield =

PVINTS = ...(12)

Thus the present value of the interest tax shields (PVINTS) is independent of the cost of debt it is simply the corporate tax rate times the amount of permanent debt (TD).

What is the total value of firm L (that is, the levered firm)? It is the sum of the present value of the after-tax operating income and interest tax shield. The operating income, R (1 - T), of the levered firm is equal to the after-tax earnings of the pure-equity (that is, unlevered) firm U. The equity- capitalisation rate (the opportunity cost of equity) of a pure-equity firm, $k_u$, should be used to discount the stream of operating income. Thus

the value of firm L (the levered firm) is equal to the value of the unlevered firm plus the present value of the interest tax shield as shown in Equation below:

Value of levered firm = Value of unlevered firm + PV of tax shield

$$V_t = v_u + TD \quad ...(13)$$

We can write Equation (13) in its expanded form as follows:

$$V_t = \frac{\overline{X}(1-T)}{k_u} + \frac{Tk_dD}{k_d} \quad ...(14)$$

where $V_t$ is the value of the firm with debt, X (I - T) is perpetual operating income stream of the pure-equity firm, $k_u$ is the pure-equity capitalisation rate, $k_d$ is the expected rate of return on debt, D is debt and D is the corporate tax rate.

Equation (13) implies that when the corporate tax rate, T, is positive (T > 0), the value of the levered firm will increase continuously with debt. Thus, theoretically the value of the firm will be maximum when it employs 100 per cent debt. This is shown in Figure 8.

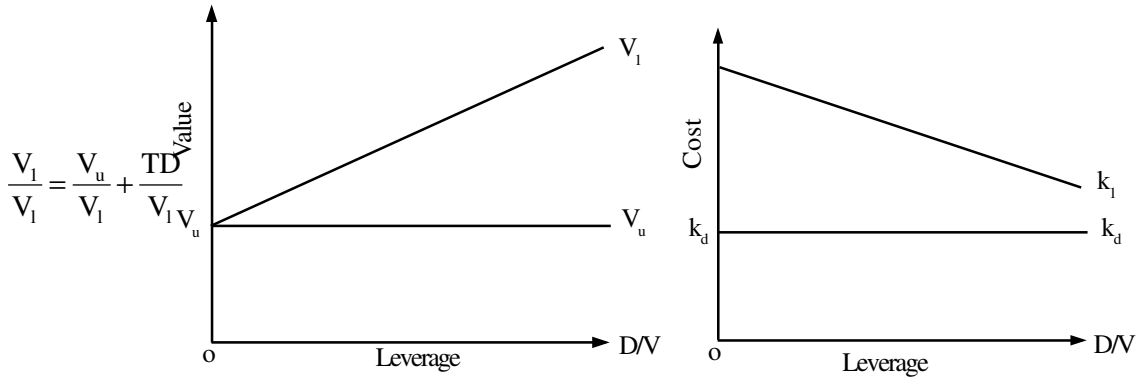



**Figure 8: Value of levered firm  Figure 9: Cost of capital of the evered firm**

$$V_l = V_u + TD$$

$$1 = \frac{V_u}{V_l} + TL \quad \text{(setting } D/V_l = L\text{)}$$

$$V_l = \frac{V_u}{1-TL}$$ Thus, for T > 0, $V_l$ will be maximum when L = 1.0.

Under the assumption of the M-M hypothesis with corporate taxes, the levered firm's cost of capital is given by the following formula:

$$k_l = k_u(1-TL) \quad ...(15)$$

where k, is the levered firm's cost of capital, $k_u$ is the pure-equity capitalisation rate,

T is the corporate tax rate and L is debt ratio. The levered firm's cost of capital is shown in Figure.

The M-M's 'tax-corrected' view suggests that, because of the tax deductibility of interest charges, a firm can increase its value or lower its cost of capital continuously with leverage. Thus the optimum capital structure is reached when the firm employs 100 per cent debt. But the observed experience does not entirely support this view. In practice, firms do not employ large amounts of debt, nor are lenders ready to lend beyond certain limits. M-M suggest that firms would adopt a target debt ratio so as not to violate the limits of the debt level imposed by lenders. They state:

> ..... existence of a tax advantage for debt financing does not necessarily mean that corporations should at all times seek to use the maximum possible amount of debt in their capital structures... (T) here are, as we pointed out, limitations imposed by lenders, as well as many other dimensions in real-world problems of financial strategy which are not fully comprehended within the framework of static equilibrium models... These additional considerations, which are typically grouped under the ruberic of the need for preserving flexibility, will normally imply the maintenance by the corporation of a substantial reserve of untapped borrowing power.

Why do companies not employ extreme level of debt in practice? There could be two possibilities: First, we need to consider the impact of both corporate and personal taxes for corporate borrowing. Personal income tax may offset the advantage of the interest tax shield. Second, borrowing may involve extra costs (in addition to contractual interest cost)-costs of financial distress—which may also offset the advantage of the interest shield. Let us examine these points in the following section.

## Economy-wide Optimum Capital Structure: Miller's Hypothesis with Corporate and Personal Taxes

Investors are required to pay personal taxes on the income earned by them. Therefore, from investor's point of view, taxis will include both corporate and personal taxes. A firm should thus aim at minimising the total taxes (both corporate and personal) while deciding about borrowing. How do personal income taxes change investor's return and value? It depends on the corporate tax rate and the difference in the personal income tax rates of investors.

Consider an example. In Illustration 6 of firms L and U, let us add information about the personal taxes. Assume that both shareholders and lenders are required to pay 40 per cent tax on their income—respectively dividends and interest. The after-tax income accuring to investors is shown in Table

| Income | Firm U | Firm L |
|---|---|---|
| 1. EBIT, | 2,500 | 2,500 |
| 2. Interest, INT = $k_d$ I) | 0 | 700 |
| 3. Profit before tax, - $k_d$D | 2,500 | 1,800 |
| 4. Tax,T( -$k_d$D) | 1,250 | 900 |
| 5. Profit after tax ( - $k_d$D)- T ( - $k_d$ D) = ( - $k_d$ D) (1 - T) | 1,250 | 900 |
| 6. Dividends to shareholders, ( - $k_d$D) (I - T) | 1,250 | 900 |
| 7. Personal taxes on dividends, Tp [( - $k_d$ D) (I - T)] | 500 | 360 |
| 8. Dividends after personal taxes, ( - $k_d$ D) (I - T) (I - $T_p$) | 750 | 540 |
| 9. Interest to debt-holders, $k_d$ D | 0 | 700 |
| 10. Personal taxes on interest, Tp ($k_d$ D) | 0 | 280 |
| 11. Interest after personal taxes, ($k_d$ D - Tp $k_d$ D) = $k_d$ D (I - $T_p$) | 0 | 420 |
| 12. Total income to investors, (8 + 11) ( - $k_d$ D) (I - T) (I - $T_p$) + $k_d$ D (1 - $T_p$) | 750 | 960 |
| 13. Interest tax shield after personal taxes, $k_d$ DT - $k_d$ DT × $T_p$ (I = $T_p$) $k_d$ DT | - | 210 |

Note that the after-tax income available to both shareholders and debt holders is less by 40 per cent on account of personal taxes. Further, you also notice that the interest tax shield after personal tax has reduced to: Rs 350 (1 - 0.4) = Rs 210. What is the present value of this perpetual stream? We shall have to adjust the discount rate for the personal taxes. This is done because the cash flows arising from the interest tax shield are computed after personal taxes. The debt holders of firm L can obtain 14 per cent before tax, but only 0.14 (1 - 0.4) = 0.08 or 8.4 per cent after personal tax. Thus, the present value of interest tax shield is:

$$\frac{\bar{x}210}{0.084} = \text{Rs } 2{,}500$$

$$\text{PVINTS} = \qquad \text{Rs } 2{,}500$$

This present value is same as obtained earlier when the personal taxes were ignored. It is because both cash flows and discount rate have been reduced by the personal tax rate of 40 per cent. Thus

$$\text{PVINTS} = \frac{\text{Corporate tax rate} \times \text{Interest} \times (1 - \text{Personal tax rate})}{\text{Cost of debt } (1 - \text{Personal tax rate})}$$

$$= \frac{t \times k_d D \times (1 - T_p)}{k_d (1 - T_p)} = TD$$

...(16)

The value of the levered firm is still given by the following formula:

$$V_t = V_u + TD$$

In reality, however, dividends are treated differently from interest income for tax

purpose. In India, for example interest income is tax exempt upto Rs 7,000 for individuals. After this, they are required to pay tax at a marginal rate which can be as high as 30 per cent. Dividends in the hands of shareholders are tax exempt, and capital gains are treated more favourably for tax purposes. The tax rate on capital gains is 20 per cent. Tax on capital gains is paid only when they are realised. Thus, an individual can defer paying tax on capital gains for a long period if he does not realise them and thus, his tax on equity income will be zero. Interest income, whether received or accrued, is taxed in the hands of individuals, although it is exempted from tax at the corporate level. Dividends are taxed at the corporate level while it is possible to avoid tax on capital gains at the personal level and pay no tax on the current dividends. We may conclude that, in general, interest income is taxed at a higher rate than equity income at the personal level.

Consider an example. In our earlier illustration, let us assume that interest income is taxed at 40 per cent and equity income is not taxed at the personal level. The after-tax earnings of investors are shown in Table. It can be seen that corporate borrowing is still advantageous since an interest tax shield after personal taxes of Rs 70 is generated. Note that the interest tax shield is reduced by the personal tax on interest income (i.e. $k_d DT - k_d DT_{pb}$). But it is substantially less than the case where equity income was taxed at 40 per cent.

| Income | Firm U | Firm L |
|---|---|---|
| 1. EBIT,X | 2,500 | 2,500 |
| 2. Interest, INT = k, I) | 0 | 700 |
| 3. Profit before tax, $\overline{X} - k_d D$ | 2,500 | 1,800 |
| 4. Tax,T(X-kdD) | 1,250 | 900 |
| 5. Profit after tax ( - $k_d$D)- T ( - $k_d$ D) = ( - $k_d$ D) (1 - T) | 1,250 | 900 |
| 6. Dividends to shareholders, ( - $k_d$D) (I - T) | 1,250 | 900 |
| 7. Personal taxes on dividends, Tp [( - $k_d$ D) (I - T)] | 0 | 0 |
| 8. Dividends after personal taxes, ( - $k_d$ D) (I - T) (I - $T_p$) | 1,250 | 900 |
| 9. Interest to debt-holders, $k_d$ D | 0 | 700 |
| 10. Personal taxes on interest, Tp ($k_d$ D) | 0 | 280 |
| 11. Interest after personal taxes, ($k_d$ D - Tp $k_d$ D) = $k_d$ D (I - $T_p$) | 0 | 420 |
| 12. Total income to investors, (8 + 11) (X - $k_d$ D) (I - T) (I - $T_p$) + $k_d$ D (1 - $T_p$) | 1,250 | 1,320 |
| 13. Interest tax shield after personal taxes, $k_d$ DT - $k_d$ DT × $T_p$ (I = $T_p$) $k_d$ DT | - | 70 |

The present value of this perpetual stream of interest tax shield is:

PVINTS =

Thus the formula for PVINTS in the case of a positive personal tax rate for lenders and no personal tax rate for shareholders can be written as follows:

$$\text{PVINTS} = \frac{\text{Corporate tax rate} - \text{Lender's Personal tax rate}) \times \text{Interest}}{\text{Cost of debt } (1 - \text{Lender's Personal tax rate})}$$

$$= \frac{(T - T_{pb})k_d D}{k_d(1 - T_{pb})} = \left[\frac{T - T_{pb}}{1 - T_{pb}}\right] D \qquad ...(17)$$

The total earnings of a firm will be distributed either as interest income or equity income. The personal tax rate on interest income is $T_{pb}$ and on equity income $T_{pe}$. $T_{pe}$ is unlikely to be equal to $T_{pb}$. mostly it will be less than $T_{pb}$, and in extreme cases it will be equal to zero. Comparing the income tax shields in Tables we can see that corporate borrowings is advantageous if

$$(1 - T_{pb}) > (1 - T_{pe})(1 - T)$$

Thus a firm should stop borrowing when $(1 - T_{pb})$ becomes equal to $(1 - T_{pe})$ $(1 - T)$. In practice, the finance manager will find it difficult to arrive at the numerical values of $T_{pb}$ and $T_{pe}$ since the firm will have a large number of shareholders and debt holders in different tax brackets.

$\frac{70}{0.084} = \text{Rs } 833$ How does leverage affect the firm value when the personal tax rates of shareholders and debt-holders differ? We have already shown that the value of the firm will be reduced when the personal tax rate of lenders is higher than that of shareholders. Miller has provided a formal answer to this question. As we know, the interest tax shield (INTS) which is the gain from leverage is the difference between the value of the levered and unlevered firm, and is also given by the product of the corporate tax rate and the amount of debt under the assumption of perpetual debt and no personal taxes:

$$\text{INTS} = k_d DT$$

$$\text{PVINTS} = k_d DT / k_d$$

$$\text{PVINTS} = V_t - V_u = TD \qquad ...(18)$$

Miller introduced personal taxes in the model and modified it.' In the unlevered firm where equity income is taxed at $T_{pe}$ personal tax rate, the shareholder's earnings will be:

$$\bar{X}\ (1\text{-}T)\ (1\text{-}T_{pe}) \qquad ...(19)$$

and when we discount these earnings at the pure-equity capitalisation rate, k~, the value of the unlevered firm will be:

...(20)

In case of the levered firm, the shareholder's earnings will be:

$$(\overline{X} - k_d D)(1 - T)(1 - T_{pe}) \quad ...(21)$$

and the debt-holders' earnings after personal taxes at a rate equal to $T_{pb}$ Will be:

$$k_d D(1 - T_{pb}) \quad ...(22)$$

The total income of both types of investors (shareholders and debt-holders) will be:

$$(\quad - k_d D)(1 - T)(1 - T_{pe}) + k_d D(1 - T_{pb})$$

$$(1 - T)(1 - T_{pe}) - k_d D(1 - T)(1 - T_{pe}) + k_d D(1 - T_{pb}) \quad ...(23)$$

Note that the first term of Equation (23) is equal to the shareholder's earnings of an unlevered firm and therefore, it can be discounted at k . The remaining terms have the Same risk as the interest payments, and therefore, they can be discounted at k,$(1 - T_{pb})$. Thus the value of the levered firm is:

$$= V_y + \left[1 - \frac{(1-T)(1-T_{pe})}{(1-T_{pb})}\right] D \quad ...(24)$$

The second term of Equation (24) is the gain from leverage (viz. the present value of the interest tax shield):

$$\overline{X}$$
V

$$\text{PVINTS} = \left[1 - \frac{(1-T)(1-T_{pe})}{(1-T_{pb})}\right] D \quad ...(25)$$

Applying Equation (25) to data in Table 18.8, we obtain:

$$\text{PVINTS} = \left[1 - \frac{(1-0.5)(1-0)}{(1-0.4)}\right] 5{,}000 = \left[1 - \frac{0.3}{0.6}\right] 5{,}000 = \text{Rs } 2{,}500$$

and when applied to data of Table we obtain:

$$\text{PVINTS} = = \left[1 - \frac{(1-0.5)(1-0)}{(1-0.4)}\right] 5{,}000 = \left[1 - \frac{0.5}{0.6}\right] 5{,}000 = \text{Rs } 833$$

We can generalise the following from Equation (25)

- If $T_{pe} = T_{pb} = 0$, then the present value of the interest tax shield is equal to: TD (corporate tax rate T times the amount of debt, D).
- If $T_{pb} > T_{pe}$ which is a reasonable assumption given the personal tax laws in India, then the present value of the interest tax shield will be less than TD: PVINTS < TD.
- If $(1 - T_{pb}) = (1\text{-}T)(1 - T_{pe})$, then the advantageous of leverage will be completely lost.

In terms of the corporate borrowing, Miller's model [Equation (25)] indicates the following. If the personal tax rate on equity income is zero, except the tax-exempt debt-holders, nobody would be interested in lending to the firm. But, from the firm's point, there is a strong incentive to borrow as the corporate taxes are reduced. Therefore, to induce debt-holders to lend to the firm, the firm will have to offer a higher before-tax interest rate. This implies that if the rate on the debt of tax-exempt investors is, say, I, then debt-holders with a personal tax rate of $T_{pb}$, will have to be at least offered a rate of interest equal to $i_0/(1 - T_{pb})$, otherwise they will not lend. The personal income tax system is generally progressive. Therefore, the firms will have to keep the interest rate rising to attract investors in high tax brackets. Firms will be motivated to keep the interest rate rising if the corporate tax saving is greater than the personal tux loss. They will stop borrowing once the-corporate tax rate, T, equals the personal tax rate, $T_{pb}$. Thus, in the equilibrium, the interest rate should be equal to: $i_0/(1-T)$. Let us verify this point. Assume that the personal tax rate on equity income is zero: $T_{pe} = 0$, then Equation (25) can be written as follows:

$$\text{PVINTS} = = \left[1 - \frac{(1-T)}{(1-T_{pb})}\right] D \qquad ...(26)$$

The advantage from leverage will become zero once the interest rate offered (i.e., the supply rate) becomes equal to tax exempt rate grossed up for taxes, $i_s = i_0 (1-T)$. The supply rate $i_s$ is equal to the demand rate $i_d$, in equilibrium:

$$i_s = \frac{i_0}{1-T} = i_d = \frac{i_0}{1-T_{pb}} \qquad ...(27)$$

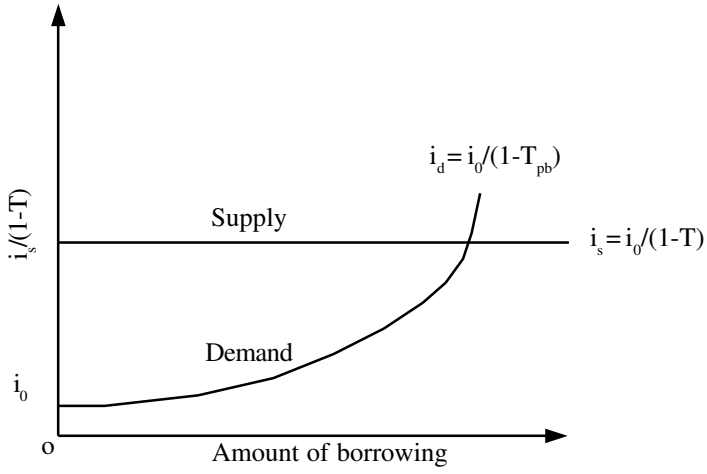
and consequently, $(1 - T) = (1 - T_{pb})$, and PVINTS = 0. If $i_s < i_0 (1 - T)$, the PVINTS > 0 and firms will attempt to reach 100 per cent debt in their capital structures. This is shown in Figure 11.3.

Miller's model has two important implications:

- There is an optimum amount of debt in the economy which is determined by the corporate and personal tax rates. In other words, there is an optimum debt-equity ratio for all firms in the economy.
- There is no optimum debt-equity ratio For a single firm. There are hundreds of firms which have already induced 'tax-exempt'' and 'low lax bracket' investors. Therefore, a single firm can-not gain or lose by borrowing more or less.

Miller's model has certain limitations:

- It implies that tax-exempt persons/institutions will invest only in debt securities and 'high-tax bracket' investors in equities.In practice, investors hold portfolio of debt and equity securities.




- The personal tax rate on equity income is not zero. Firms do pay dividends. If $T_{pe}$ is positive, more investors can be induced to hold debt securities. Assume T = 0.25 and T = 0.5. Then the total tax on equity income is: 0.5 + 0.25 (1 - 0.5) = 0.625 or 62.5 per cent. More debt can be raised until investors in 62.5 per cent tax brackets are covered.
- Investors in high-tax brackets can be Induced to invest in debt securities indirectly. They can invest in those institutions wherefrom income is tax exempt. These institutions, in turn, can invest in the corporate bonds.

We can summarise our discussion of M-M's and Miller's models as follows. Under M-M's model, the existence of the corporate taxes provide a strong incentive to borrow. In fact, it is ideal for a firm to have 100 per cent debt in its capital structure. They ignore personal taxes. Miller's model considers both the corporate as well as the personal taxes. It concludes that the advantage of corporate borrowing is reduced by the personal tax loss. The important implication of the model is that there is no optimum capital structure for a single firm, although for the economy as a whole, there does exist equilibrium amount of aggregate debt. From a single firm's point of view, therefore, the capital structure does not matter. Miller's model is based on some controversial assumptions, and therefore, most people still believe that in balance, there is a tax advantage to corporate borrowing.

### Financial Distress

We have argued earlier that it is difficult to believe that a firm should have 100 per cent debt because of tax advantage. Why don't firms in practice borrow 100 per cent? What are the offsetting disadvantages of debt? The offsetting disadvantages are grouped under the term financial distress. A firm exposeh to higher business risk faces a greater chance of financial distress. The business risk of a firm depends on operating risk, intensity of competition, price elasticity, economic conditions, the size of the firm,

extent of diversification etc. Financial distress occurs when the firm finds it difficult to honour the obligations of creditors. The extreme form of financial distress is insolvency. Insolvency could be very expensive. It involves legal costs. The firm may have to sell its assets at 'distress' prices. More important consideration is the inflexibility of raising funds when needed if the firm has already used heavy amount of debt. Non-availability of funds on acceptable terms could adversely affect the operating performance of the firm.

Financial distress has many indirect costs as well. It has a great effect on the attitude of management. The shareholders may like the management to invest in risky, marginal projects so that debt holder's wealth is transferred. Management may also avoid investment in profitable projects since, under an insolvency or financial distress, debt holders are likely to benefit more from such investments. Creditors lose their patience when a firm faces financial problems. They force the firm into liquidation to realise their claims. A financially distressed firm also has a tendency to emphasise short-term profitability at the cost of long-term sustainability and profitability.

Financial distress reduces the value of the firm. Thus, the value of a levered firm is given as Value of levered firm = Value of unlevered firm + PV of tax shield - PV of financial distress

$$V_t = v_u + TD - PVFD \qquad ..(28)$$

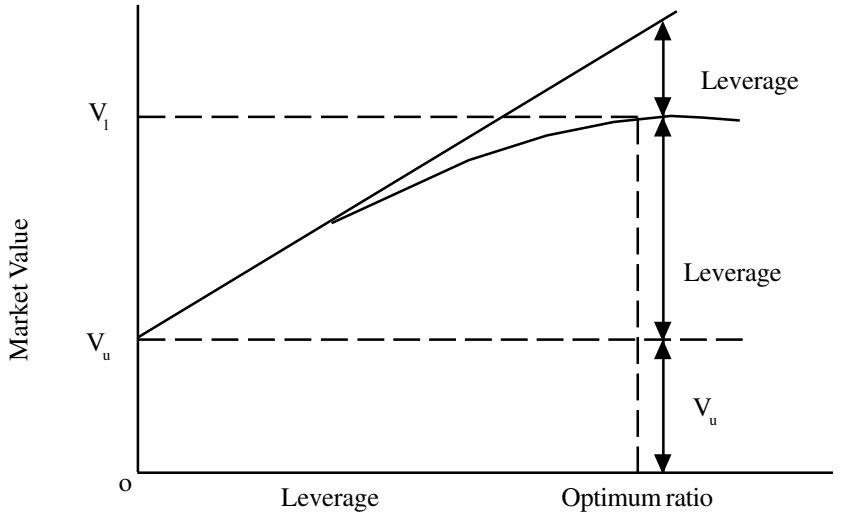



Figure 11.4 shows the capital structure of the firm is determined as a result of the tax benefits and the costs of financial distress. The present value of the interest tax shield increases with borrowing but so does the present value of the costs of financial distress. However, the costs of financial distress are quite insignificant with moderate level of debt, and therefore, the value of the firm increases with debt. With more and more debt, the costs of financial distress increases and therefore, the tax benefit

shrinks. The optimum point is reached when the present value of the tax benefit becomes equal to the present value of the costs of financial distress. The value of the firm is maximum at this point.

## CAMP and Capital Structure

Leverage causes variability in the shareholder' return (EPS or ROE). This adds financial risk. As a consequence, the beta of a firm's equity will increase as it introduces debt in its capital structure. We know that a portfolio consists of individual securities. Each security has its beta, and the beta of the portfolio is the weighted average beta of individual securities in the portfolio. Similarly, a firm is a portfolio of assets, and therefore, the asset beta of a firm, P~I, is the weighted average of betas of individual assets. Thus,

$$\beta_a = \beta_1\omega_1 + \beta_2\omega_2 + \beta_3\omega_3 + \ldots.$$

$$\beta_a = \sum_{i=1}^{n}\beta_i\varpi_i \qquad ...(29)$$

where $\beta_a$ is the weighted average beta of assets, Pi is the beta of ith asset and ..... is the weight of *i*th asset.

A firm's assets are financed by debt and equity. Therefore, a firm's asset beta will also equal to the weighted average of the firm's equity beta and debt beta. Assuming no corporate tax, the beta of assets will be as follows:

$$\beta_a = \beta_e\omega_e + \beta_d\omega_d \qquad ...(30)$$

where ... is equity beta, We is weight of equity, .... is debt beta and w, is weight of debt. Weight of equity is equal to the market value of equity (S) divided by the total value of the firm (V) and the weight of debt will be equal to the market value of debt (D) divided by the total value of the firm (V).

Thus,

$$\beta_a = \beta_e\left(\frac{S}{S+D}\right) + \beta_d\left(\frac{D}{S+D}\right) \qquad ...(31)$$

What is beta of equity for a levered firm? We can derive equity beta from Equation (31) as follows:

$$\beta_e\left(\frac{S}{S+D}\right) = \beta_a - \beta_d\left(\frac{D}{S+D}\right)$$

$$\beta_e = \beta_a\left(\frac{S+D}{S}\right) - \beta_d\left(\frac{D}{S+D}\right)\left(\frac{S+D}{S}\right)$$

$$= \beta_a \left(1 + \frac{D}{S}\right) - B_d\left(\frac{D}{S}\right) = \beta_a + (\beta_a - \beta d)\frac{D}{S} \qquad ...(32)$$

We can observe from Equation (32) that the equity beta increases linearly with leverage (D/S) since it adds financial risk to the shareholder's return.

**Illustration 1:** Unlevered Firm has no corporate tax. The observed beta on its equity is 1.20. The beta of debt is 0.20. The company has a debt-equity ratio of 0.40. Calculate the company's asset beta.

$$\begin{aligned} \beta_e &= \beta_a + (\beta_d - \beta_e)D/S \\ 1.20 &= \beta_a + (\beta_a - 0.20)0.40 \\ \beta_e + 0.4\beta_a &= 1.20 + 0.08 \\ \beta_a &= 1.28/1.4 = 0.914 \end{aligned}$$

Debt has low risk. If we assume that debt is risk-free, then $\beta_d = 0$. If $\beta_d = 0$, then $\beta_a$ (asset beta) is given as follows:

$$\begin{aligned} \beta_e &= \beta_a + (\beta_d - \beta_d)D/S \\ \beta_e &= \beta_a + \beta_a D/S \qquad (\text{since } \beta_d = 0) \end{aligned}$$

$$\beta_a = \frac{\beta_e}{1 + D/S} \qquad ...(33)$$

$$\left(1 - \frac{\beta_e[1-(D/V)]}{[1-(D/V)T]}\right) \beta_a = \frac{S\beta_e(1-D)}{(1-LT)}$$

## Corporate Tax and Interest Tax Shield

Firms in practice pay taxes, and interest paid on debt is tax deductible. The asset beta should be adjusted for the tax effect. The adjustment factors will be the tax rate and the firm's leverage (debt ratio). The adjusted beta will be as follows:

...(34)

where V is total market value of debt and equity (i.e. S + D).

As we have stated earlier, the risk of debt holders is quite low. If they have no risk, they will earn risk-free rate and $\beta_d$ will be zero. Thus, Equation (34) can be expressed as follows:

$$\beta_a = \frac{\beta_e(SV)}{[1-(D/V)T]} \qquad (\text{since } \beta_d = 0)$$

...(35)

where L is D/V. From Equation (35), we can express $\beta_e$ as follows:

$$\beta_e = \beta_a \left[ \frac{(1-LT)}{(1-L)} \right] \quad ...(36)$$

**Illustration 2:** Nicole Publishing Companys' market value of shares and debt is Rs 50 crore and Rs 15 crore respectively. The beta of the company's share is 1.32. The expected corporate tax rate for the company is 35 percent. Calculate Nicole's asset beta.

Total value of the firm, V = 50 + 15 = Rs 65 crore

Value of shares, S = Rs 50 crore

Value of debt, L) = Rs 15 crore

Debt ratio, D/V = L = 15/65 = 0.23

$$\beta_a = \frac{\beta_e(1-L)}{(1-LT)} = \frac{1.32(1-0.23)}{(1-0.23\times 0.35)} = \frac{1.016}{0.9195} = 1.10$$

It is not difficult to appreciate that for an unlevered firm (a firm without any debt), the asset and equity bet will be the same. For a levered firm, the cost of equity under CAPM will be as follows:

$$k_e = r_f\ 3\text{-}\ (r_m - r_f)\ \beta_e \quad ...(37)$$

$$= r_f + (r_m - r_f)\beta_a \quad ...(38)$$

where $\beta_a$ is the asset beta of an unlevered firm.

**Illustration 3:** Chemicals has an equity beta of 1.25 and debt ratio of 0.5. The risk-free rate is 9 per cent and the expected market rate of return is 20 per cent. The corporate tax rate is 35 percent. What is Desai chemical's required rate of return on equity?

If we use Equation (37), we obtain:

$k_e = 0.09 + (0.20 - 0.09)1.25 = 0.09 + 0.1375 = 0.2475$ or 24.75%

The asset beta is:

$\beta_a =$

Using Equation (37), we obtain:

$k_e = 0.09 + (0.20 - 0.09)0.758$ $= 0.09 + (0.20 - 0.09)0.758 \times 1.65$

$= 0.09 + (0.20\text{-}0.09)1.25 = 0.2475$ or 24.75%

## Cost of Equity and Beta of a Division

It has been argued that in evaluating a division's investment, its cost of capital should be used as the discount rate. The risk of the division may not be the same as the risk of the firm. The beta of the division may, therefore, be higher or lower than the firm's beta. We also explained that in practice, a division's beta may be approximated by finding out the betas of the comparable firms in the same industry to which division belongs. However, the comparable firms may have different levels of debt. Before using the beta of a comparable firm (or weighted average betas of the comparable firms) to a division, adjustment for leverage should be made. The following steps are involved:

- Identify comparable firms in the same industry as the division.
- Calculate the betas of the comparable firm.
- Estimate the comparable firms asset betas by adjusting them for leverage and tax. (This process is called 'unlevering' the beta) ,
- Calculate the average beta from the comparable firms' asset betas that can be used as the beta for the division,

**Illustration 10:** A large engineering company wants to diversify into fertiliser business organise it as a new division. The company found a comparable fertiliser company that has an equity beta of 1.35, and debt ratio of 0.72. The corporate tax rate is 35 per cent. The engineering company will have a debt ratio of 0.50 for proposed fertiliser business. Calculate the beta for the proposed new division.

$$\left[\frac{(1-L)}{(1-LT)}\right] = 1.35\left[\frac{1-0.72}{1-0.72\times 0.35}\right] = 0.51$$

First, we shall 'unlever' the equity beta (that is, calculate the asset beta) of the comparable firm:

$$\beta_a = \beta_e$$

Second, se can now 'lever' the equity beta for the division by incorporating its debt ratio:

$$\beta_e = \beta_a\left[\frac{(1-L)}{(1-L)}\right] = 0.51\left[\frac{1-0.50\times 0.35}{1-0.50}\right] = 0.51\times 1.65 = 0.84$$

The equity beta for the division is lower than that of the comparable firm since it will employ less debt.

## Adjusted Present Value

Equation (14) gives the value of a levered firm:

$$V_l = V_u + TD = \frac{\overline{X}(1-T)}{k_u} + \frac{Tk_dD}{k_d} \qquad ...(14)$$

Recall that $k_U$ is the cost of capital of an all-equity (unlevered) firm, it $\overline{X}(1-T)$ is perpetual after-tax cash flows (net operating income) of an all-equity firm and $Tk_d D$ is a perpetual stream of interest tax shield, Equation (14) implies the following required rate of return for a levered firm:

$$k_t = V_u (1-TL)$$

where k, is the cost of capital of the levered firm and L is debt ratio (D/V).

We can use $k_l$, as the discount rate for those investment projects that generate perpetual cash flows (perpetual after-tax all-equity cash flows and perpetual interest tax shields). In practice, it not common to find projects with perpetual cash flows. Projects have finite life, and firms are able to raise funds from financial institutions or public which are tied to specific projects. This is more so under project financing · Thus, the amounts of interest and principal repayments are predetermined, and they are accounted for within the life of the project. Such projects have their unique capital structure.

How can we evaluate the net present value of projects that are not prepetual investments and that do not have constant capital structure? It is not possible to estimate the weighted cost of capital for such projects We can use the adjusted present value (APV) method for evaluating such investments.

We can rewrite Equation (14) for valuing an investment project with finite cash flows as follows:

$$APV = \sum_{i=}^{r}$$

...(39)

In practice, a project may get many other benefits (or involve penalties) in addition to the interest tax shield. Equation (39) can be extended to incorporate the value of such benefits (or costs). There is no method available to adjust such items in estimating the weighted average cost of capital.

**Illustration 4:** Gujarat Engineering Company is considering a new project to manufacture steel tubes. The estimated project outlay is Rs 64 crore which will be raised by issuing equity of Rs 40 crore and borrowing a 15 per cent loan of Rs 24 crore from a financial institution for eight years. The loan will be repaid in three equal instalments at the end of years 6, 7 and 8. The project is expected to generate an annual after-tax cash flow of Rs 12 crores over the eight-year life of the project. The all-equity required rate of return is 18 per cent. The corporate tax rate is 35 percent. The terminal value of the project is assumed to be zero. Should the company make investment to manufacture steel tube? We can use APV method for evaluating the project.

The project is expected to generate an after-tax annuity of Rs 12 crore for 8 years. The interest tax shield is calculated as follows:

| *Year* | *Loan at the Beginning* | *Interest* | *Principal Repayment* | *Loan at the End* | *Interest Tax Shield* |
|---|---|---|---|---|---|
| 0 | - | - | - | 24 | - |
| 1 | 24 | 3.60 | - | 24 | 1.26 |
| 2 | 24 | 3.60 | - | 24 | 1.26 |
| 3 | 24 | 3.60 | - | 24 | 1.26 |
| 4 | 24 | 3.60 | - | 24 | 1.26 |
| 5 | 24 | 3.60 | - | 24 | 1.26 |
| 6 | 24 | 3.60 | 8 | 16 | 1.26 |
| 7 | 16 | 2.40 | 8 | 8 | 0.84 |
| 8 | 8 | 1.20 | 8 | 0 | 0.42 |

The project's APV can be calculated by using Equation (40):

$$APV = \sum_{i=1}^{8} \frac{12}{(1.18)t} \left[ \sum_{i=1}^{6} \frac{1.26}{(1.15)t} + \frac{0.84}{(1.15)^7} + \frac{0.42}{(1.15)^8} \right]$$

$$= (12 \times 4.0776) + [1.26 \times 3.7845 + 0.84 \times 0.3759 + 0.42 \times 0.3269]$$

$$= 48.93 + [4.77 + 0.32 + 0.141 = 48.93 + 5.23 = \text{Rs } 54.16$$

The adjusted net present value (ANPV) is:

ANPV = APV - Initial Cost = 54.16 - 64 = - Rs 9.84

Since ANPV is negative, the project should not be accepted.

What will happen to the project's ANPV if the company is able to negotiate loan of Rs 24 crore at concessional interest rate of 10 per cent from the government if it agrees to start the project in a backward area? If the market interest rate is assumed to be 15 per cent, the project gets a 'subsidy' of 5 percent. Also, it will get interest tax shield. The interest subsidy and interest tax shields are calculated as follows (assuming that loan is repaid in equal instalments at the end of years 6, 7 and 8):

| **Year** | **Interest Subsidy** | **Interest Tax Shield** |
|---|---|---|
| 1. | (0.15 - 0.10) 24 = 1.20 | 0.35 × 0.10 × 24 = 0.84 |
| 2. | (0.15 - 0.10) 24 = 1.20 | 0.35 × 0.10 × 24 = 0.84 |
| 3. | (0.15 - 0.10) 24 = 1.20 | 0.35 × 0.10 × 24 = 0.84 |
| 4. | (0.15 - 0.10) 24 = 1.20 | 0.35 × 0.10 × 24 = 0.84 |
| 5. | (0.15 - 0.10) 24 = 1.20 | 0.35 × 0.10 × 24 = 0.84 |
| 6. | (0.15 - 0.10) 24 = 1.20 | 0.35 × 0.10 × 24 = 0.84 |
| 7. | (0.15 - 0.10) 16 = 1.20 | 0.35 × 0.10 × 16 = 0.84 |
| 8. | (0.15 - 0.10) 8 = 1.20 | 0.35 × 0.10 × 8 = 0.84 |

The project APV will be:

$$APV = \sum_{t=1}^{8} \frac{12}{(1.18)^t} + \left[\sum_{t=1}^{6} \frac{0.84}{(1.15)^t} + \frac{0.56}{(1.15)^7} + \frac{0.28}{(1.15)^8}\right] + \left[\sum_{t=1}^{6} \frac{1.20}{(1.15)^t} + \frac{0.80}{(1.15)^7} + \frac{0.40}{(1.15)^8}\right]$$

$$= 48.93 + [3.18 + 0.21 + 0.09] + [4.54 + 0.3P + 0.13]$$

$$= 48.93\ 3\text{-}\ 3.48 + 4.97 - 57.38$$

The project's ANPV is:

$$ANPV = 57.38 - 64$$

The project, in spite of the benefit of interest subsidy, is still unattractive.

## Illustrative Problems

**Problem 1:** Kelley Manufacturing Co. has a total capitalisation of Rs 10,00.000, and it normally earns Rs 1,00,000 (before interest and taxes). The Financial manager of the firm wants to take a decision regarding the capital structure. After a study of the capital market, he gathers the following data:

| Amount of Debt Rs. | Interest Rate % | Equity Capitalisation Rate (at given level of debt) % |
|---|---|---|
| 0 | - | 10.00 |
| 1,00,000 | 4.0 | 10.50 |
| 2,00,000 | 4.0 | 11.00 |
| 3,00,000 | 4.5 | 11.60 |
| 4,00,000 | 5.0 | 12.40 |
| 5,00,000 | 5.5 | 13.50 |
| 6,00,000 | 6.0 | 16.00 |
| 7,00,000 | 8.0 | 20.00 |

(a) What amount of debt should be employed by the firm if the traditional approach is held valid?

(b) If the Modigliani-Miller approach is followed, what should be the equity capitalisation rate?

Assume that corporate taxes do not exist, and that the firm always maintains its capital structure at book values.

**Solution**

(a) As per the traditional approach, optimum capital structure exists when the weighted average cost of capital is minimum. The weighted average cost of capital calculations at book value weighs are as follows:

| $k_e$ (1) | $W_e$ (2) | $k_d$ (3) | $W_d$ (4) | $k_e W_e$ (5) | $k_d W_d$ (6) | $k_0$ (7)=(5)+(6) |
|---|---|---|---|---|---|---|
| 0.100 | 1.0 | - | - | 0.100 | - | 0.1000 |
| 0.105 | 0.9 | 0.040 | 0.1 | 0.095 | 0.0040 | 0.0985 |
| 0.110 | 0.8 | 0.040 | 0.2 | 0.080 | 0.0080 | 0.0960 |
| 0.116 | 0.7 | 0.045 | 0.3 | 0.082 | 0.0135 | 0.0947 |
| 0.124 | 0.6 | 0.050 | 0.4 | 0.074 | 0.0200 | 0.0944 |
| 0.135 | 0.5 | 0.055 | 0.5 | 0.065 | 0.0275 | 0.0950 |
| 0.160 | 0.4 | 0.060 | 0.6 | 0.060 | 0.0360 | 0.1000 |
| 0.200 | 0.3 | 0.080 | 0.7 | 0.060 | 0.0560 | 0.1160 |

The firm should employ debt of Re 4,00,000 as the weighted average cost of capital is minimum at this level of debt.

(b) According to the M-M approach, the cost of capital is a constant, and the cost of euqity increases linearly with debt. The equilibrium cost of capital is assumed to be equal to pure equity capitalisation rate, which is 10 per cent in the present problem. The equity capitalisation rate is given by the following formula:

$$k_e = k_0 + (k_0 - k_d) \frac{\text{Debt}}{\text{Equity}}$$

The equity capitalisation rates will be:

| Debt Rs | $k_d$ | $k_0$ | | $(k_0 - k_d)$ | Debt/Equity | | $k_e$ |
|---|---|---|---|---|---|---|---|
| 0 | - | 0.10 | + | (0.10-0.000) | 0 | = | 0.1000 |
| 1,00,000 | 0.040 | 0.10 | + | (0.10-0.040) | 1,00,000/9,00,000 | = | 0.1067 |
| 2,00,000 | 0.040 | 0.10 | + | (0.10-0.040) | 2,00,000/8,00,000 | = | 0.1150 |
| 3,00,000 | 0.040 | 0.10 | + | (0.10-0.045) | 3,00,000/7,00,000 | = | 0.1236 |
| 4,00,000 | 0.050 | 0.10 | + | (0.10-0.050) | 4,00,000/6,00,000 | = | 0.1333 |
| 5,00,000 | 0.050 | 0.10 | + | (0.10-0.055) | 5,00,000/5,00,000 | = | 0.1450 |
| 6,00,000 | 0.060 | 0.10 | + | (0.10-0.060) | 6,00,000/4,00,000 | = | 0.1600 |
| 7,00,000 | 0.080 | 0.10 | + | (0.10-0.080) | 7,00,000/3,00,000 | = | 0.1467 |

**Problem 2:** The Levered Company and the Unlevered Company are indentical in every respect except that the Levered Company has 6 per cent Rs 2,00,000 debt outstanding. As per the NI approach, the valuation of the two firms is as follows:

| | Unlevered Co. Rs | Levered Co. Rs |
|---|---|---|
| Net operating income, X | 60,000 | 60,000 |
| Total cost of debt, $k_d D$ | 0 | 12,000 |
| Net earnings, NI | 60,000 | 48,000 |
| Equity capitalisation rate, $k_e$ | 0.100 | 0.111 |
| Market value of shares, S | 6,00,000 | 4,32,000 |
| Market value of debt, D | 0 | 2,00,000 |
| Total value of the firm, V | 6,00,000 | 6,32,000 |

Mr X holds Rs 2,000 worth of the Levered Company's shares. Is it possible for Mr X to reduce his outlay to earn same return through the use of arbitrage? Illustrate.

**Solution**

Through arbitrage it is possible for Mr X to reduce his outlay and earn the same return.

1. Mr X would sell his shares in the Levered Company for Rs 2,000.
2. He would create a personal leverage equal to his share of debt in the Levered Company by borrowing Rs 926 (= Rs 2,000 x Rs 2,00,000/Rs 4,32,000).
3. He would buy Rs 2,778 (= Rs 6,00,000 x Rs 2,000/Rs 4.32,0001 of the Unlevered Company's shares His return is:

| | |
|---|---|
| Return on the Unlevered Co.'s shares: Rs 2,778 × 10% | Rs 2,77.80 |
| Less: Interest, Rs 926 × 6% | 55.56 |
| Net return | Rs 2,22,24 |

His return from the Levered Co. is Rs 2,000 x 11.1% = Rs 222.22, same as in the Unlevered Co. However, the funds involved in the Unlevered Co are Rs 2,778 - Rs 926 = Rs 1,852 which is less than Rs 2,000 cash outlay involved in the Levered Company.

**Problem 3:** Firms A and B are similar except that A is unlevered, while B has Rs 2,00,000 of 5 per cent debentures outstanding. Assume that the tax rate is 40 per cent; NOI is Rs 40,OM) and the cost of equity is 10 per cent. (i) Calculate the value of the firms, if the M - M assumptions are met. (in Suppose $V_B$ = Rs 3,60,000. According to M-M. do these represent equilibrium values? How will equilibrium be set? Explain.

***Solution***

(i) The value of the unlevered firm is:

$$V_A = \frac{(1-T)\overline{X}}{k} = \frac{(1-0.4)\text{Rs } 40{,}000}{0.10} = \text{Rs } 2{,}40{,}000$$

The value of the levered firm is:

$$V_B = V_A + TD = \text{Rs } 2{,}40{,}000 + 0.4 \text{ of Rs } 2{,}00{,}000$$
$$= \text{Rs } 2{,}40{,}000 + \text{Rs } 80{,}000 = \text{Rs } 3{,}20{,}000$$

(ii) These do not represent the equilibrium values. Firm B is overvalued by Rs 40,000 (= Rs 3,60,000 - Rs 3,20,000). The arbitrage process with taxes will work as follows to restore equilibrium

Assume an investor owns and return is l0 per cent of B Co.'s shares. His invstment is:

$$0.10 \times (\text{Rs } 3,60,000 - \text{Rs } 2,00,000) = 0.10 \times \text{Rs } 1,60,000 \text{ Rs } 16,000$$

and return is

$$0.10 \times [(\text{Rs } 40,000 - \text{Rs } 10,000)\ (1\text{-}0.4)] = 0.10 \times \text{Rs } 13,000 = \text{Rs } 1,800$$

The investor can get the same income by shifting his investment to A Co. He would sell his hildings in B Co. for Rs 16,000 and borrow on personal account Rs. 12,000, which is his percentage holdings in B Co.'s debt i.e., 0.10 (1-0.4) Rs 2,00,000 = Rs 12,000. He would then, purchase 10 per cent of A Co.'s share: 0.10 × Rs 2,40,000 = 24,000. His return and outlay would be:

| | **Rs** |
|---|---|
| Return 0.10 (1-0.4) 40.000 | 24,000 |
| Less: cost of personal debt 0.05 x Rs 12,000 | 600 |
| Net return | 1,800 |
| Total funds available at his disposal: | |
| From sale of B Co.'s shares | 16,000 |
| Borrowed funds | 12,000 |
| | 28,000 |
| Total cash outlay in A Co.'s shares | 24,000 |
| Uncommitted funds | 4,000 |

Through arbitrage and the substitution of personal for corporate leverage, the investor can switch from B Company to A Company, earn the same total return of Rs 1,800, and have funds left over to invest elsewhere. This process would continue till the equilibrium is restored.

**Problem 4:** The following are the costs and values for the firms A and B according to the traditional approach:

| | **A** **Rs** | **B** **Rs** |
|---|---|---|
| Total value of firm, V | 50,00 | 60,000 |
| Market value of debt. D | 0 | 30,000 |
| Market value of equity, S | 50,000 | 30,000 |
| Expected net operating income, $\overline{X}$ | 5,000 | 5,000 |
| Cost of debt, INT = $k_d$ D | 0 | 1,800 |
| Net income, - $k_d$ D | 5,000 | 5,000 |
| Cost of equity, $k_e$ = ( -$k_d$D)/S | 10.00% | 10.70% |
| Debt-equity ratio, D/S | 0 | 0.5 |
| Average cost of capital, $k_0$ | 10.00% | 8.33% |

Compute the equilibrium value for Firms A and B in accordance with the M-M thesis. Asume that (i) taxes do not exist and (ii) the equilibrium value of $k_0$ is 9.09 per cent.

**Solution**

The equilibrium values are shown below:

for Firms A and B in accordance with the M-M thesis. Assume that (i) taxes do not exist and (ii) the equilibrium value of $k_0$ is 0.09 per cent.

| | **A** **Rs** | **A** **Rs** |
|---|---|---|
| Expected net operating income, | 5,000 | 5,000 |
| Total cost of debt, INT = $k_d$D | 0 | 1,800 |
| Net income, -$k_d$D | 5,000 | 3,200 |
| Average cost of capital, $k_0$ | 0.909 | 0.909 |
| Total value of firm, V = /$k_0$ | 55,000 | 55,000 |
| Market value of debt, D | 0 | 30,000 |
| Market value of shares, S = V- D | 55,000 | 25,000 |
| Cost of equity, $k_e$ = ( X-$k_d$ D)/S | 0.909 | 0.128 |

## Asymmetric Information Theory

Also called the pecking order theory, this theory is based on the assumption that managers have better information than investors, postulates that there is a preferred "pecking order" of financing: first use retained earnings (and depreciation), then debt, and, finally, as a last resort only, issue new common stock. This theory leads to the conclusion that firms should maintain a borrowing capacity reserve so that they can always issue debt on reasonable terms rather than have to issue new stock at the wrong time.

Another important point that needs to be remembered is that the optimal capital structure is structured by the managers in terms of book value rather than market value terms. As book values reflect the historical costs of the assets, these have little to do with the ability to produce cash flows and debt servicing capability. As the main focus of analysing capital structure is to find a structure which maximises the firm's market value, and hence its stock prices, so it can only be analysed by an analysis of the market values. But the problem with using the market values is that they are unpredictable, so managers tend to use book values which are far easier to predict.

Another point that is not considered is of the growth of the firm. Growth rates have implications on the marketing approach, investments, organisation size, structure and capital requirements. When the projected growth is rapid, the capital structure has to be flexible enough to vary within a certain range of debt and equity ratio to accommodate funds requirements for the future growth of the firm. A contracting market for the company's products may indicate a need to move away from debt. This is because in case of reduced sales and hence lower profits, the risk of the firm defaulting on debt

servicing is high so the interest rates charged by the creditors increase to reflect the changing risk profile of the company.

Sometimes promoters having management capability and experience in high growth potential areas are lacking in financial strength. These companies, if they have to raise funds in the market will have to financially leverage their meagre capital contribution by a high incidence of debt. Here, the need to retain management control limits the amount of equity that can be raised and subsequently the debt that can be raised, too.

## Taxation and capital structure

In 1963, MM added corporate taxes to their model. With corporate taxes considered, a firm's stock price was shown to be directly related to its use of debt financing -- higher the percentage of debt financing, the higher the stock price. Under the MM with tax theory, firms should use virtually 100% debt financing. The reason for this result is the corporate tax structure - returns to stockholders come from after-tax earnings, but returns to creditors are paid before tax. The effect of this tax treatment is that more of a company's operating income is left for investors when more debt financing is used.

Modigliani and Miller basic propositions with corporate taxes are as follows:

**Proposition I**

The total market value of a leveraged firm is equal to (1) the value of an unleveraged firm in the same risk class plus (2) the gain from leverage, which is the value of the tax savings due to debt financing and which equals the corporate tax rate times the amount debt the firm uses.

$$\frac{EBIT\,(1-T)}{k_{e,L}} = k_{o,L} + \text{Risk Premium} = k_{e,U} + (k_{e,U} - k_d)(1-T)\left(\frac{D}{E}\right)$$

$$V_L = V_U + T_D$$

With zero debt the value of the unleveraged firm is equal to the value of its equity

$$E = VU =$$

**Proposition II**

The cost of equity of a leveraged firm is equal to (1) the cost of equity of an unleveraged firm in the same risk class plus (2) a risk premium, whose size depends on the differential between the costs of equity and debt to an unleveraged firm, the amount of financial leverage and the corporate tax rate.

This means that as the firm's use of debt increases, its cost of equity also rises but at a slower rate now because of the effect of (1-T) which is less than 1.

### Empirical Evidence Against MM Hypothesis

In spite of the MM arguments, firms do not usually use anywhere close to 100% debt

financing. In an attempt to modify MM's model to make it more consistent with actual behaviour, many of their assumptions were relaxed in papers by other authors. In particular, the possibility of financial distress drastically changed the MM results. In the modified model, tax savings cause the value of a firm to rise as more and more debt is used, but at some point (the optimal structure), the value of the firm begins to fall with additional debt because the tax benefits are more than offset by the increasing costs of potential financial distress.

The MM model as modified to include financial distress suggests to managers

- that a certain amount of debt is good
- that too much debt is bad, and
- that there is an optimal amount of debt for every firm.

Thus, the modified MM theory, which is called the trade-off theory of capital structure, provides useful insights into the factors that affect a firm's optimal capital structure. Here the marginal costs and benefits of debt financing are balanced against one another, and the result is an optimal capital structure that fall somewhere between zero and 100% debt.

## Tax Perspective

Both Debt or Equity require the company to service the same. Interest is paid on debt and dividends on equity. Interest, which is 100% deductible for Income Tax purposes, provides the company a tax shield for the amount of interest being charged.

Let us take an example to compare two modes of financing:

| | **Case 1** | **Case 2** |
|---|---|---|
| **Company** | **ABC Ltd.** | **XYZ Ltd.** |
| Equity (Rs. Mn) | 10 | 30 |
| Debt (Rs. Mn) | 20 | nil |
| Turnover (Rs. Mn) | 100 | 100 |
| Cost of Goods sold (Rs. Mn) | 50 | 50 |
| Other Expenses (Rs. Mn) | 40 | 40 |
| Interest (Rs. Mn) | 2 | Nil |
| Profit Before Tax (Rs. Mn) | 8 | 10 |
| Tax (Rs. Mn) | 2.4 | 3.0 |
| PAT (Rs. Mn) | 5.6 | 7.0 |

Company XYZ enjoys a tax shield of Rs 0.6mn. Assuming that the above capital structure remains unchanged for 3 years, then at the current level of profitability, after 3 years company ABC would have paid Rs 6mn as interest whereas the company XYZ would have paid Rs 4.2 mn thus saving Rs 1.8mn in taxes in 3 years.

However, a major drawback with debt is that it entails a liability for the company for a particular period of time and thus might act as a drawback in improving profitability during the lean phase of business. However, equity doesn't have the above mentioned disadvantage. During stable market conditions, debt is perhaps the cheapest mode of raising capital from external sources. But in volatile market conditions, equity is perhaps the safest mode.

Normally a company wishes to raise capital by way of both equity and debt because of the several constraints mentioned below. To make the task easier in deciding what to raise and how much to raise, we use a technique known as EBIT-EPS analysis. This analysis helps us to understand how sensitive is EPS to changes in EBIT under different financing alternatives. It is also possible to calculate the break even EBIT level (for two alternative financing plans), i.e., the level of EBIT for which the EPS is the same. The EBIT indifference point between the two alternative plans can be obtained mathematically by solving the following equation for EBIT:

$$\frac{(EBIT - I_1)(1 - t)}{n_1} = \frac{(EBIT - I_2)(1 - t)}{n_2}$$

Where,

EBIT = indifference point between the two alternative financing plans

$I_1$, $I_2$ = interest expenses before taxes under financing plans 1 and 2

t = income tax rate

$n_1$, $n_2$ = number of equity shares outstanding after adopting financing plans 1 and 2.

Below this level of EBIT it would be useful to raise money from equity only and above this level of EBIT, raising money from debt would be a suitable alternative.

## Assessment of Debt Capacity & Planning The Capital Structure

At the optimum capital structure the value of an equity share is the maximum and the average cost of capital is the minimum. A capital structure is considered to be appropriate if the following conditions are met:

1. Profitability: The capital structure should result in maximum profitability.

2. Solvency: Company should not run the risk of insolvency because of the increased debt in the balance sheet.
3. Flexibility: The capital structure should provide enough flexibility to the company to raise additional funds whenever required without constraints.
4. Control: Control of the company should not be lost because of the high dilution of equity.

This means that the finance manager has to make a compromise between the best capital structure and the peculiar needs of the company.

## Factors Influencing Capital Structure

In the real world taking decisions on capital structure is not so easy as it is made out till now. In deciding the capital structure of a company, the following points need to be considered:

### Corporate Strategy

Corporate strategy is the main factor determining the financial structure of a company. The market growth rates form a basis for defining the Organisation structure, Investment in Assets and Overall Capital Intensity (Debt/Equity Financing). The fact that the company has to source funds from the markets, makes it imperative to factor in the market responsiveness to the company's call for funds. Capability to service the funds, both debt and equity and the growth phase of the business have to be considered in tandem. Other strategic decisions like management control level, risk averseness or risk taking nature of the management, etc. have also to be considered.

Ultimately, the most appropriate capital structure will be the one, which most closely supports the strategic direction of the business with the least cost and at a reasonably acceptable risk level.

### Nature of the Industry

The nature of the industry plays an important role in capital structure decisions.

**Capital Intensity:** Capital structure should factor in the type of the assets being financed. Capital intensive firms rely mostly on long term debt and equity. Generally speaking, long term assets should be financed by a balance between term debt and equity and short term assets should be financed less by long term sources (like term debt and equity) and more by short term debt. The terms current (short term) and fixed (long term) assets are determined by the nature of the industry and the business itself. For example, a rapidly growing non-seasonal and non-cyclical business may regard part of its investments in short term assets like inventories and accounts receivable, as permanent

investments and fund it by long term sources. If on the other hand, the business is seasonal in nature, the seasonal peaks fund requirements may have to be funded by short term debt.

**Cyclical Business:** In businesses like construction, capital and higher consumer goods their volumes, and hence requirements of funds, are affected by the changes in the national and global scene. Businesses subject to such variations need a capital structure that can buffer the risks associated with such swings. Again manoeuvrability of capital structure, is at a premium during times of contraction.

**Competition:** The degree of competition is also a major factor to be considered in deciding the capital structure. In highly competitive industry with low entry barriers, companies with deep pockets can only survive in the long run.

**Product or business life cycle:** During the initial phase of the growth curve of a business/product the risk is high. Debt is hard to come by due to the riskiness of the venture and funding has to be through the venture capital equity. Financial leverage is low, which could be increased as the product/business establishes itself. As the business matures, increased cash flows may reduce the need for debt funds.

### Current and Past capital Structure

Current capital structure of a company is determined largely by past decisions. Investment decisions of the past, acquisitions, take-overs, financing policy, dividends etc. go into forming the current capital structure which is difficult to change overnight. Altering current capital structure can be done by raising capital, retiring debts, buying back shares, taking on debt, altering dividend payout policies, alteration in earning capacity, etc. Also, as past decisions decide current capital structure, current changes in the capital structure decide the future capital structure. Hence, utmost care has to be exercised in decision and implementation of changes in the capital structure.

While making the capital structure decisions, the company has to consider the different life cycle stages which are :

- the pioneering stage
- the expansion stage
- the stagnation/stabilisation stage

The pioneering stage is one of rapid increase in demand for the products/services of the company. The risk is highest at this stage of the life cycle of the company and the efficient companies are the ones to survive. The financial cost of borrowing is very high at this stage, due to the risk perception about the company. To survive this the capital structure should orient more towards equity and if available utilise soft loans from the government.

The expansion stage is the next stage, during which the strong companies survive the competitive struggle and aim to expand their market share and volumes. During this stage, huge investments are made to expand production/service capacity. Requirement of funds is high during this stage. Subject to the corporate strategy of funding projects and the market conditions, the company may raise capital at the lowest possible cost. As the earnings stabilise, the company will be in a position to weather any small variations in business, then it can seek to financially leverage itself within a pre-fixed ceiling, by bank loans or financial institutional loans. It is during this stage that companies are typically expected to reward their investors with dividend and stock dividend/splits.

Stabilisation/stagnation stage is the last and final stage. A dynamic management will always be on the lookout for expansion/diversification into new projects. It could, again depending on corporate strategy, go in for green-field projects or take over existing units, seek mergers, acquisitions and strategic alliances, etc. Usually a recession in economy opens up a vast number of such opportunities which cash rich companies can take advantage of. In case of lack of such opportunities, the company could reduce the financial leverage and save on interest and if possible down size the equity by buy back of shares. Buy back of shares acts to boost investor confidence in the company and also makes equity serviceable during recession.

## EBIT - EPS Analysis & ROI - ROE Analysis

As a method to study the effect of leverage on capital structure, EBIT - EPS analysis essentially involves the comparison of alternative methods of financing under various assumptions of EBIT. A firm has the choice to raise funds for financing its investment proposals from different sources in different proportions. For instance, it can (i) exclusively use equity capital (ii) exclusively use debt, (iii) exclusively use preference capital, (iv) use a combination of (i) and (ii) in different proportions; (v) a combination of (i), (ii) and (iii) in different proportions, (vi) a combination of (i) and (iii) in different proportions, and so on. The choice of the combination of the various sources would be one which, given the level of earnings before interest and taxes, would ensure the largest EPS. Consider Example 4.3.

Suppose a company has a capital structure exclusively comprising of equity shares amounting to Rs.10,00,000. The firm now wishes to raise additional Rs. 10,00,000 for expansion. The firm has various alternatives, three of them are given below:

(A) It can raise the entire amount in the form of equity capital.

(B) It can raise 50 per cent as equity capital and 50 per cent as 5% debentures.

(C) It can raise the entire amount as 6% debentures.

Further assume that the existing EBIT is Rs.1,20,000, the tax rate is 35 per cent, outstanding shares 10,000 and the market price per share is Rs.100 under all the three alternatives.

Which financing plan should the firm select?

**Solution**

EPS Under Various Financial Plans

| *Particulars* | *Financing Plans* | | |
|---|---|---|---|
| | ***A*** | ***B*** | ***C*** |
| EBIT | Rs 1,20,000 | Rs 1,20,000 | Rs 1,20,000 |
| Less: Interest | ------- | 25,000 | 60,000 |
| Earnings before taxes | 1,20,000 | 95,000 | 60,000 |
| Taxes | 42,000 | 33,250 | 21,000 |
| Earnings after taxes | 78,000 | 61,750 | 39,000 |
| Less: Preference dividend | ------ | ------ | ------ |
| Earnings available to ordinary shareholders | 78,000 | 61,750 | 39,000 |
| Number of shares | 20,000 | 15,000 | 10,000 |
| Earnings per share (EPS) | 3.9 | 4.1 | 3.9 |

The calculations in Table reveal that given a level of EBIT of Rs.1,20,000, the financing alternative B, which involves 50 per cent ordinary shares and 50 per cent debt, is the most favourable with respect to EPS.

Table also indicates that the annual before-tax costs of the various financing plans are:

1. Financing Plan B Rs.25,000
2. Financing Plan C 60,000

Financing plan A involves no cost as there is no fixed financial charge. That the financing plan involves a specific amount of cost, is another way of saying that an equal amount of earnings before interest and taxes is necessary to cover the fixed financial charges. Earnings per share would be zero for plans B, C for the EBIT level of Rs.25,000, Rs.60,000 respectively. This level of EBIT may be termed as financial break even (BEP) level of earnings before interest and taxes because it represents the level of EBIT necessary for the firm to break even on its fixed financial charge. In other words, it is the level of EBIT at which the firm can satisfy all fixed financial charges (i.e. interest and preference dividend). EBIT less than this level will result in negative EPS. The financial break-even point can be determined by Eq.

$$\text{Financial break-even point} = \frac{1 + D_p}{1 - t}$$

where I = Annual interest charges

DP = Preference dividend

T = Tax rate

Equation gives before - tax earnings necessary to cover the firm's fixed financial obligations. As fixed financial charges are added, the break-even point for zero EPS is increased by the amount of the additional fixed cost. Beyond the financial break-even point, increase in EPS is more than the proportionate increase in EBIT. This is illustrated in Table, which presents the EBIT-EPS relationship for the data in Example under the various EBIT assumptions given in the box

| | |
|---|---|
| (i) | Rs.80,000 (4 per cent return on total assets) |
| (ii) | Rs.1,00,000 (5 per cent return on total assets) |
| (iii) | Rs.1,30,000 (4 per cent return on total assets) |
| (iv) | Rs.1,60,000 (4 per cent return on total assets) |
| (v) | Rs.2,00,000 (4 per cent return on total assets) |

EBIT-EPS Analysis under Various EBIT Assumptions for the three financing Plans of Example

(i) EBIT = Rs. 80,000 (4 percent return on investments)

| ***Particulars*** | ***Financing Plans*** | | |
|---|---|---|---|
| | ***A*** | ***B*** | ***C*** |
| EBIT | 80,000 | 80,000 | 80,000 |
| Less: Interest | ------- | 25,000 | 60,000 |
| EBIT | 80,000 | 55,000 | 20,000 |
| Less: Taxes | 28,000 | 19,250 | 7,000 |
| EAT | 52,000 | 35,7 | 13,000 |
| Less: Preference dividend | ------ | ------ | ------ |
| EAT for equity-holders | 52,000 | 35,750 | 13,000 |
| EPS | 2.6 | 2.38 | 1.3 |

(ii) EBIT = Rs. 1,00,000 (5 percent return )

| ***Particulars*** | ***Financing Plans*** | | |
|---|---|---|---|
| | ***A*** | ***B*** | ***C*** |
| EBIT | 1,00,000 | 1,00,000 | 1,00,000 |
| Less: Interest | ------- | 25,000 | 60,000 |
| EBIT | 1,00,000 | 75,000 | 40,000 |
| Less: Taxes | 35,000 | 26,250 | 14,000 |
| EAT | 65,000 | 48,750 | 26,000 |
| Less: Preference dividend | ------ | ------ | ------ |
| EAT for equity-holders | 65,000 | 48,750 | 26,000 |
| EPS | 3.25 | 3.25 | 2.6 |

(iii) EBIT = Rs. 1,30,000 (6.5 percent return )

| *Particulars* | *Financing Plans* | | |
|---|---|---|---|
| | *A* | *B* | *C* |
| EBIT | 1,30,000 | 1,30,000 | 1,30,000 |
| Less: Interest | ------- | 25,000 | 60,000 |
| EBIT | 1,30,000 | 1,05,000 | 70,000 |
| Less: Taxes | 45,500 | 36,750 | 24,500 |
| EAT | 84,500 | 68,250 | 45,500 |
| Less: Preference dividend | ------ | ------ | ------ |
| EAT for equity-holders | 84,500 | 68,250 | 45,500 |
| | | | 4.55 |
| EPS | 4.22 | 4.55 | |

(iv) EBIT = Rs. 1,60,000 (8 percent return )

| *Particulars* | *Financing Plans* | | |
|---|---|---|---|
| | *A* | *B* | *C* |
| EBIT | 1,60,000 | 1,60,000 | 1,60,000 |
| Less: Interest | ------- | 25,000 | 60,000 |
| EBIT | 1,60,000 | 1,35,000 | 1,00,000 |
| Less: Taxes | 56,000 | 47,250 | 35,000 |
| EAT | 1,04,500 | 87,750 | 65,000 |
| Less: Preference dividend | ------ | ------ | ------ |
| EAT for equity-holders | 1,04,500 | 87,750 | 65,000 |
| EPS | 5.2 | 5.8 | 6.5 |

(v) EBIT = Rs. 2,00,000 (10 percent return )

| *Particulars* | *Financing Plans* | | |
|---|---|---|---|
| | *A* | *B* | *C* |
| EBIT | 2,00,000 | 2,00,000 | 2,00,000 |
| Less: Interest | ------- | 25,000 | 60,000 |
| EBIT | 2,00,000 | 1,75,000 | 1,40,000 |
| Less: Taxes | 70,000 | 61,250 | 49,000 |
| EAT | 1,30,000 | 1,13,750 | 91,500 |
| Less: Preference dividend | ------ | ------ | ------ |
| EAT for equity-holders | 1,30,000 | 1,13,750 | 91,500 |
| EPS | 6.5 | 7.6 | 9.1 |

Table shows that when the EBIT level exceeds the financial break-even level (Rs.25,000, Rs.60,000 for financing alternatives, B, C respectively) EPS increases. The percentage increase in EPS is the greatest when EBIT is nearest the break-even point. Thus, in

Plan C, an increase of 25 per cent in EBIT (from Rs.80,000 to Rs.1,00,000) results in a 100 per cent increase in EPS (from Re 1.3 to Rs.2.6), whereas the percentage increase in EPS is only 40 per cent (from Rs.6.5 to Rs.9.1) as a result of the change in EBIT at higher levels from Rs.1,60,000 to Rs.2,00,000 (i.e. 25 per cent increase).

Tables show that the EPS for different financing plans at a given level of EBIT is equal. At EBIT levels above or below the given levels, the EPS is higher or lower. Thus, for alternatives A and C at the EBIT level of Rs.1,20,000 the EPS is the same, that is, Rs. 3.9. If EBIT is below this level, alternative A (ordinary shares) will provide higher EPS; above this level, the debt alternative (C) is better from the viewpoint of EPS.

The earnings per share (EPS) in alternatives A and B are the same at EBIT level of Rs.1,00,000. Above this, B plan would lead to higher EPS; at levels lower than this, financing plan A would provide higher EPS.

The debt alternative (B) gives higher EPS; at levels lower that this, financing plan A would provide higher EPS.

## Operating Conditions and Business Risk

One very important factor on which the variability of EPS depends is the growth and stability of sales. As you may recall that EPS will fluctuate with fluctuations in sales. The magnitude of the EPS variability with sales will depend on the degrees of operating and financial leverages employed by the company. Firms with stable sales and favourable cost price structure and successful operating strategy will have stable earnings and cash flows and thus, can employ a high degree of leverage as they will not face difficulty in meeting their fixed commitments The likely fluctuations in sales increase the business risk. A small change in sales can lead to a dramatic change in the earnings of a company when its fixed costs and debt are high. As a result, the shareholders perceive a high degree of financial risk if debt is employed by such companies. A company will get into a debt trap if operating conditions become unfavourable and if it lacks in focussed strategy:

The fluctuating raw materials and component prices cause ups and downs in the revenues and profits of a ship-building company. With the right operating strategy and appropriate prudent financing, a company can manage to sail safely Hindustan Shipyard Limited (HSL), however, is finding it quite difficult to come out of the troubled waters due to huge borrowings It has a total outstanding of Rs 554 crore: working capital loan Rs 138 crore, development loan for modernisation Rs 69 crore, and outstanding interest on these loans ns 160 crore; cash credit Rs 62 crore, outstanding interest, cash credit Rs 65 crore and penal interest Rs 60 crore. How did this hppen?HSL's trouble began when, between 1981 and 1982, Japanese and South Korean shipbuilders started offering "heavily subsidised rates" against the rates fixed by the Indian

government; based on international parity price In effect, building ships turned out to be unviable for the yard. Further, HSL's overtime bill soared up, being a highly overstaffed company. It had 11,000 workers in 1990. A lack of strategy paved way for unchecked downfall. Orders continued declining, and became almost nil by 1988 and 1989. To tide over this, company borrowed funds, and since operating performance did not improve, the company fell deeper and deeper into debt trap.HSL is technically insolvent. The capital restructuring plan are on to put the company back on its feet.

*Source:* Messiasl Lionel, Hindustan Shipyard: A Dead Weight Debt, The Economic Times, 15 Feb, 1994.

Sales of the consumer goods industries show wide fluctuations; therefore. they do not employ a large amount of debt. On the other hand, the sales of public utilities are quite stable and predictable. Public utilities, therefore, employ a large amount of debt to finance their assets. The expected growth in sales also affects the degree of leverage. The greater the expectation of growth, the greater the amount of external financing needed since it may not be possible for the firm to cope up with growth through internally generated funds. A number of managers consider debt to be chapter and easy to raise. The growth firms, therefore, may usually employ a high degree of leverage. Companies with declining sales should not employ debt in their capital structures as they would find difficulty in meeting their fixed obligations. Non-payment of fixed charges can force a company into liquidation. It may be noted that sales growth and stability is just one factor in the leverage decision; many other factors would dictate the decision. There are instances of a large number of high growth firms employing no or small amount of debt.

## Cost of Capital and Valuation Approach

The cost of a source of finance is the minimum return expected by its suppliers. The expected return depends on the degree of risk assumed by investors. A high degree of risk is assumed by shareholders than debt-holders. In the case of debt-holders, the rate of interest is fixed and the company is legally bound to pay interest whether it makes profits or not. For ordinary shareholders, the rate of dividends is not fixed and the board of directors has no legal obligation to pay dividends eiren if the profits are made by the company. The loan of debt-holders is returned within a prescribed period, while shareholders will have to share the residue only when the company is wound up. This leads one to conclude that debt is a cheaper source of funds than equity. This is generally the case even when taxes are not considered. The tax deductibility of interest charges further reduces the cost of debt. The preference share capital is also cheaper than equity capital, but not as cheap as debt. Thus, using the component, or specific, cost of capital as a criterion for financing decisions and ignoring risk, a firm would always like to employ debt since it is the cheapest source of funds.

### Pecking Order Hypothesis

The cost of equity includes the cost of new issue of shares and the cost of retained earnings. The cost of debt is cheaper than the costs of both these sources of equity funds. Considering the cost of new issue and retained earnings, the latter is cheaper because personal taxes have to be paid by shareholders on distributed earnings while no taxes are paid on retained earnings as also no floatation costs are incurred when the earnings are retained.

As a result, between the two sources of equity funds, retained earnings are preferred it has been found in practice that firms prefer internal finance. If the internal funds are not sufficient to meet the investment. outlays, firms go for external finance, issuing the safest security first. They start with debt, then possibly hybrid securities such as convertible debentures, then perhaps equity as a last resort. Myers has called it the pecking order theory since there is not a well-defined debt-equity target and there are two kinds of equity, internal and external, one at the top of the pecking order and one at the bottom.

### Trade-off Theory

The specific cost of capital criterion does not consider the entire issue. It ignores risk and the impact on equity value and cost. The impact of financing decision on the overall cost of capital should be evaluated and the criterion' should be to minimise the overall cost of capital, or to maximise the value of the firm. If we consider the tax shield advantage of debt (on account of interest tax deductibility), then debt would have a favourable impact on value and would help to reduce the overall cost of capital. It should, however, be realised that a company cannot continuously minimise its overall cost of capital by employing debt. A point or range is reached beyond which debt becomes more expensive because of the increased risk (financial distress) of excessive debt to creditors as well to shareholders. When the degree of leverage increases, the risk of creditors increases, and they demand a higher interest rate and do not grant loan to the company at all, once its debt has reached a particular level. Further, the excessive amount of debt makes the shareholders' position very risky. This has the effect of increasing the cast of equity. Thus, up to a point the overall cost of capital decreases with debt, but beyond that point the cost of capital would start increasing and, therefore, it would not be advantageous to employ debt further. So, there is a combination of debt and equity which minimises the fimr's average cost of capital and maximises the market value per share. In practice, there is generally a range of debt-equity ratio wilhin which the cost of capital is minimum or the value is maximum. As stated earlier in this chapter, for individual companies, this range can be found out empirically and the firm can operate safely within that range.

The valuation framework makes it clear that excessive debt will reduce the share: price (or increase the cost of equity) and thereby lower the overall return to shareholders, despite the increase in EPS. The return of shareholders is made of dividends and appreciation in share prices, not of EPS. Thus, the impact of debt - equity ratio should be evaluated in terms of value, rather than EPS.

The difficulty with the valuation framework is that managers find it difficult to put into practice. It is not possible for them to quantify all variables. Also, the operations of the financial markets are so complicated that it is not easy to understand them. But this kind of analysis does provide insights and qualitative guidance to the decision maker.

The trade-off between cost of capital and EPS set the maximum limit to the use of debt. However, other factors should also be evaluated to determine the appropriate capital structure for a company.

### Cash Flow Approach

One of the features of a sound capital structure is conservatism. Conservatism does not mean employing no debt or small amount of debt. Conservatism is related to the fixed charges created by the use of debt or preference capital in the capital structure and the firm's ability to generate cash to meet these fixed charges. In practice, the question of the optimum (appropriate) debt-equity mix boils down to the firm's ability to service debt without any threat of insolvency and operating inflexibility. A firm is considered prudently financed if it is able to service its Fixed charges undet any reasonably predictable adverse conditions.

The fixed charges of a company include payment of interest, preference dividends and principal, and they depend on both the amount of loan securities and the terms of payment. The amount of fixed charges will be high if the company employs a large amount of debt or preference capital with short-term maturity. Whenever a company thinks of raising additional debt, it should analyse its expected future cash flows to meet the fixed charges. It is mandatory to pay interest and return the principal amount of debt. If a company is not able to generate enough cash to meet its fixed obligation, it may have to face financial insolvency. The companies expecting larger and stable cash inflows in the future can employ a large amount of debt in their capital structure. It is quite risky to employ fixed charge sources of finance by those companies whose cash inflows are unstable and unpredictable. It is possible for a high growth, profitable company to suffer from cash shortage if its liquidity (working capital) management is poor. We have examples of companies like BHEL, NTPC etc., whose debtors are very sticky and they continuously face liquidity problem in spite of being profitable. Servicing debt is very burdensome for them.

One important ratio which should be examined at the time of planning the capital structure

is the mtio of net cash inflows to fixed charges (debt-servicing ratio). It indicates the number of times the fixed financial obligations are covered by the net cash inflows generated by the company.

The greater the coverage, the greater is the amount of debt a company can use. However, a company with a small coverage can also employ a large amount of debt if there are not significant yearly variance in its cash inflows and a small probability of the cash inflows being considerably less to meet fixed charges in a given period. Thus, it is not the average cash inflows but the yearly cash inflows which are important to determine the debt capacity of a company. Fixed financial obligations must be met when due, not on an average or in most years but, always.' This requires a full cash flow analysis.

## Debt Capacity

The technique of cash flow analysis is helpful in determining the firm's debt capacity. Debt capacity is the amount which a firm can service easily even under adverse conditions; it is the amount that the firm should employ. There may be lenders who are prepared to lend to you. But you should borrow only if you can service debt without any problem. A firm can avoid the risk of financial distress if it can maintain its ability to meet contractual obligation of interest and principal payments. Debt capacity, therefore, should be thought in terms of cash flows rather than debt ratios. A high debt ratio is not necessarily bad. If you can service high debt without any risk, it will increase shareholders' wealth. On the other hand, a low debt ratio can prove to be burdensome for a firm which has liquidity problem. A firm faces financial distress (or even insolvency) when it has cash flow problem. It is dangerous to finance a capital intensive project out of borrowings which has built in uncertainty about the earnings and cash flows. National Aluminium Company is an example of a wrong initial choice of capital structure, without analysing the company's debt servicing ability.

Nationa Aluminium Company (NALCO), started in 1981, is the largest integrated aluminium complex in Asia of total investment of Rs 2,408;crore, borrowings from a consortium of European banks financed to the extent of $ 830 million or Rs 1,119 crore (46.5 per cent). The loan was repayable by 1995. Aluminium is an electricity-intensive business; each tonne of aluminium needs over 15,000 kw of electricity. Since its commissioning in 1988, Nalco has exported substantial portion of its production since the domestic demand has been very low than what the company had projected at its inception. The falling international prices in last few years have eroded the company's profitability. The net profit of Rs 172 crore in 1989 dropped to Rs 14 crore in 1991-92. The he 1,119 crore Eurodollar loan has appreciated to Re 2,667 crore inspite of having repaid Rs 644 crore. Due to profitability and liqu:,dity problem and hit by the depreciating rupee and the liberalised exchange mechanism, the company is

forced to reschedule repayments of its debt by the year 2003 instead of 1995. Nalco's debt-equity ratio has increased from 1 : 1 to 2.7 : 1.The reasons for Nalco's plight is its decision to go for the production of aluminium which consumes heavy electricity in addition to alumina. The problem of power shortage led to the setting up of power plant which is proving very costly to the company. The overcapacity of aluminium production world wide and highly competitive prices have added to Nalco's woes. Nalco is trying to get out of its problems by attempting to diversify into value-added products.Nalco's fate can change if the domestic demand for aluminium picks up and international prices rise. The mounting debt of the company poses a question: Should you use heavy dose of debt (since it is available from certain sources) to finance investments in a business like aluminium which has worldwide over capacity, fluctuating international prices and expensive and short supply of electricity· in the country in which it is set up? Debt would accentuate the financial crises when a company has built-in operating uncertainties

*Source:* Based on an article by Sudipt Dutta, NALCO: undeR a Debt Mountain, Business India, August 17-30, 1992, pp. 77-78.

## Components of Cash Flows

The cash flows should be analysed over a long period of time, which can cover the various adverse phases, for determining the firm's debt policy.' The cash flow analysis can be carried out by preparing profoma cash flow statements to show the firm's financial conditions under adverse conditions such as a recession. The expected cash flows can be categorised into three groups.

- Operating cash flows
- Non-operating cash flows
- Financial flows.

Operating cash flows relate to the operations of the firm and can be determined from the projected profit and loss statements The behaviour of sales volume, output price and input price over the period of analysis should be examined and predicted.

Non-operating cash flows generally include capital expenditures and working capital changes. During a recessionary period, the firm may have to specially spend for the promotion of the product. Such expenditures should be included in the non-operating cash flows. Certain types of capital expenditure cannot be avoided even during most adverse conditions. They are riecessary to maintain the minimum operating efficiency. Such irreduciable, minimum capital expenditure should be, clearly identified.

Financial flows include interest, dividends, lease nentals, repayment of debt etc. They are further divided into: contractual obligations and policy obligations. Contractual obligations include those financial obligations, like interest, lease rentals and principal

payments, that are matters of contract and should not be defaulted Policy obligations consist of those financial obligations, like dividends, that are at the discretion of the board of directors. Policy obligations are also called discretionary obligations.

The cash flow analysis may indicate that a decline: in sales, resulting in profit decline or losses, discretionary obligations. may not necessarily cause cash inadequacy This may be so because cash may be realised from permanent inventory and receivable Also, some of the pemranent current liabilities may decline with fall in sales and profits. On the other hand, when sales and profits are growing, the firm may face cash inadequacy as large amount of cash is needed to finance growing inventory and receivable. If the profits decline due to increase in expenses or falling output prices, instead of the decline in the number of units sold, the firm may face cash inadequacy because its funds in inventory and receivable will not be released The point to be emphasised is that a firm should carry out cash flow analysis to get a clear picture of its ability to service debt obligations even under the adverse conditions, and thus, decide about the proper amount of debt in the capital structure This can be done by examining the impact of alternative debt policies on the firm's cash flow ability. The firm should then choose the debt poiicy which it can service.

### Cash Flow Analysis Versus EBIT-EPS Analysis

Is cash flow analysis superior to EBIT-EPS analysis? How does it incorporate the insights of the finance theory? The cash flow analysis has the following.

- It focuses on the liquidity and solvency of the firm over a long-period of time, even encomyassing adverse circumstances Thus. it evaluates the firm's ability to meet fixed obligations.It goes beyond the analysis of profit and loss statement and also considers changes in the balance sheet items.
- It identifies discretionary cash flows. The firm can thus prepare an action plan to face adverse situations.
- It provides a list of potential financial flows which can be utilised under emergency.
- It is a long-term dynamic analysis and does not remain confined to a single period analysis.

The most significant advantage of the cash flow analysis is that it provides a practical way of incorporating the insights of the finance theory. As per the theory, debt financing has tax advantage. But it also involves risk of financial distress. Therefore, the optimum amount of debt depends on the trade-off between tax advantage of debt and risk of financial distress, financial distress occurs when the firm is not in a position to meet its cont,actual obligations. The cash flow analysis indicates when the firm will find it difficult to service its debt. Therefore, it is useful in providing good insights to determine the debt capacity which helps to maximise the market value of the firm.

## Cash Flow Analysis Versus Debt-Equity Ratio

The cash flow analysis clearly reveals that a higher debt-equity ratio is not risky if the company has the ability of generating substantial cash inflows in the future to meet its fixed financial obligations. Financial risk in this sense is indicated by the company's cash-flow ability, not by the debt-equity ratio. To quote Van Home;

...the analysis of debt-to-equity ratios alone can be deceiving, and analysis of the magnitude and stability of cash-flows relative to fixed charges is extremely important in determining the appropriate capital structure for the firm. To the extent that creditors and investors analyse a firm's cash-flow ability to service debt, and management's risk preferences correspond to those of investors, capital structure decisions made in this basis should tend to maximise share price.

The cash flow analysis does have its limitations It is difficult to predict all possible factors which May influence the firm's cash flows. Therefore, it is not a fool-proof technique to determine the firm's debt policy.

## EBIT-EPS Analysis

The EBIT-EPS analysis, as a method to study the effect of leverage, essentially involves the comparison of alternative methods of financing under various assumptions of EBIT. A firm has the choice to raise funds for financing its investment proposals from different sources in different proportions. For instance, it can (i) exclusively use equity capital (ii) exclusively use debt,

(iii) exclusively use preference capital, (iv) use a combination of (i) and (ii) in different proportions; (v) a combination of (i), Oil and (iii) in different proportions, (vi) a combination of (i) and (iii) in different proportions, and so on. The choice of the combination of the various sources would he one which, given the level of earnings before interest and taxes, would ensure the largest EPS. Consider Example 2.

## Example 2:

Suppose a firm has a capital structure exclusively comprising of ordinary shares amounting to Re 10,00,000. The firm now wishes to raise additional Rs 10,00,000 for expansion. The firm has four alternative financial plans:

(A) It con raise the entire amount in the form of equity capital.

(B) It can raise 50 per cent as equity capital and 50 per cent as 5% debentures.

(C) It can raise the entire amount as 6% debentures.

(D) It can raise 50 per cent as equity capital and 50 per cent as 5% preference capital.

Further assume that the existing EBIT are Rs 120, 000, the tax rate is 35 per cent, outstanding ordinary shares' 10,000 and the market price per share is Rs 100 under all the four alternatives.

Which financing plan should the firm select?

## Solution

**EPS under Various Financial Plans**

| | Financing plans | | | |
|---|---|---|---|---|
| | **A** | **B** | **C** | **D** |
| EBIT | 1,20,000 | 1,20,000 | 1,20,000 | 1,20,000 |
| Less Interest | - | 25,000 | 60,000 | - |
| Earnings before taxes | 1,20,000 | 95,000 | 60,000 | 1,20,000 |
| Taxes | 42,000 | 33,250 | 21,000 | 42,000 |
| Earning after taxes | 78,000 | 61,750 | 39,000 | 78,000 |
| Less preference dividend | - | - | - | 25,000 |
| Earnings available to ordinary shareholders | 78,000 | 61,750 | 39,000 | 53,000 |
| Number of Shares | 20,000 | 15,000 | 10,000 | 15,000 |
| Earnings per share (EPS) | 3.9 | 4.1 | 3.9 | 3.5 |

The calculations in above table reveals that given a level of EBIT of Rs 1,20,000, the financing alternative B, which involves 75 per cent ordinary shares and 25 per cent debt, is the most favourable with respect to EPS. Another disclosure of the table is that although the proliortion of ordinary shares in the total capitalization under the financing plan D is also 75 per cent, that is, equal to plan B, EPS is considerably different (lowest). The difference in the plans B and D is due to the fact that interest on debt is tax-deductible while the dividend on preference shares is not. With 35 per cent income tax, the explicit cost of preference shares would be higher than the cost of debt.

Table also indicates that the annual before-tax costs of the various financing plans are:

1. Financing Plan B Rs 25,000
2. Financing Plan C 60,000
3. Financing Plan D 38,426

Financing plan A involves no cost as there is no fixed financial charge. That the financing plan involves a specific amount of cost, is another way of saying that an equal amount of earnings before interest and taxes is necessary to cover the fixed financial charges. Since preference dividend is not tax-deductible, we must divide the total dividends by one, minus the tax rate, in order to obtain the EBIT necessary to cover these dividends as a financial charge. Assuming a 35 per cent tax rate, preference dividend of Rs 25,000 can be paid on EBIT of Rs 38,462. The fixed financial charge would, therefore, be higher. Earnings per share would be zero for plans B, C and D for the EBIT level of

Rs 25,000, Rs 60,000 and Rs 38,462 respectively. This level of EBIT may be termed as financial break even level of earnings before interest and tares because it represents the level of EBIT necessary for the firm to break even on its fixed financial charge. In other words, it is the level of EBIT at which the firm can satisfy all fixed financial charges (i.e. interest and preference dividend). EBIT less than this level will result in negative EPS. The financial break-even point can be determined by Eq.

$$\text{Financial break-even point} = I + \frac{PD}{1-t}$$

where I = Annual interest charges

PD = Preference dividend

t = Tax rate

Equation gives before-tax earnings necessary to cover the firm's fixed financial obligations. As fixed financial charges are added, the break-even point for zero EPS is increased by the amount of the additional fixed cost. Beyond the financial break-even point, increase in EPS is more than the proportionate increase in EBIT.

(i) Rs 80,000 (4 per cent return on total assets)

(ii) 1,00,000 (5 per cent return on total assets)

(iii) 1,30,000 (6.5 per cent return on total assets)

(iv) 1,60,000 (8 per cent return on total assets)

(v) 2,00,000 (10 per cent return on total assets)

**Assumptions for the four Financing Plans**

**(i) EBTT a Re 80,000 (4 per cent return on investments)** Financing Plans

| | A | B | C | D |
|---|---|---|---|---|
| EBIT | 80,000 | 80,000 | 80,000 | 80,000 |
| Less interest | - | 25,000 | 60,000 | - |
| EBT | 80,000 | 55,000 | 20,000 | 80,000 |
| Less taxes | 28,000 | 19,250 | 7,000 | 28,000 |
| EAT | 52,000 | 35,750 | 13,000 | 52,000 |
| Less preference dividend | - | - | - | 25,000 |
| Ear for equity number | 52,000 | 35,750 | 13,000 | 27,000 |
| EPS | 2.6 | 2.38 | 1.3 | 1.8 |

**(ii) EBIT = Rs 1,00,000 (5 per cent return)**

| | | | | |
|---|---|---|---|---|
| EBIT | 1,00,000 | 1,00,000 | 1,00,000 | 1,00,000 |
| Less interest | - | 25,000 | 60,000 | - |
| EBT | 1,00,000 | 75,000 | 40,000 | 35,000 |
| Less taxes | 35,000 | 26,250 | 14,000 | 35,000 |
| EAT | 65,000 | 48,750 | 26,000 | 65,000 |
| Less preference dividend | - | - | - | 25,000 |
| EAT for equity holders | 65,000 | 48,750 | 26,000 | 40,000 |
| EPS | 3.25 | 3.25 | 2.6 | 2.67 |

**(iii) EBIT = Rs 1,30,000 (6.5 per cent return)**

| | | | | |
|---|---|---|---|---|
| EBIT | 1,30,000 | 1,30,000 | 1,30,000 | 1,30,000 |
| Less interest | - | 25,000 | 60,000 | - |
| EBT | 1,30,000 | 1,05,000 | 70,000 | 1,30,000 |
| Less taxes | 45,500 | 36,750 | 24,500 | 45,500 |
| EAT | 84,500 | 68,250 | 45,500 | 84,500 |
| Less preference dividend | - | - | - | 25,000 |
| EAT for equity holders | 84,500 | 68,250 | 45,500 | 59,500 |
| EPS | 4.22 | 4.55 | 4.55 | 3.97 |

**(iv) EBIT a Rs 1,60,000 (8 per cent return)**

| | | | | |
|---|---|---|---|---|
| EBIT | 1,60,000 | 1,60,000 | 1,60,000 | 1,60,000 |
| Less interest | - | 25,000 | 60,000 | - |
| EBT | 1,60,000 | 1,35,000 | 1,00,000 | 1,60,000 |
| Less taxes | 56,000 | 47,250 | 35,000 | 56,000 |
| EAT | 1,04,000 | 87,750 | 65,000 | 1,04,000 |
| Less preference dividend | - | - | - | 25,000 |
| EAT for equity holders | 1,04,000 | 87,750 | 65,000 | 79,000 |
| EPS | 5.2 | 5.8 | 6.5 | 5.3 |

(v) **EBIT = Rs 2,00,000 (10 per cent return)**

| | | | | |
|---|---|---|---|---|
| EBIT | 2,00,000 | 2,00,000 | 2,00,000 | 2,00,000 |
| Less interest | - | 25,000 | 60,000 | - |
| EBT | 2,00,000 | 1,75,000 | 1,40,000 | 2,00,000 |
| Less taxes | 70,000 | 61,250 | 49,000 | 70,000 |
| EAT | 1,30,000 | 1,13,750 | 91,000 | 1,30,000 |
| Less preference dividend | - | - | - | 25,000 |
| EAT for equity holders | 1,30,000 | 1,13,750 | 91,000 | 1,05,000 |
| EPS | 6.5 | 7.6 | 9.1 | 7 |

It can be seen from above Table that when the EBIT level exceeds the financial break-even level (Rs 25,000, Rs 60,000 and Rs 38,462 for financing alternatives, B, C and D' respectively) EPS increases. The percentage increase in EPS is the greatest when EBIT is nearest the break-even point. Thus, in Plan C an increase of 25 per cent in EBIT (from Rs 80,000 to Rs 1,00,000) results in a 100 per cent increase in EPS (from Re 1.3 to Rs 2.6), whereas the percentage increase in EPS is only 40 per cent (from Rs 6.5 to Rs 9.1) as a result of the change in EBIT at higher levels from Rs 1,60,000 to Rs 2,00,000 (i.e. 25 per cent increase).

We can also see from Tables that the EPS for different financing plans at a given level of EBIT is equal. At EBIT levels above or below the given level, the EPS is higher or lower. Thus, for alternatives A and C at the EBIT level of Rs 1,20,000 the EPS is the same, that is, Rs 3.9. If EBIT is below this level, alternative A (ordinary shares) will provide higher EPS; above this level, the 1 debt alternative (C) is better from the viewpoint of EPS.

Between preference share (D) and ordinary share (A) alternatives, the EPS is equal (Rs 5.2) at Rs 1,60,000 EBIT level. above this level alternative D will give better EPS; while below it, alternative A. The earnings per share (EPS) in alternatives A and B are the same at EBIT level of Re 1,00,000. Above B would provide higher EPS.

The debt alternative (B) gives higher EPS for all levels of EBIT as compared to the preference share alternative (D).

### Indifference Point

The EBIT level at which the EPS is the same for two alternative financial plans is referred to as the indifference point/level. The indifference point may be defined as the level of EBIT beyond which the benefits of financial leverage begin To operate with respect to earnings per share (EPS). In operational terms, if the expected level is to exceed the indifference level of EBIT, the use of fixed-charge source of funds (debt) would be advantageous from the viewpoint of EPS, that is, financial leverage will be favourable and lead to an increase in the EPS available to the shareholders. The capital structure should include debt. If, however, the expected level of the EBIT is less than the indifference point, the advantage of EPS would be available from the use of equity capital.

The indifference point between two methods of financing can be obtained mathematically (algebraic approach) as well as graphically.

Algebraic Approach Mathematically, the indifference point can be obtained by using the following symbols:

X = earnings before interest and taxes (EBIT) at the indifference point

$N_1$ = number of equity shares outstanding if only equity shares are issued

$N_2$ = number of equity shares outstanding if both debentures and equity shares are issued

$N_3$ = number of equity shares outstanding if both preference and equity shares are issued

$N_4$ = number of equity shares outstanding if both preference shares and debentures are issued

I = the amount of interest on debentures

P = the amount of dividend on preference shares

t = corporate income tax rate

Dt = tax on preferance dividend

For a New Company The indifference point can be determined by using the following equations:

(i) Equity shares versus debentures:

$$\frac{X(1-t)}{N_1} = \frac{(X-1)(1-t)}{N_2} \qquad \text{(a)}$$

(ii) Equity shares versus preference shares:

(b)

(iii) Equity shares versus preference

(c)

(iv) Equity shares versus preference shares and debentures:

(d)

For and Existing Company If the debentures are already outstanding, let us assume

i, = interest paid on existing debt, and I2 = interest payable on additional debt, then the indifference point would be determined by Equation (e)

(e)

**Example 3:**

The financial manager of a company has formulated various financial plans to finance Rs 30,00,000 required to implement various capital budgeting projects:

(i) Either equity capital of Rs 30,00,000 or Rs 15,00,000 108 debentures and Rs 15,00,000 equity;

(ii) Either equity capital of Rs 30,00,000 or 13% preference shares of Rs 10,00,000 and Rs 20,00,000

(iii) Either equity capital of Rs 30,00,00 or 13% preference capital of Rs 10,00,000, (subject to dividend tax of 10 per cent), Rs 10,00,000 1046 debentures and Rs 10,00,000 equity; and

(iv) Either equity share capital of Rs 20,00,000 and 104b debentures of Rs 10,00,000 or 13% preference capital of Re 10,00,000. 10% debentures of Rs 8,00,000 and Rs 12,00,000 equity.

You are required to detetmine the indifference point for each financial plan, assuming 35 per cent corporate tax rate and the face value of equity shares, as Rs 100.

**Solution**

**TABLE: Determination of Indifference Point**

$$\frac{X(1-0.35)}{30,00,000} = \frac{(X-\text{Rs } 1,50,000)(1-0.35)}{15,000}$$

(i)

or

or

or $0.65X = 1.3X - \text{Rs } 1,95,000$

or $-0.65X = -\text{Rs } 1,95,000$

$$X = \frac{\text{Rs } 1,95,000}{0.65} = \text{Rs } 3,00,000$$

**Confirmation table**

| | Equity financing | Equity + debt financing |
|---|---|---|
| EBIT | Rs 3,00,000 | Rs 3,00,000 |
| Less interest | - | 1,50,000 |
| Earning before taxes | 3,00,000 | 1,50,000 |
| Less taxes | 1,05,000 | 52,500 |
| Earnings for equity holders | 1,95,000 | 97,500 |
| Number of equity shares | 30,000 | 15,000 |
| EPS | 6.5 | 6.5 |

(iii) $$\frac{X(1-t)}{N_1} = \frac{X(1-I)(1-t)}{N_3}$$

or

or

or $X = Rs\ 6,00,000$

**Confirmation Table**

| | Equity financing | Equity+Preference financing |
|---|---|---|
| EBIT | Rs 6,00,000 | Rs 6,00,000 |
| Less taxes | 2,10,000 | 2,10,000 |
| Earning after taxes | 3,90,000 | 3,90,000 |
| Less dividends on preference shares | - | 1,30,000 |
| Earnings for equity holders | 3,90,000 | 2,60,0000 |
| Number of equity shares | 30,000 | 20,000 |
| EPS | 13 | 13 |

(iii) $$\frac{X(1-t)}{N_1} = \frac{(x-I)(1-t) - P(1+Dt)}{N_4}$$

or

or

$$X = \text{Rs } 4{,}80{,}000$$

**Confirmation table**

| | Equity financing | Equity+debt+ Preference financing |
|---|---|---|
| EBIT | Rs 4,80,000 | Rs 4,80,000 |
| Less interest | - | 1,00,000 |
| Earning before taxes | 4,80,000 | 3,80,000 |
| Less taxes | 1,68,000 | 1,33,000 |
| Earnings after tax | 3,12,000 | 2,47,000 |
| Less dividends including dividend tax on preference shares | - | 1,43,000 |
| Earnings available for equity holders | 3,12,000 | 1,04,000 |
| Number of equity shares | 30,000 | 10,000 |
| EPS | 10.4 | 10.4 |

$$\frac{X(1,50,000)(0.65)}{30,000} = \frac{(X - \text{Rs } 35,500)(1 - 0.35) - 1,30,000}{20,000}$$

$$\frac{(X - I)(1 - t)}{N_1} = \frac{(x - I)(1 - t) - P}{N_4}$$

or

or $X = \text{Rs } 5{,}50{,}000$

**Confirmation table**

| | Equity financing | Equity + Preference + Debentures financing |
|---|---|---|
| EBIT | Rs 5,50,000 | Rs 5,50,000 |
| Less interest | 1,00,000 | 80,000 |
| Earning before taxes | 4,50,000 | 4,70,000 |
| Less taxes | 1,57,500 | 1,64,500 |
| Earnings after tax | 2,92,500 | 3,05,500 |

| | | |
|---|---|---|
| Less dividends preference shares | - | 1,30,000 |
| Earnings for equity holders | 2,92,500 | 1,75,500 |
| Number of equity shares | 20,000 | 12,000 |
| EPS | 14.625 | 14.625 |

Graphic Approach The indifference point can also be determined graphically. Figures 1 and 2 portray the graphic representation of financial plans (i) and (ii) of Example 7. The horizontal X-axis represents EBIT while EPS is represented on the Y-axis.

In order to graph the financial plan, two sets of EBIT-EPS coordinates are required. The EPS values associated with EBIT values of Rs 2,00,000 and Rs 6,00,000 are calculated and plotted on the graph paper under each financial plan in case of Figure 1. It may noted that 100 per cent equity inancing plan starts from origin (O) because EPS would be zero if EBIT is zero. However, EBIT required to have the value of the EPS as zero is Rs 1,50,000, that is, the interest charges payable on 105 debentures of Rs 15,00,000. Therefore, the starting point of 50 per cent equity financing plan is away from the point of the origin (i.e. it starts from Rs 1.5 lakh). The point at which the two lines intersect is the indifference point (IP). When we draw a perpendicular to the X-axis from the point of intersection, we have EBIT required for the IF. A line drawn from the point of intersection and joined with the Y-axis determines the EPS at the indifference point -

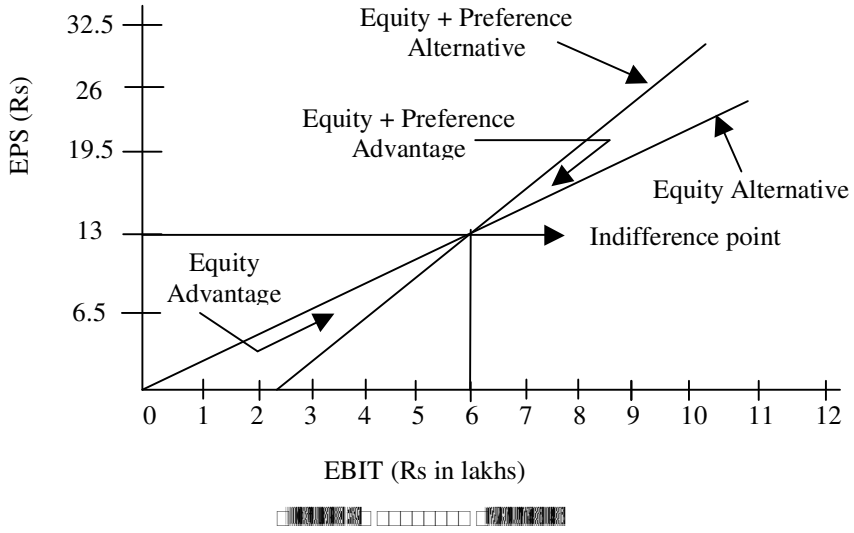


An important point to be remembered in relation to the drawing of 33 per cent preference share financial plan (Fig. 2) is that EPS would not be zero if the firm's EBIT is Rs 1,30,000, because dividend payable on preference share is not tax-deductible. The firm must earn so much more than

Rs 1,30,000 that it is left with Rs 1.30,000 after paying taxes. This amount can be calculated dividing by (1- t). The required amount Is Rs 2,00,000 (Rs 1,30,000) ÷

(1-0.35). Thus, the starting point of preference share financial plan would be Rs 2 lakh.

The indifference points of Figs. 1 and 2 correspond to what we have determined through the algebraic approach. But the utility of the EBIT-EPS chart lies in its being more informative regarding the EBIT-EPS relationship. It gives a bird's eye view of EPS at various Levels of EBIT. The EPS value at the estimated level of EBIT can be promptly ascertained. Moreover, it more easily explains why an equity financing plan is better than other plans requiring debenture and/or preference shares for the EBIT level below the BEP. For instance, Fig 2. indicates that for all EBIT levels below Rs d lakh, the EPS under equity alternative is greater than 33 per cent preference share financing plan and for all EBIT levels above Rs 6 lakh, the EPS is greater under 33 per cent financing plan than 100 per cent equity financing. The IP can be compared with the most likely level of EBIT. If the likely level of EBIT is more than the IF, the use of fixed cost financing plan may be recommended, otherwise equity plan would be more suitable. To sum up, the greater the likely level of EBIT than the indifference point, the stronger is the case for using levered financial




plans to maximise the EPS. Conversely, the lower the likely level of EBIT in relation to the indifference point. the more useful the unlevered financial plan would be froni the view point of EPS. In other words, financial leverage will be favourable and shareholders will get higher EPS if the return on total investment is more than the fixed cost (interest and preference dividend). If the return is less than the fixed financial charge, the EPS will decline with the use of debt and the leverage will be unfavourable. The financial leverage will have no effect on EPS in case the return on investment is exactly equal to the fixed financial costs.

The indifference point may be computed in another way using nlarket value as the basis. Since the operational objective of financial management is the maximisation of share prices, the market price of shares of a firm with two different financial plans

should be identical. Thus, on the basis of level of EBIT which ensures identical market price for alternative financial plans, the indifference point can be symbolically computed by following Equation.

$$P/E_1\left[\frac{X(1-t)}{N_1}\right] = P/E_2\left[\frac{(x-1)(1-r)-D_P}{N_2}\right]$$

where PEI = P/E ratio of levered plan and P/E2 = P/E ratio of unlevered plan.

Determine the indifference point at which market price of equity shares of a corporate firm will be the same frdm the following data:

1. Funds required, Rs 50,000.
2. Existing number of equity shares outstanding, 5,000 @ Rs 10 per share.
3. Existing 10% debt, Rs 20,000
4. Funds required can be raised either by (a) issue of 2,000 equity shares, netting Rs 25 per share or (b) new 15 per cent debt.
5. The P/E ratio will be 7 times in equity alternative and 6 times in debt alternative.
6. Corporate tax rate, 35 per cent.

**Solution**

$$P/E_1\left[\frac{(x-I_1)(1-t)}{N_1}\right] = P/E_2\left[\frac{(x-1_1-I_2)-(1-t)}{N_2}\right]$$

$$7\left[\frac{(x-\text{Rs } 2{,}000)0.65}{7{,}000}\right] = 6\left[\frac{(x-\text{Rs } 9{,}500)0.65}{5{,}000}\right]$$

or $$\frac{0.65x-\text{Rs } 1{,}300}{7{,}000} = \frac{0.65x-\text{Rs } 6{,}175}{5{,}000}$$

or $5(4.55x - \text{Rs } 9{,}100) = 7(3.9 \times \text{Rs } 37{,}050)$

or $4.55x = \text{Rs } 2{,}13{,}850$, i.e. $\times = \text{Rs } 47{,}000$

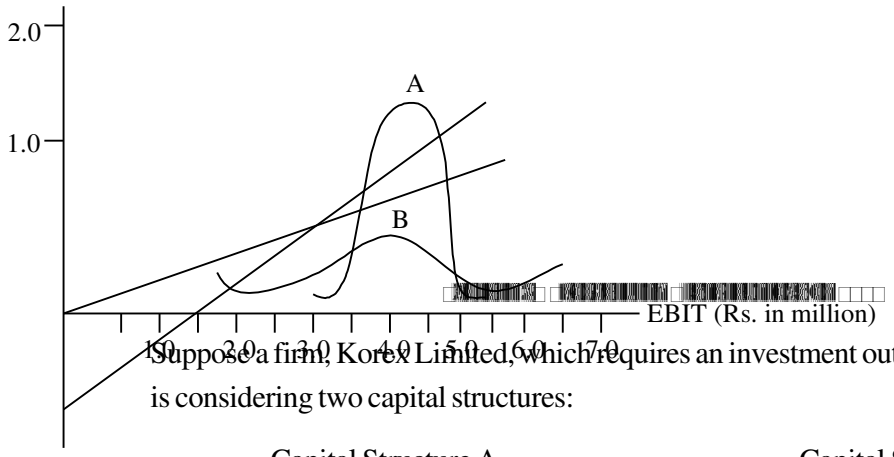
**Confirmation table**

| | 15% Debt issue | Equity issue |
|---|---|---|
| EBIT | Rs 47,000 | Rs 47,000 |
| Less interest | 9,500 | 2,000 |
| Earning before taxes | 37,500 | 45,000 |

| | | |
|---|---|---|
| Less taxes | 13,125 | 15,750 |
| Earnings after tax | 24,375 | 29,250 |
| Number of equity shares | 5,000 | 7,000 |
| Earnings per share | 4.875 | 4.18 |
| P/E ratio (times) | 6 | 7 |
| Market price of the share | 29.25 | 29.25 |

## ROI-ROE Analysis

In the preceding section we looked at the relationship between EBIT and EPS under alternative financing plans. Pursuing a similar line of analysis, we may look at the relationship between the return on investment (ROI) and the return on equity (ROE) for different levels of financial leverage.




Suppose a firm, Korex Limited, which requires an investment outlay of Rs 100 million, is considering two capital structures:

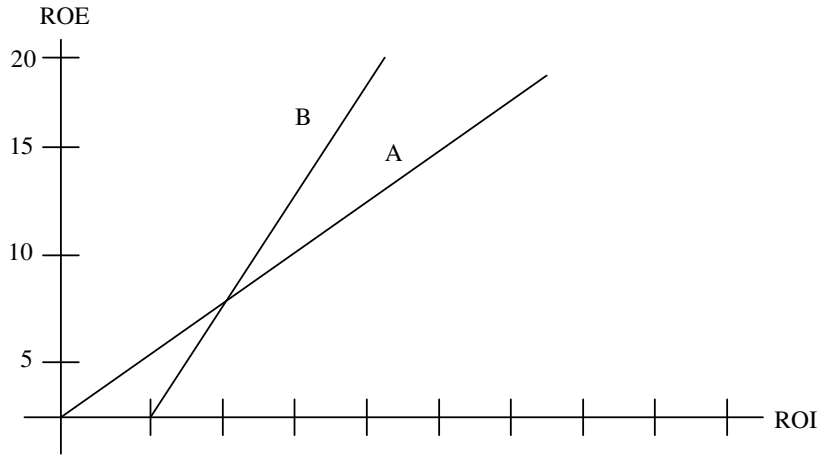
| Capital Structure A (Rs in million) | | Capital Structure B (Rs in million) | |
|---|---|---|---|
| Equity | 100 | Equity | 50 |
| Debt | 0 | Debt | 50 |

While the average cost of debt is fixed at le~per cent, the ROI (defined as EBIT divided by total assets) may vary widely. The tax rate of the firm is 50 per cent.

Based on the above information, the relationship between ROI and ROE (defined as equity earnings divided by net worth) under the two capital structures, A and 8, would be as shown in Exhibit graphically the relationship is shown in Exhibit

| | Capital Structure A | | | | | Capital Structure B | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ROI | 5% | 10% | 15% | 20% | 25% | 5% | 10% | 15% | 20% | 25% |
| EBIT (Rs in million) | 5 | 10 | 15 | 20 | 25 | 5 | 10 | 15 | 20 | 25 |
| Interest | 0 | 0 | 0 | 0 | 0 | 5 | 5 | 5 | 5 | 5 |
| ·Profit after tax | 5 | 10 | 15 | 20 | 25 | 0 | 5 | 10 | 15 | 20 |
| Tax | 2.5 | 5 | 7.5 | 10 | 12.5 | 0 | 2.5 | 5 | 7.5 | 10 |
| Profit after tax | 2.5 | 5 | 7·5 | 10 | 12.5 | 0 | 2.5 | 5 | 7.5 | 10 |
| Return an equity | 2.5% | 5% | 7.5% | 10% | 12.5% | 0% | 5% | 10% | 15% | 20% |

Relationship between ROI and ROE Under Alternative Capital Structure




Looking at' the relationship between ROI and ROE we find that:

1. The ROE under capital structure A is higher than the ROE under capital structure B when ROI is less than the cost of debt.
2. The ROE under the two capital structures is the same when ROI is equal to the cost of debt. Hence the indifference (or breakeven) value of ROI is equal to the cost of debt.
3. The ROE under capital structure B is higher than the ROE under capital structure A when ROI is more than the cost of debt.

## Mathematical Relationship

The influence of ROI and financial leverage on ROE is mathematically as follows:

$$ROE = [ROI + (ROI - r) D/E] (1 - t)$$

where ROE = return on equity

ROI = return on investment

r = cost of debt

D/E = debt-equity ratio

t = tax rate

Applying the above equation to Korex Limited when its D/E ratio is 1, we may calculate the value of ROE for two values of ROI, namely, 15 per cent and 20 per cent.

ROI= 15%

ROE = 115 + (15 - 10) 1] (0.5)= 12·5%

ROI = 20 per cent

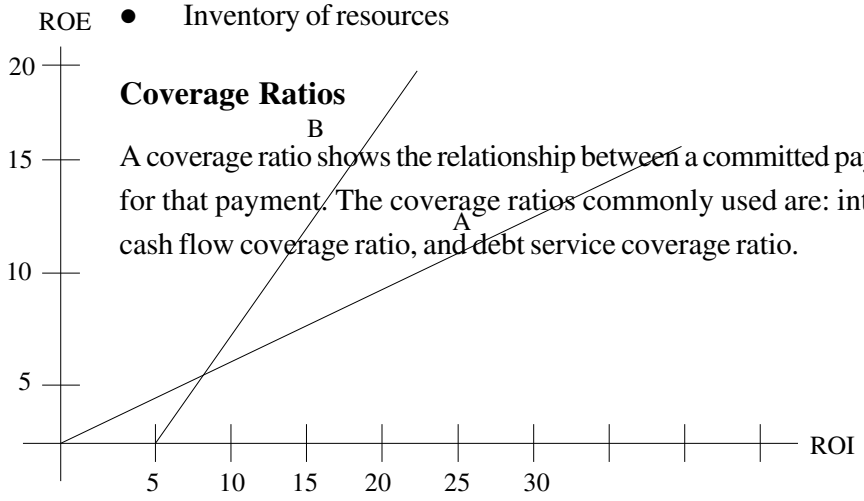
ROE = [20 + (20 - 10) 1] (Q.5) = 15.0%

These results, as expected, are in conformity with our earlier analysis.

## Assessment of Debt Capacity

Employment of debt capital entails two kinds of burden: interest payment and principal repayment. To assess a firm's debt capacity we lode at its ability to meet these committed paymens. This may be judged in terms of:

- Coverage ratios
- Coverage Ratios
- Inventory of resources




## Coverage Ratios

A coverage ratio shows the relationship between a committed payment and the source; for that payment. The coverage ratios commonly used are: interest coverage ratio, cash flow coverage ratio, and debt service coverage ratio.

Interest Coverage Ratio The interest coverage ratio (also referred to as the times interest earned ratio) is simply defined as:

$$\frac{\text{Earnings before interest and taxes}}{\text{Interest on debt}}$$

To illustrate, suppose the most recent earnings before interest and taxes (EBIT) for Vitrex Company were Rs. 120 million and the interest burden on all debt obligations were Rs. 20 million. The interest coverage ratio, therefore, would be 120/20 = 6. What does it imply? It means that even if EBIT drops by 83'h per cent, the earnings of Vitrex Company cover its interest payment.

Though somewhat commonly used, the interest coverage ratio has several deficiencies: (i) It concerns itself only with the interest burden, ignoring the principal repayment obligation. (ii) It is based on a measure of earnings, not a measure of cash flow. (iii) It is difficult to establish a norm for this ratio. How can we say that an interest coverage ratio of 2, 3, 4, or any other is adequate?

Cash Flow Coverage Ratio This may be defined as:

$$\frac{\text{EBIT} + \text{Depreciation} + \text{Other non} - \text{cash charges}}{\text{Interest on debt} + \dfrac{\text{Loan repayment instalment}}{(1 - \text{Tax rate})}}$$

To illustrate, consider a firm:

| | |
|---|---|
| Dcpreciation | Rs. 20 lakhs |
| EBIT | Rs. 120 lakhs |
| Interest on debt | Rs. 20 lakhs |
| Tax rate | 50% |
| Loan repayment instalment | Rs. 20 lakhs |

The cash flow coverage ratio for this firm is:

It may be noted that in calculating the cash flow coverage ratio the loan repayment amount in the denominator is adjusted upward for this tax factor because the loan repayment amount, unlike the interest, is not a tax-deductible payment.

The cash flow coverage ratio is a distinct improvement over the interest coverage ratio in measuring the debt capacity; it covers the debt' service burden fully and it focuses on

cash flows. However, it too is characterised by the problem of establishing a suitable norm for judging its adequacy.

Debt Service Coverage Ratio Financial institutions which provide the bulk of long-term debt finance judge the debt capacity of a firm in terms of its debt service coverage ratio. This is defined as:

$$\text{DSCR} = \sum_{i}^{n} \frac{\text{PAT}_i + \text{DEP}_i + \text{INT}_i}{\text{I}_i + \text{LR}_i} / n$$

where DSCR = debt service coverage ratio,

PAT, = profit after tax for year i

DEPi, = depreciation for year i

INTi = interest on ions-term loan for year i

LRIi = loan repayment instalment for year i

n = period of the loan

To illustrate the calcularion of debt service coverage ratio, consider a project with the following financial characteristics.

***(Rs. in lakhs)***

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Profit after tax | -2.0 | 10.0 | 20.0 | 25.0 | 30.0 | 40.0 | 40.0 | 50.0 | 55.0 | 55.0 |
| Depreciation | 12.0 | 10.8 | 9.72 | 8.75 | 7.87 | 7.09 | 6.38 | 5.74 | 5.17 | 4.65 |
| Interest on long-term loan | 17.6 | 17.6 | 17.05 | 14.85 | 12.65 | 10.45 | 8.25 | 6.05 | 3.85 | 1.65 |
| Loam repayment Instalment | - | - | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |

$$\text{DSCR} = \sum_{i=1}^{10} \frac{\text{PAT}_i + \text{DEP}_i + \text{INT}_i}{\text{INT}_i + \text{LRI}_i} / 10 = 19.65 / 10 = 1.965$$

Normally, financial institutions regard a debt service coverage ratio of 2 as satisfactory. If this ratio is significantly less than 2 and the project is otherwise desirable, a term loan of a longer maturity may be provided. By the same token, if this ratio is significantly more than 2, the maturity period of the loan may he shortened.

## Probability of Cash Insolvency

In assessing the debt capacity of a firm the key question is whether the probability of cash insolvency associated with a certain level of debt is acceptable to the management and not so much whether a particular coverage norm is satisfied. Gordon Donaldson, advocating the use of such an approach, has suggested that the analysis of debt capacity may broadly involve the following steps:

1. Determination of the tolerance limit on the probability of cash insolvency.
2. Specification of the probability distribution of cash flows under adverse conditions (recessionary conditions).
3. Calculation of the fixed charges associated with various levels of debt,
4. Estimation of the debt capacity of the firm as the highest level of debt which is acceptable, given the tolerance limit, the probability distribution, and the fixed charges defined above,

This kind of analysis may be illustrated with the help of information for Phoenix Limited which is given below:

Tolerance Limit The management of the company does not want the likelihood of cash insolvency to exceed 5 per cent even in adverse (recessionry) conditions.

Probability Distribution Under adverse (recessionry) conditions the company would have an expected cash inflow of Rs. 50 million with a standard deviation of Rs, 30 million. The cash inflow would be normally distributed. The initial cash balance of the company is Rs. 1.26 million.

Fixed Charges The annual fixed charges associated with various levels of debt would be as follows:

| **Level of Debt** | **Annual Fixed Charges** |
|---|---|
| Up to Rs. 5 million | Rs 0.25 million for every Rs 1 million of debt |
| Between Rs. 5 million and Rs. 10 million | Rs 0.26 million for every Rs. 1 million debt |
| Between Rs. 10 million and Rs. 15 million | Rs 0.27 million for every Rs. 1 million of debt. |

Debt Capacity Given the above information the debt capacity may be established as follows:

1. Since the cash inflow is normally distributed the following variable has a standard normal distribution (Z distribution):

$$\frac{\text{Cash inflow - Mean value of cash inflow}}{\text{Standard deviation of cash inflow}}$$

2. The Z value corresponding to 5 per cent cumulative probability (which reflects the risk tolerance of the management) is - 1.653
3. Since m = Rs. 50 million, s = Rs. 30 million, and the Z value corresponding to the risk tolerance limit is --1.645, the cash available from the operations of the firm to service the debt is equal to X: which is defined as:

$$\frac{X - 50}{30} = -1.645$$

This means X = Rs. 0.65 million

4. The total cash available for servicing the debt will be equal to:

   Rs 0.65 million (cash available from operations)

   Rs. 1.26 million (initial cash balance)

   = Rs. 1.91 million.

5. The level of debt that can be serviced with Rs. 1.91 million is as follows:

| **Amount** | **Annual fixed charges** |
|---|---|
| Rs. 5.00 million | 0.25 × 5.00 = Rs. 1.25 million |
| Rs. 2.54 million | 0.26 × 2.54 = Rs 0.06 million |
| Rs. 7.54 million | Rs. 1.91 million |

## Inventory of Resources

Normally, when a firm's debt capacity is being assessed, certain coverage ratios, as discussed above, are looked into. In addition, firms resorting to more sophisticated analysis try to estimate the likelihood of cash insolvency (or cash inadequacy under recessionary conditions for different levels of debt for establishing their? debt, capacity it would be helpful to supplement such analyses by estimating potential sources of liquidity available to the firm to meet possible cash drains. These sources, as suggested by Gordon Donaldson, may be divided into three categories:

**Uncommitted Reserves** These are reserves maintained primarily as an insurance against adverse developments and not earmarked for any specific purpose. Usually these reserves can be tapped at a relatively short notice.

**Reduction of Planned** Outlays Resources may be made available by effecting reductions and cuts in proposed outlays and disbursements. Typically such reductions and cuts, while they release resources, tend to impair the profitability

**Liquidation of Assets** In order to tide over an unmanageable drain of cash, the firm may raise resources by iiquidat;ng some of its assets.

Following Table drawn from an article written by Gordon Donaldson' shows the above mentioned categories along, with their subclassifications.

**Table: Inventory of Resources**

## Capital Structure Policies in Practice

There is clearly some value to debt financing, and firms use different amounts of debt depending on their tax rates, their asset structures, and their inherent riskiness.

Unfortunately, capital structure theory does not provide neat, clean answers to the question of the optimal capital structure. Thus, many factors must be considered when actually choosing a firm's target capital structure, and the final decision will be based on both analysis and judgement.

If a firm has perpetual cash flows, then a relatively simple model can be used to value the firm at different capital structures. In theory, this model can be used to find the capital structure that maximises the firm's stock price. However, the inputs to the model are very difficult, if not impossible, to estimate. Further, most firms are growing, so they do not have constant cash flows.

Since one cannot use only quantitative models to determine the optimal capital structure, managers must also consider such qualitative factors as long-run viability, managerial conservatism, lender institutions attitudes, reserve borrowing capacity, managerial constraints, control, asset structures, profitability and taxes.

Wide variations in capital structure exist, both across industries and among individual firms within industries. The variations across industries can be explained to a large extent by the economic fundamentals of the industry and the variations across companies in the same industry by their operating fundamentals and management decisions.

- Indian corporates employ substantial amount of debt in their capital structure in terms of the debt-equity ratio as well as total debt to total assets ratio. Nonetheless, the foreign controlled companies in India use less debt than the domestic companies. The dependence of the Indian corporate sector on debt as a source of finance has over the years declined particularly since the mid-nineties.
- The corporate enterprises in India seem to prefer long-term borrowings over short-term borrowings. Over the years, they seem to have substituted short-term debt for long-term debt. The foreign controlled companies use more long-term loans relatively to the domestic companies.
- As a result of debt-dominated capital structure, the Indian corporates are exposed to a very high degree of total risk as reflected in high degree of operating leverage and financial leverage and, consequently, are subject to a high cost of financial distress which includes a broad spectrum of problems ranging from relatively minor liquidity shortages to extreme cases of bankruptcy. The foreign controlled companies, however, are exposed to lower overall risk as well as financial risk.
- The debnt service capacity of the sizeable segment of the corporate borrower as measure by (i) interest coverage ratio and (ii) debt service coverage ratio is inadequate and unsatisfactory.
- Retained earnings are the most favoured source of finance. There is significant difference in the use of internally generated funds by the highly profitable corporates relative to the low profitable firms. The low profitable firms use different form of debt funds more than the highly profitable firms.
- Loan from financial institutions and private placement of debt are the next most widely used source of finance. The large firms are more likely to issue bonds in the market than small corporates.
- The hybrid securities is the least popular source of finance amongst corporate India. They are more likely to be used by low growth firms. Preference shares are used more by public sectors units and low growth corporates.