# Capital Structure

Capital Structure is the proportion of debt, preference and equity capitals in the total financing of the firm's assets. The main objective of financial management is to maximize the value of the equity shares of the firm. Given this objective, the firm has to choose that financing mix/capital structure that results in maximizing the wealth of the equity shareholders. Such a capital structure is called as the optimum capital structure. At the optimum capital structure, the weighted average cost of capital would be the minimum. The capital structure decision influences the value of the firm through its cost of capital and can affect the share of the earnings that pertain to the equity shareholders.

The following points will highlight the top three theories of capital structure.

Capital Structure Theory

1. Net Income (NI) Approach:

According to NI approach a firm may increase the total value of the firm by lowering its cost of capital.

When cost of capital is lowest and the value of the firm is greatest, we call it the optimum capital structure for the firm and, at this point, the market price per share is maximised.

The same is possible continuously by lowering its cost of capital by the use of debt capital. In other words, using more debt capital with a corresponding reduction in cost of capital, the value of the firm will increase.

The same is possible only when:

(i) Cost of Debt ($K_d$) is less than Cost of Equity ($K_e$);

(ii) There are no taxes; and

(iii) The use of debt does not change the risk perception of the investors since the degree of leverage is increased to that extent.

Since the amount of debt in the capital structure increases, weighted average cost of capital decreases which leads to increase the total value of the firm. So, the increased amount of debt with constant amount of cost of equity and cost of debt will highlight the earnings of the shareholders.

Illustration 1:

X Ltd. presents the following particulars:

EBIT (i.e., Net Operating income) is Rs. 30,000;

The equity capitalisation ratio (i.e., cost of equity) is 15% ($K_e$);

Cost of debt is 10% ($K_d$);

Total Capital amounted to Rs. 2,00,000.

Calculate the cost of capital and the value of the firm for each of the following alternative leverage after applying the NI approach.

Leverage (Debt to total Capital) 0%, 20%, 50%, 70% and 100%.

**Solution :**

**Statement Showing the Cost of Capital and the Value of the Firm**

| Degree of Leverage | 0 | 0.2 | 0.5 | 0.7 | 1.0 |
|---|---|---|---|---|---|
| | Rs. | Rs. | Rs. | Rs. | Rs. |
| Equity Capital | 2,00,000 | 1,60,000 | 1,00,000 | 60,000 | — |
| Debt Capital | — | 40,000 | 1,00,000 | 1,40,000 | 2,00,000 |
| Total | 2,00,000 | 2,00,000 | 2,00,000 | 2,00,000 | 2,00,000 |
| EBIT @ 15% | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 |
| Less : Interest on Debt | — | 4,000 | 10,000 | 14,000 | 20,000 |
| Earnings to Equity | 30,000 | 26,000 | 20,000 | 16,000 | 10,000 |
| Market Value of Debt | — | 40,000 | 1,00,000 | 1,40,000 | 2,00,000 |
| Market Value of Equity | | | | | |
| Earnings $\left(\dfrac{Earnings}{K_e}\right)$ | 2,00,000 | 1,73,333 | 1,33,333 | 1,06,667 | 66,667 |
| Total Value of the firm | 2,00,000 | 2,13,333 | 2,33,333 | 2,46,667 | 2,66,667 |

**Thus,**

| | 0 | 0.2 | 0.5 | 0.7 | 1.0 |
|---|---|---|---|---|---|
| Cost of Debt $(K_d)$ — Given | 10% | 10% | 10% | 10% | 10% |
| Cost of Equity $(K_e)$ — Given | 15% | 15% | 15% | 15% | 15% |
| Average Cost of Capital $\left(\dfrac{T}{V}\right)$ | 30% | 28% | 25% | 23% | 20% |

**Workings :**

Average Cost of Capital is computed as under (under various financing plans) :

$$K_w = \left(\frac{T}{V}\right)K_d + \left(\frac{S}{V}\right)K_e, \text{ substituting the values :}$$

(i) When leverage is 0

$K_w = 0 \times 10 + 2 \times 15 = 30\%$

(ii) When leverage is 0.2

$K_w = .4 \times 10 + .16 \times 15 = 28\%$

(iii) When leverage is 0.5

$K_w = .10 \times 10 + .10 \times 15 = 25\%$

(iv) When leverage is 0.7

$K_w = .14 \times 10 + .6 \times 15 = 23\%$

(v) When leverage is 1

$K_w = .20 \times 10 + 0 \times 15 = 20\%$

From the above table it is quite clear that the value of the firm (V) will be increased if there is a proportionate increase in debt capital but there will be a reduction in overall cost of capital. So, Cost of Capital is increased and the value of the firm is maximum if a firm uses 100% debt capital.

It is interesting to note the NI approach can also be graphically presented as under (with the help of the above illustration):
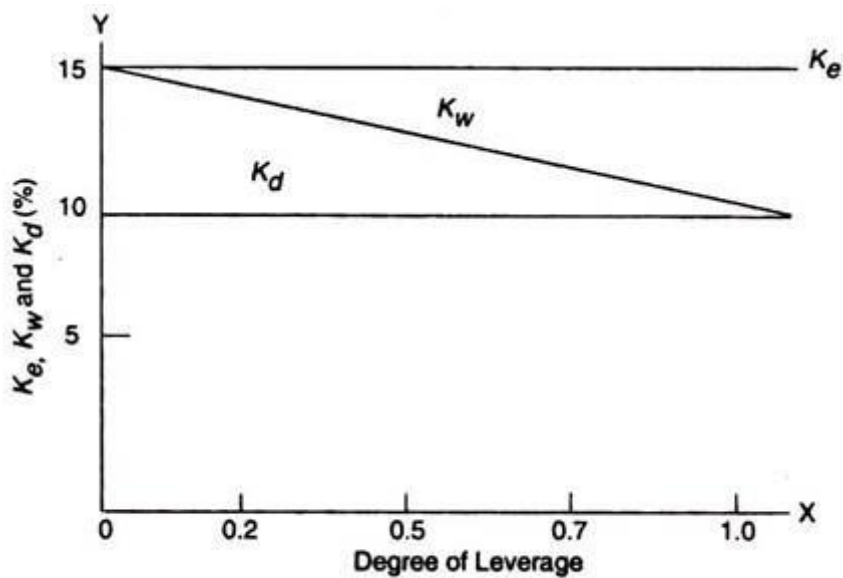
**Fig. 2.1 : Behaviour of $K_e$, $K_w$ and $K_d$ as per Net Income Approach**

The degree of leverage is plotted along the X-axis whereas $K_e$, $K_w$ and $K_d$ are on the Y-axis. It reveals that when the cheaper debt capital in the capital structure is proportionately increased, the weighted average cost of capital, $K_w$, decreases and consequently the cost of debt is $K_d$.

Thus, it is needless to say that the optimal capital structure is the minimum cost of capital if financial leverage is one; in other words, the maximum application of debt capital.

The value of the firm (V) will also be the maximum at this point.

 2. Net Operating Income (NOI) Approach:

Now we want to highlight the Net Operating Income (NOI) Approach which was advocated by David Durand based on certain assumptions.

They are:

(i) The overall capitalisation rate of the firm $K_w$ is constant for all degree of leverages;

(ii) Net operating income is capitalised at an overall capitalisation rate in order to have the total market value of the firm.

Thus, the value of the firm, V, is ascertained at overall cost of capital ($K_w$):

$V = EBIT/K_w$ (since both are constant and independent of leverage)

(iii) The market value of the debt is then subtracted from the total market value in order to get the market value of equity.

$S – V – T$

(iv) As the Cost of Debt is constant, the cost of equity will be

$K_e = EBIT – I/S$

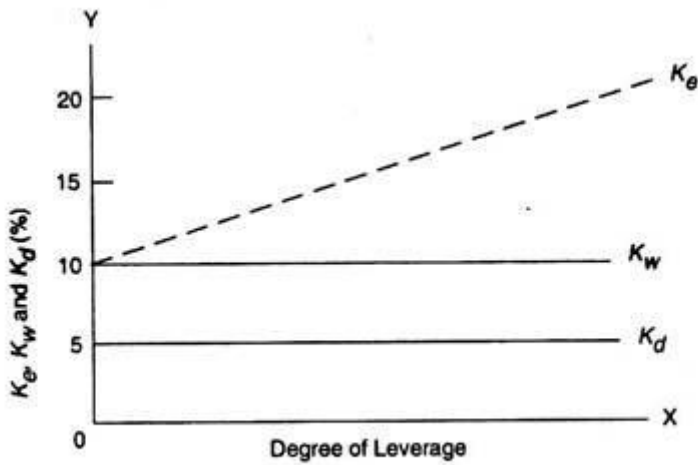The NOI Approach can be illustrated with the help of the following diagram:

**Fig. 2.2 : Behaviours of $K_e$, $K_w$ and $K_d$ under Net Operating Income Approach**

Under this approach, the most significant assumption is that the $K_w$ is constant irrespective of the degree of leverage. The segregation of debt and equity is not important here and the market capitalises the value of the firm as a whole.

Thus, an increase in the use of apparently cheaper debt funds is offset exactly by the corresponding increase in the equity- capitalisation rate. So, the weighted average Cost of Capital $K_w$ and $K_d$ remain unchanged for all degrees of leverage. Needless to mention here that, as the firm increases its degree of leverage, it becomes more risky proposition and investors are to make some sacrifice by having a low P/E ratio.

**Illustration 2:**

**Assume:**

Net Operating Income or EBIT Rs. 30,000

Total Value of Capital Structure Rs. 2,00,000.

Cost of Debt Capital $K_d$ 10%

Average Cost of Capital $K_w$ 12%

Calculate Cost of Equity, $K_e$: value of the firm V applying NOI approach under each of the following alternative leverages:

Leverage (debt to total capital) 0%, 20%, 50%, 70%, and 100%

**Solution :**

## Statement Showing the Cost of Equity and the Value of the Firm

| Degree of Leverage | 0 | 0.2 | 0.5 | 0.7 | 1.0 |
|---|---|---|---|---|---|
| | Rs. | Rs. | Rs. | Rs. | Rs. |
| Equity Capital | 2,00,000 | 1,60,000 | 1,00,000 | 60,000 | — |
| Debt Capital | — | 40,000 | 1,00,000 | 1,40,000 | 2,00,000 |
| Total | 2,00,000 | 2,00,000 | 2,00,000 | 2,00,000 | 2,00,000 |
| EBIT | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 |
| Less : Interest on Debt Capital (10%) | — | 4,000 | 10,000 | 14,000 | 20,000 |
| Earnings to Equity | 30,000 | 26,000 | 20,000 | 16,000 | 10,000 |
| Value of firm (V) $V = \dfrac{EBIT}{K_w}$ | 2,50,000 | 2,50,000 | 2,50,000 | 2,50,000 | 2,50,000 |
| Less : Value of Debt (T) | — | 40,000 | 1,00,000 | 1,40,000 | 2,00,000 |
| Value of Equity (S) | 2,50,000 | 2,10,000 | 1,50,000 | 1,10,000 | 50,000 |
| **Thus,** | | | | | |
| $(K_d)$ Given | 10% | 10% | 10% | 10% | 10% |
| $(K_e)$ Given | 12% | 12% | 12% | 12% | 12% |
| $(K_e)\left(\dfrac{EBIT}{S}\right)$ | 12% | 12.4% | 13.3% | 14.5% | 20% |

Leverage (debt to total capital) 0%, 20%, 50%, 70%, and 100%

**Solution :**

## Statement Showing the Cost of Equity and the Value of the Firm

| Degree of Leverage | 0 | 0.2 | 0.5 | 0.7 | 1.0 |
|---|---|---|---|---|---|
| | Rs. | Rs. | Rs. | Rs. | Rs. |
| Equity Capital | 2,00,000 | 1,60,000 | 1,00,000 | 60,000 | — |
| Debt Capital | — | 40,000 | 1,00,000 | 1,40,000 | 2,00,000 |
| Total | 2,00,000 | 2,00,000 | 2,00,000 | 2,00,000 | 2,00,000 |
| EBIT | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 |
| Less : Interest on Debt Capital (10%) | — | 4,000 | 10,000 | 14,000 | 20,000 |
| Earnings to Equity | 30,000 | 26,000 | 20,000 | 16,000 | 10,000 |
| Value of firm (V) $V = \dfrac{EBIT}{K_w}$ | 2,50,000 | 2,50,000 | 2,50,000 | 2,50,000 | 2,50,000 |
| Less : Value of Debt (T) | — | 40,000 | 1,00,000 | 1,40,000 | 2,00,000 |
| Value of Equity (S) | 2,50,000 | 2,10,000 | 1,50,000 | 1,10,000 | 50,000 |
| **Thus,** | | | | | |
| $(K_d)$ Given | 10% | 10% | 10% | 10% | 10% |
| $(K_e)$ Given | 12% | 12% | 12% | 12% | 12% |
| $(K_e)\left(\dfrac{EBIT}{S}\right)$ | 12% | 12.4% | 13.3% | 14.5% | 20% |

Although the value of the firm, Rs. 2,50,000 is constant at all levels, the cost of equity is increased with the corresponding increase in leverage. Thus, if the cheaper debt capital is used, that will be offset by the increase in the total cost of equity $K_e$, and, as such, both $K_e$ and $K_d$ remain unchanged for all degrees of leverage, i.e. if cheaper debt capital is proportionately increased and used, the same will offset the increase of cost of equity.

3. Traditional Theory Approach:

It is accepted by all that the judicious use of debt will increase the value of the firm and reduce the cost of capital. So, the optimum capital structure is the point at which the value of the firm is highest and the cost of capital is at its lowest point. Practically, this approach encompasses all the ground between the Net Income Approach and the Net Operating Income Approach, i.e., it may be called Intermediate Approach.

The traditional approach explains that up to a certain point, debt-equity mix will cause the market value of the firm to rise and the cost of capital to decline. But after attaining the optimum level, any additional debt will cause to decrease the market value and to increase the cost of capital.

In other words, after attaining the optimum level, any additional debt taken will offset the use of cheaper debt capital since the average cost of capital will increase along with a corresponding increase in the average cost of debt capital.

Thus, the basic proposition of this approach is:

(a) The cost of debt capital, $K_d$, remains constant more or less up to a certain level and thereafter rises.

(b) The cost of equity capital $K_e$, remains constant more or less or rises gradually up to a certain level and thereafter increases rapidly.

(c) The average cost of capital, $K_w$, decreases up to a certain level remains unchanged more or less and thereafter rises after attaining a certain level.

The traditional approach can graphically be represented under taking the data from the previous illustration:
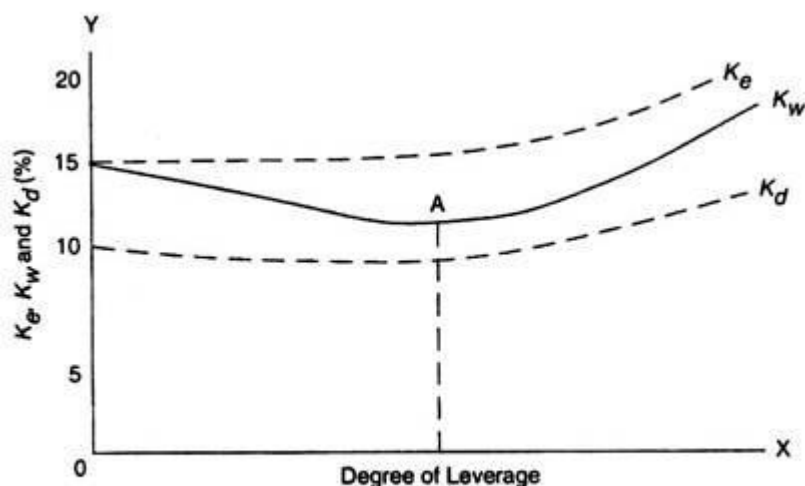


Fig. 2.3 : Behaviour of $K_e$, $K_w$ and $K_d$ under Traditional Approach

It is found from the above that the average cost curve is U-shaped. That is, at this stage the cost of capital would be minimum which is expressed by the letter 'A' in the graph. If we draw a perpendicular to the X-axis, the same will indicate the optimum capital structure for the firm.

Thus, the traditional position implies that the cost of capital is not independent of the capital structure of the firm and that there is an optimal capital structure. At that optimal structure, the marginal real cost of debt (explicit and implicit) is the same as the marginal real cost of equity in equilibrium.

For degree of leverage before that point, the marginal real cost of debt is less than that of equity beyond that point the marginal real cost of debt exceeds that of equity.

Illustration 3:

EBIT

| | |
|---|---|
| Total Value | Rs. 30,000 |
| Capital Structure | Rs. 2,00,000 |

| Cost of Equity | | Cost of Debt | |
|---|---|---|---|
| Up to Rs. 1,00,000 | @ 15% | Up to Rs. 1,00,000 | @ 10% |
| Between Rs. 1,00,000 and Rs. 1,50,000 | @ 18% | Between Rs. 1,00,000 and Rs. 1,50,000 | @ 12% |
| Between Rs. 1,50,000 and Rs. 2,00,000 | @ 20% | Between Rs. 1,50,000 and Rs. 2,00,000 | @ 15% |

Calculate the cost of capital and the value of the firm under each of the following alternative degrees of leverage and comment on them:

Leverage : $\left(\dfrac{\text{Debt}}{\text{Total Capital}}\right)$ = 0%, 20%, 50%, 70%, 100%.

**Solution :**

### Statement Showing the Cost of Capital and the Value of the Firm

| Leverage | 0 | 0.2 | 0.5 | 0.7 | 1.0 |
|---|---|---|---|---|---|
| Given — | | | | | |
| $K_d$ | 10% | 10% | 10% | 12% | 15% |
| $K_e$ | 15% | 15% | 15% | 18% | 20% |
| $K_w = \left(\dfrac{T}{V}\right)K_d + \left(\dfrac{S}{V}\right)K_e$ | 30%* | 28% | 25% | 27.6% | 30% |
| EBIT | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 |
| Less : Interest on Debt ($K_d \times T$) | — | 4,000 | 10,000 | 16,800 | 30,000 |
| Earnings to Equity (EBIT – I) | 30,000 | 26,000 | 20,000 | 13,200 | — |
| Amount to Debt (T) | — | 40,000 | 1,00,000 | 1,40,000 | 2,00,000 |
| Value of Equity  S = $\left(\dfrac{EBIT}{K_e}\right)$ = | 2,00,000 | 1,73,333 | 1,33,333 | 73,333 | — |
| Total Value of the firm (V = T + S) | 2,00,000 | 2,13,333 | 2,33,333 | 2,13,333 | 2,00,000 |

* (i) When financing leverage is 0

$$K_w = \left(\frac{T}{V}\right)K_d + \left(\frac{S}{V}\right)K_e$$

= .0 × 10 + 2 × 15

= 30%

(ii) When financing leverage is .2

= .4 × 10 + .16 × 15 = 28%

(iii) When financing leverage is .5

= .10 × 10 + .10 × 15 = 25%

(iv) When financing leverage is .7

= .14 × 12 + .6 × 18 = 27.6%

(v) When financing leverage is 1.0

= 2.0 × 15 + 0 × 20 = 30%

Thus, from the above table, it becomes quite clear the cost of capital is lowest (at 25%) and the value of the firm is the highest (at Rs. 2,33,333) when debt-equity mix is (1,00,000 : 1,00,000 or 1: 1). Hence, optimum capital structure in this case is considered as Equity Capital (Rs. 1,00,000) and Debt Capital (Rs. 1,00,000) which bring the lowest overall cost of capital followed by the highest value of the firm.

*Variations on the Traditional Theory:*

This theory underlines between the Net Income Approach and the Net Operating Income Approach. Thus, there are some distinct variations in this theory. Some followers of the traditional school of thought suggest that $K_e$ does not practically rise till some critical conditions arise. Only after attaining that level the investors apprehend the increasing financial risk and penalise the market price of the shares. This variation expresses that a firm can have lower cost of capital with the initial use of leverage significantly.

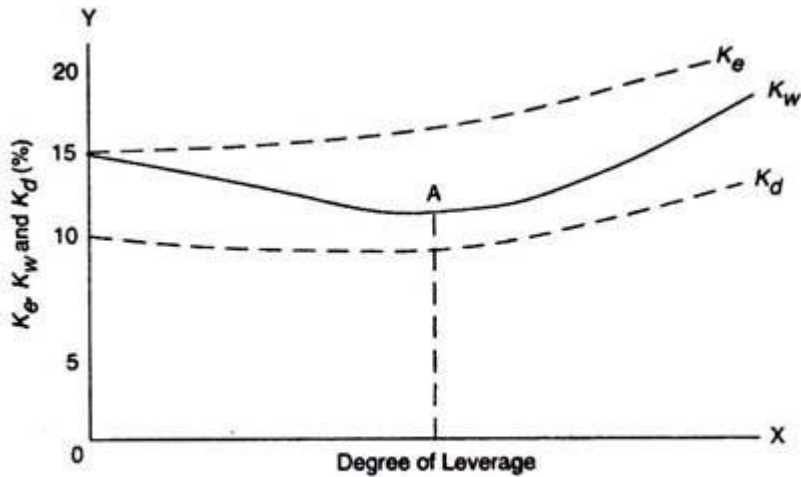This variation in Traditional Approach is depicted as:



Fig. 2.4 : Behaviour of $K_e$, $K_w$ and $K_d$ under variation of
Traditional Approach (when $K_e$ constant at first)

Other followers e.g., Solomon, are of opinion the $K_e$ is being saucer-shaped along with a horizontal middle range. It explains that optimum capital structure has a range where the cost of capital is rather minimised and where the total value of the firm is maximised. Under the circumstances a change in leverage has, practically, no effect on the total firm's value. So, this approach grants some sort of variation in the optimal capital structure for various firms under debt-equity mix.

Such variation can be depicted in the form of graphical representation:
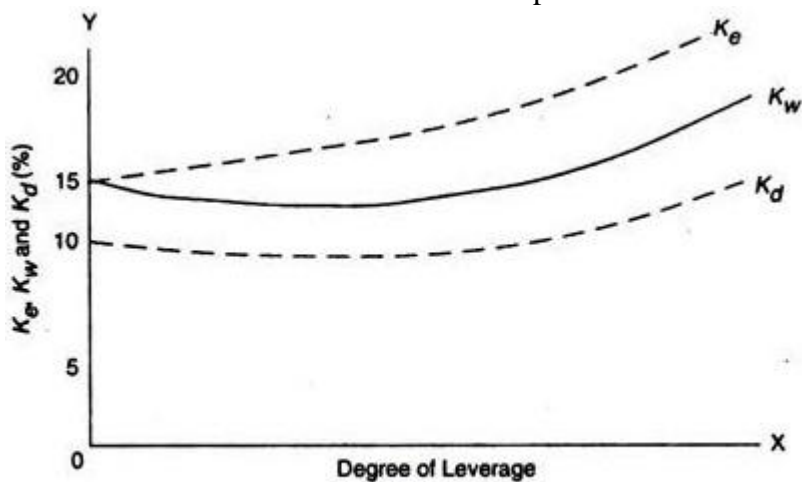


Fig. 2.5 : Behaviour of $K_e$, $K_w$ and $K_d$ under Saucer-Shaped
$K_e$ Curve of Traditional Approach