Chapter-3

Conceptual Framework
3.0. INTRODUCTION

In the last chapter we have discussed the review of literature of financial structure, productivity and the studies which tried to relate financial structure and productivity. On the basis of review of literature we have framed our conceptual framework for the thesis. The conceptual framework has been divided into four parts:

1. Productivity
2. Financial structure based on the theory of finance
3. Final concept to relate the theory of production and finance theory
4. Conclusion

3.1. PRODUCTIVITY

We assume that production takes place through **Cobb-Douglas technology**. The function for the standard form for production of a good with 2 factors is:

\[ Y = A L^\alpha K^\beta \]  

where:

- \( Y \) = Real Value Added
- \( L \) = Labour input
- \( K \) = Capital input
- \( A \) = Total factor productivity

\( \alpha \) and \( \beta \) are the output elasticities of labour and capital, respectively. These values are constants determined by available technology.

Further, if \( \alpha + \beta = 1 \), the production function has constant returns to scale.

If \( \alpha + \beta < 1 \), the returns to scale are decreasing.

If \( \alpha + \beta > 1 \), the returns to scale are increasing.

In the case of a C-D function, constant returns to scale operate by definition. Therefore, the alternative formulation of C-D function is:
A. Technology

\[ Q = A \frac{L^\alpha K^\beta}{L} \]  \hspace{1cm} ...\( (2) \)

\[ \frac{Q}{L} = A \frac{L^\alpha K^\beta}{L} \]  \hspace{1cm} ...\( (3) \)

\[ \frac{Q}{L} = A L^{\alpha-1} K^\beta \]  \hspace{1cm} ...\( (4) \)

\[ \frac{Q}{L} = A \frac{K^\alpha}{L^{1-a}} \]  \hspace{1cm} ...\( (5) \)

Labour Productivity = \( A \left( \frac{K}{L} \right)^\beta \)  \hspace{1cm} ...\( (6) \)

In other words, with a given C-D function, with CRS (constant returns to scale) the average productivity of labour is positively related to technology (K/L). This implies that with a given technology, only a certain number of workers can combine with the given capital employed. Since Q/L is fixed for a given technology, we cannot expect value added to grow in greater proportion than what is prescribed by the given technology.

B. Factor Allocation

Technology is defined as K/L ratio. The output is limited by the cost constraint. Ideally, the total cost of inputs given by the iso-cost line is a constraint that does not permit the output to increase beyond the level given by K/L ratio and the resources employed according to the factor mix. Technology is defined as a ray from the origin in the production. As K/L increases, for a given iso-quant of production, the slope of the iso-quant rises. The slope represents the factor price ratio. Factors of production are allocated by the principle:

\[ \frac{MP_K}{P_K} = \frac{MP_L}{P_L} \]  \hspace{1cm} ...\( (7) \)

\[ \frac{MP_L}{MP_K} = \frac{P_L}{P_K} \]  \hspace{1cm} ...\( (8) \)

As technology improves from \( \frac{K^1}{L^1} \) to \( \frac{K}{L} \) the output per worker improves or labour is displaced for maintaining the same level of output. This would happen only if the
factor price of labour rises. Thus $\text{MRS}_{L,K}$ rises and equilibrium shifts from ‘a’ to ‘b’ as shown in Figure 3.1:

![Figure 3.1: Technology and Productivity](image_url)

Labour is displaced from $L_1$ to $L_0$ because labour is costlier and the equilibrium shifts from ‘a’ to ‘b’. Since the output is the same, being on the same isoquant, the labour productivity is now higher. This shows that as the embodied technological progress takes place and labour productivity increases.

**C. Single Factor Productivity**

Factor remuneration and productivity are closely related through the principle of factor allocation. Production is based on the choice of employing factors of production. This is done with the help of marginal productivity and marginal factor cost. Marginal productivity moves in the same direction as average productivity or single factor productivity. There are two measures of single factor productivity (SFP):

i. $\frac{\text{Real Value Added}}{\text{Units of Labour}} = \text{Labour Productivity} = \frac{Q}{L}$ \hspace{1cm} ...(9)

ii. $\frac{\text{Real Value Added}}{\text{Units of Capital}} = \text{Capital Productivity} = \frac{Q}{K}$ \hspace{1cm} ...(10)
With the given technology (K/L) it is not possible to either increase the output or reduce the cost. Strictly speaking, if all the factors of production are paid according to their productivity or contribution, all the output is exhausted. Moreover, each factor of production is paid according to its contribution – marginal productivity (marginal revenue product). Under competitive conditions in the factor market, the average wage is equal to marginal wage (or marginal factor cost). Similarly, MR is equal to AR or Price. Hence,

\[ Aw \times F = \text{Total Input Cost} \] \hspace{1cm} \text{(11)}

where:

\( Aw \) = Average wage
\( F \) = number of units of factors.

\[ Q \times AR \ (or \ P) = \text{Total Value of Output} \] \hspace{1cm} \text{(12)}

If production is allocatively efficient, the total output is exhausted. In the case of 4 inputs, since other bought out inputs are included, \( Q \) is total output. Therefore, this applies to multi-factor C-D function as well. Strictly output cannot be greater than what the technology provides because with a given factor proportion and given factor prices, the total inputs are equal to real output.

**D. Total Factor Productivity**

Contrary to the above mentioned production theory which explains allocative efficiency based on a given embodied technology but in the real world productivity is affected and measured by another concept called ‘Total factor productivity’.

‘Total Factor Productivity (TFP) is the portion of output not explained by the amount of inputs used in production. As such, its level is determined by how efficiently and intensely the inputs are utilized in production’ Comin (2006).

As per our understanding of technology, production and factor allocation of all factors of production are paid according to their single factor productivities. And, if output cannot increase with a given technology and a corresponding level of factor inputs, then there can be no extra output, under the circumstances.
However, TFP or technical efficiency can be defined in two ways:-

i. The excess output generated by a given set of inputs, with a given technology.
ii. The resources saving or cost saving achieved for producing a given output with a given technology.

In the first case it can be captured through a production function and in the second case through a cost function. We chose the first definition because we are measuring it with a production function (C-D function). So far we have been arguing from the point of view of SPF or Q/L (Labour productivity). As the names suggest TFP is the contribution of all factors of production over and above what they are paid for. This excess output can be attributed to technology defusion, learning effect, adopting best practices of production, organisational efficiency, managerial efficiency and technical efficiency. In terms of a production function, it is the output or value added that is not explained by the sum of factor share, namely α and β.

E. Measurement of TFP

TFP of technical efficiency has the effect of lowering the average cost curve as shown in Figure 3.2.

![Figure 3.2: Effect of Technical Efficiency](image-url)
This implies that the same output is being produced by a lower implicit cost or a lesser use of inputs. If input use is being reduced with the same amount of output the productivity is increasing. Two things can be said:

i. In the extreme case if no inputs are used still there would be some output.

ii. This increased productivity is not due to any single factor but due to all factors of production.

Coming back to C-D function:

$$Q_t = A L^\alpha K^\beta$$  ...(13)

In the limiting case, with a given technology:

As $K$ and $L \to 0$

$Q_t \to A$

Therefore, $A$ is the residual output which is TFP.

Also,

$$\frac{Q_t}{(L^\alpha K^\beta)_t} = A$$  ...(14)

$A$ is the constant; therefore, it is the output to input ratio and measures technical efficiency or managerial efficiency. Alternatively, this can be seen as the effect of all omitted variables (technical efficiency etc.) TFP, therefore in a ‘catch – all – variable’. TFP can be measured in two ways.

At a point of time which shows static equilibrium and over a period of time which is TFP growth. With a given technology the static equilibrium is shown in Figure 3.3.

At ‘a’ 100 units of output are produced with $0L_1$ of labour and $0K_1$ of capital. When both inputs are doubled to $K_2$ and $L_2$ respectively, output doubles to 200, as per CRS assumption. The equilibrium conditions obtains:

$$MRS_{KL} = \frac{MRP_L}{MRP_K} = \frac{AW_L}{AW_K} = \frac{p_L}{p_K}$$  ...(15)

This implies that all the factor of production have been paid according to their contribution to output. Technical efficiency can be measured at a point of time in terms of resource savings as shown in Figure 3.4.
Figure 3.3: Equilibrium and Returns to Scale

Figure 3.4: Total Factor Productivity
The angle ‘n’ in Figure 3.4, represents given technology. Along this ray from the origin the output grows at equal units as the inputs grow in proportion. But extra output (105 units) are produced with the help of only $K_1 + L_1$ of inputs. The residual output can be seen as 5% extra output given the input use or it can be seen as 5% resource saving given 105 units as the fixed output. If the firm has established a better practice of technology, along with all unobservable factors that lead to overall efficiency, then in each year, this pattern of productivity will repeat.

When measured over period of time at each level of output, if there is a constant residual output then TFP would be growing at the rate of 5% per annum. This can be measured as follows:-

$$Q_t = e^{a+bt} L^a K^\beta$$  \hspace{1cm} (16)

We will measure TFP by the use of the above equation.

$Q$ = Real Value Added  
$L$ = Real Wages  
$K$ = Real Capital input  
$t$ = Time  
$\alpha$ = Elasticity of output w.r.t. Labour  
$\beta$ = Elasticity of output w.r.t. Capital  
$a$ = Technical Efficiency (We are using technical efficiency for the limiting case and TFP when it is generalized).  
$b$ = TFP Growth (ACGR)

Taking log on both sides and adding error term:

$$Log Q_t = A + bT + \alpha Log L_t + \beta Log K_t + U_t$$  \hspace{1cm} (17)

where  
$Log Q$ = Log of Real Value Added  
$Log L$ = Log of Real Wages  
$Log K$ = Log of Real Capital input  
$T$ = TFP  
$t$ = Time  
$U_t$ = Error term
If we dynamize the above equation, we will get:

\[
(\log Q_t) = \hat{\alpha} + b \cdot T + \alpha (\log L)_t + \beta (\log K)_t
\]  

...(18)

The error term \( U_t \) and ‘\( a \)’, the intercept, do not have any growth trend.

Hence, \( \hat{\alpha} \) is zero because total efficiency (as measured at a point of time) does not grow. But when it is measured over a period of time it grows at the rate (5%) per annum which is equal to ‘\( b \)’ (the coefficient of the time variable which grows by ‘1’ every year). Moreover, if TFP growth does not take place ‘\( b \)’ would not exist.

In simplified terms:

\[
(\log Q_t) - \left[ \alpha (\log L) + \beta (\log K) \right] = \text{‘}b\text{’}
\]  

...(19)

Therefore, ‘\( b \)’ = TFP growth (per annum)

F. Technological Progress

Technological progress could be embodied or disembodied. When it is embodied it arises out of a change in the technology (K/L) and as K/L ratio goes up as the productivity.

\[
\left( \frac{Q}{L} \right)_t = A \left( \frac{K}{L} \right)_t
\]  

...(20)

In the continuous measure:

\[
\left( \frac{Q}{L} \right)_t = A \left( \frac{K}{L} \right)_t
\]  

...(21)

Therefore, labour productivity is rising along with embodied technological progress. The technical progress is contained within the capital goods or fixed assets. Therefore, extra output is due to labour productivity does not come without an increase in both inputs. Only ‘K’ is growing faster than ‘L’. The additional output is not residual. Moreover, total efficiency factor ‘A’ is constant unlike the previous case where it is growing at the rate ‘\( b \)’. This alters allocative efficiency but does not affect Total efficiency as shown in Figure 3.1
Therefore, embodied technical progress does not lead to any residual output. It involves investment in capital goods. This implies that:

i. Disembodied technological progress or TFP growth leads to residual output, cash flow surpluses etc., without investment.

ii. Embodied technical progress involves investment and leads to reduction in the wage bill because labour productivity improves.

It is therefore clear that both ‘A’ (Technical efficiency) and ‘b’ (TFP growth) are parts of the same phenomenon and represents residual output. As such this output is not measurable ex-ante. It is in the nature of ‘unpaid’ services of both capital and labour. Since it cannot be measured ex-ante it cannot be paid for. It is therefore TFP growth is both ‘residual’ and ‘opaque’. The costing cannot be incorporated in the technology. It is therefore known as disembodied technological progress. In financial terms, the residual output gets added to the cash inflows but, since the TFP is ‘unpaid’ it is opaque.

Another dimension of technology is that it is an average technology. This applies both to the existing technology and the technical progress. At a point of time, when measured, some firms are able to practice the technology better. Such firms are known as frontier firms. The difference between the best practical technology and other firms is a measure of ‘Frontier Technical Inefficiency’. The C-D production function is good at measuring average technology.

The empirically measured TFP growth is also known as average measure. Individual firms can have either negative or positive TFP. The TFP measure could be large in magnitude or small. The empirical measure of TFP growth could bear either a negative sign or a positive one. Since the practices vary the ‘β’ would have a standard error which will be small or large, and hence, ‘β’ could be significant or insignificant.

This leads to all the given possibilities as shown in Tables 3.1 and 3.2:

<table>
<thead>
<tr>
<th>Table 3.1: Interpreting Coefficients by Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>TFP Large</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>Significant</td>
</tr>
<tr>
<td>Not Significant</td>
</tr>
</tbody>
</table>

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Table 3.2: Interpreting Coefficients by Value

<table>
<thead>
<tr>
<th>TFP Positive</th>
<th>TFP Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>+ + + +</td>
</tr>
<tr>
<td>Small</td>
<td>+ + +</td>
</tr>
</tbody>
</table>

The number of ‘X’ and ‘+’ indicate the desirability of the measured TFP growth.

Table 3.1, represents that the TFP coefficient, ‘x x x x’ is large as well as significant; therefore it is the best representative of TFP growth. If TFP coefficient is ‘x x x’, then it represents a smaller but significant value of TFP growth which is better than a not significant, positive TFP ‘x x’. TFP coefficient, ‘x’ is a poor indicator of TFP growth as the coefficient is small as well as not significant.

Table 3.2, represents 4 situations. The best one is when the TFP coefficient is positive as well as large, i.e. at ‘+ + + +’. It shows that without any increase in inputs the output is positively increasing. The next best option is a positive but small TFP coefficient, i.e. ‘+ + +’. After this a small and negative TFP coefficient ‘+ +’ is preferred over a large and negative TFP coefficient, as ‘+’ it represents decrease in output with the same level of inputs, which is basically negative TFP growth.

3.2. FINANCIAL STRUCTURE

Financing decision of a firm deals with the determination of capital and financial structures of that firm. Here, the composition of the capital structure and financial structure is the vital one. Capital and financial structures of a firm may be composed of:

i. Equity capital – internal and external
ii. Preferred capital
iii. Debt capital – short-term and long-term

Financial structure is the left side of a firm’s balance sheet detailing how its assets are financed, including debt and equity issues.
Also, financial structure is the way in which a company’s assets are financed, such as short term borrowings, long term debt, and owner’s equity.

“Capital structure is the composition of debt and equity securities that comprises a firm’s financing of its assets.” J.J. Hampton.

The Major distinctions between Capital Structure and Financial Structure are as under:

A. Capital Structure

Capital structure represents only the permanent (long-term) source of financing and excludes the short term sources of financing, i.e. current liabilities are not included in it. The cost of capital is determined by capital structure. It is limited in scope as compared to financial structure. It is basically a part of total financing and not the whole financing.

B. Financial Structure

Financial structure represents both the permanent (long-term) and temporary (short-term) sources of financing, i.e. current liabilities are included in it. It is wider in scope and includes the total/whole financing.

C. Characteristics of Financial Structure

i. It is a mixture of both debt and equity
ii. It is the composition of retained earnings, debenture, preferred share, ordinary shares and short term borrowings.
iii. Long-term and short term capital is included in it.

D. Features of Optimal Financial Structure

The features of an optimal financial structure differ from firm to firm, depending on the nature, size, products and markets, environments, specific and general etc. The general broad features are as under:

i. Profitability: Within the constraints, maximum use of leverage at a minimum cost should be made.
ii. Solvency: The excessive use of debt threatens the solvency of the company. If the cost of debt is relatively high, then the debt should be avoided.
iii. Flexibility: It should be flexible so that the company can change it to finance its profitable activities or to meet the changing conditions.

iv. Control: The financial structure should involve minimum risk of loss of control of the company.

E. Theories of Financial

The interest in the financial structure has been driven by the existing theory of finance which is discussed as under:

a. Net Income Approach

According to the Net Income (NI) approach, suggested by Durand (1952), the capital structure decision is relevant to the valuation of the firm. In other words, a change in the financial leverage will lead to a corresponding change in the overall cost of capital as well as the total value of the firm. If, therefore, the degree of financial leverage as measured by the ratio of debt to equity is increased, the weighted average cost of capital will decline, while the value of the firm as well as the market price of ordinary share will increase. Conversely, a decrease in the leverage will cause an increase in the overall cost of capital and a decline, both in the value of the firm as well as the market price of equity shares.

The NI approach to valuation is based on three assumptions:

i. There are no taxes.

ii. The cost of debt is less than the equity-capitalization rate or the cost of equity.

iii. The use of debt does not change the risk perception of investors.

This means that the financial risk perception of the investors does not change with the introduction of debt or change in leverage that implies that due to change in leverage, there is no change in either the cost of debt or the cost of equity. The implication of the three assumptions underlying is, debt in the capital structure increases and as a result, the weighted average cost of capital tends to decline, leading to and increases in the total value of the firm. Thus, with the cost of debt and cost of equity being constant, the
increased use of debt (increase in leverage), will magnify the shareholder’s earnings and, thereby, the market value of the ordinary shares.

The financial leverage is, according to the NI approach, an important variable to the capital structure of a firm. With a judicious mixture of debt and equity, a firm can evolve an optimum capital structure which will be the one in which value of the firm is the highest and the overall cost of capital is the lowest and it would lead to the maximum market price per share.

The significant conclusion, therefore, of the NI approach is that if the firm uses no debt or if the financial leverage is zero, the overall cost of capital will be equal the equity-capitalization rate. The weighted average cost of capital will decline and will approach the cost of debt as the degree of leverage reaches one.

**b. Net Operating Income (NOI) Approach**

Another theory of capital structure, suggested by Durand (1959), is the Net Operating Income (NOI) approach. This approach is diametrically opposite to the NI approach. The essence of this approach is that the capital structure decision of a firm is irrelevant. Any change in leverage will not lead to any change in the total value of the firm and the market price of shares as well as the overall cost of capital is independent of the degree of leverage.

This NOI approach is based on the proposition that the overall cost of capital/capitalization rate ($K_O$) is constant.

The NOI approach to valuation argues that the overall capitalization rate ($K_O$) of the firm remains constant, for all degrees of leverage. The value of the firm ($V_F$), given the level of earnings before interest and taxes (EBIT), is determined by the following equation:

$$V_F = \frac{EBIT}{K_O}$$  \hspace{1cm} (22)

In order words, the market evaluates the firm as a whole. The split of the capitalization between debt and equity is, therefore, not significant.
Residual Value of Equity

The value of equity (S) is a residual value, which is determined by deducting the total value of debt (D) from the total value of the firm (V_F). Symbolically, total market value of equity capital is:

\[ S = V_F - D \] \hspace{1cm} \text{(23)}

Changes in Cost of Equity Capital

The equity-capitalization rate/cost of equity capital (K_S) increases with the degree of leverage. The increase in the proportion of debt in the capital structure relative to equity shares would lead to an increase in the financial risk to the ordinary shareholders. To compensate for the increased risk, the shareholders would expect a higher rate of return on their investments. The increase in the equity-capitalization rate (or the lowering of the price-earnings ratio, that is, P/E ratio) would match the increase in the debt-equity ratio. The K_S would be:

\[ K_S = K_O + (K_O - K_d) \left( \frac{P}{S} \right) \] \hspace{1cm} \text{(24)}

Where:
- K_d = Cost of debt.
- K_O = Overall Capitalization Rate.
- K_S = Cost of Equity Capital
- D = Value of Debt
- S = Value of Equity

Cost of Debt

The cost of debt has two parts:

i. Explicit cost which is represented by the rate of interest. Irrespective of the degree of leverage, the firm is assumed to be able to borrow at a given rate of interest. This implies that the increasing proportion of debt in the financial structure does not affect the financial risk of the lenders and they do not penalize the firm by charging higher interest.
ii. Implicit or ‘hidden’ cost. As shown in the assumption relating to the changes in 
Ks, increase in the degree of leverage or the proportion of debt to equity causes an 
increase in the cost of equity capital. This increase in Ks, being attributable to the 
increase in debt, is the implicit part of Kd.

Thus, the advantage associated with the use of debt, supposed to be a cheaper source of 
funds in terms of the explicit cost, is exactly neutralized by the implicit cost represented 
by the increase in Ks. As a result, the real cost of debt and the real cost of equity, 
according to the NOI approach, are the same and equal Ko. This implies that the total 
market value of the company is constant for all capitalization structures.

c. Traditional View of Capital Structure

The preceding discussions clearly show that the Net Income Approach (NI) as well as 
Net Operating Income (NOI) represents two extremes as regards the theoretical 
relationship between financing decisions as determined by the capital structure, the 
weighted average cost of capital and the total value of the firm. While the NI approach 
takes the position that the use of debt in the capital structure will always affect the 
overall cost of capital and the total valuation, the NOI approach argues that capital 
structure is totally irrelevant. The traditional approach is midway between the NO and 
NOI approaches. It is discussed as follows.

The traditional view of company capital structure suggests that the average cost of 
capital does depend on the level of gearing. The implication is that there is an individual 
company optimum level of gearing at which cost of capital will be minimized and the 
value of firm maximized.

The traditional view of the relationship between capital structure and the cost of capital 
is that the judicious mix of debt and equity capital can reduce the firm’s cost of capital, 
and that an optimum capital structure exists for every firm. When a company has both 
equity and debt in its capital structure, then the cost of capital can be expressed as a 
weighted average cost of capital where the cost of each type of capital in the company 
is weighted by its proportional value in the total value of the company. This is normally 
expressed as follows:

\[
K_o = \frac{K_s}{S+D} S + \frac{K_d}{S+D} D
\]

...(25)
The above formula does not consider taxation and if this is to be taken into account then the after tax cost of debt should be sued in the calculation. This would be $K_d \times (1-t)$ where $t$ is the rate of corporation tax. The traditional view of capital structure was that as the level of gearing increased over moderate debt ranges, the average cost of capital fell because of the lower cost of debt capital compared with equity capital. It was assumed that moderate amounts of debt did not add significantly to the risks attached to holding equity, so that initially the company would not have to offer higher returns to its equity shareholders. This would cause the weighted average cost of capital to decline, thus increasing the value of company. As the proportion of debt in the capital structure rises, two things happen: first, the equity shareholders realize that their investment is becoming riskier and therefore, demand a higher rate of return from the company and secondly, lenders advancing money to an already geared company will also recognize increasing risk on their investment as the level of gearing rises and expect a higher rate of return on succeeding trenches of debt advanced. The result of this on the cost of capital is that the increasing cost of both debt and equity will end to cancel out the advantage gained by substituting lower cost debt for equity. Thus, although traditionalists claim that overall cost of capital is initially reduced by introducing debt into the capital structure, it is recognized that as the level of debt increases the total cost of capital no longer decreases and eventually starts to rise again at higher levels of debt.

Several writers have expressed doubts about the logic of the traditional view and the associated thesis that a change in leverage in itself can increase a firms’ total market value or reduce its overall cost of capital. According to Durand’s (1959) position and NOI approach to valuation which he advocates, a change in leverage can only change the way in which operating earnings and the attendant uncertainty of these earnings is distributed between the bondholders and owners: it cannot change the total amount of uncertainty. And since the market value of a company depends on these totals, leverage in itself cannot change total market value.

A vigorous denial of the traditional position leverage is that contained in an important and controversial paper by Modigliani-Miller (1958). Their conclusion is that, apart from tax considerations, financial structure, as such, has so influence whatever on a company’s cost of capital.
d. Modigliani and Miller (MM) Approach

MM demonstrated that it was the income generated by the firm from its business activities, which determined value, rather than the way in which this income was split between providers of capital under the following assumptions:

i. Perfect capital markets exist where individuals and companies can borrow unlimited amounts at the same rate of interest.

ii. There are no taxes or transaction costs.

iii. Personal borrowing is a perfect substitute for corporate borrowing.

iv. Firms exist with the same business or systematic risk but different levels of leverage.

v. All projects and cash flows relating thereto are perpetuities, and any debt borrowed is also perpetual.

If two firms with the same level of business risk but different levels of gearing sold for different values, then shareholders would move from the overvalued to the undervalued firm and adjust their level of borrowing through the market to maintain financial risk at the same level. In this way shareholders would increase their income while maintaining their net investment and risk at the same level. This process of arbitrage (Arbitrage mean the simultaneous buying and selling of essentially identical assets at different prices. The buying increases the price of undervalued asset, and the selling decreases the price of overvalued asset.) would drive the price of the two firms to a common equilibrium total value. The basic three propositions of the Modigliani Miller (1958) approach are as follow:

**Proposition I**

MM argue that, for firms in the same risk class, the total market value is independent of the debt – equity combination. Further, the market value of any firm is given by capitalizing its expected total earnings at the capitalization rate appropriate to an all equity company of that risk class. This proposition can be expressed as follows:

\[
V_F = S + D = \frac{NOI}{K_0}
\]  

...(26)
This proposition can be stated in an equivalent way in terms of the firm’s average cost of capital as \( \frac{\text{NOI}}{V_f} \), which is the ratio of its expected earning to the market value of all securities.

Moreover,

\[
\text{NOI} = K_o V_f = K_s (S) + K_d (D)
\]  

...(27)

But by definition,

\[
K_0 = \frac{\text{NOI}}{V_f}
\]  

...(28)

Therefore,

\[
K_o = K_s \left( \frac{s}{V_f} \right) + K_d \left( \frac{D}{V_f} \right)
\]  

...(29)

Equation 26 expresses \( K_o \) as the weighted average of the expected rates of return on equity and debt capital of the firm, or \( K_o \) is shown to be the weighted average cost of capital. Since cost of capital is defined as the expected NOI divided by the total market value of the firm, and since MM conclude that the total market value of the firm is unaffected by the debt equity mix, it follows that the cost of capital is independent of the capital structure and is equal to the capitalization rate of a pure equity stream of its class. That is, \( K_o = K_s \) for an un levered firm. If \( K_o \) is invariant to the value of debt, then other variable in equation 3 must adjust to compensate unless \( K_o = K_s + K_d \) in which case equation 3 reduces to the identity of \( K_o = K_o \).

Thus, two firms identical in all respects except for their capital structure cannot command different market value nor have different cost of capital. But if there is a discrepancy in the market value’s or the cost of capital, arbitrage will take place, which will enable investors to engage in personal leverage to restore equilibrium in the market.

**Proposition II**

MM’s proposition II, which defines the cost of equity, follows from their proposition 1 and shows the implications of NOI approach. This can be illustrated using the weighted
average cost of capital formula previously examined. If \( K_u \) is the return required on the equity of an unlevered firm, then it will be equal to the weighted average cost of capital of all geared firms in the same risk class as:

\[
K_o = K_u = K_s \left( \frac{S}{V_f} \right) + K_d \left( \frac{D}{V_f} \right)
\]  

...(30)

Multiplying throughout by \( S+D \) we obtain:

\[
K_u S + K_u D = S K_s + D K_d
\]  

...(31)

\[
S K_s = K_u S + K_u D - D K_d
\]  

...(32)

Dividing by \( S \) gives:

\[
K_s = K_u + \frac{K_u D}{S} - \frac{K_d D}{S}
\]  

...(33)

\[
K_s = K_u + \frac{D}{S} (K_s - K_d)
\]  

...(34)

This expression shows that the expected ROE of a geared company is equal to the expected return on a pure equity stream plus a risk premium dependent on the level of debt in the capital structure. The effect on the \( K_s \) of introducing debt into the capital structure is that the \( K_s \) rises linearly to offset the lower – cost directly, giving a constant weighted average cost of capital irrespective of the level of gearing.

Taken together, the two Modigliani-Miller (1958) propositions imply that the inclusion of more debt in the capital structure will not increase the value of the firm, as the benefits of cheaper debt will be exactly offset by the increase in its riskiness, hence the cost of its equity.

e. Corporate Income Taxes and the Cost of Capital

MM’s original work, published in 1958, assumed zero taxes. In 1963, they published a second article, which included corporate taxes. With corporate income taxes, they concluded that leverage will increase a firm’s value – because interest on debt is a tax deductible expense, more of a leveraged firm’s operating income flows through to
investors, hence the value of the firm is higher. Here, are the MM propositions when corporations are subject to income taxes:

**Proposition I**

The value of a levered firm is the sum of value of an unlevered firm in the same risk class and the gain from leverage, which is the value of the tax savings due to debt financing and which equals the corporate tax rate \( t \) times the amount of the debt the firm uses:

\[
V_L = V_u + t \cdot V_d
\]  

...(35)

The important point here is that when corporate taxes are introduced, the value of the levered firm exceeds that of the unlevered firm by the amount \( tV_d \). It also indicates that as the use of debt increases, so a firm’s value is maximized at virtually 100 percent debt financing.

The value of unlevered firm can also be found by using following equation which states that the value of the firm is its equity value. Thus,

\[
V_u = \frac{[NOI \cdot (1-t)]}{K_{su}}
\]  

...(36)

**Proposition II**

The cost of equity to a levered firm is equal to 1) the cost of equity to an unlevered 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 unlevered firm, the amount of financial leverage used, and the corporate tax rate:

\[
K_{sl} = K_{su} + (K_{su} - K_d) \cdot (1 - t) \cdot \left( \frac{P}{S} \right)
\]  

...(37)

This equation is identical to the previous equation except \((1-t)\) term. Since \((1-t)\) is less than 1, the imposition of corporate taxes causes the \( K_s \) to rise at a slower rate than it did in the absence of taxes. It is this characteristic, along with the fact that produces the proposition I result, namely, the increase in firm value as leverage increases.
The implication of this result is that the more debt the better. But, there is a flaw in this model, as they did not consider the effects of personal taxes. Merton Miller (1977) introduced a model to show how leverage affects firms’ values when both personal and corporate taxes are taken into account. With personal taxes included, the value of an unlevered firm is as follows:

\[ V_u = \frac{[EBIT \ (1-T_c) (1-T_s)]}{K_{su}} \] ... (38)

Where \(1-T_s\), adjusts for personal taxes. Therefore, the numerator shows how much of the firm’s operating income is left after the unlevered firm itself pays corporate income taxes and its investors subsequently pay personal taxes on their equity income. Since the introduction of personal taxes lowers the usable income to investors, personal taxes reduce the value of the unlevered firm, other thing held constant.

Miller’s results (1977) can also be obtained from an arbitrage proof. To begin with, divide the levered firms’ annual cash flow (CF), into those going to stockholders and those going to the bondholders, considering both corporate and personal taxes.

\[ CF_L = \text{Net CF to stockholders} + \text{Net CF to bondholders.} \]

\[ = (EBIT - I) \ (1 - T_c) \ (1 - T_s) + I \ (1 - T_d) \] ... (39)

Here, \(I\) is the annual interest payment. Above equation can also be written as follows:

\[ CF_L = (EBIT) \ (1 - T_c) \ (1 - T_s) - I \ (1 - T_c) \ (1 - T_s) + I \ (1 - T_d) \] ... (40)

We know, value of firm is:

\[ V_f = \frac{CF}{K_o} \] ... (41)

Thus,

\[ V_L = \frac{[EBIT \ (1-T_c) (1-T_s)]}{K_{su}} - \frac{[I \ (1-T_c) (1-T_s)]}{K_d} + \frac{[I \ (1-T_d)]}{K_d} \] ... (42)
This equation can also be written as:

\[
V_L = V_u + \frac{[I (1 - T_d)]}{K_d} 1 - \frac{[(1-T_c)(1-T_s)]}{1-T_d}
\] ... (43)

But,

\[
\frac{[I (1 - T_d)]}{K_d} = Market \ value \ of \ debt = D
\] ... (44)

By substituting D, we get the Miller model:

**Miller Model:**

\[
V_L = V_u + \left[ 1 - \frac{(1-T_c)(1-T_s)}{1-T_d} \right] D \] ... (45)

The Miller model estimates the value of a levered firm in a world with both corporate and personal taxes. The gain, G, from the tax benefit of corporate debt with three types of taxes is:

\[
G = \left[ 1 - \frac{(1-T_c)(1-T_s)}{1-T_d} \right] D \] ... (46)

It is significant to note here that

1. If \( T_c = T_s = T_d = 0 \) i.e. in an economy of no taxes, there will be no difference in value of levered and unlevered firm.
2. If \((1-T_c) (1-T_s) = (1-T_d)\), then gain from using leverage would be zero. This implies that the tax advantage of debt to the firm would be exactly offset by the personal tax advantage of equity. Under this condition, capital structure would have no effect on a firms’ value or its cost of capital.

So, one can conclude that till the effective tax rate on income from stock is less than from tax rate on income from bonds, the value of levered firms’ will be more than the value of an unlevered firm. Miller (1977) has also pointed out that this point as an equilibrium point and he further argued that firms in the aggregate would issue a mix of debt and equity such that this equilibrium point is reached. Thus, according to Miller, the conclusions derived from the original zero tax model are correct.
But, there are number of problems with both the Modigliani-Miller (1958) and Miller (1977) models, which are discussed as follows:

i. It could be questioned whether personal borrowing is a substitute for corporate borrowing given the corporate sector’s limited liability and its ability to borrow at keener rate of interest than the personal sector.

ii. It is not possible to identify companies in the same risk class. No two identical companies exist.

iii. In the real world taxes and transaction costs exist and these need to be considered.

iv. Modigliani-Miller (1958) assumed that corporations and investors could borrow at the risk-free rate. Although others have introduced risky debt into the analysis, to reach the Modigliani-Miller (1958) and Miller (1977) conclusions it is still necessary to assume that both corporations and investors can borrow at the same rate.

Despite, the criticisms that can be levelled at the unrealistic assumptions made by MM there is almost universal acceptance of their conclusions, given the assumptions made. If different levels of capital structure are to affect both cost of capital and the value of the firm, then we must identify the imperfections in the world assumed by MM. This means there are two essential differences between the conclusions of traditional view and those of Modigliani-Miller (1958). First, under traditional view, the firm’s value and cost of capital are related to its capital structure, where as Modigliani-Miller’s proposition I stated that they are independent of capital structure. Second, under MM’s proposition II, if management aims to maximize shareholder returns, they would employ 100 per cent debt. This is based on two assumptions: 1) the firm does not face any costs associated with financial distress which rise as the level of leverage increases; and (ii) the marginal rate of return which debt holders require remains constant. Thus, if the manager wants to maximize the value of the firm, the difference between the benefits and cost of debt must be maximized. Modern debate on capital structure derives from this conflict between traditional view and MM’s view. This conflict is discussed in next section.
f. The Optimal Capital Structure and the M & M Hypothesis

The difference between optimal capital structure theory and the M&M hypothesis can be exaggerated. Both models emphasize the point that the use of one class of financing has rebound effects on the costs of the rest of the financial structure. In the optimal model, the overall cost of capital at any given time is constant within the range of the optimal capital structure. Debt or equity financing or some combination may be used for any particular project, as long as the financial mix is kept within an optimal range. Nevertheless, because every type of financing has interactions with the other sources of financing, the return on a project is not to be compared to the direct cost of its mode of financing but to the overall cost of the financial mix.

In the M&M model, the interaction between different types of financing is complete so there is no optimal financial structure. Thus the firm’s overall cost of capital at any point of time is constant at the proper financial mix, or it is constant regardless of the mix. Quite importantly, both of these views are in opposition to the sequential cost models, in which the cost of capital depends on the financing that is being used currently, so that the cost is lowest when the firm uses retained earnings, rises for outside borrowing, and become still higher when borrowing capacity is strained and additional funds depends on the flotation of new shares.

The modern theory says that the optimal level of debt is determined at the point when the marginal gain from leverage is equal to the marginal expected loss associated with increased financial distress and other market imperfections. Accordingly, the market imperfections, which help in determining the optimal capital structure of firm, are discussed as under:

F. Determinants of Capital Structure

a. Agency Cost

Jensen and Meckling (1976) introduced the concept of agency cost. Agency cost arises because of the divergence of interest between bondholders and stockholders. There are two types of agency costs, agency cost of debt and agency cost of equity. We know that if a single owner firm wishes to finance projects in excess of the firm’s internal
resources, the firm always has two options; to issue equity or debt. If the firm issues equity, the owner-manager’s fractional interest within the firm decreases. This increases the incentives for an owner-manager to undertake excessive perk consumption since the costs to the owner of such activities have been lowered as a result of a reduction in his fractional interest. Then the external shareholders incur some costs to be sure that original owner-manager acts fully in their interest. Such costs include: i) the monitoring expenses of the principal (the equity holders); ii) the bonding expenses of the agent (the manager); and iii) the money value of the reduction in welfare experienced by the principal due to the divergence between the agent’s decisions and those which maximize the welfare of the principal. This cost is known as agency cost of equity. However, in the presence of efficient markets, which incorporate expectations, external investors anticipate such actions by the owner-manager of the firm. Accordingly, the price of new equity is discounted to take into account the monitoring costs of external shareholder’s. Under these circumstances, the owner manager would prefer to finance new projects using debt rather than equity. However, issuing debt to finance investment also incurs agency costs. These arises as a result of conflict of interest between external lenders and the owner manager’s incentive to invest in high risk projects which, if successful offer high return, which accrue exclusively to the owner-manager but at the same time, increase the likelihood of failure. If the project fails, the owner manager’s exposure is limited to the value of his equity holdings. Debt holders, on the other hand, do not share the profits of success, but will share in the costs of a bankruptcy; they are incurring extra risk without additional expected returns. Thus, the agency cost of debt include the opportunity costs caused by the impact of debt on the investment decisions of the firm; the monitoring and bond expenditures by both the bond holders and the owner manager, and the costs associated with bankruptcy and reorganization.

Following Lee and Kwok (1988) and Brugman (1996) agency cost of debt has been calculated as the ratio of advertising and research and development expenditures to sales. Myers (1977) under investment hypothesis suggests an inverse relationship between agency costs of debt and leverage. The literature suggests that MNC’s have higher agency costs of debt than DC’s.
b. The Effect of Multiple Tax Shields

Corporate often get more tax shields other than available on debt from the governments’ such as investment tax credits, depreciation allowances and oil depletion allowances. Due to non-debt tax shields, firms’ effective tax rates differ from firm to firm. DeAngelo and Masulis (1980) analyzed this concept and predicted that firms will select a level of debt that is negatively related to the level of other tax shield substitutes such as investment tax credits, depreciation or depletion. They also point out that as more and more debt is utilized the probability of having insufficient earnings to utilize fully all available interest tax shields will increase. Thus, the expected value of interest tax shields will decline. The existence of multiple forms of tax shields may produce an optimal debt structure. In addition, if there are significant bankruptcy costs, this will reinforce conditions producing an optimal capital structure. The marginal expected benefit of interest tax shields will be related to the marginal expected cost of bankruptcy to produce an optimal degree of financial leverage.

c. Evidence from Exchange Offers

Some aspects of influences on capital structure were tested in a study of exchange offers by Masulis (1980). He studied exchanges of debt for common stock, debt for preferred stock, and preferred stock for common stock. The advantages of studying exchange offers is that financial leverage is changed with no simultaneous change in the amount of investments or assets of the firm. Hence the influence of a relatively pure financial event can be analyzed. He stated that it is difficult to choose between alternative theories when interpreting these results. If debt is issued to retire equity, existing bondholders may suffer a wealth loss if the claim of the new debt is not subordinated. The reason is that the existing debt is riskier with a smaller equity base. Hence the market value of the debt claim would be expected to fall. Shareholders would benefit from this redistribution effect. Another possibility, however, is that the value of the equity increases because of the tax benefit of the additional debt. A third possibility is that an exchange offer that increase leverage may be interpreted as favorable information (a signal) about a change for the better in the firm’s future prospects. Thus, the findings are consistent with three possible explanations.


d. Information Asymmetry and Signaling

Ross (1977) postulates that manager – insiders have information about their own firms not possessed by outsiders. He demonstrates that the capital structure decision is not irrelevant and in some cases a unique interior optimal capital structure exists if (1) the nature of the firm’s investment policy is signaled to the market through its capital structure decision and (2) the manager’s compensation is tied to the truth or falsity of the capital structure signal. The essence of Ross’s model is that the value of the firm’s information is reflected in a private good and the returns from its portfolio. Potential buyers of the intermediary’s claim can judge whether the intermediary has developed valuable information by observing the extent to which the entrepreneurs or organizers of the financial intermediary have been willing to invest in their own firm’s equity shares. In general, the degree to which owners are willing to invest in their own projects will serve as a signal of project quality. Thus, a firm’s value will be related positively to the fraction of its equity held by its organizers. This higher value will also give the firm greater debt capacity and lead it to use greater amount of debt. While debt is not a signal in this model, its use will be correlated positively with the Firm’s value.

e. Bankruptcy Costs

To this point we have established that the cost of equity rises with financial leverage, but the cost of debt may also rise with leverage. Even if the debt is risky, it has been established that the Modigliani-Miller propositions still hold [Rubinstein, 1973] as long as there are no bankruptcy costs. But with bankruptcy costs, optimal degree of leverage will change.

f. Leverage

Fatemí (1988) in his study has given nine ratios of monitoring financial structure of a firm. Out of these following two measures of leverage have often been used by many researchers for testing the leverage of a firm:

\[
L_1 = \frac{(LTD + STD)}{LTD + STD + EC + PC} \quad \text{...}(47)
\]
Pandey (1976) has made use of both the ratios to determine the relationship between cost of capital and capital structure of a firm. L.C. Gupta (1983) in his study has pointed out “Preference capital is part of permanent capital as it cannot be taken out from the enterprise without at the same time being replaced by equity.” Thus, when we are measuring leverage, preference capital should not be included in debt. Moreover, the two measures of leverage found to be correlated at 1 percent level of significance. Thus, we have made use of $L_1$ in this study for empirical analysis.

**g. Size**

It has been suggested in many studies that size is correlated with valuation. Pandey (1976), Matta (1984), Titman (1988), Michel and Shaked (1986) provide evidence, which, suggest that direct bankruptcy costs constitute a larger proportion of a firm’s value as that value decreases. It is also the case that relatively large firms tend to be more diversified and less prone to bankruptcy. These arguments suggest that large firms should be highly leveraged.

**h. NDTS**

Non-debt tax shields, measured by the ratio \([\text{operating income} - \text{interest expenses} - (\text{total taxes paid/ corporate tax rate})/ \text{sales}]\). NDTS reduce the firm’s tax burden and thus the need for acquiring debt related tax shields. Fatemi (1988) hypothesizes that a higher level of expected NDTS, among other factors, could account for the lower debt ratio of foreign companies.

**i. Profitability**

This is measured as the average ratio of EBIT to total assets over the period of ten years i.e. 1993-2002. Myers (1984) pecking order theory predicts that leverage will be negatively related to profitability because firms prefer to obtain financing through internally generated funds rather than debt.
3.3. RELATIONSHIP BETWEEN ‘FINANCIAL THEORY AND THEORY OF PRODUCTION’

In this thesis, our interest goes beyond the existing financial structure theories because we believe that there is a deep relationship between finance theory and production theory. Any firm cannot produce without finance. But the nature of financing will not only depend upon financial factors but also on real factors.

There are vital linkages between financial decisions, capital budgeting decision (Investing decision), dividend decision and working capital management decision. The primary objectives of financial management are wealth maximisation and profit maximisation. While in the literature, wealth is emphasized at the cost of profit maximisation. The link between the two and the link amongst the different financial decisions is under emphasized.

In the following analysis we have given certain arguments to substantiate the above argument:

A. Gross Profit

Profit maximisation implies maximisation of gross profit. If gross profits are high it can be assumed that net profits will also be high because both interest and taxes are a fraction of profit. As long as gross profit rises there is scope for both growth of the firm through retained profits while sufficient dividend is distributed through distributed profits. Such a business policy would retain the confidence of the investors. It would improve market performance and hence would increase wealth of the firm. Higher surpluses would enable greater liquidity and would facilitate working capital needs.

B. Use of Reserves/Surplus

Secondly no business would like to have idle surpluses. They would either be used for liquidating debt or for financing growth and hence would influence capital budgeting decisions, working capital decisions and through such decisions would constantly affect the financial structure. In the following sections we are developing a conceptual framework which has the following dimensions:
a. The Nature of Leverage

Apparently leverage is the D/E ratio which is a small number. However there could be a range of interpretations that explains leverage. A high leverage ratio could be produced by either large debt or a relatively low equity base. There could be many factors which influence the leverage. On one hand there are a set of factors on the supply side of capital. The credit worthiness of the company would be responsible for a higher proportion of debt capital being supplied by the suppliers of debt capital mainly the financial institutions, individuals and companies.

Another factor would be external borrowings. This would depend upon the international exposure and financing potential. Similarly the asset base of the company including current assets would also be responsible for a potential for increasing in the supply of debt capital. One the other hand the supply factors may affect the availability of equity capital. The suppliers of equity capital could be influenced by the performance of the company. In case the company is new to an industry, both in absolute and relative term than it will not be able to raise enough of equity capital. Even if the company is existing one but it seeks equity capital for diversification, the prospective investors may not have the confidence that the company may invest the equity capital wisely because of lack of experience in the new industry. With the given requirement of capital, if the companies’ effort to raise equity capital is insufficient it would have to rely on debt capital. Therefore, the demand side factors may not be supported by the supply of equity capital.

D/E ratio is an indicator of financial structure and yet is not entirely determined by the strategy, demand and wishes of the company owners. This is the primary justification of our study. It implies that financial structure has a varied set of determinants. The existing theories of financial structure limit themselves to certain known determinants. Secondly, these theories treat the financial structure as though it is uniquely determined by the strategies of financial decisions. From the above argument it is apparent that not only is it a product of both demand and supply factors but it can also be argued that it is a product of both financial and real factors.
b. The Interrelation amongst Financial Decisions and Objectives of Financial Decisions

The emphasis of pure theory of finance is on the following:

i. Capital budgeting decisions which are essentially decision of project investment or long term project investment.

ii. Financing decisions are related to the total capital of the firm.

iii. Dividend decisions which are partly related to incentivising investment. If stockholders are not satisfied than it affects the market performance.

c. The Real and Financial Determinants of Financial Structure

Finance theory does not recognise the role of real factors. Dividend affects the market performance and profitability. If the shareholders are not satisfied it affects the market performance. Dividend decisions lead to retained profits. The objective of retaining profit is re-investment which leads to growth. This is the basic link between “Finance Theory” and “Theory of Growth of Firms”.

Financial economics on the other hand rest upon the following:

i. Optimal allocation of resources (best combination of factor inputs)

ii. The conflict between ownership and control

iii. Theory of growth of firms

Therefore, this study goes beyond the narrow prospective study of pure finance.

Our approach is a synthesis between pure finance theory and theory of firms and hence could be understood as a study in financial economics. Optimal allocation of resources lead to efficiency in a static sense but it cannot be limited to that, therefore the study of productivity can be understood only through developing a dynamic framework.

Dynamic efficiency could be found both in terms of “long term allocative efficiency” and “dynamic technical efficiency”. Dynamic technical efficiency is captured in the notion of “Total Factor Productivity Growth”.

Allocative efficiency can only be altered only through a change in the factor proportion and this would necessarily imply change in the factor remuneration. Whereas in the case of technical efficiency change in factor proportion as well as factor remuneration.
3.4. CONCLUSION

After going through the concept of productivity and theory of financial structure, it is clearly understood that there is a deep linkage between productivity and financial structure. On the basis of the conceptual framework, the next chapter deals with the research methodology which will be applied on the cement, pharmaceutical and steel industry. In research methodology, we will frame a set of real and financial variables. We will be doing different types of treatment with each variable as per the nature of the variable. The real and financial variables will be treated as per our requirement for the final model, i.e., a new model which will establish linkage between financial structure and productivity.