CHAPTER III
REVIEW OF EMPIRICAL STUDIES

The past decades have seen the growth of various countries from unknown to known, “under-developed” to “developed” and some still developing. Investment being the backbone of any growing economy has attracted the researchers worldwide. Since the seminal article of Modigliani and Miller (MM)\(^1\) in 1958, a number of researches have been carried out to understand the interaction of investment, financing and dividend decisions. Ironically, a large number of studies undertaken with Modigliani and Miller (MM) as a base have shown a divergence in results from MM’s results. A major part of the research has been done for developed economies such as United States (US), United Kingdom (UK), Canada, Japan and so on. Quite a few studies have taken samples from developing economies. A review of some of the relevant researches has been presented in the following paragraphs to duly accentuate the importance of the proposed research in Indian context.

This chapter has been divided into three sections. Section 3.1 reviews United States (US) based studies on financing of investment expenditures whereas Section 3.2 appraises the relevant researches conducted with other countries (except United States and India) as sample. The next section, Section 3.3 has been designed to throw light on relevant Indian studies. Conclusion has been given in the end, in Section 3.4.

3.1 REVIEW OF UNITED STATES (US) BASED STUDIES

In this section an attempt has been made to review the empirical studies conducted with United States (US) companies as a sample. As the empirical studies are many, an attempt has been made to review some of the important studies.

Gordon, M.J. (1963)²

Gordon reviewed whether a corporation’s share price is independent of dividend rate or not and the validity of Modigliani and Miller’s³ conclusions with certainty assumption in his article “Optimal investment and financing policy”. In the beginning of the critique he accepted Modigliani and Miller’s⁴ proof of theorem under the assumption of future certainty. However, later on Modigliani and Miller themselves withdrew their assumption but affirmed that postulates of “imputed rationality” and “symmetric market rationality” help in holding the fundamental conclusion good. He added that the corporate announcement regarding retention of earnings of a specified amount changed the dividend expectations as well as raises the discount rate. This according to him occurred as the reduction in near dividend but increased the distant dividends and caused a rise in the discount rate which in turn resulted in a fall in share price. He further clarified that the profitability of investment was neutralized because when rate of return on investment is set equal to discount rate; change in level of investment has no influence on share price.

He has further stated that investors have an aversion to risk or uncertainty and this may lead to uncertainty regarding dividends in the future. Hence, it is quite possible that investors may use a discount rate which is an increasing function of rate of growth of dividends. This will lead to an impact on share price. He further gave empirical support to his views by presuming that a corporation will (1) retain the fraction $b$ of its income in each future period; (2) earn a rate of return, $r$, on the common equity investment in each future period; (3) maintain the existing debt-equity ratio; and (4) undertake no new outside equity financing. Hence, under the above assumptions the current dividend is $D_0 = (1 - b) Y_0$, and its rate of growth is $br$ and the entire dividend expectation is as follows:

$$P_0 = \frac{(1-b)Y_0}{k-br}$$

Here, $Y_0$ is earning in time $t = 0$.

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³ Modigliani and Miller, 1958, op. cit.
⁴ Modigliani and Miller, 1958, op. cit.
He accepted the limitations but at the same time argued that perhaps his model presented a rich and accurate statement of dividend expectations. Further, by holding \( r = k \), the price of share become independent of dividend, satisfying Modigliani and Miller (MM)’s position. His empirical findings suggested \( k \) to be an increasing functional of \( br \) and that price was a function of dividend, \( k \) and all variables other than dividend. He concluded that the subject required further study as the axiomatic basis of Modigliani and Miller (MM)’s position was not powerful enough to force acceptance of their conclusions.

**Myers, Stewart C. (1974)**

Myers provided a general approach for analysis of interactions of corporate financing and investment decisions, and to derive its implications for capital budgeting decisions. The framework was set by a mathematical programming formulation of the problem of financial management. He specified the firm’s objective as a function of investment and financing decisions and captured the interactions as a series of constraints to the optimal solution. He argued that the marginal investment is justified if the project’s ‘Adjusted Present Value’ is positive. APV has been used as it shows the adjusted contribution of the project (after taking in to account its side effects on other investment and financing options). The side effects come as the project effects the debt capacity of the company and source/use constraints as well. He conducted a reexamination of weighted average cost of capital to derive a more general and flexible capital budgeting rule. He concluded that the original Modigliani and Miller (MM) formula is acceptably accurate for the projects’ which do not shift the firm’s risk class or target debt ratio.

He further provided that APV was subject to objections due to lack of realism, increased complication, the unfamiliarity of managers with the concept and the deficiencies of a static model. The static assumptions under APV were considered a real liability though they were no worse than traditional approaches to this dimension. Perhaps, the benefits attached to APV included a natural basis for

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analyses of the lease vs. buy or lease vs. borrow decision. APV could also readily incorporate the impact of dividend policy. Further, the impact of subsidized borrowings available for certain investments was clear in this framework. In the conclusion, he suggested using APV as an operational capital budgeting standard for at least large and/or unusual projects in order to avoid errors and also to develop a linear programming model to assist financial planners by adding some more assumptions.

**George M. McCabe (1979)**

McCabe conducted a study titled “The Empirical Relationship between Investment and Financing: A New Look” to stress that investment and financing decisions are made simultaneously and must be studied in the context of a simultaneous equation model. He undertook the model from Dhrymes–Kurz (1967) after making appropriate changes to remove their misspecifications and certain other attempts made over time. He highlighted the importance of lagged variables in understanding the investment equation. The absence of the same rendered Dhrymes–Kurz (DK)’s attempt mis-specified. McCabe used cross-sectional data and lagged variables. The data of 112 firms was collected from Annual Compustat tapes for a period of 1966-73. The hypothesis of the study was that firms raise funds from profits and outside financing and allocate them between investment and dividend decisions. Moreover, the use of lagged endogenous variables restricted the direct application of cashflow constraint. Attempts made for the use of variables which measured short-term financing in preliminary work yielded no great results and equity was not considered an important source. The lagged variables were restricted to three years due to too much multicollinearity to produce useful results in other cases. He chose to use two stage least squares because of its simplicity and

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the relatively small vulnerability to specification error (as compared to so-called full information methods). The study concluded a strong evidence of interdependence between spending (investment and dividend) decisions and the fund raising decision (debt). It appeared that management determined long run investment and dividend levels were met by new long-term debt or short term financing. The results were markedly against the Modigliani and Miller 8 (MM) proposition of no interdependence between investment and financing decision. Further, he argued that investments, dividend, and new debt are each set at long-run equilibrium levels. This theory was not entirely in support of traditional view of finance that the firm has an optimal capital structure.

Clark, Peter K.; Greenspan, Alan and Goldfeld, Stephan M. (1979)9

Clark et al (1979) attempted to analyze the investments in United States (US) economy in 1970s. The work was structured to explain the steep drops of 1974-75 and subsequent slow recovery of non residential fixed investment by standard theories of business investment. Further they also compared the predictions of various economic models for the five year period from 1973-78 to provide for a good "specification test" and to find the importance of investment rates and other capital costs considerations in business fixed investment. Moreover, there was another objective of identifying the most effective policies for maintaining and increasing the share of non-residential fixed investment in total output over next few years and the investment prospects for 1979-81.

They used five models viz., generalized accelerator, cashflow combined with accelerator, neoclassical, modified neoclassical and securities value to reduce the problem of model dependence. Generalized accelerator model undertakes a linear relation of current net investment to current and past changes in output. However flexibility was added because it fits observed series of investment and output well. The second model, accelerator cashflow stressed the need for adding

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8 Modigliani, F. and M. Miller, 1958, op. cit.
profits as they convey some information about future profitability of a firm and internal funds could be cheaper than external funds due to imperfect borrowed funds market. The empirical specification of this model was similar to previous one except the inclusion of lagged cashflow as an explanatory variable. The neoclassical model further introduced a variant of accelerator equation, with capital-output ratio allowed to vary inversely with the relative price of capital inputs. The next was modified neo-classical model and lastly, securities value (Q) model was applied to explain investment on a financial basis in terms of portfolio balance.

The data relating to investment, real output, cashflow and the investment deflator was gathered from U.S. Bureau of Economic Analysis, national income and product accounts. The flow of funds statistics were supplied by the Board of Governors of the Federal Reserve System. The analysis revealed that business fixed investment was only a little lower than expected investment calculated by the historical relationship between output and capital cost. Output was the primary determinant of non residential fixed investment. The simple accelerator and modified neoclassical model fitted closest with the historical data. The lowest estimated forecast error led to best post sample forecasts by simple accelerator model. However, the modified neoclassical model’s best fit was impaired by the high variance of coefficients. Conditional forecasts were made with accelerator model for equipments and with the accelerator–cash flow model for structures. The evidence indicated that output was the primarily determinant of business fixed investment over the next three years. Further, he estimated a rising fixed investment with approximately maintaining its fraction of total output. Conversely, a tailspin in the economy was expected to show adverse effects on investment.

**Peterson, Pamela P., and Gary A. Benesh**  
(1983)

Peterson and Benesh (1983) conducted a reexamination of the empirical relationship between investment and financing decisions to update and expand the

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evidence on inter-relationships. They followed Dhrymes and Kurz\textsuperscript{11} and McCabe\textsuperscript{12} in selecting the model. A three equation model was applied with investment, dividend and new debt as explanatory variables in each one of them. Moreover, each equation contained two remaining endogenous variables as explanatory variables along with a profit variable that was assumed to be pre-determined. Lagged variables wherever required were used directly as any weighing scheme was considered inappropriate for such a relatively large sample from several different industries. The data obtained from Standard and Poor’s expanded firms were analyzed over a five year period with an exception of utilities and finance companies and companies with incomplete information.

Two distinct approaches were used to test Modigliani and Miller (MM)’s independence hypothesis. The first approach used a simultaneous equation estimation technique of two stage least squares (2 SLS) and three stage least squares (3 SLS) which was in tune with previous studies. Reduced-form regression was conducted in the second approach with seemingly unrelated regressions (SUR) estimation techniques. This approach helped in analyzing the impact of a change in exogenous variable on the endogenous variable and enabled the researcher to calculate a valid goodness of fit statistics ($R^2$) for the model. The Pearson’s correlation coefficients showed positive relationship between investment and dividend and were significant in 4 out of 5 years. Moreover, the correlation between investment and new debt was positive in all periods but was significant in only three of the five periods. Additionally, the correlation between dividend and new debt has been found to be negative in two periods and positive in three periods, with a significant positive correlation present in two of the periods. However, 3 SLS substantiate the view that financing decisions have impact on the level of investment expenditures and, therefore, are contrary to Modigliani and Miller (MM)’s independence hypothesis. The coefficient of the dividend variable in the investment equation is negative in each of the five years and significantly different from zero in four of the five years. In three of the five years, the coefficient of the new debt variable is statistically significant and positive as hypothesized. In the

\textsuperscript{11} Dhrymes and Kurz, 1967, op. cit.
\textsuperscript{12} McCabe, 1979, op.cit.
dividend equation, lagged dividends as the explanatory variable had a positive impact on current dividends and were highly significant in every year. Level of net new debt was primarily dependent on investment expenditures and profits. The coefficient of the investment variable is positive as predicted by the funds flow approach and significant in every year, while that of the profit variable is consistently negative and significant in three years. The results obtained when restrictions have been imposed on the reduced-form equations confirm those obtained from 3SLS approach. The null hypothesis has been rejected proving the view that, investment and financing decisions were jointly determined and that investment decisions were influenced by financing decisions. They finally concluded that market imperfections were of sufficient magnitude to lead to jointly-determined investment and financing decisions.

Fazzari, Steven and Hubbard, R. Glenn and Petersen, Bruce C. (1988)\textsuperscript{13}

A study of financing constraints and corporate investment was conducted by Fazzari, Hubbard and Peterson. The work revolved around Q theory of investment and empirical implementation relied upon cost of adjustment approach. They developed a model to show that capital market imperfections could limit the availability of external finance to particular types of firms. They demonstrated the result by modifying a simple model of firm’s financial and investment decisions developed in the public finance literature. They first analyzed the “full information” firms that did not face financing constraints due to asymmetric information and later on with constrained firms. Differences were identified in Q, financing behavior and investment across the firms classified by their retention behavior. The two predictions that served as a base for the work were that for firms facing asymmetric information in capital markets, q can fluctuate over a substantial range in excess of unity with little or no response of investment and investment can be “excessively sensitive” to cashflow fluctuations. They framed a mathematical model for maximizing the value of the firm subject to certain explicit and implicit constraints

relating to capital accumulation, new shares, sources, “uses and dividend” constraints. Lagrangian multipliers were also associated with the constraints. The data was compiled from value line data for the period of 1969-84. The data of 1969 was used to construct lag variables. 421 United States (US) manufacturing firms satisfied the three point sample selection criterion which was as follows:

a) Consistent data availability
b) No mergers (because they could pose problems in constructing lags)
c) Not financially distressed (i.e. only those firms were considered that had positive sales growth from 1969 to 1984).

Financially constrained firms were classified in four classes according to their retention behavior in the presence of information asymmetries. This was a robust approach because it limited the sensitivity of the classification of outliers of dividend-income ratio. The theory also tried to estimate the contribution of cashflow towards explaining investment and it was found that estimated coefficients on lagged cashflow were positive, statistically significant and of comparable magnitude for all classes. The study concluded that imperfect information could create “financing hierarchies” in the use of internal and external finance. Many developing firms in rapidly growing industries might have faced a significant range of Q values over which no dividends were paid and external finance was very costly to obtain and the investment was constrained by current cashflow. It was also revealed that financial constraints were important even for relatively large firms. Hence the research provided empirical support to the existence of imperfect capital markets and financing constraints.

**Pruitt, S. W. and Gitman, L. J. (1991)**

Pruitt and Gitman (1991) analyzed the opinions of practicing finance managers by a mail questionnaire based survey of 1000 largest United States (US) firms in 1988. The purpose of the study was to collect the opinions of finance managers regarding the interplay of investment, financing and dividend decisions.

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The sample firms included all companies in the 1987 Fortune 500 listing plus the second 500 largest firms drawn from the Compustat industrial files. Due to the large number of statements included in the study, two separate survey instruments were developed and employed on the basis of a random process with the first one addressing issues related to investment and financing interactions and the second restricted to dividend and financing practices.

A seven-point semantic differential scale was employed to allow the respondents to indicate their degree of “disagreement” or “agreement” with each of the 30 survey statements. Finally, three “open-ended” questions in which respondents were asked to list those variables they felt would be most valuable to an analyst seeking to econometrically describe his firm’s future investment expenditures, external capital requirements and dividend payments. A total of 104 usable responses were received. Of this total, 49 of the received surveys were concerned with investment-financing interactions and 65 dealt with dividend-financing issues. Most of the survey respondents were top management executives with an average work experience of “20+” years. The funds-flow approach was followed where the firm is assumed to allocate funds raised from operations and external financing between research and development, capital investment expenditures and cash dividends. Thus, an insight into the impact of endogenous and exogenous variables on the investment, financing, and dividend decisions of major United States (US) firms could be drawn.

The survey results indicated that financial leverage and investment decisions of the firms were primarily dependent on changes in firm’s sales level and current and past profits as supported by a majority of respondents. On the other hand, the majority of financial managers refuted the importance of dividend policies, new debt, and new equity and provided a strong support to Modigliani and Miller\(^{15}\) (MM)’s separation principle. Some other factors where respondents were equally divided between “agreed” and “disagreed” were previous investment expenditures, past variability of firm’s earnings and level of prevailing interest rates. As regarding the corporate financing decision (issue of new debt/equity); degree of financial leverage, level of current investment outlays, prevailing interest rates and net working capital position

\(^{15}\) Modigliani, F. and M. Miller, 1958, op. cit.
were ranked as the most influencing factors. The variables that could not get majority support but equally divided the respondents were; past profits, changes in sales level and importance of new equity issued in deciding the new debt to be issued. Conversely, the factors such as dividend levels, dollar value of net plant and equipment, risk, and depreciation charges did not appear to be closely linked to financing decisions. Further, current and past profits, past variability of earnings, growth rate and dollar value of dividends paid were chosen as the determinants of dividend decision. Investment and financing variables did not get majority support.

The last section listed the popular explanation variables as provided by the respondents such as potential market growth, corporate profitability, and level of cashflows, market interest rates, market share and level of depreciation charges. The research suggested that opinions held by Modigliani and Miller (MM) through their separation principle were held by practicing financial managers of real world despite significant violations of underlying assumptions.

**Whited, Toni M (1992)**

Debt, liquidity constraints and their impact on corporate investment was studied by Whited (1992) using panel data. He addressed the question of the interdependence of financing and investment using the Euler equation of a structural model of investment to isolate the precise role of financing constraints in the investment process. He did not rely on reduced-form regression of investment on q, cashflow and output due to divergence of measured average q from marginal q. He asserted that cashflow might proxy for an accelerator effect or for future investment opportunity information albeit not covered by q.

The work of Fazzari et al (1988) was extended by concentrating on debt instead of equity finance. In fact a large number of studies have proved debt to be the primary marginal source of external funds. The work was based on the premise that small firms with low liquid asset positions have limited access to debt markets. Due to this the financial variables should enter directly into the Euler equation through their

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effect on the Lagrangian multiplier on a constraint restricting debt issuance. Also, the
investment Euler equation of the standard neo-classical model should hold across
adjacent periods for a priori unconstrained firms but be violated for constrained firms.
He stated the basic model as maximizing the value of a firm subject to four
constraints. Here, value of the firm was defined as present discounted value of the
expected after-tax dividend stream and the constraints were related to definition of
dividends and capital stock, non negativity of dividends and transversality condition
which prevented the firm from borrowing an infinite amount to payout as dividends.
An additional borrowing constraint specified that the maximum amount that a
company could have in a given period was determined by the lending sector for each
period according to an assessment of firm’s ability to repay. Proxies for marginal
product of capital and assumption of quadratic adjustment costs were taken to
parameterize the model. The data was taken from the combined annual and over-the-
counter COMPUSTAT industrial files to maintain diversity for studying cross
sectional differences. Moreover, firm specific time-series on output, costs, investment,
and the tax adjusted price of capital goods, the interest coverage ratio, and the market
debt-to asset ratio as well as of other instruments were also collected. The sample
period for the study was from 1975-86 and the study covered 325 manufacturing
firms with consistent data availability, excluding the firms where merger accounted
for more than 15 percent increase in assets during the study period. The sample
selection procedure indicated discarding of smaller and highly levered firms,
apparently facing financing constraints. The division of sample along the lines of firm
size showed the median value of capital stock for the firms that have bond rating to be
17 times larger than the median value of those that do not. Debt growth was negative
for the firms without bond ratings and positive for the firms with bond ratings. The
effects of financial factors appeared to matter more for priori unconstrained firms.
Also, a more important role of the debt assets ratio was evident in picking up the
effect of financing constraint. The exclusion restrictions on either of the financial
variables were rejected for all three groups. Hence, the effect of constraint appeared to
be stronger for firms that do not participate in the corporate bond market. He
validated the separation of sample on the basis of access to organized bond markets as
this presumed that firms are constrained more on the margin of debt finance than on
that of outside equity finance. The large size of the firms added credibility to the research results as majority of the U.S. manufacturing corporations are smaller than those in the sample hence even more financially constrained.

Euler equation approach also emphasized on the effects of liquidity constraints on the firm’s discount rate and therefore on its inter-temporal allocation of investment. He further suggested analyzing a time-series interaction between a firm’s balance sheet position and its investment expenditures.

**Oliner, Stephen D and Rudebusch, Glenn D (1992)**\(^{17}\)

Oliner and Rudebusch attempted to identify the hierarchy in sources of finance. They also extended the work of Fazzari, Hubbard and Peterson\(^{18}\) by attempting to determine the hierarchy of sources of finance for a panel of U.S. firms and estimated the sensitivity of investment spending to internal funds across firms believed to differ with respect to both information problems and transactions costs. They also tested the sensitivity of investment to cash flow across firms with different ratios of common-stock dividends to net income. However, dividend policy was mainly viewed as an indicator of those firms that may face liquidity constraints for whatever reason. They employed three proxy variables for the degree of the information asymmetry facing a firm. The first was the firm’s age, defined as the number of years since the firm’s initial public offering of common stock denoted by \(\text{AGE 78}\), the firm’s age in 1978. The secondary proxy for asymmetric information was the firm’s exchange listing (\(\text{EXCH}\)) i.e. a dummy variable that equals zero for firms whose common stock traded over the counter (OTC) during all or part of 1978-83 and one for firms listed on the New York Stock Exchange (NYSE) over the entire period. Third proxy for asymmetric information related to the stock trading behavior of corporate insiders. The insider trading variable was employed to measure if the firm’s insiders tend to trade on the same side of the market. Such a convergence of activity would suggest that insiders have information that is not publicly available. It was denoted by \(\text{INTR}\).

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\(^{18}\) Fazzari, Hubbard and Petersen, 1988, op. cit.
whose value ranged between 0 and 1 and was explained by buying and selling of insider stock.

Although AGE78, EXCH and INTR were their main proxies for information problems, they also constructed two indicators of the severity of agency costs. These indicators, both of which reflected the structure of shareholding, attempted to capture the degree of difficulty in controlling managerial behavior. They assumed that issue size and firm size were positively correlated; small firms would be expected to face relatively high transactions costs of external finance. Based on this reasoning, they employed firm size as the proxy of transaction costs. The empirical measure of firm size was the replacement value of firm’s fixed capital stock at the beginning of the year. However, the use of SIZE as a proxy of transaction costs required fixation of other characteristics of the firm that may vary with size – such as age and inside equity holdings.

They used a firm-level data in the form of two parallel panels covering the period of 1977-83. The first panel was constructed from the 1984 volume of Moody’s Industrial Manual, comprising of 99 firms, virtually all of which were listed on the NYSE for the entire sample period and a second panel of 21 OTC firms from the 1978 and 1984 volumes of Moody’s Industrial Manual. INTR was constructed from data in the SEC’s Official Summary of Security Transactions and Holdings. The Official Summary contains monthly information on insider stock trading for each publicly-traded firm, which was aggregated to annual totals at the firm level. The Corporate Data Exchange’s (CDE) Stock Ownership Directory was also used for extraction of relevant data. The empirical analysis of the financing hierarchy was conducted with reduced-form investment equations that included Tobin’s Q, cashflow and sales as independent variables explaining investment. All variables except Q were scaled down by the firm’s beginning of the period capital stock measured at replacement value. Constants were used to capture firm-specific and year-specific effect. Cashflow seemed to have a significant positive influence on investment while Q had virtually no effect. As sales and Q were included as controls for profit opportunities, the significant coefficient on CF/K suggested that liquidity per se affected investment. The link between investment and internal funds was consistent with the existence of a financing hierarchy. To explore the source of this hierarchy, they augmented reduced-
form equation to include multiplicative interactions of Q, S/K and CF/K with the firm characteristics i.e. age, exchange, exchange listing and so on. They concluded that information asymmetries were a source of financing hierarchy. The extra sensitivity of investment to cash flow for firms believed to face large asymmetries was, in most cases, marginally significant at only the 5 percent to 10 percent levels. Firm size for which transaction costs were used as proxy did not explain the financing hierarchy for the firms in the sample. They themselves admitted that this negative result may simply reflect the difficulty of constructing proxies for agency cost, along with the fact that data on shareholding was available for only relatively mature firms.

Mauer, David C. and Triantis, Alexander J (1994)\textsuperscript{19}

Mauer and Triantis (1994) investigated interactions of corporate financing and investment decisions in a dynamic framework using a model with operating adjustment and recapitalization cost. They used a multi-period contingent claims model where the firm has the flexibility to dynamically manage both investment and financing decisions overtime. They initiated with a firm producing stochastically priced single commodity which had production and financial flexibility in terms of operating adjustment and recapitalization cost respectively.

They studied interactions between the firm’s investment, operating and financing decisions in the firm’s value maximization framework by using numerical solution techniques to solve the model and analyze interaction effects. They calculated the levered firm’s value using an adjusted present value approach, where the value of interest tax shields augmented the net present value of the operating cash flow stream. Production flexibility showed a significant effect on financing decisions. The firm’s average leverage ratio was higher and the range over which the firm allowed its leverage ratio to vary was higher and the range over which the firm allowed its leverage ratio to vary was narrower with smaller operating adjustment costs. As a result, the present value of interest tax shields net of recapitalization costs

increased as operating adjustment cost decreased. However, the increase in net tax shield value was smaller and recapitalization costs lower. Moreover, production and final flexibility did not come out as perfect substitutes as the hedging benefit of production flexibility had less impact on the net tax shield value of debt financing when costs of dynamically managed capital structure were small. The results were in sharp contrast with static capital budgeting models regarding financial policy’s effect on initial investment decision and subsequent operating decisions. They asserted that value of the firm had a negligible effect due to leverage. Moreover, the firm could forego earning tax shields only over the period of delaying investment in a dynamic setting model. They concluded that loss in tax shields value from waiting for additional uncertainty resolution was not large enough for the firm to significantly deviate from the investment and operating policies of an equivalent un-levered firm.

**Calomiris, Charles W. and Hubbard, Glenn R (1995)**²⁰

Calomiris and Hubbard (1995) investigated the relationship between internal finance and investment by taking evidence from undistributed profits tax of 1936-37. The objective of the study was to test the model of financing costs under asymmetric information with firm level data on relative cost of internal funds and external funds. They employed new firm level data set from the 1930s which aptly suited to measure the shadow value of internal funds and relate it to firm’s characteristics and behavior. The sample was drawn from manufacturing firms during the rapid recovery and subsequent recession of 1933-38. This allowed to investigate the potential effects of financial constraints on the firm’s growth during expansion and to take advantage of heterogeneity in the sample to discover which firms placed highest value on internal funds and whether these firms were sensitive to cash flow disturbances. The cost of external finance was directly estimated on the basis of firm’s responses to a unique tax “experiment” i.e. the undistributed profits tax of 1936-37. They argued that cross sectional evidence from firms’ responses to the undistributed profits tax provided evidence of very high costs of external finance for a large proportion of firms.

The data of 273 firms was compiled from Survey of American Listed Corporations (1940) which summarized the data submitted to Securities and Exchange Commission for all publicly traded firms including detailed information on balance sheets, expense and income statements, and record of dividend distribution. The firms with inconsistent date (accounting year) from 1934-36, negative earnings, unavailability of stock price data and/or insufficient tax and dividend data to calculate maximum marginal rate of the surtax on undistributed profits (SUP) were excluded from the analysis. The principal source of data on SUP taxes and dividends was Moody’s Industrial Manual. The firm-level evidence on size, profitability, leverage, and stock price changes for firms at different surtax margins in 1936 as well as aggregate data on the high floatation costs of publicly traded securities supported that capital market frictions arising from asymmetric information were an important source of high costs of external finance for business fixed investment.

They followed Fazzari, Hubbard and Peterson (1988)\(^{21}\) by estimating versions of neo-classical investment model controlling for firms investment opportunities using Tobin’s Q and sales growth. In the aggregated regression both Q and cashflow entered positively but the cashflow effect was small and statistically insignificant. The results for surtax-margin heterogeneity revealed that the sensitivity of investment to internal funds was concentrated in firms with retention ratios above 40 percent. The analysis revealed that only high Q and high retention firms exhibited cashflow sensitivity to investment and the effects were more statistically significant for those firms than for the whole sample. Hence the investment of firms paying highest rates of surtax was sensitive to shifts in both firms’ opportunities and internal funds. They concluded that surtax on undistributed profits in the 1930s offered a rare opportunity to measure the shadow price differential between internal and external finance constraints associated with a “financing hierarchy” in determining investment behavior.

\(^{21}\) Fazzari, Hubbard and Petersen, 1988, op. cit.
Cleary (1999)\textsuperscript{22}

Cleary (1999) carried out a study to show that firm’s investment decisions were directly related to financial factors. He argued that financial structure may be relevant for investment decisions for companies facing uncertain prospects that operate in imperfect or incomplete capital markets where the cost of external funds exceeds that of internal funds. He followed the approach of Kaplan and Zingales (1997)\textsuperscript{23} for classifying firms according to their financial variables that were related to financial constraints. The financial status of the firm was determined by using multiple discriminant analysis similar to Altman’s Z to capture the desired cross-sectional properties of the firms by transforming entire profile of characteristics into a univariate statistic. However, he did not allow the group composition to vary by implicitly assuming that the financial factors faced by the firms did not change over time. The major focus of the work was on comparison of investment-liquidity sensitivities across different group of firms.

He took a sample of 1317 United States firms for a period from 1987 to 1997 from the SEC Worldscope Disclosure Data Set. Banks, insurance companies, other financial companies and utility companies were deleted from the sample. Moreover, the firms with positive value for sales, total assets, net fixed assets, and market-to-book ratio were included. The sample included 709 NYSE Listed companies, 416 NASDAQ companies and 192 companies listed on AMEX or other U.S. exchanges covering manufacturing, agricultural, retail, wholesale trade and service firms. Further, the firms were classified into groups according to a period financial constraint index referred to as $Z_{FC}$ which was a proxy for current ratio, debt ratio, fixed charge coverage, liquidity, leverage, profitability, net income margin, sales growth and slack/net fixed assets.

Discriminant analysis classified the firms into three groups,

- Firms with increasing dividends and not financially constrained
- Firms with cut in dividends and most likely to be financially constrained


• Firms which did not change the dividend payments

A regression equation was estimated following various aspects of the work done by Fazzari et al (1988)\(^ {24}\) and Kaplan and Zingales (1997)\(^ {25}\) using fixed firm and year effects. Regression estimates indicated that the firm’s investment decisions were sensitive to the investment opportunities as given by market-to-book, but were even more sensitive to liquidity variables. Additionally, a bootstrap methodology was used to determine significance levels of observed differences in coefficient estimates across different firm categories. Large sample evidence demonstrated that the investment decisions of the firms with high creditworthiness were significantly more sensitive to the availability of internal funds than that of less creditworthy. It also supported that least constrained firms are the most sensitive to cashflow availability. However, the observed sensitivities might be due to general behavioral characteristics of most firm managers and not due to “managerial risk aversion”.

The studies reviewed in this section strongly put forward the need to study the impact of financing on capital expenditure decisions of a firm. McCabe (1979)\(^ {26}\) made a remarkable attempt to study the interdependence of investment and financing decisions using two stage least squares with a cross-section sample of United States (US) companies. He undertook the model from Dhrymes – Kurz (1967)\(^ {27}\) and modified by adding lagged variables. As the preliminary work yielded no great results, the variables measuring short-term financing and equity were not considered important. The results were markedly against the Modigliani and Miller (MM)\(^ {28}\) proposition of no interdependence between investment and financing decision. Clark et al (1979)\(^ {29}\) used five models viz., generalized accelerator, cashflow combined with accelerator, neoclassical, modified neoclassical and securities value to reduce the problem of model dependence. Output was found to be the primary determinant of non residential fixed investment and simple accelerator and modified neoclassical

\(^{24}\) Fazzari, Hubbard and Petersen, 1988, op. cit.
\(^{25}\) Kaplan and Zingales, 1997, op. cit.
\(^{26}\) McCabe, 1979, op. cit.
\(^{27}\) Dhrymes and Kurz, 1967, op. cit.
\(^{28}\) Modigliani and Miller, 1958, op. cit.
\(^{29}\) Clark et al, 1979, op. cit.
model fitted closest with the historical data. Peterson and Benesh (1983)\(^{30}\) applied a three equation model with investment, dividend and new debt as explanatory variables in each one of them. They concluded that three stage least squares substantiated the view that financing decisions have impact on the level of investment expenditures. Moreover, investment and financing decisions were jointly determined and that investment decisions were influenced by financing decisions.

Fazzari, Hubbard and Peterson (1988)\(^{31}\) conducted a study of financing constraints and corporate investment with Q theory of investment. The study concluded that imperfect information could create “financing hierarchies” in the use of internal and external finance. Pruitt and Gitman (1991)\(^{32}\) analyzed the opinions of practicing finance managers by a mail questionnaire based survey. The survey results indicated that investment decisions of the firms were primarily dependent on changes in firm’s sales level and current and past profits. However, the research suggested that opinions held by Modigliani and Miller\(^{33}\) through their separation principle were held by practicing financial managers of real world despite significant violations of underlying assumptions.

Whited (1992)\(^{34}\) and Oliner and Rudebusch (1992)\(^{35}\) extended the work of Fazzari et al (1988) of the interdependence of financing and investment. The latter concluded that cash flow seemed to have a significant and positive influence on investment and Q had virtually no effect. The link between investment and internal funds was consistent with the existence of a financing hierarchy. Mauer and Triantis (1994)\(^{36}\) used a multi period contingent claims model to investigate interactions of corporate and investment decisions in a dynamic framework. Calomiris and Hubbard (1995)\(^{37}\) investigated the relationship between internal finance and investment. They also followed Fazzari, Hubbard and Peterson (1988)\(^{38}\) by estimating versions of neo-classical investment model controlling for firms investment opportunities using

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\(^{30}\) Peterson and Benesh, 1983, op. cit.
\(^{31}\) Fazzari, Hubbard and Peterson, 1988, op. cit.
\(^{32}\) Pruitt and Gitman, 1991, op. cit.
\(^{33}\) Modigliani and Miller, 1958, op. cit.
\(^{34}\) Whited, 1992, op. cit.
\(^{35}\) Oliner and Rudebusch, 1992, op. cit.
\(^{36}\) Mauer and Triantis, 1994, op. cit.
\(^{37}\) Calomiris and Hubbard, 1995, op. cit.
\(^{38}\) Fazzari, Hubbard and Petersen, 1988, op. cit.
Tobin’s Q and sales growth. The analysis revealed that only high Q and high retention firms exhibited cashflow sensitivity to investment. Cleary (1999)\textsuperscript{39} carried out a study to show that firm’s investment decisions were directly related to financial factors. Regression estimates indicated that the firm’s investment decisions were sensitive to the investment opportunities as given by market-to-book, but were even more sensitive to liquidity variables.

The studies reviewed in this section have revolved around the theme of interaction of investment and financing decisions and have used various theories of investment and econometric models for analysis. The present study is an attempt to conduct a study using an Indian economy (developing economy) based sample by applying an appropriate investment model suitable in Indian conditions to derive conclusive evidence about impact of financing variables in investment equation.

3.2 REVIEW OF OTHER COUNTRIES’ (EXCEPT USA AND INDIA) STUDIES

This section provides the review of empirical studies conducted in other countries except United States (US) and India.

Devereux, Michael and Schiantarelli, Fabio (1989)\textsuperscript{40}

Devereux and Schiantarelli provided economic evidence of the impact of financial factors like cashflow, debt and stock measures of liquidity on the investment decisions of U.K. firms. The study supported the view that differential information and incentive problems make external finance costlier than internal finance. While agency costs on one hand made debt issues less attractive, the tax deductibility of interest payments on the other hand made it more attractive. New share issues were at the same time disadvantageous because of transaction costs, tax reasons or asymmetric information. Informal evidence on transactions costs in the

\textsuperscript{39} Cleary, 1999, op. cit.
United Kingdom (UK) suggested that there were large fixed costs in issuing new equity.

The empirical importance of financial variables, in particular cashflow and stock measures of liquid assets as stressed by many econometric studies of investment based on firm level data was carried forward in this study. These variables were introduced via an extension of Q model of investment to analyze the significance of cashflow and effect of financial factors across different types of firms, according to size, age and type of industry. The model included financial distress/ agency costs as an increasing function of stock of debt and decreasing function of stock of liquid assets and cashflow. Capital stock was also an explanatory variable. Moreover, perfect competition, linear homogeneity of the production, adjustment and agency costs function were the underlying assumptions. Debt and liquid assets were chosen endogenously together with investment and new share issues. The study was based on a sample of 720 firms in the United Kingdom (UK) manufacturing sector over the period 1969-1986, quoted on the London Stock Exchange. Accounting data of each firm was collected by Datastreams and market valuations were taken from London Shareprice Database. The results indicated that in all cases cashflows were significantly associated with investment. Stock measures of liquidity did not play an important empirical role. The stock of debt gave a negative impact on investment although its significance depended on sample size. Q played a significant role in the full sample but not for a sub-sample of typically small firms. Cashflows played more important role for larger firms than smaller apparently due to lower relative cashflow or higher agency costs of large firms. The age-wise classification indicated a higher importance of cashflows for newer firms perhaps due to larger information asymmetries. The work finally concluded to take capital market imperfections as an important ingredient of any extension to or reformulation of the adjustment cost model of investment.
Corporate structure, liquidity and investments were examined by Hoshi, Kashyap and Scharfstein (1991) with two sets of Japanese firms. The objective of the study was to present evidence that the information and incentive problems in capital markets affect investment. The first set of firms had close financial ties with large Japanese banks that served as primary source of external finance and were a part of Keiretsue (industrial group/institution that coordinates activities of member firms and has both shareholders and creditors of group firms). However, the second set of firms had weaker links with the main bank and was usually independent. The paper was devoted towards exploring the importance of liquidity for investment decisions and role of banks and other financial intermediaries in channeling funds into productive investment. They expected that liquidity would be more important for independent firms than the affiliated ones.

The data of about 337 firms continuously listed on Tokyo Stock Exchange between 1965 and 1986 (having fiscal year ending in March) was collected from Nikkei Financial Data Tapes. Fiscal year ending March was chosen to simplify the construction of (tax-corrected) Tobin’s average q, used further in the analysis. The companies were selected on the basis of Nakatani’s (1984) refinement of Keiretsue no Kenkyu’s classification (This scheme focused on the strength of a firm’s relationship to the financial institutions in the group) and eliminated the firms that switched groups. 121 firms were from affiliated group, 24 independent and 192 were a hybrid mix of affiliated and independent firms. The study of the two set of firms showed that gross investment normalized by the beginning of the period capital stock; liquidity-capital and production-capital ratios were just about the same across the two sets. However, the ratios were a little larger and more volatile for independent firms’ along with a higher Tobin’s q. The striking difference was of higher debt-equity ratio as close banking relationships reduced the cost of financing for group firms.

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Hoshi, Takeo; Kashyap, Anil and Scharfstein, David (1991)41

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The regression equation was set up with liquidity; Tobin’s Q and lagged production as regressors. Investment, production and liquidity measures were normalized by firm’s capital stock in the beginning of the year to normalize the effects of scale. Further, firm dummy and yearly dummy variables were introduced to remove firm specific effects and macro shocks respectively. The results indicated that though the effect of production and liquidity were statistically significant and positive but Q was unable to explain investment alone for all firms collectively. Further, the liquidity variables were much larger for independent firms than group firms. The analysis of 192 hybrid firms was conducted by dividing them in three sub-groups. The first sub-group of firms had some connection to a major group but no major close financial ties with groups’ banks. Second sub-group was neither independent, nor affiliated firms and third one comprised of subsidiaries of group firms. Liquidity was found to be important for first and second sub-group; however the third sub-group’s investment was not particularly sensitive to liquidity. Hence, the companies with close ties to bank were less liquidity constrained, although the economy as a whole might be liquidity constrained. They concluded that costs and benefits were attached with close banking relationships. They admitted that there were costs (reserve requirements, monitoring costs and control by banks over corporate managers) and benefits associated with close banking relationships and a deeper insight was desirable.

Bond, Stephen and Meghir, Costas (1994a)⁴²

In 1994, Bond and Meghir carried out a study on “Dynamic Investment Models and the Firm’s Financial Policy” by using macro economic data for an unbalanced panel of 626 quoted United Kingdom (UK) manufacturing companies for 1974-86. The firm level data was used for investigating the sensitivity of investment to the availability of internal funds using the hierarchy of finance approach to corporate policy. They developed an empirical model of investment based on Euler equation of the standard neoclassical model of capital accumulation subject to adjustment costs. The standard model of investment as such did not have

a substantial role of financial policy. It could happen only if the firm preferred to use one source of financing over the other and such preference would arise if the tax system favored capital gains over dividend income or if transaction costs of issuing fresh equity were significant. The presence of bankruptcy cost would also make debt finance increasingly expensive as the probability of bankruptcy rises with greater proportions of debt finance, although lower levels of the same may be attractive due to tax advantages. This situation indicated the existence of “pecking order” (Myers, 1984)\(^43\).

They introduced two sources of discrimination between retained earnings and new share issues into the model, namely, differential personal taxation on capital gains and dividend income, and transactions charges associated with the new issues. To consider the empirical implications of the introduced changes, they initially considered a situation where a firm had no debt. The results indicated significant differences in the investment behavior of sub-samples of the firms categorized according to their financial policies. The model also suggested the possibility that some of the firms might be in a regime in which their investment expenditure was liquidity constrained and it would increase response to a windfall increase in the earnings. Results for the whole sample indicated that a dynamic relationship between this period’s investment and its previous rate was broadly consistent with the optimal path implied by the adjustments costs model. They also found that investment depends upon measure of dividends and new share issues when sub-groups were not allowed. They concluded that neither the standard neo-classical model nor the pure hierarchy of finance provided adequate explanation to their sample. The main weakness of the hierarchy model seemed to be the firm’s reluctance to pay zero dividends.

**Estrada, Angel and Valles, Javier (1998)\(^44\)**

Estrada and Valles conducted a study titled “Investment and Financial Structure in Spanish Manufacturing Firms” to empirically analyze the interrelatedness

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\(^{43}\) Myers, 1984, op. cit.

of investment and financing variables within a non-linear Euler equation set-up. They followed Bond and Meghir (1994)\textsuperscript{45} by considering the endogeneity of investment relationship between two consecutive periods by setting a supply function of funds. They tested the influence of financial variables on investment decisions within neo-classical framework in which all the firms faced same marginal cost of debt. Further, they accepted an alternative model with an elastic credit supply function of the current level of external funds and the asset structure. An attempt was made to collect evidence about group of firms that was financially constrained. Moreover, the relevance of bankruptcy risk in the determination of financial constraint could help explain the differences on the cyclic behavior of investment and other real variables in response to monetary and fiscal policies.

The study was based on the itemized information about non-financial firms in Centre de Balances Del Banco De Espana (CBBE) during the period from 1983-92. The firms listed for five consecutive periods or more were selected except those with agriculture, energy, construction or services as their main activity. The final sample had 1,508 firms with 12,205 observations. Capital stock series was obtained using the perpetual inventory method with constant sectoral depreciation rate and a sectoral deflator. The Euler equation of investment model was set up with the assumption of independence from the financial variables. The investment demand function was not linear in the variables and in structural parameters. Generalized method of moments was used as the estimation procedure. They estimated a non-linear investment demand function that came from an optimization under uncertainty. Such function took account of adjustment costs in the investment process and the fact that firms had power in the goods market. The tax differential between external and internal funds was recognized and one period investment lag was also considered. The neo classical model of investment was rejected due to presence of correlation between its financial variables and error term. Further, they modeled the influence of financial constraints on investment through credit supply. The results supported the existence of asymmetric information in the credit market which implied a premium in the cost of external finance that was dependent on indebtedness and collateral of the firm. Lastly,

\textsuperscript{45} Bond and Meghir, 1994a, op. cit.
it was also found that smaller Spanish firms were more financially constrained due to bigger unit cost of their external resources.

Goergen and Renneboog (2000) conducted a study titled “Investment Policy, Internal Financing and Ownership Concentration in the United Kingdom (UK)” to investigate whether investment spending of firms was sensitive to the availability of internal funds. They focused on the impact of relative voting power and liquidity of investment spending in United Kingdom (UK) firms. The empirical version of the Bond and Meghir (1994) Euler-equation model was extended by including variables capturing ownership concentration and shareholder coalition. They categorized four broad classes of models as neoclassical model, the sales accelerator model, the Tobin’s q model and the Euler-equation model, quite in line with Clark et al (1979) but with certain extensions and modifications. In the neoclassical model, the relative cost of capital was the main determinant of corporate investment along with cash flow sensitivities for firms and the model did not include any forward-looking variables. Similarly, the sales accelerator model did not include expectations about the company’s growth potential and assumes that investment grows along with total sales. They further added that as data on expectations was not available; the relations between investment decisions, expected future levels of output and the hurdle rate (the minimum required rate of return acceptable for investment projects) could not be estimated. Even the Tobin’s q based models were criticized due to difficulty in measuring the replacement value of assets. Moreover, Tobin’s q would only include future expectations if the firm was a price taker in perfectly competitive industries, had constant returns to scale and if the stock market value correctly measured the fundamental expected present value of the firm’s future net cash flows. In practice, these conditions may not be fulfilled. Finally, they suggested the Euler-equation

46 Goergen M. and Renneboog, L., "Investment Policy, Internal Financing and Ownership Concentration in the UK", Centre for Economic Research, November 2000  
47 Bond and Meghir, 1994a, op. cit.  
48 Clark, Greenspan and Goldfeld, 1979, op. cit.
model used by Bond and Meghir (1994)\textsuperscript{49} was based on the first-order conditions of a maximizing process.

The model dealt with the shortcomings of the neoclassical and average Tobin’s q models. The level of investment relative to the capital stock was a function of discounted expected future investment adjusted for the impact of the expected changes in the input prices and net marginal output. The Euler’s specification controlled for the influence of expected future profitability on investment spending. At the same time no explicit measure of expected demand or expected costs was required as future unobservable values were approximated by instrumental values. They set up the following four hypotheses:

- There was no relation between a firm’s investment decision and its cashflow stock.
- Whether presence of a large outside share block held by an industrial or commercial company, or an individual or family not related to a director, made any difference to the first hypothesis.
- There was no relation between investment and internally generated funds in companies where institutional shareholders owned large ownership stakes.
- Inside ownership did not influence the investment-cash flow relation.

The analysis was based on a sample of 250 companies, randomly selected from all the companies quoted on the London Stock Exchange in 1998. Financial Institutions, estate companies and insurance companies were excluded. A data panel was constructed for the period 1988-1993 because the ownership data had to be collected by hand from company reports. The recession period of 1988 to 1993 was chosen during which corporate liquidity constraints might have been severe. The companies with inconsistent data who were delisted through takeovers or turned insolvent in 1988-91 were excluded.

The data for the model were collected using the same variable definitions and the same Datastream codes as used by Bond and Meghir (1994)\textsuperscript{50}. New Share Issues were collected from the London Share Price Database. Ownership data on the size of shareholdings for both, the existing and new shareholders for each year in the period\textsuperscript{51}

\textsuperscript{49} Bond and Meghir, 1994a, op. cit.

\textsuperscript{50} Ibid.
1988-1993 were collected from the annual reports. A panel over a six year-period (1988-1993) was collected to capture dynamic adjustment processes and to control better for the effect of omitted variables. The two main approaches to test the investment-cash flow relation were to either partition the sample by a variable expected to reflect financing constraints (e.g. a low dividend payout ratio) and the models are subsequently run for each sub-sample or inclusion of interactive terms, each consisting of a dummy variable set to one if the firm’s ownership of financial situation satisfies a certain criterion in the model. The advantages of latter method were emphasized. All the models were estimated Arellano and Bond’s Dynamic Panel Data (DPD)-program written in GAUSS. The basic Bond and Meghir (1994)\textsuperscript{51} model was estimated using the three different estimation techniques OLS, GMM\textsubscript{diff} and GMM\textsubscript{sys}. Only the model estimated with GMM\textsubscript{sys} dynamics of the structural adjustment costs of Bond and Meghir (1994)\textsuperscript{52} model was not rejected and the size, sign and significance of the explanatory variables were in line with the theoretical predictions and the empirical results of Bond and Meghir (1994)\textsuperscript{53} model. For the whole sample, there was no evidence of a positive relation between the levels of internally generated funds and subsequent investment spending, or no evidence of consistent over-or under-investing. The interaction term with cash flows showed that the investment spending of companies with financing needs was almost three times as sensitive to the availability of cash flow liquidity constraints as firms without financing needs leading to rejection of the first hypothesis. Moreover, the third hypothesis was also rejected because the sensitivity to the presence of internally generated funds disappeared for companies with the high levels of institutional ownership suggesting a reduction in sub-optimal investment spending. While for companies without large share stakes controlled by industrial companies, investment was not cash flow dependent, the presence of voting control by industrial companies induced a positive relation between cash flow and investment spending resulting in either overinvestment or underinvestment.

\textsuperscript{51} Ibid.
\textsuperscript{52} Ibid.
\textsuperscript{53} Ibid.
Galizia, Federico and Brien, Dermot O’ (2002)\textsuperscript{54}

Galizia and Brien investigated whether the capital expenditures explained the determination of debt issues for listed companies in United Kingdom (UK), Germany, France and Italy over a decade. They suggested funds flow perspective because cashflow statements could only present sum of sources and sum of uses. The major concern of the study was to understand and establish an econometrics relationship between capital expenditure and new debt despite the fact that the above mentioned companies had high debt component in existing capital structure along with consistent data availability of excess internal funds over investment needs. The sample included only consolidated accounts for companies with consistent data availability. However, those with negative net worth and/or large outlier (extremely high values than rest of the sample) values for profitability and market-to-book were rejected. The companies were grouped in five categories, namely, United Kingdom (UK) manufacturing (192), United Kingdom (UK) services (120), French (60), Italian (43) and German (36) companies. The relevant data was extracted from Worldscope database compiled by Bureau Van Dijk. The study maintained an eclectic approach and included elements from both trade-off and pecking order theory of capital structure stating that companies issue debt only after consuming internal sources.

Five main determinants of debt issues selected on the basis of literature review included lagged level of leverage, size of the company, availability of fixed assets to be used as collateral, profitability and current ratio. The long-term debt was normalized by sum of capital expenditure and net assets from acquisitions as a measure to control heteroskedasticity. A null hypothesis of no relationship between capital expenditure and issues of debt was examined to avoid the effect on any pre-determined variable on the ratio. The results confirmed a strong positive influence of leverage and availability of collateral on debt issues. The performance of other variables was more mixed across countries. Further, liquidity as measured by current ratio had a positive effect on activities of cash strapped companies. They

refuted the circulatory problem given that leverage could be predicted on the basis of pre-determined variables other than past issues of debt. Broad similarities in the balance sheets of companies in different countries and sectors were found along with fundamental differences in cashflow statements between United Kingdom (UK) and continental companies. A strong negative relationship was found between debt issued and profitability in United Kingdom (UK), while no significant relationship could be found for Germany, France and Italy.

The results were consistent with dynamic models of leverage and applied to all countries. The availability of collateral had a significant positive influence on debt issues in all countries except France. Also, the measure of fit for the cross-sectional regressions was quite high. On the other hand, descriptive statistics suggested that debt issues were infrequent while capital expenditures were non-zero for almost all companies/years. Lastly, debt issues were more frequent in companies with “financial surplus” as compared to those in financial deficit.

**Bruinshoofd, W.A. (2004)**

Corporate investment and financing constraints were studied by Bruinshoofd (2004) for research department of De Nederlandsche Bank to explore the relevance of financing constraints and to build a flexible reduced-form model for simultaneous analysis of financial and investment between capital structure and investment subject to financing constraints. Q model, reduced-form regression and Euler’s investment equation were analyzed to find the suitability of identifying financially constrained firms. The major advantage of reduced-form model is to abstain from explicit modeling of the adjustment cost technology. Conversely, they may be particularly ill-suited in determining structural determinants of capital demand. It was further asserted that validity of reduced-form models was sustained if mismeasurement of investment opportunities was same for constrained and unconstrained firms.

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55 Bruinshoofd, W.A., “Corporate Investment and Financing Constraints: Connections with Cash Management”, WO Research Memoranda (discontinued), Netherlands Central Bank, Research Department, 2004
On the other hand, Euler’s equation had an edge over the reduced-form models because of abstinence from using noisy stock market information to characterize investment opportunities. However, they might encounter difficulty in picking up effects of financing constraints when they remained equally tight over time. The author further discussed the inability of factors like, size, leverage or cash holdings in identifying financially constrained firms due to univariate stratification. He focused on debt and cash holding because these variables produced some of the most striking and contradictory results when applied as sample stratification devices to the financing constraints analysis. He further maintained that a firm may rationally keep precautionary spare debt capacity to avoid costs of financial distress and to maintain financial slack. He proposed vector autoregressive investment model where investment in fixed assets was explained by expected net return on capital, cashflow cash assets and cash target. All the variables were assumed to be appropriately deflated. This model allowed deviations of liquidity holdings from targeted levels to impact investment spending while also allowing for a lagged feedback effect from investment outlays to cash dynamics. It was considered as a powerful tool to simultaneously analyze investment and financial decisions. He concluded by recommending the use of information on optimal cash management policies to identify firms that face financing constraints i.e. the amount of “free cash” (cash which firms can readily commit to new investments without looking towards external markets) with a firm.

Aivazian, Varouj A.; Ge, Ying and Qiu, Jiaping (2005)\textsuperscript{56}

Aivazian, Ge and Qu analyzed the impact of leverage on firm’s investments with reference to Canadian companies. The paper provided several important dimensions pertaining to problem of endogenity (leverage might proxy for growth opportunities) in the relationship of investment and leverage. They argued that Canadian evidence was of particular interest because of similar institutional and regulatory structure as of United States (US). The study was conducted to derive

some interesting results by comparing the conclusions of two similar yet quite independent samples.

He presented two theoretical links between leverage and investment. At first, the under-investment theory according to which increase in leverage reduces the incentives to shareholders since partial benefits (positive net present value of investment opportunities) accrues to the bondholders. It also centers on liquidity effect that firms with large debt commitments invests less irrespective of availability of growth opportunities. The next was the use of leverage as a mechanism for overcoming the over-investment problem because of a negative relationship between debt and investment for firms with weak growth opportunities. The data was collected from Compustat Canadian 1999 Annual File for a period from 1982-1999. The average age of firms was 8.2 and 863 firms were in the final sample after checking and screening for coding errors and missing variables. They used two alternative definitions for leverage. The first one was book value of total liabilities divided by book value of total assets while the other was book value of long-term debt divided by total assets. Both the measures had empirical support. They estimated a reduced-form investment equation to examine the impact of leverage on investment where investment was the dependent variable and independent variables included cash flows, lagged Tobin’s Q, lagged leverage and lagged net sales of the firm. Further they employed random as well as fixed effect model to control individual firm heterogeneity along with pooled regression. For pooling regression, the Huber/White/Sandwich estimators of standard errors were used. The Lagrangian multiplier test was used to test the random effect model verses the pooling regression. The Hausman specification test was used to test the fixed effect model verses the random effect model. The results suggested that fixed effect model was most appropriate for estimating investment equation. Collinearity was not serious as the correlation among independent variables was low. They also addressed the endogenity problem in the relationship between investment and leverage.

The results indicated that leverage had a significantly negative impact on firm’s investment and the impact was stronger for low growth opportunities than firms with high growth opportunities. The negative effect was large and robust to different measures of leverage, to different samples and to alternative econometric
methodologies. They concluded by supporting the theory that leverage has a disciplining role for firms with weak growth opportunities.

Cava, Gianni La (2005)\textsuperscript{57}

Cava carried out a study of financial constraints and cost of capital to examine the factors driving corporate investment in Australia by using panel data of listed companies covering the period from 1990 to 2004. He also explored the effect of cashflow on investment to highlight the significance of internal funds for financially constrained companies. He asserted that panel data could help in minimizing the simultaneity problem, usually encountered in macro studies of investment. Moreover it allowed to determine if changes in financing costs mattered more for certain type of firms and with a fairly short time-series.

He estimated an Error Correction Model (ECM) of investment. He insisted that the inclusion of financial factors as short-term determinants of investment was important to understand the monetary policy transmission process through “credit” and “interest” rate channels. A firm was considered financially constrained if its investment was dependent on changes in retained earnings. He used reduction in dividend payments as the indicator of financial constraints as an unconstrained firm would have no incentive to cut dividends due to the attached signaling effect. The use of dummy variables for the year in which firm made a dividend cut allowed in shifting between constrained and unconstrained sub-periods over the study period. Though a firm’s dividend policy might not be a good indicator of the level of financing constraint, nonetheless the econometric analysis showed it to be a useful indicator. He further pointed out that a constrained firm might not show cashflow sensitivity as the sample may have a mix of constrained and distressed firms. Financially distressed firms were identified through negative cashflow. Such firms might use an increase in cashflows to reduce their debt burden instead of long-term investments.

\textsuperscript{57} Cava, Gianni La, “Financial Constraints, the User Cost of Capital and Corporate Investment in Australia” Research Discussion Paper (2005-12), Economic Analysis, Reserve Bank of Australia, December 2005
The relevant data about financial accounts of Australian companies was taken from Bloomberg database related to publicly listed companies on Australian Stock Exchange between 1990 to 2004 (including delisted companies of past five years). The sample excluded banks, financial services, insurance and property trusts (different policy mechanism) and firms with consistent data availability of at least three consecutive years. The top and bottom 2 percent of each variable was trimmed to decrease the effect of outliers. However, 3 percent was trimmed for investment and cashflow to encounter the strong merger effect and technology boom during the study period. The first year observations were lost due to differencing. A final (unbalanced) sample of 300 firms and 1,700 firm-year observations was developed after controlling for the possible endogeneity by using lagged variables over two years as instruments. The study was able to minimize the ‘survivor bias’ due to inclusion of certain delisted companies and was expected to better capture the effects of cashflow on firms that are probably financially distressed. Investment i.e. the dependent variable was measured as a percentage change in capital stock (after adding back depreciation). Real sales (measured as firm-level sales revenue divided by aggregate GDP deflator), cashflow and the real user cost of capital were the explanatory variables. The user cost of capital was defined as cost of finance plus depreciation costs, adjusted for the effects of corporate taxes, subsidies and inflation. The sample was reasonably represented as well as correlated with macro variables as (nominal fixed) investment, gross earnings and sales constituted 70 percent of their respective aggregate concepts as reported in National Accounts.

The study focused on a reduced-form model instead of an explicit model as the main focus was to uncover determinants of investment and while not explicitly derived, the investment equation still allowed for short-run adjustment and expectation lags. Even other microeconomic studies supported the performance of implicit model over the structural ones. The ECM specification was derived from the static capital demand equation which defined natural log of firm’s desired capital stock as a function of lagged capital stock, current and lagged sales and cashflows. Financial constraints were modeled by augmenting the basic ECM with a dummy variable for dividend cut. Further, three separate dummies were used for financially constrained, distressed and loss makers to cover distress effect. A form
of fixed effects estimation was adopted because firm-specific effects were expected to be present either as a result of technological heterogeneity or non-random sampling. The ECM was estimated using Arellano-Bond two step Generalized Method of Moments estimator in the dynamic setting. This helped in eliminating firm specific effects by differencing the equations and used lagged values of endogenous variables as instruments. Sargan test for identifying the restrictions and direct test of serial correlation in residuals was used to validate the instruments. The results indicated a negative and significant lagged investment rate across successive time periods. The speed of adjustment parameter also had the expected negative sign implying that the firms with excess capacity cut back on their investment plans. Short-run effects showed positive and significant real sales. Cashflow did not seem to affect the investment of either unconstrained or constrained firms on an average. The study concluded real sales and user cost of capital as significant determinants of firm-level investment in both short and long run. It also suggested that internal funds would play an important role for financially constrained firms which could not obtain enough external funding to meet the desired level of investment.

This section has discussed various studies researched in the area of dependence of investment on financing in various other countries apart from United States (US) and India. Devereux and Schiantarelli (1989)\textsuperscript{58} analyzed the impact of financial factors like cashflow, debt and stock measures of liquidity on the investment decisions of U.K. firms. Cashflows were found to be significantly associated with investment while stock measures of liquidity did not play an important empirical role. Corporate structure, liquidity and investments were observed by Hoshi, Kashyap and Scharfstein (1991)\textsuperscript{59} with two sets of Japanese firms. The results indicated that though the effect of production and liquidity were statistically significant and positive but \text{Q} was unable to explain investment alone for all firms collectively. Estrada and Valles (1998)\textsuperscript{60} followed Bond and Meghir (1994a)\textsuperscript{61} in studying the investment and financing structure in Spanish manufacturing firms. The neo-classical model of

\textsuperscript{58}Devereux and Schiantarelli, 1989, op. cit.
\textsuperscript{59}Hoshi, Kashyap, and Scharfstein, 1991, op. cit.
\textsuperscript{60}Estrada and Valles, 1998, op. cit.
\textsuperscript{61}Bond and Meghir, 1994a, op. cit.
investment was rejected due to presence of correlation between its financial variables and error term. It was also found that smaller Spanish firms were more financially constrained due to bigger unit cost of their external resources.

Goergen and Renneboog (2000)\(^6^2\) also used Euler-equation model by including variables capturing ownership concentration and shareholder coalition. For the whole sample, there was no evidence of a positive relation between the levels of internally generated funds and subsequent investment spending, or no evidence of consistent over-or under-investing. Most of the studies in this section have supported the impact of financing on investment decisions. Cashflows have largely been found as positively significant. A similar study is therefore required in Indian context to assess the significance of these results in a developing economy.

### 3.3 REVIEW OF INDIAN STUDIES

The following discussions provide a review of relevant Indian studies.

**Krishnamurty, K. and Sastry, D.U. (1975)\(^6^3\)**

Krishnamurty and Sastry (1975) conducted one of the earliest studies on investment and financing in Indian corporate sector. The study analyzed the determinants of fixed and inventory investment, dividends (savings) and external finance. Additionally, the factors governing disposition of profits between dividends and savings, the forces influencing external financing were also studied. The study covered a wide spectrum of Indian manufacturing sector covering consumer, intermediate and capital goods industries with 310 companies. The analysis was done industry wise due to different growth rates and government policies faced by them.

The relevant data was collected from Profit and Loss Statements and Balance Sheets from Bombay Stock Exchange Official Directory for a period of 1960-70. The cross-section analysis was supplemented by time-series analysis. Investment behavior was studied in the context of flexible accelerator model with financial variables. This

\(^6^2\) Goergen and Renneboog, 2000, op. cit.
implies that company moves from current to the desired level of capital stock at a particular speed of adjustment and not instantaneously. Such lags arise on account of technological, institutional factors and expectations. However, it was also highlighted that accelerator based models may not be apt for developing economies like India due to government supported investment promotion. Furthermore, accelerator principle would apply to new investment only. Depreciation reserves were therefore used to account for replacement investment. It represented the accumulated sum of annual depreciation provision that was set aside by the firms. Though it might not reflect actual capital used, it could estimate the average age of equipment. In the basic equation investment was explained by change in sales (accelerator), inventory investment, gross retained earnings, flow of net debt (external finance), depreciation reserves at the beginning of the year along with closing quarter and yearly dummies. Capacity utilization, though an important variable, was left out of analysis due to lack of data. Investment was defined as change in gross fixed investment over a year; gross retained earnings were profits after tax and dividends but before depreciation and change in current and non-current liabilities was precisely flow of net debt. All the variables were at current prices but the pooled cross-section analysis involving flow and stock variables, both current and lagged required price deflation. Due to the problem in obtaining appropriate deflators, the variables were deflated by capital stock at the beginning of the year to counter the problem of heteroskedasticity.

The analysis displayed the importance of accelerator in the explanation of fixed investment. However, the extreme form of controls inclusive of price and distribution indicated absence of accelerator effect in specific industries. Internal and external financial flow variable were found significant but the effect of external funds was comparatively larger than internal funds. The age of equipment as measured by depreciation reserves failed in showing the effect of replacement on fixed investment. Inventory investment was found to be competitive with its fixed counterpart. To summarize, the OLS results revealed that accelerator, financial variables and inventory investment were crucial determinants of fixed investment. Further, accelerator, internal and external fund flows and fixed investment were fairly able to explain inventory investment through OLS estimation. External funds seemed to have an edge over retained earnings. The 2SLS results displayed absence of complete inter-
dependence of investment, dividends and external financing with an exception of jute industry. Pair-wise inter-dependence was however present for investment and external financing. No interaction was observed between investment and dividend policies. The 2SLS results differed in certain aspects than OLS but the former were given preference due to simultaneity.

Athey, M. J. and Laumas, P. S. (1994)⁶⁴

Athey and Laumas conducted a study on internal funds and corporate investment in India. The study of interaction of investment and financing decisions using firm level data in less developed countries or developing countries drew attention as most of the research till date has been done in developed economies. The data for the study was collected from Stock Exchange Official Directory covering almost all the listed firms and the data was confined to the manufacturing firms for a period of 1978 to 1986.

Finally, the sample included 256 firms which were selected by excluding those firms which did not have continuous data availability or changed the financial year during the study period. The sample was further classified according to size and type of industry which showed that almost two-fifth of the firms were from chemical or general engineering, depicting the general structure of Indian manufacturing sector. Another purpose of the study was to investigate the importance of internal funds for investment by comparing the sensitivity of investment to the changes in internal funds for different groups of firms as the firms were classified on the basis of priority and non-priority sector. The relationship between internal funds and investment was studied using the traditional sales accelerator model by which the fluctuations in output or sales motivate changes in capital spending. Investment was defined as change in book value of gross assets plus the amount of capital retired during a particular year. This value was calculated as the sum of current year’s depreciation plus change in accumulated depreciation over the year. The single equation model expressed investment as a function of the sales accelerator, internal funds and

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replacement investment with the standard assumption of predetermined explanatory variables. Accelerator was represented by current and lagged values of change in real net sales and internal funds were measured by current net profit. The current net profit was considered as a proxy for internal funds because to the extent that firms are financially constrained, capital spending would depend on the amount of funds currently available to the firms. Depreciation was used as a separate explanatory variable as the authors felt that it would help in giving a clearer interpretation of importance of internal funds for investment. All the variables were further divided by beginning of period capital stock which was calculated as beginning of period capital stock for the previous year plus investment during the current year, net of depreciation and adjusted for priced deflator for gross capital formation in the manufacturing sector.

The results obtained were estimated in the form of deviations from mean in order to control for un-measurable or unobservable firm characteristics and also to avoid omitted variable bias in the estimated coefficients. Further, the use of fixed effect procedure would also help in avoiding the potential selectivity bias which might have crept in due to the sample selection rule. The results indicated that the current value of the change in real net sales, net profit and depreciation were the important determinants of the capital spending for the selected sample as all the three coefficients had the expected sign and were found to be statistically significant. It was also concluded that the internal funds variable was relatively more important for large firms than for smaller firms. Another variation in the model was presented by using cashflow as the measure of internal funds where cash flow was defined as net profit plus depreciation. However this did not alter the basic results. Further, to examine the robustness of the result with respect to changes in estimation technique, they estimated the same equation using the first difference approach. Even in this case the net profit was relatively more important for the large firms than the smaller ones. The results were consistent with recent studies using firm level data in developing or less developed countries. The result indicated existence of heterogeneity among firms in the link between internal funds and investment. However, the relationship was sensitive to the specification of internal funds.
Purohit, Badri Narayan; Lall, Gouri Shankar and Panda, Jagannath (1994)\textsuperscript{65}

Purohit, Lall and Panda conducted an intensive study on the trend and pattern of fixed asset management of joint stock companies in eastern India during 1976-77 to 1987-88. The primary aim of the study was to analyze the effectiveness of fixed asset management in relatively backward eastern region in an underdeveloped country. Trends related to fixed investments were studied in totality and variable-wise in terms of age, size and industry. The relevant data was collected from various volumes of Official Directory of Stock Exchange, Bombay. Financial statements of the companies’ from 1976-77 to 1987-88 were also obtained from the same source.

Purposive sampling technique was used and statutory corporations, government companies and private limited companies were excluded to maintain uniformity. 2,233 companies formed the universe for the study as they were registered and working in the state of Orissa and Bihar during the study period. Thereafter, continuous and uniform data was available for a total of 183 companies. A sample of 100 companies was taken which represented 2 percent of total companies and 27.05 percent of total paid-up capital of the non-government public limited companies of that region in the year 1988. The data was analyzed with the help of various accounting and statistical tools. Further, it was presented as Funds Flow Statement, Fixed Investments Analysis Statement; Fixed Investments Growth Statement, Statement of Correlation, Statement of Financing Structure and Statement of Level of Financing Fixed Investments. The results indicated an increasing trend in fixed investments. Routine investments in the first two years were followed by growth investments in the rest of the years. There was significant correlation of incremental fixed investments with sales, profits and depreciation respectively. Apart from these internal factors, tax liability and availability of funds had a considerable impact on fixed assets investment decision. Even variable-wise analysis presented a similar trend like that of total sample companies taken together.

\textsuperscript{65} Purohit, Badri Narayan; Lall, Gouri Shankar and Panda, Jagannath, Capital Budgeting in India, Kanishka Publishers Distributors, 1994
It was concluded that the total sample’s average investment was influenced more by the priority, very old and large sized companies during the entire study period. Moreover, profits exerted considerable impact on the fixed investments trend for medium sized companies. All the groups of companies had the majority of their routine and growth investment financed through internal sources. Further, long-term debt and new equity followed internal funds in terms of usage of investment purposes. The first hypothesis was regarding the growth and expansion investments being made, only in leaps or discontinuously proved to be invalid. Sales and profits showed considerable influence on fixed investment trend of the sample companies. Depreciation charges and investment in fixed assets influenced each other to a great extent for both total sample and variable-wise analysis. Lastly, internal sources of funds were generally utilized for routine investments but the proposition regarding use of external funds was found to be invalid. The study was concluded as a fact finding research that used simple statistical tools and techniques for analysis. It lacked the use of lagged variables which have been considered inevitable in similar international studies. Moreover, no precise model was developed or applied.

**Kumar, Ganesh A; Sen, Kunal and Vaidya, R. R. (2001)**

Investment and financing constraints with outward orientation as constraint identifier were analyzed by Kumar, Sen and Vaidya in a study on Indian firms. They intended to explore the impact of market oriented reforms on investment behavior of Indian companies. The study focused on post 1991 scenario when financial institutions gained considerable freedom along with greater flexibility to the manufacturing sector. The discussion on theoretical and empirical issues suggested the presence of information asymmetries and incentive problems.

The financial factors became an important determinant of investment decisions as the above mentioned problems made it difficult to communicate true status of investment opportunities to the outsiders. Hence the starting point of the empirical analysis was to identify a priori to classify the firms belonging to ‘high

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information costs’ or ‘low information costs’ categories. They argued the firms’ outward orientation to be an apt basis in the light of market based reforms. Size attribute was also used to classify the firms. The empirical specification was drawn along the lines of Devereux and Schiantarelli (1990)\textsuperscript{67} and Harris et al. (1994)\textsuperscript{68}.

Investment in fixed assets (dependent variable) was explained by sales accelerator, cashflow, stock of long-term debt and stock of liquid assets. The debt and liquid assets were included to control the effects of leverage and collaterizable assets on investments. Variables were incorporated to capture firm specific and time specific effects. The relevant balanced panel data of 718 firms was extracted from PROWESS, CMIE database of Indian corporate sector based on consistent data availability over the period of 1993-98. Only the private corporate manufacturing firms with positive net worth for at least five years out of six years were included in the sample. The firms were classified as domestic and export oriented depending on consistent history of exports and/or sizeable portion of export earnings and as small and large on assets basis. The first difference form was used in order to conserve degrees of freedom and deal with firm-specific effects. Moreover, time effects were dealt by using time dummies for each year in the sample. The expected endogeneity of the regressors lead to the estimation of model using GMM approach after initially applying OLS method. One period lagged values were used as instrumental variables in GMM estimates and the model was separately estimated for different categories of firms. The results indicated statistically significant coefficient of internal funds in the presence of financing constraints on the basis of outward orientation. However, size did not turn out to be a relevant proxy for identification of high- and low-information cost firms as the evidence on performance of variables was mixed. GMM suggested that smaller firms faced financing constraints but the results on the basis of OLS estimates were completely opposite. Regarding rest of the regressors, accelerator was significant across all categories except exporting firms and long-term debt was positive and significant for all firms. Further, GMM

\textsuperscript{67} Devereux and Schiantarelli, 1989, op. cit.

suggested that liquid assets were insignificant and time effects were significant for only 1997. Finally, the industrial dummies were found to be insignificant suggesting that determinants of investment were immune of the type of industry.

Gangopadhyay, S., Lensink, R. and Van Der Molen, R. (2001)\textsuperscript{69}

Gangopadhyay, Lensink and Molen examined the effect of business group affiliation on corporate investment behavior in India. They asserted that business groups play an important role in corporate India and it might even impact the investment decision-making. Firms associated with business groups might get financing for investments either from other group affiliates or from banks (which may favor group affiliates than stand alone firms for borrowing funds). They hypothesized that group firms have better access to external funds. The cashflow sensitivity of investment spending was measured by taking firm’s cashflow as a proxy for internal funds.

The balanced data set contained 684 listed Indian companies from 1989 to 1997 of which 455 were group affiliated and rest of them were stand alone firms. The variables were extracted from CIMM database of CMIE. As the net investment (dependent variable) was derived by taking first difference of net fixed assets, first year’s observations were not taken into account. Outliers were deleted from the sample. Group affiliation was regressed on size, age and leverage to get a clearer picture of the relationship and size was found to be very significant variable. However, this regression did not imply anything about causality. They estimated standard accelerator cum cash-flow investment model in which net investment was explained as a function of sales and cashflow scaled as by beginning of the period total assets. Group affiliation was added as a dummy variable in the investment equation. It is worth mentioning that inclusion of lagged variable as an explanatory variable did not change the results. The initial estimation in first difference was done through OLS to capture fixed effects and time was introduced as a dummy variable.

The coefficient of sales had the expected and significant sign but cashflow was significant for standalone firms only. Further, the model was augmented by distinguishing firms on the basis of size and age dummies. It additionally revealed that both large and small group affiliates were having lower cash sensitivities than their stand alone counter parts. The instrumental variable estimation technique specifically GMM was used to deal with endogenity of explanatory variables.

The accelerator effect displayed dismal performance as the variable was not significant. Although, OLS and GMM had high difference in coefficient values, they primarily concluded that group affiliates were less financially constrained than stand alone firms. They also expressed the critique of the methodology followed by them. The three main issues were a priori classification of firms, problem that internal funds may proxy for profitability of investment and use of investment cashflow sensitivity as a symbol of financing constraint. But they added that the critique applied to situations where high investment-cashflow sensitivity was interpreted as a more severe financing constraint. They concluded by adding that the results did not comment on the efficiency of investment.

Nair, V.R. Prabhakaran (2004)\textsuperscript{70}

Nair analyzed if financial liberalization helped in reducing credit constraints faced by corporate sector with a panel of Indian companies. The paradigm shift in Indian economy from a repressed regime to market based allocation during early nineties and their impact on financing of corporate investments got due recognition due to growth process of the economy.

The study aimed to explore the said impact with ‘firm size’ as a priori proxy for degree of financial constraints faced by firms. He used an augmented accelerator model to substantiate the theoretical view that Indian manufacturing firms increased investment expenditures primarily as a response to potential profit enhancing opportunities. The empirical analysis was carried out by estimating an unrestricted

investment equation of the lagged augmented accelerator model. This model was chosen due to its successful performance in other countries, cohesiveness with the available data and the characteristic that it consists of variables that were observable.

The relevant firm level data was extracted from PROWESS, CMIE. A total of 19852 pooled observations were collected pertaining to 2269 firms over the period of 1993-94 to 2003-04. The basic equation had investment explained by lagged investment, change in output, cashflow and stock of outstanding debt with output term being the basic variable which helped in capturing the expected change in demand for the firm’s product. This in turn brought the accelerator effect which explains a direct positive relationship of output or change in output with investment. Cashflow was added to the basic accelerator model to measure the liquidity position of the firm and ability to depend on internal sources for investment financing. The ratio of gross cashflow before interest and tax to capital was the precise definition of cashflow. Debt (sum of both short-term and long-term debt) to capital ratio was used on the premise of cost of outside financing being positively correlated with the degree of leverage, referred to as agency cost. A financial liberalization index was constructed and used as a dummy variable with values assigned for repressed, partially repressed, largely liberalized and fully liberalized financial sector. He asserted that estimation of the model using OLS might yield unsatisfactory results due to endogeneity problem in panel data. Endogeneity problem was primarily expected in dynamic investment models due to presence of lagged dependent variable and correlation of error term with output and cashflow eventually paving way for GMM estimation.

The investment equation was estimated in first difference to eliminate fixed effects. However, the consistency of GMM estimator depends on whether the lagged values of the micro variables were valid instruments in regression procedure. Serial correlation of error term was a necessary condition for validity of these instruments. Sargan test of over identifying restrictions was conducted by analyzing sample analog of the moment condition and the second test examined if error term was not serially correlated. The results indicated that financial liberalization had helped in reducing the credit constraints with an exception of small firms. Moreover, cashflow dependence of small firms increased in post liberalization period. One of
the unexpected results of the analysis was positive and significant coefficient of debt to capital ratio for large firms irrespective of financial liberalization. However, this result did not hold good for non-group and non-exporting firms. He found that financial liberalization reduced the financial constraints from large group and exporting firms. Finally, the existence of market imperfections in financial markets might prevent economy wide efficiency in the post liberalization period.

**Bhattacharyya, Surajit (2007)**

Bhattacharyya collected evidence from Indian manufacturing firms in micro-econometric framework regarding determinants of private corporate investment particularly during the first phase of liberalization. He attempted to examine the role of accelerator and financial factors, individually and collectively affecting business fixed investment. He proposed that alternative neo-classical investment accelerator relationships could be formulated with nominal and real accelerator models depending on whether nominal and real output determines investment. Those models were:

- **Neoclassical Nominal Accelerator Model I** where rate of real net investment was a function of rate of change in nominal output of the firm and rate of change in nominal user cost of capital.
- **Neoclassical Nominal Accelerator Model II** where rate of nominal net investment was a function of rate of change in nominal output of the firm and rate of change in nominal user cost of capital.
- **Neoclassical Real Accelerator Model I** where rate of real net investment was a function of rate of change in output and rate of change in real user cost of capital.
- **Neoclassical Real Accelerator Model II** where rate of real net investment was a function of rate of change in output and rate of change in real user cost of capital, and the difference between inflation in the output price and inflation in investment good price.

**Note:**

Additionally, accelerator models of investment and neoclassical theory of capital accumulation have been criticized for absence of financial constraints. This absence of constraints was possible in perfect capital market framework which is a far cry from reality. Factors like market segmentation and credit rationing may lead to discretionary role of capital- and ownership-structure apart from surpluses and reserves in determining the realized amount of investment and making financing and investment decisions inter-dependent. Henceforth, the importance of internal funds increases due to presence of asymmetric information, transactions and agency costs. He used the Profit and Loss Statements and Balance Sheets from Bombay Stock Exchange Official Directory.

The balanced panel included 26 firms from Electronics, Electrical Equipment and Cables (hereafter, EEEC) and 28 firms from General Engineering (hereafter, GE) category with the data range of 1991-92 to 1997-98. The inclusion of lagged variables extended the data backwards till 1990-91. Nominal Net investment was defined as change in Net Fixed Assets over two successive periods. Net Sales figures were taken from Profit and Loss Statements. Accumulated depreciation allowances and retained earnings (two different measures used in regressions were volume of retained earnings and retained earnings to net profit ratio) were the main internal sources of finance. The real values of all the variables were obtained by dividing the nominal values of a year by the year end Wholesale Price Index. The significance of liquidity variables was tested up to two lagged periods. Unlike similar studies, investment and liquidity variables were maintained in volume instead of deflating by beginning of the period capital stock. He argued that volume was all the more important for retained earnings.

The choice of model was largely guided by the data availability and user cost of capital could not be included due to lack of the same. The Nominal investment functions were similar to Neoclassical Nominal accelerator Model II and real net investment functions were similar to Neoclassical Real accelerator Model I. The rest of the two formulations could not be estimated due to lack of data. Both the estimated models had one period lagged investment on the right hand side to analyze short-run dynamism and current and one period lagged accelerators to examine past and present’s influence in firm’s investment activities. Initially both
random effects and fixed effects model were tried using SAS software but both were rejected by Hausman specification test for random effects model and F- test respectively. Hence OLS was used with pooled cross section- time series data. White’s correction factor has been followed to resolve the problem of heteroskedasticity by obtaining a covariance matrix estimator that was consistent even in the presence of heteroskedasticity and was not dependent on any specific structure of heteroskedasticity term. Multicollinearity was checked by correlation matrix but the results were not severe with a cut-off correlation coefficient of 0.7.

The study yielded greater importance of internal funds for EEEC than GE. In most of the regression, retained earnings performed better than retained earnings ratio indicating relative importance of quantum of internally generated funds than retention decisions. However, there was some evidence in favor of firms being more concerned about retention ratio than dividend payout ratio. Current accelerator remained consistently significant in EEEC conversely; the presence of lagged accelerator was not only consistent in GE but became stronger with the inclusion of liquidity. Further, it was hypothesized that increase in last period’s profitability as a proxy for expected future profits would induce current net investment. Moreover, the firm’s accessibility to external capital was also explored in relation to its investment activities measured by financial strength (proprietary ratio). GE firms were found to be more creditworthy than their EEEC counterparts. Both profitability and financial strength were found to be exogenous for GE but the former was endogenous in EEEC companies. The study concluded that the availability of internal liquidity was one of the important determinants of net investment activities of Indian manufacturing firms.

3.4 CONCLUSION

This chapter has presented a summarized view of some finance researches on the issue of financing of capital expenditures across different industries spanning over a number of countries. The review of empirical studies conducted herein suggests that there are significant differences between the financing patterns of the firms of developed and developing countries and their impact on investment. Firms
of the developed countries tend to rely more on external funds than developing
countries. However, the contribution of equity as a significant explanatory variable
for investment has been largely refuted in both developed and developing
economies. It is noticeable that underdeveloped and imperfect capital markets
discourage the firms from raising capital market funds and induce the corporate
sector to largely base their investment decisions on internally generated funds.

On the basis of the review of empirical work done so far, it can be concluded
that the various sources of funds have varied degree of significance in explaining
investment behavior. The present study aims to make a comprehensive study on the
financing of capital expenditures in Indian corporate sector by considering fourteen
industries and companies in both the sectors – private and public. Therefore, the
present study is an attempt to bridge the gap in this vital area in the Indian content.