Chapter-2
Empirical Studies
CHAPTER II

EMPIRICAL STUDIES

The objective of this chapter is to present a review of the various empirical studies conducted on the determinants of investment in fixed assets in India and abroad. There have been quite a few studies of fixed investment behaviour in India and abroad. Most of them were meant as components of major econometric models and are therefore aggregative in nature. Such studies tend to emphasize the Keynesian version and the 'naïve' accelerator formulation. The more significant of such studies, on aggregate investment behaviour are surveyed in Desai1.

Review of Indian Studies

There have been some attempts made in India to study the determinants of fixed investment2. Some are time series and others are cross-section studies. Most of the studies are based on cross section data for several industries. The most representative of these studies by V.K.Sastry3, and Krishnamurthy and Sastry etc. are reviewed briefly in the following pages.

1.V.K.SASTRY’S ANALYSIS

Sastry analysed investment, dividend and external finance behaviour of the corporate sector for the period 1955-60. The individual balance sheets, of a sample of 389 medium and large public limited companies, are the main source of data. In the investment in fixed assets equation, the current and previous year sales change, debt - equity ratio and flow of external finance are the significant

determinants. The sales change variable, when a two-year lag is attempted, became erratic. Two stage least square method could not improve the performance of the estimators. The inventory investment equation is formulated so as to reflect the adjustment in actual and planned inventory stock, thereby giving main emphasis to the demand side. Inventory investment has, however, been treated quite independently of financial decisions. In this equation the adjustment coefficient is expected to depend upon price expectations. External finance is positively affected by investment outlays and negatively affected by initial debt outstanding and retained earnings. The two equations—investment in fixed assets and external finance—suggested that the major financial source for investment in fixed assets has been debt.

Sastry’s main emphasis is on the dividend equation, which is included to describe the stability of dividend policy and thereby characterize the internal financial position (indirectly). The dividend equation based on Lintner’s adjustment model has provided a good description of corporate dividend policies. The permanent income hypothesis model of Eisner, which differs from Lintner’s model in its final form with respect to the error term, did not hold well.

2. STUDIES OF KRISHNAMURTHY AND SASTRY

Another analysis of the investment behaviour of the corporate sector, viewed from the financial angle, is by Krishnamurthy and Sastry. The study is based on cross section, pooled cross section, and time series analysis of (firms belonging to) seven industry groups, namely; Cotton Textiles, Jute, Chemicals, Engineering, Paper and Paper Board, Sugar and Cement. Investment in fixed assets, as well as in inventories—analysed in isolation and in simultaneous equations framework, including dividend and external finance equations. In the

5. R. Eisner (1958, II).
four equations set up, the first two equations describe investment behaviour together with the interaction between the two types of investment, the other two remaining equations—dividend and external finance—describe financial behaviour. The basic objective of the analysis has been an examination of the interdependence between investment and financial policy decisions. Although single equation and simultaneous equation procedures have been employed, the analysis is presented mainly on the basis of the Ordinary Least Square (O.L.S.) estimates. 2 SLS estimates have proved contradictory to OLS results in some cases.

Major emphasis is placed on the accelerator part of the investment equation, in the cross section analysis. In the time series case, only current sales change is employed to represent the Marginal Efficiency of Investment schedule. The model consisting four equations and one identity is given as:

\[
\begin{align*}
I(t) &= f_1(\Delta S(t), RENT(t), FNDE(t), IN(t), K(t-1)) \\
IN(t) &= f_2(\Delta S(t), RENT(t), FNDE(t), I(t), INS(t-1)) \\
DIV(t) &= f_3(PN(t), DIV(t-1), I(t)+, IN(t), FNDE(t)) \\
FNDE(t) &= f_4(RENT(t), I(t), IN(t), NDE(t-1)) \\
PN(t) &= DIV(t)+RENT(t)
\end{align*}
\]

Where

\begin{align*}
I(t) &\quad : \text{Gross fixed investment in year } t \\
\Delta S(t) &\quad : \text{Sales change in year } t \\
RENT(t) &\quad : \text{Gross retained earning in year } t \\
FNDE(t) &\quad : \text{Flow of net debt in year } t
\end{align*}

IN (t) : Inventory investment in year t
K (t-1) : Gross fixed assets at the end of the period (t-1)
INS (t-1) : Stock of inventories at the end of the period (t-1)
DIV (t) : Dividends in year t
PN (t) : Gross profits net of taxes in year t
NDE (t-1): Net debt at the end of the year (t-1).

The time series results refer to the period 1956-57—1970-71, whereas the cross section analysis is based on the data for the period 1960-1970. The period 1950-51—1955-56 is omitted because of non-availability of a correction ratio (paid up capital) for the period. The main conclusions, which emerge from over all analysis are as follows:

(i) The accelerator appears to be a significant determinant of investment in fixed assets on the basis of OLS results but the 2 SLS results suggest its effectiveness only in some cases7 (Accelerator variables appear in the investment equations of 5 industries estimated by OLS method, whereas only 3 equations have these variables in the investment equation estimated by 2 SLS method). In the time series8 analysis, the effect of accelerator variable on fixed assets investment is absent9.

(ii) On the basis of the cross section analysis, the financial variables appear to be important in both OLS and 2 SLS cases. For investment in fixed assets, external finance, appears to be more important than internal finance, according to Ordinary Least Square (OLS) results, whereas the 2 SLS results suggest internal finance to be relatively more significant,

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7. The industries, which represent the effect of accelerator in investment in fixed assets equation, are Cotton Textiles, Jute and Engineering.
8. For time series analysis, mainly 2 SLS procedure has been used.
9. The accelerator appears to be insignificant due to a declining trend in capacity utilization.
although external finance appears in the investment equation. In the time series analysis, external finance appears to be more important relative to retained earnings for explaining investment in fixed assets and in inventories.

(iii) The time series results suggest that strict inter-dependence among the three decisions-investment, dividend and external finance-is absent. Only a pairwise interdependence is observed between investment and external finance. Investment policies influence external finance more than dividend decisions. The OLS and 2 SLS results of cross section analysis show an almost complete absence of interdependence among the three policy decisions. This implies that dividend decisions are either independent of investment decisions or the external finance decisions.

3.G.D.MISRA'S ANALYSIS

G.D.Misra analysed fixed and inventory investment, financing and earnings in the corporate sector in India for the period 1950-51 to 1970-71 (21 years). The various issues of RBI Bulletins, Articles, Finance of Indian Joint Stock Companies-every 5 years, special issue-1966-Financial Statistics of Joint Stock Companies in India are the main sources of data. For his study, he has chosen medium and large public limited companies belonging to 14 industries.

In the investment in fixed assets equation, Sales change, Gross internal funds (Retained earnings + depreciation), Debt flow, New issues (equity), Inventory investment, Debt outstanding, Depreciation stock as a proportion of gross fixed assets and current liquidity (i.e., ratio of current assets to total net assets) are the significant determinants.
G. D. Misra used three models in his analysis. Those are:

1. Flexible Accelerator model
2. Fixed Coefficient Pure Accelerator model
3. Mixed Model.

Thus the investment equation, more appropriate for empirical testing may
be taken as\(^{10}\).

\[
(I/K) \ t = b_0 + b_1 (\Delta S/K) \ t + b_2 (\Delta S/K) \ t-1 + b_3 (\Delta S/K) \ t-2 + b_4 (RED/NW) \ t +
\]
\[
b_5 (DBTFLW/NW) \ t-1 + b_6 (NI/NW) \ t + b_7 (INV/K) \ t + b_8 (DBTOUT/NW)
\]
\[
t-1 + b_9 (DPRNST/GFA) \ t-1 + b_{10} (LQDTY) \ t.
\]

Where

- \((\Delta S/K) \ t\) : Change in sales deflated by paid up capital, for current period t.
- \((RED/NW) \ t\) : Gross internal funds (Retained earnings plus depreciation) deflated by net worth, for current period t.
- \((DBTFLW/NW) \ t-1\) : Debt flow deflated by net worth, for period t-1.
- \((NI/NW) \ t\) : New issues deflated by net worth, for period t.
- \((INV/K) \ t\) : Inventory investment deflated by paid up capital, for the period t.
- \((DBTOUT/NW) \ t-1\) : Debt outstanding divided by net worth, for the period t-1. It represents financial risk.
- \((DPRNST/GFA) \ t-1\) : Depreciation stock as a proportion of gross fixed assets in the period t-1. It gives the age distribution of fixed assets.

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\(^{10}\)(i) By appropriate we mean the set of variables as well as the definition of the variables. We have defined the variables by using deflators to account for empirical as well as theoretical problems.

(ii) The formulation of the model depends upon the neoclassical (equilibrium) approach, which gives \(l = f(MEI, MCC)\). Since the investment function includes MCC, one may consider it in the framework of Duesenberry. See J.S. Duesenberry (1958, I). Of course there is another approach by Klien, which gives the same type of investment function. See L.R. Klien, (1948, II).
LQDTY\textsuperscript{1} : Current liquidity position represented by the ratio of current assets to total net assets.

K : Paid up capital.

NW : Net worth.

GFA : Gross fixed assets.

Misra's empirical Analysis of Investment behaviour is based on the interpretation of the results obtained by Ordinary Least Square (OLS) & Two Stage Least Square (2 SLS) procedures.

Main findings:

1. As an explanation of the behaviour of investment in fixed assets, neither the flexible accelerator model nor the fixed coefficient accelerator (sales version) model performed well. The time profile followed by the accelerator coefficients in the fixed coefficient model is almost V-Shaped for seven industries and the corporate sector. It is rising for three industries. The evidence of a falling time profile is available for sugar & jute according to OLS results, & for tobacco according to 2 SLS results. 2SLS results imply a rising time profile for shipping.

2. In the mixed model, the effect of the accelerator on investment in fixed assets is realised (according to both the OLS and 2 SLS results), except for three industries-Coal Mining, Iron & steel and Engineering.

3. The mixed model is found more appropriate to explain investment in fixed assets. The financial variables appear to be more important. Internal funds (RED) variable has explained investment in fixed assets for 12 &7 industries according to OLS &2 SLS results respectively.
Conclusion:

In this analysis, two propositions have been tested:

(i) 'The investment and financial policy decisions are interdependent.'

(ii) 'The rates of return on three types of funds—one internal and two externals—are different.

While testing these propositions, their efforts centered around the judgement regarding the general contention that 'investment in fixed assets is financed by internal funds, and inventory investment is financed by external funds', and the nature of capital structure (or finance mix).

4. STUDY OF Dr. PREM KUMAR

Another analysis relating to the growth rate of total net assets in Indian corporate sector is by Dr. Prem Kumar. His period of study is 1969-70 to 1978-79 (10 years), coincides with 4th & 5th five year plans. The main source of data is collected from Stock Exchange Directory & Annual reports of the corporate bodies. In addition to this various other source of data collected from Kothari's Industrial and Economic Guide and various documents issued by the Centre for monitoring Indian Economy.

Dr. Prem Kumar used the multivariate model (Regression model) in his analysis. The equation is:

\[ g = x + B_1 \text{PTP} + B_2 \text{TPL} + B_3 \text{SIZ} + B_4 \text{SAL} + B_5 \text{MON} + B_6 \text{OLG} + B_7 \text{SCO} + B_8 \text{CAU} + B_9 \text{VAL} + B_{10} \text{RET} + B_{11} \text{LIQ} + B_{12} \text{LTF} + B_{13} \text{DVS} + \epsilon \]

Where

\[ g = \text{Growth rate of total net assets} \]
\[ \text{PTP} = \text{Average Pre-tax profits as percentage of sales} \]
\[ \text{TPL} = \text{Tax planning defined as average tax provision as percent of pre-tax profits.} \]
\[ \text{SIZ} = \text{Average size measured by total net assets} \]
\[ \text{SAL} = \text{Growth rate of sales} \]
\[ \text{MON} = \text{Dummy variable for monopoly} \]
\[ \text{OLG} = \text{Dummy variable for oligopoly} \]
\[ \text{SCO} = \text{Growth rate of selling costs} \]
\[ \text{CAU} = \text{Average capacity utilisation (percent)} \]
\[ \text{VAL} = \text{Average valuation ratio defined as the average ratio of market price to book value} \]
\[ \text{RET} = \text{Retention ratio defined as profits retained as percent of net profits} \]
\[ \text{LIQ} = \text{Liquidity defined as the ratio of quick assets to current liabilities} \]
\[ \text{LTF} = \text{Long-term finance defined as the debentures + long-term loans as percent of total net assets} \]
\[ \text{DVS}_2 = \text{Diversification at 2-digit level} \]
\[ \text{DVS}_3 = \text{Diversification at 3-digit level.} \]

Main findings

1. The growth of sales, capacity utilisation, market structure, long-term finance and liquidity have been observed to have strong influence on the growth of the firms under study. The influence of profitability, tax
planning and retained earnings on the growth was found to be statistically non-significant.

2. A part of the growth of firms in the Indian corporate sector still remains unexplained.

5. PRASANTH KUMAR SAHOO'S ANALYSIS

Prasanth Kumar Sahoo\textsuperscript{12} analyses the investment and financing pattern through stepwise multiple regression technique over the cross section of 15 selected manufacturing industries in the private corporate sector in India. This comparative study of the two periods, i.e., 1971-72 and 1980-81 is made with a view to ascertaining the change in the patterns of financing over the decade.

It is proposed to analyse the determinants of both the gross fixed investment and inventory investment. The role of financial variables, both internal as well as external, is considered. Among the financial variables, internally generated funds (retained profits and depreciation provision), long-term debt, share capital, bank borrowings and trade credit granted) have received attention. For the purpose of analysis, the following functional relationships have been set up.

(i) Change in gross fixed assets is assumed to be related to changes in long-term debt, share capital and internally generated funds.

(ii) Variation in inventory is assumed to be related to variations in bank borrowing, trade credit and internally generated funds.

Methodology

This analysis is based on the data published by the Reserve Bank of India on the finance of non-financial, non-Government, medium and large public

\textsuperscript{12}\textsc{Prasanth Kumar Sahoo, "Sources of Finance for Indian Corporate Sector (1988), Deep\&Deep Publications.}
limited companies. In the data published by RBI, the number of companies covered have varied over time. Thus, the data is incomparable. To overcome this difficulty, each variable was divided by the number of firms and thus data for an average firms was obtained. The average firm data was then used for the statistical analysis. Stepwise linear regression technique has been used for analysis.

The equations of the analysis are as follows:

(i) \[ \Delta GFA = \alpha_0 + \alpha_1 IGF + \alpha_2 LTD + \alpha_3 SC \]
(ii) \[ \Delta INV = \beta_0 + \beta_1 IGF + \beta_2 BB + \beta_3 TC \]

Where

- GFA = Gross fixed assets
- IGF = Internally generated funds.
- LTD = Long-term debt
- SC = Share capital
- INV = Inventory
- BB = Bank borrowing
- TC = Trade credit
- \( \Delta \) = First difference operator (i.e., change in the current period over the previous period).
- \( \alpha_0, \alpha_1, \alpha_2, \alpha_3 \), \( \beta_0, \beta_1, \beta_2, \beta_3 \) = Regression Coefficients.

In the analysis of investment behaviour, financial variables like, internal finance, external finance and cost of borrowing are considered as important determinants.
Conclusions

The important results which emerge from the econometric analysis of the financing of gross fixed assets are as follows:

(1) Investment in fixed assets is determined by both internal as well as external factors. But relatively speaking, internally generated funds play an important role in gross fixed assets.

(2) Growth rate in profitability, ploughing back of retained profits and accumulated depreciation are the probable reasons for the growth of internal funds to finance a substantial percentage of fixed assets during 1971-72. However, there was a deceleration in the growth of profits and consequential fall in margin on sales and return on total tangible assets during 1980-81. Internally generated funds, which occupied a position of considerable importance in financing fixed assets during 1971-72, corresponding diminished in weightage during 1980-81.

6. STUDIES OF M.RANGANATHAN & R.MADHUMATHI

Another analysis of the investment behaviour of the corporate sector, viewed from the market price angle, is by M.Ranganathan & R.Madhumathi13. Their period of study is 10 years i.e., 1982-1993. The individual balance sheets of (a sample of 100 companies) Bombay Stock Exchange Official Directory and Bombay Stock Exchange National Index, are the main sources of data.

The type of analysis used is the multiple regression model. This model is capable of providing the influence of each variable as well as the total significance.

In the investment equation, the market price, net sales, cash flows, debt and equity are significant determinants.

Major findings

1. Business investments are influenced by fundamental variables such as net sales & cash flows and also the financing variable equity.


3. After considering the results of all four theories framed in the hypothesis the final conclusion that market price is an indirect determinant of investment growth has been arrived at.

Among the time series studies Krishnamurthy's investment functions are aggregative in character covering the entire private sector for the period 1948-61.

Capacity utilization, profits, and long-term rate of interest are found to be of some importance in determining private investment in machinery and equipment. The studies of Divatia and Athawale and that of Swamy and Rao are aggregative and relate to the corporate sector. These studies cover the period 1955-70 and 1954-70 respectively. Divatia and Athawale conclude that a

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Combination of accelerator and profits can explain gross capital formation adequately. The study by Swamy and Rao attempts an integrated treatment of the flow of funds and their uses. They infer that accelerator, flow of funds, internal as well as external and capital intensity are significant determinants of corporate fixed investment. The attempt by Krishna and Krishnamurthy focuses attention on public investment as a determinant, among others, of corporate fixed investment. The period covered is 1950-66. Public investment could be viewed as a surrogate for aggregate demand. They infer that public investment expenditures are an important determinant of corporate investment. The macro econometric models for India contain global investment functions and an appraisal for these can be found in the survey by Desai15.

The study by Sarkar examines bivariate relationship of investment with change in sales, lagged profits and interest rate for several individual industries for the period 1950-65. Finite distributed lag models in sales change and in profits are also tried. The results suggest that profit-investment relationship is more pronounced than investment-sales relationship. Interest rate is found to be generally of no importance. Jameson’s paper covers twenty-five individual industries in the corporate sector and relates to the period 1951-66. The paper emphasizes the user cost variable and concludes that it has a significant impact on the rate of investment in most of the industries. Kanbur’s work on Fertilizer Corporation of India relates to the period 1960-69. The variables considered are sales and liquid assets. The results are not satisfactory although the coefficients have the appropriate signs. The study by Ramarao and Anjaneyulu on the cotton textile industry relates to the period 1952-69. They have an investment equation in a model integrating output, utilization of capacity and investment. Sales and capital stock at the beginning of the period are significant determinants of fixed

investment. Patnaik’s study for the period 1950-65 relates to some individual industries and to the aggregate corporate sector as well. The study suggests that the rate of investment and the rate of profit are closely related, but this relationship is obscured by the operation of special factors in certain years; the inclusion of dummy variables to take account of such special factors goes a long way towards explaining investment movements.

The studies are at constant prices except that of Swamy and Rao, Sarkar and Patnaik. All the studies relating to corporate sector, except that of kanbur, have made use of consolidated balance sheet data published periodically by the Reserve Bank of India.

One of the earliest cross-section studies in the field of corporate investment in India is by Bagchi. His study is a cross-section analysis across twenty-seven industries covering such diverse activities like tea plantations, electricity supply and shipping. The unit of analysis in industry. Yearly cross sections have also been tried. The effect of development rebate and other tax concessions on fixed investment has also received some attention recently. See, V. V. Somayajulu, *Tax Incentives and Other Determinants of Corporate Investment Behaviour in Indian Industries, 1965-66 through 1970-71—An Economic Analysis*, paper presented at the Indian Econometric Conference, January 1975.

The consolidated balance sheet data of public limited companies published by the Reserve Bank of India have been used. Investment equations, one with sales

change and another with profits separately using yearly averages for the two periods, 1952-55 and 1957-59 have been estimated. The broad conclusion of the study is that profits after tax has a more powerful influence on the level of investment than changes in sales. Patnaik estimates a simple cross-section relationship using average data for the three samples of Reserve Bank of India series with industry as unit of analysis. No significant relationship is found between the rate of investment and the rate of profit. Siddharthan analyses the investment behaviour of firms belonging to two conglomerates, the Tatas and the Birlas in a cross-section study based on balance sheet data for the period 1963-72. The rate of growth of assets is explained by average profitability and its variability, growth rate of sales and non-production Expenditure. The results suggest that the growth rate of sales and non-production expenditure are important determinants. However, in the short-run profitability appears to be important in the case of oligopoly and competitive firms. The analysis further reveals that the behaviour of conglomerate firms differs in different markets viz., monopoly and oligopoly and others.

The financial variables considered in these studies do not include new equity. The reason perhaps is non-separability of new equity from summary balance sheets that have been generally used in cross-section studies. However, new equity is not a major component of the total flow of funds in India.

All the cross-section studies are at current prices. The cross-section studies except that of Bagchi attempt to correct for heteroscedasticity by deflating the variables by a size measure. In the studies of V.K.Sastry and that of Krishnamurthy and D.U.Sastry different size measures have been used to deflate different variables in the equation so that some of the deflated variables acquire economic meaning. The specific examples are deflation of sales change by sales (rate of change of sales), investment by capital stock (rate of change of capital) and debt by net worth (debt equity ratio). This has not been an uncommon practice in the literature. In so far as different size measures may not be inappropriate from a
statistical point of view. However, the use of different size measures for different variables in an equation can not retrieve the original specification.

The time series studies of Divatia and Athawale, Jameson, Swamy and Rao and RamaRao and Anjaneyulu are in the framework of capital stock adjustment models. The cross section studies generally attempt the analysis in the same framework, and use finite distributed lags in sales. Except the study of Krishnamurthy and D.U.Sastry where the specification of the lag structure is considered in some detail, others confine only to one or two lags. Both the cross-section and time series studies except one use the ordinary least-squares estimation procedure.

Apart from the studies reviewed above, some work has begun to emerge in the area of short-run investment forecasting. Paul and Rangarajan have made a serious attempt to explore systematically the forecasting ability of various bodies of data, such as consents for capital issues, flow of funds and the data available with term lending financial institutions, for the corporate sector17.

The earlier work in India is stimulative, thought-provoking and is of immense help to the present researcher in her research design. Taking the clues from the earlier studies, the researcher has been able to formulate the objectives of the study, frame the models and find out the determinants of investment in Gross Block and Plant & Machinery in some selected Indian companies belonging to sample Industries.

EMPIRICAL STUDIES IN ABROAD

There are a number of empirical studies conducted on the determinants of fixed investment of corporate sector abroad but only some of the studies are mentioned here.

JOHN. R. MEYER & EDWIN KUH'S ANALYSIS

John.R.Meyer & Edwin kuh\textsuperscript{18} analysed investment decision for the period 1946-1950 i.e., 5 years. Securities & Exchange Commission Form 10.K is the main source of data.

The type of analysis is used cross section and Time series models. The equations in these models are:

Cross section models:

1. \[ I_t = f_1 (S_t, D_{t-1}, A_{t-1}, S_{t-1}, C_t, L_{t-1}, U_t)] K_{t-1} \]
2. \[ I_t = f_2 (P_t \text{ or } P_{t-1}, D_{t-1}, A_{t-1}, S_{t-1}, C_t, L_{t-1}, U_t)] K_{t-1} \]

Time series models:

1. \[ I_t = g_1 (S_t, R_t, E_{t-1}, W_{t-1}, U_t)] \]
2. \[ I_t = g_2 (P_t, P_{t-1}, R_t, E_{t-1}, W_{t-1}, U_t)] \]

Where

\begin{align*}
I & = \text{Gross investment in both new and old plant and equipment;} \\
S & = \text{Sales;} \\
P & = \text{Net profits, net income to surplus;} \\
D & = \text{Depreciation expense;} \\
A & = \text{Depreciation reserves which is taken as a measure of equipment age;}
\end{align*}

\[ S_1 = \text{Change in sales}; \]
\[ C = \text{needed capacity as measured by the gross product of Current sales times the peak gross fixed assets to sales ratio reached between 1946 and 1949}; \]
\[ L = \text{The stock of net quick liquidity, i.e., current assets less inventory and current liabilities}; \]
\[ K = \text{Gross fixed assets}; \]
\[ R = \text{The interest rate as measured by the yield on grade A industrial bonds}; \]
\[ E = \text{The stock Price Index for a particular industry}; \]
\[ W = \text{The relative price of labour as measured by the ratio of labour to capital cost indices}; \]
\[ U = \text{Statistic term representing the influence, assumed random, of the unincluded variables}; \]
\[ t = \text{The time period so that as a subscript it denotes the year to which a particular flow variable refers and the end of year value for stock variables}. \]

Main findings:

1. **Deprecation reserve**: These results associated with ex ante expectations based on echo effect theories, no important technical reasons for doubting the empirical validity of these results were found. When analysing Cross-Section data, the senility effect is more than strong enough to generally overcome any echo effects upon investment. Relation of aged capital stock to the firm's financial behaviour
was also surveyed. It was found that firm with older plant and equipment also had larger stocks of net liquid assets.

2. The liquidity & tax policy aspects of the depreciation expense variable: The investigation of the correlation results yielded two principal conclusions.

1) That the relationship between investment and depreciation expense is counter cyclical, being insignificant in economic situations of stability or deceleration and insignificant under converse circumstances.

2) That the observed relationships are due primarily, if not exclusively, to liquidity considerations and are not at all dependent on differences in equipment durability.

As per matters of tax policy, the results suggest that, at least a limited extent, deflationary trends or incipient stagnation can be combated by grants of accelerated amortization.

3. Profit & acceleration variables: Of all the basic assumptions, plentiful liquidity seemed most essential to the effectiveness of the accelerator and once liquidity became some what pinched, the availability of funds became a crucially important determinant of investment outlay in and of itself.

The relative importance of the sales and profits variables were just reversed in the results obtained from the annual and averaged data models, profits being more important in the former and sales more important in the latter.

4. Financial patterns, Dividend policy and Trade position: In the 1946 to 1950 period External sources were used and long-term debt was very strongly preferred to equity.

The simple correlation between dividends and investment were chiefly marked by extreme heterogeneity in the results.
5. The liquidity restraint and the internal growth rates of small and large firms: The small firms tend to grow at internal rates every bit as fast, if not faster than large firms as long as the general economic climate is one of prosperity and easy availability of necessary funds.

6. Stock prices (interest rates) and investments are influenced in common by similar economic phenomena. While the second interpretation stresses causal relation between stock market actions and investment expectations.

EDWIN KUH’S ANALYSIS

Another analysis of the gross investment behaviour of the corporate sector is by Edwin Kuh for the period 1935 to 1955 (war years 1942 & 45 are excluded) i.e., 18 years. Records of Securities and Exchange Commission are the main source of data.

In the Gross investment equation, sales, gross retained earnings, capital stock, capital intensity and desired capacity increment are significant determinants. Cross-section and Time series models are used in this analysis.

Main findings:

Edwin Kuh proposes to present some of the main impressions of the more detailed material. This will be done under three headings.

I. Statistical & Technical considerations:

1. Qualitative and quantitative differences between errors in cross-sections and errors in time series are large, and therefore, it is dangerous to place reliance on one type of data in order to make inferences about the others.

2. The profit model showed substantially more high correlations with the cyclical indicators than the sales model. Hence, when sales are excluded from an equation, relatively more important factors of a systematic, cyclical sort are not taken into account. This at least suggests the qualitative superiority of sales, acceleration models.

3. The average time constant error was twice as large for the profit model as for the sales model.

4. While this observation verges on triviality, it does suggest that there are a number of highly relevant criteria often ignored by lag selection procedures, which concentrate exclusively on maximizing multiple correlations.

II. Theory of Investment:

1. Long-term capital requisition decisions implied by different financing policies that were approached in the context of a growth model. The rate of growth in assets and output can be used to generate a demand for external financing. This model complements the short-term, cyclical, internal finance model. If correct, it suggests that long-term growth considerations will dominate external finance decisions, while dividend – investment policies are concurrently geared to short-run fluctuations in output.

2. A taxonomic, diagrammatic approach to internal cost of capital functions and their relation to sources of financing were also developed. In the present instance where risk preferences, finance and investment are related in such a complex way, it appears illuminating to sketch out profit maximization implications of behavior which often and perhaps needlessly, appear to be only disembodied empirical generalizations.

III. Economic implications:

1. John Meyer has found that gross retained earnings and a relative capacity measure are both important, the gross retained earnings variable having a substantially lower elasticity than the capacity
variable. Our results are generally in accord with these findings. The answer then seems to be that both are important, but those sales have greater impact.

2. It is clear that the independent influence of sales, given the level of capital stock, is substantially greater than the independent influence of profits. It is also true, however, that profits become relatively more important, the greater the lag involved.

3. It was reported that the strongest influence on investment came from lagged (or the average of lag and current) profit and not from current profit, while the influence of capacity pressure appears strongest in the current rather than in the preceding year.

4. While the theoretical results referred to imply that low values of reaction coefficients are likely to be observed for investment equations, they also suggest that the coefficients of a retained earnings equation too would be small and of the same magnitude.

5. Another ingredient of the theoretical developments stressed the relation between growth of fixed assets and external finance. The basic model was developed by Domar and modified slightly to meet the particular requirements of this study. Instead of using micro-economic data it was necessary to use aggregate data, in this case two-digit manufacturing industries, because of the discreteness with which external finance is obtained for industrial firms. While the growth model did not predict resort to external funds with great accuracy, it proved a moderately reliable predictor. The model systematically understated the actual amount of external funds, which were sought.