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Determinants of Inventory Investment Behaviour in Iron and Steel Industry in India: An Econometric Analysis

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Abstract: ***In the present paper the determinants of inventory investment behaviour in Indian Iron and Steel Industry are being investigated in the framework of flexible accelerator model. The explanatory variables considered for the study are flow of net debt, retained earnings, profit after tax, sales change variable and inventory investment. This paper used the data of public limited companies, which are non-governmental and non-financial, for the period 1999-2000 to 2010-11. The model has two specifications in which time--series and pooled data is employed for estimation using ordinary least squares method. The results of the two above mentioned analyses, revealed the importance of external finance as a determinant of inventory investment in Indian iron and steel industry. Appropriate monetary and financial policies are thereby called for to strengthen the accessibility of finance by the companies under the industry. The influence of accelerator, profit after tax and retained earnings on inventory investment expenditures of the industry is found to be weak.***

JEL classification numbers: E22, G31.

Keywords: External finance, Inventory investment, Flexible accelerator.

I. INTRODUCTION

Investment has widely been regarded as one of the main driving forces of economic growth. The two most important of investment are fixed capital and inventory spending which are also responsible for the volatility in the Gross Domestic Product (GDP).Inventory investment has been recognized as one of the main component of investment. Inventory investment contributed only about 1% of the total investment spending (Mankiw, 2003) yet its volatility is so high that calls for the study of its determinants. Inventory investment is the change in the stocks of materials, work in process, and finished goods within a firm, industry, or entire economy over a specified period of time. Because in most instances the measure encompasses a variety of goods, it is usually measured in currency units, perhaps deflated.

Steel industry is playing a major role in the economic growth of a country, as it is evident from the experience of the all major industrial economies, especially at the initial stage of their development. The higher consumption of iron and steel is seen as an indicator of higher development in infrastructure, which explains the growing demand for iron and steel throughout the expanding global economy. While steel continues to have a stronghold in traditional sectors such as construction, housing and ground transportation, special steels are increasingly used in engineering industries such as power generation, petrochemicals and fertilizers, thus considered to be the backbone of the human civilization. The production and per capita consumption of steel is a major contributor to a country's gross domestic product (GDP) and an indicator of its industrial and economic strength. Hence the economic prosperity and growth of an economy is very closely related to the quantity of steel consumed by it.

The Indian steel industry contributes to nearly 2% of the GDP and employs over 5 lakh people. As per official estimates, the Industry today directly contributes 2 per cent of India's Gross Domestic Product (GDP) and its weightage in the official Index of Industrial Production (IIP) is 6.2 per cent. India is the fourth largest producer of crude steel in the world and is

expected to become the second largest producer by 2015. The Ministry of Steel has projected that finished steel production levels will be at 115.3 MT by 2017. The largest consumer of steel in India is the construction and infrastructure sector accounting for 61 % of total consumption in 2010. Another reason for the robustness in steel demand is the increasing investment in infrastructure which is set to raise steel demand by approximately 40 million tones per annum (MTPA) from Five year Plan 2013-17. It provided direct employment to around 0.5 million of people and contributes nearly 2% of the Gross Domestic Product (GDP) as in 2008.

Given the above backdrop, its importance and its potential to make a significant contribution to national income, employment absorption, regional spread across states etc., there is a need to develop the industry further on modern lines to gear it up to the growing needs at home and to compete with the foreign players in the global market. The phenomenal growth in iron and steel sector necessitated an analysis of the role of determinants of inventory investment.

II. Review of Literature

In this section an attempt has been made to review the literature on inventory investment base on its determinants. The literature reviewed has been broadly grouped into two categories: the literature outside India and within India.

Studies Abroad: According to the acceleration principle, firms aim at optimum or desired stock of inventories in relation to a given level of output/sales. Pioneering work in this field was taken up by Metzler in 1941. Metzler was of the view that firms like to maintain inventories in proportion to output/sales and they succeeded in achieving the desired level of inventories in a unit time-period. That is, any discrepancy between the actual and the desired level of inventories is adjusted within the same time period. Needless to say, such an instantaneous adjustment is an unrealistic assumption to make. As a result, there have been a series of modifications that were made to provide for partial adjustment. Goodwin (1948) assumed that firms attempted only a partial adjustment of the discrepancy between the desired stocks as determined by the level of output and the existing stock. Darling and Lovell (1965) modified Metzler's formulation based on the simple acceleration principle and obtained the relationship on the basis of the flexible accelerator principle.

Rate of interest was used as a proxy for the opportunity cost of carrying stocks or as a measure of the cost of financial accommodation needed to facilitate inventory investment. Several studies have found it to be a significant variable; important among such studies include Hilton (1976) and Irvine (1981). Maccini and Rossana (1984) assumed that "desired stocks" depend on the current expected real interest rate as well as current expected sales and expected input prices. Current expected real rates were related to actual rates through distributed lag relationships and empirical work proceeded. These studies, however, generally failed to establish any substantial and systematic evidence of a relationship between the real interest rate and inventory investment, especially with finished goods inventories in manufacturing. Furthermore, the literature was subjected to criticism that it lacked a basis in explicit optimization.

Louri (1991) examined the effect of monetary policy on inventory investment in Greek manufacturing industry. Using time series data from the annual accounts of Greek firms for the period 1958-85, they found that interest rate and inflation rate expectations exercised a significant influence on inventory investment but in the opposite direction. He also found that interest rate coefficient is significant and has a negative sign in case of total inventory investment and raw materials; though in case of finished goods they have a negative sign but an insignificant coefficient. He also concluded that different types of inventories behave differently, thus showing diverse responses to price and quantity variables. Hay and Louri (1994), in their study of a panel of UK firms for the period 1960-85, found that microeconomic factors mattered much more and interest rates was not a significant determinant of inventory investment.

Anticipated price changes, measured by changes in wholesale price index of inventories, were taken as an explanatory variable to capture the speculative element in inventory. This suggested that there is a positive relationship between price changes and inventory. An increase in sales is expected to increase the demand for stocks for the purpose of meeting the orders

regularly. Lee and Koray (1994) investigated the association between sales uncertainty and inventory behavior for the US wholesale and retail trade sector and showed that the variance in sales did not affect inventory behavior in either sector. On the contrary, Bo, in (2001) in contrast, focused on firm level data and used a small panel of Dutch companies (770 observations) to investigate the impact of demand uncertainty. She was of the view that demand uncertainty (measured by the volatility of sales) had a positive and significant impact on inventory investment. Caglayan *et al.* (2012) observed that sales uncertainty has a positive impact on inventories, indicating that firms facing high demand uncertainty build up inventories to avoid stock-out. They also showed that inventory buildup declines as firms hold more liquid assets.

Abramovitz (1950) and Modigliani (1957) used capacity utilization as another independent variable in the inventory investment equation. These studies brought out the importance of capacity utilization in influencing investment expenditures. Inventory –turnover ratio was included as a determinant of inventory investment by Metzler (1941), Darling (1959) and Lovell (1964). It was evident from their study that this variable had a positive impact on investment. An increase in capacity utilization is also expected to increase the demand for stock by increasing the demand for raw materials and increasing the inventories of finished goods. Thus, the variable, capacity utilization, is postulated to have a positive coefficient in the equation.

Fixed investment as another determinant of desired level of inventories was included in the model. Fixed investment is generally expected to have an inverse effect on inventory investment mainly because of competing demand for the limited funds. However, in case of an expanding firm, the two components may be complementary. Besides, availability of funds from retained earnings and external sources, may also affect investment decision by providing funds for financing inventory. Bo's model (2004) fixed investment had been incorporated in order to study the inventory decision of the firm. Using Dutch listed non-financial firms during 1985-2000, the study found that the inventory stock is negatively associated with fixed investment. The results suggested that the inventory stock may be used by the firm as a buffer in response to unexpectedly high demand. In addition, the firm may hold the inventory stock as a contingency substitute for the financial source of fixed investment.

Among the studies which considered financial variables as determinants are Eisner (1978) and Dhrymes and Kurz (1967). Eisner found that liquidity and cash flow variables are important determinants of inventory investment. Kashyap, Lamont and Stein (1994), Gertler and Gilchrist (1994) and Carpenter, Fazzari and Petersen (1994) were of the view that such financial variables, (cashflow/ assets) do have an influence on inventory movements of small firms but the case may not be so with respect to large firms. Therefore, retained earnings and flow of debt are postulated to have positive coefficients. Carpenter, Fazzari and Peterson (1995) estimated within-firm regressions for a standard inventory stock adjustment model augmented with financial variables on quarterly firm-level panel data. They concluded that cash flow fluctuations explain a substantial amount of inventory fluctuations for the US firms. They found strong support for the existence of financing constraints due to the adverse selection and moral hazard problems in debt and equity markets generated as a result of asymmetric information between firms and potential suppliers of external finance. They did find cash flows to be a significant determinant of inventory investment for some classes of firms and for some periods, although there were cases where cash flow turned out to be insignificant.

Ian Small (2000) uses a panel consists of 527 manufacturing quoted firms in UK and covers the period 1977-94, to examine whether the effect of cash flow on inventory investment reflects the presence of financially constrained firms.. The sample is restricted to those companies whose main activity in terms of sales was in manufacturing, and for which at least eight consecutive years of data are available. The Generalised Method of Moments (GMM) procedure was employed for estimation. The main finding is that the effect of cash flow on inventory investment is concentrated among firms identified as financially constrained using either their financial policy or a criterion based on their current ratio. Contrary to what previous studies have found, using firm size or the coverage ratio to define financially constrained firms does not reduce the effect of cash flow on the inventory investment of unconstrained firms. Combined with Bond and Meghir's similar findings for fixed investment, the results in this paper suggest that cash flow effects form part of the monetary transmission mechanism.

Bo (2002), in her study on Dutch inventory investment, used firm level data on Dutch firms over the period 1984-1995. Her results, which were based on the Lovell model augmented with financial variables showed that capital market imperfections were relevant to explain inventory behaviour and thus provide evidence that the firms that were likely to be financially constrained, respond much more sharply to cash flow shocks than those firms that were less likely to be constrained.

Important Studies of Inventory Investment in India: Inventory, in most industries, accounts for the largest proportion of gross working capital. A number of studies have been conducted to find out the determinants of investment in inventories. Most of these studies are based on the time series and pooling of cross section of time series data pertaining to manufacturers' inventories. The following discussion provides a brief review of studies, dealing with factors influencing investments in inventory in India.

Krishnamurty's study (1964) was an aggregative one and dealt with inventories in the private sector of the Indian Economy as a whole for the period during 1948-61. The data was taken from the Central Statistical Organization's study on capital formation. This study concluded that neither profits nor capacity version of the accelerator, if taken separately, can satisfactorily explain investment. However, if these two are taken together along with interest rate, perhaps it can provide a better explanation of investment in the private sector.

Krishnamurty and Sastry's study in 1970 was perhaps the most comprehensive study on manufacturers' inventories. They used the CMI data and the consolidated balance sheet data of public limited companies published by the RBI, in order to analyse each of the major components, like the raw materials, goods-in-process and finished goods, for 21 industries over the period ranging from 1946-62. The study was a time series one although there were some inter-industry cross-section analyses that were carried out in the analysis. The Accelerator represented by change in sales, bank finance and short-term interest rate was found to be an important determinant. The utilisation of productive capacity and price anticipations was also found to be relevant in the study. In another study conducted by them in 1975, they analysed inventory investment in the context of the flexible accelerator with financial variables. Both the RBI and the Stock Exchange, the Official Directory, Mumbai data for seven important industries were [had been] taken for the period of 1956-69. Their study of pooled cross-section analysis was based on current prices whereas the time series analysis using the RBI data was based on constant prices. The OLS results showed the important influence of the accelerator, internal and external funds flow and fixed investment on inventory investment.

Sastry (1975) conducted a cross-section study of the total inventories of companies across several heterogeneous industries for the period 1955-60 using the balance sheet data of public limited companies in the private sector. The study brought out the importance of accelerator which was represented by a change in sales. It also showed a negative influence of fixed investment on inventory investment.

The study by Vinod Prakash (1970) was based on a time series analysis with mostly undeflated data taken from CMI and Annual Survey of Industries (ASI) for the period 1946-63. There were three different models that were applied for industry groups and for six important individual industries. The Output/sales, capacity utilization, short-term rate of interest, money supply, foreign exchange availability, price index, size and time trend were taken as explanatory variables. The simple accelerator model with output, gave better results for industrial groups, whereas the ratio model seemed to perform better in the analysis of individual industry.

The study by George (1972) was a cross-section analysis of the balance sheet data of 52 public limited companies for the period 1967-70. The Accelerator, internal and external finance variables were considered in the equations for raw materials including goods-in-process and total inventories. However, equations for finished goods inventories considered only output variable. Accelerator and external finance variables were found to be important determinants of inventory investment.

The analysis by Swamy and Rao (1975) of the flow of funds of public limited companies applied an equation for aggregate inventory investment. The RBI data for the period 1954-70 was adopted and used in this particular study. The explanatory variables considered were the accelerator, flow of bank borrowings, index of man-days lost and capacity by the call rate. The Accelerator, bank finance and fixed investment were also found to be significant in the study.

N.C. Gupta's study (1987) examined the determinants of total inventory investment in the aluminum and non-ferrous semi-firms in the private sector. The data used for this particular study was taken from the Stock Exchange, Official Directory, Mumbai for a period of 9 years, ranging from1966-67 to 1974-75. The Analysis was based on pooling of time series of cross-section data. The Demand factor and external finance turned out to be significant determinants in the aluminum industry. Both retained earnings and external finance were considered to be important determinants in case of non-ferrous semis. Competition for investment funds between fixed and inventory investment was suggested both in aluminum and non-ferrous semis.

Adesh Sharma (1994) applied the accelerator model with financial variables to determine the factors influencing investment in inventories in pesticides industry in India. The Data for his study was taken from the Stock Exchange Official Directory, Mumbai for the period 1978-1992 in respect of 18 firms in this industry. The coefficients of the accelerator and financial variables were found to be significant and positive. The coefficient of inventory stock was, however, significant and negative.

III. OBJECTIVES

In the light of the above literature reviewed, the purpose of the research is

- To estimate the investment functions for inventory investment of Iron and Steel industry.
- To examine the nature of the relationship-competitive or complementary that might prevail between fixed and inventory investment in the iron and steel industry in India.

IV. METHODOLOGY

A. Data

The source of data for this study is the Reserve Bank of India, Mumbai. The data is on non-government, non-financial public limited companies in the Iron and steel industry in India. It provides information on the liability and assets and also on income, expenditure and appropriation account.

The company wise data are available from 1980-81 onwards. The data frequency is annual covering the period 1980-81 to 2010-11. The number of companies in the original data set was much higher but companies with fewer than twelve consecutive years of data are deleted from the data set. For the present study, the sample period is 1999-2000 to 2010-2011. It is important to note that due to regulations and constraints which existed in the pre-liberalisation, there were only few companies operating in this industry. It was only after deregulation period that new companies emerged. Hence the study considered only those companies which emerged after 1998. Even for companies which were established before the liberalization, the data in the pre-liberalisation is not comparable to data in the post-liberalisation period. However, for time series study the data has been classified into three groups. The rationale for segregating data into three groups A, B and C, in the case of time series study is to gain more units, that is, more companies can be included for the analysis. In group 'A', we have six companies with data from 1995-1996 to 2010-2011. In group 'B' there are 27 companies with data from 1997-98 to 2010-11. In group 'C' there are 38 companies with data from 1999-2000 to 2010-11. A Cross-section analysis was also carried out but not shown in this article. The result of the cross-section analysis confirmed the results of the analysis shown here.

B. Formulation of the model

In this study, inventory investment behavior is analyzed within the framework of a flexible accelerator model. The naïve accelerator model has not been considered since it assumes no lags in the adjustment process, which is highly an unrealistic assumption. In reality it is found that there exist procurement lags between orders and deliveries and the length of these lags will depend on the source of supply and their availability. Uncertainty in the market for raw material and the demand for the final product is another factor influencing the speed of adjustment.

The accelerator effect has been included in the model and is represented by current sales change variable and its lagged variables. The inclusion of lagged sales change is to accounts partly for expectations of net sales changes (proxy to expectational-accelerator hypothesis) and partly for partial adjustment process (proxy to flexible accelerator hypothesis).

The model includes two financial variables, the flow of net debt and the retained earnings. The flow of net debt represents the external finance while the retained earnings or retained profits represent the internal finance. Firms fund their long and short term needs through the flow of net debt and/or securities financing. Traditional theories of intermediation stress substitution between bank loans (proxy to flow of net debt) and securities. However some researchers are of the opinion that bank loans are complimentary to securities financing. But bond issuance cannot fully substitute for bank lending when banking systems enter a crisis. Hence bank loans or alternatively flow of net debt has been chosen to best represent external finance.

Accumulated depreciation allowances and retained earnings are the two main internal sources of finance to a firm. Depreciation allowances are set aside primarily to replace the worn-out capital; whereas retained earnings can be entirely used for new capital formation. Our measures of internal liquidity are based on retained earnings which we find more relevant for investment decisions of firms. Retained earnings are obtained from profit after tax net of dividends. The retained earnings taken along with current depreciation is considered as gross retained earnings, which is considered as one of the independent variable in the present model.

Another variable included is the fixed investment which is found to compete for financial resources with inventory investment in most empirical studies. Inventory-turnover ratio affect inventory investment positively because higher ratio in the past suggests that maintenance of high levels inventory-turnover ratio is a trend of the firm and it will be reluctance to deviate from this trend. New investment depends upon the gap between desired stock and the existing stock. So stock of inventories in the previous year is postulated to have a negative relationship with existing stock since the more the inventory accumulated the less will be the demand for addition into it.

In this study a finite distributed lag structure is considered for sales change variables as well as for the financial variables. All the variables are in current prices. However all the variables are deflated by capital stock of the previous period; whereas the sales change variables are deflated by sales of the previous year. This process of deflation helps to correct for heteroscedasticity.

In the cross-section study, where cross-section regressions for each year are computed, the results of the regressions with R^2 more than 0.2 are reported. The method for estimation used is ordinary least squares (OLS). The model specifications are given below:

$$IN_t/K_{t-1} = a + \sum_{L=0}^{2} b_L \Delta S_{t-L}/S_{t-L-1} + \sum_{L=0}^{2} c_L RENT_{t-L}/K_{t-L-1}$$

$$+ \sum_{L=0}^{2} d_L FNDE_{t-L-1}/K_{t-L-1} + e\, I_t/K_{t-1} \quad \ldots. (1)$$

$$IN_t/K_{t-1} = a + \sum_{L=0}^{2} b_L \Delta S_{t-L}/S_{t-L-1} + \sum_{L=0}^{2} c_L RENT_{t-L}/K_{t-L-1}$$

$$+ \sum_{L=0}^{2} d_L FNDE_{t-L}/K_{t-L-1} + e\, I_t/K_{t-1} + f\, INS_{t-1}/K_{t-1} + g\, INS_t/S_t \quad \ldots. (2)$$

$$IN_t/K_{t-1} = a + \sum_{L=0}^{2} b_L \Delta S_{t-L}/S_{t-L-1} + \sum_{L=0}^{2} c_L PAT_{t-L}/K_{t-L-1}$$

$$+ \sum_{L=0}^{2} d_L FNDE_{t-L}/K_{t-L-1} + e\, I_t/K_{t-1} \quad \ldots. (3)$$

$$IN_t/K_{t-1} = a + \sum_{L=0}^{2} b_L \Delta S_{t-L}/S_{t-L-1} + \sum_{L=0}^{2} c_L PAT_{t-L}/K_{t-L-1}$$

$$+ \sum_{L=0}^{2} d_L FNDE_{t-L}/K_{t-L-1} + e\, I_t/K_{t-1} + f\, INS_{t-1}/K_{t-1} + g\, INS_t/S_t \quad \ldots. (4)$$

Where L = 0, 1, 2 are one year lags and a, b, c, d, e, f and g are regression coefficients of the respective variables

And I = Gross Fixed Investment

K = Gross fixed assets.

ΔS = sales change

IN = Inventory investment.

RENT = Gross retained earnings.

FNDE = Flow of net debt (External finance)

PAT = Profits after taxes'

INS = Stock of inventories

t = Time subscript.

V. Discussion of the Results

A. *Time-Series Analysis*

The results for specification (1) are given in Table (1) of the Table Appendix. The R^2 varies from 0.45 to 0.94. Lagged sales change of one year is significant in only one case while the current sales change and its second lag are not statistically significant at all. Retained earnings is significant in two cases but its lags are not so. Flow of net debt is significant in four cases while its lags are not significant at all. Fixed investment is statistically significant in more than half of the regressions.

The results for specification (2) are given in the Table (2) of the Table Appendix. The second lag cannot be calculated for lack of degree of freedom. The R^2s' values have improved with the inclusion of current and lag stock of inventories, where the highest value is 0.98 and lowest is 0.82. The sales change variable is not significant at all while its lag is significant in one case only. Current stock of inventories, retained earnings and its lags are statistically significant in few cases. The flow of net debt and stock of inventories with one lag are good explanatory variables of inventory investment but lagged flow of net debt is not significant at all. Fixed investment is statistically significant explanatory variable and it bears an inverse relationship to inventory investment.

For specification (3) the results are given in Table (3) of Table Appendix. The values of the R^2s range from 0.40 to 0.98. Sales change is significant in two cases while its lags are significant in few cases. Profit after tax is significant in more than half of the regressions. Flow of net debt and their lags are significant only in few cases. Fixed investment is significant in more than half of the regressions.

The results for specification (4) are presented in Table (4) of the Table Appendix. The R^2s' value ranges from 0.67 to 0.96. Sales change and its lags are significant in few of the regressions. Profit after tax is significant in half of the regressions while its lag is significant in only one case. Flow of net debt is statistically significant in only two cases but its lags are not showing any influence on inventory investment. Fixed investment is significant in all the regressions.

In conclusion, we can say that the R^2s are very high which is around 0.9 in most cases. Retained earnings, profit after tax, flow of net debt show weak influence on inventory investment. Fixed investment shows that it is statistically significant explanatory variable. The existence of an inverse relationship between fixed and inventory investment is clearly indicated.

B. Pooled Analysis

The results of pooled cross-section and time-series analysis, for all specifications, are given in Table (5) of Appendix. The R^2s' values are high ranging from 0.70 to 0.97. Retained earnings, profit after tax, current stock of inventories, flow of net debt and fixed investment are statistically significant variables. But the lagged of these variables are not statistically significant as the current variables. Sales change is significant in few cases but its second lag is significant in all cases.

So all the current variables have good explanatory powers but their lags do not exhibit such power except for the two-year lagged sales change. The analysis also shows that there is negative relationship between fixed and inventory investment. The results from this analysis are better than from the previous two analyses in terms of providing explanation of the dependent variable.

C. Main Findings

1. Both external and internal finance are important determinants of inventory investment.
2. External funds exert more influence on inventory investment than internally generated funds.
3. Fixed investment influence inventory investment in an inverse manner.
4. Lagged variables exert weak influence on inventory investment except for sales change.
5. Accelerator has not indicated sufficient effect on inventory investment in iron and steel industry. But the trend is such that its influence is shown after a period of time.
6. The D.W. statistics in the time-series analysis are around 2.1 which imply that the results are free from auto-correlation.

VI. Conclusion

The analysis of inventory investment clearly indicates that current demand considerations are not a priority in the inventory investment decisions in the Iron and Steel Industry in India. The analysis shows that the two-year lagged sales changes which represent the flexible accelerator seems to affect inventory investment to a certain extent. For meeting inventory investment requirements in the industry, both types of finance are resorted to, but there seems to be a bias towards external finance. Moreover, investment in fixed assets is found to compete with investment in inventories, thereby confirming the inverse relationship between these two types of investment.

APPENDIX:

TIME SERIES (OLS)
TABLE (1)
Dep var: IN_t/K_t

Cons	$\Delta S_t/S_{t-1}$	$\Delta S_{t-1}/S_{t-2}$	$\Delta S_{t-2}/S_{t-3}$	$RENT_t/K_{t-1}$	$RENT_{t-1}/K_{t-2}$	$RENT_{t-2}/K_{t-3}$	$FNDE_t/K_{t-1}$	$FNDE_{t-1}/K_{t-2}$	$FNDE_{t-2}/K_{t-3}$	I_t/K_{t-1}	R^2	F	p	DW
A														
0.4343 (1.98)	0.1461 (0.67)			0.2491 (0.98)			0.4051 *(2.03)			-0.486 *(2.88)	0.6263	4.19	**	1.9960
0.9030 *(3.35)	0.1846 (1.03)	0.5940 *(2.68)		0.2693 (1.1)	0.2307 (0.88)		0.3762 (1.91)	0.0734 (0.41)		-0.4988 *(-3.67)	0.859	5.22	**	2.0387
1.2156 (1.18)	0.2746 (0.95)	0.7966 (0.63)	1.4038 (1.59)	0.5315 (1.24)	0.4774 (0.44)	0.0646 (0.06)	0.5567 *(2.2)	0.1522 (0.14)	0.4255 (0.26)	-0.4281 (-1.82)	0.9024	4.85	**	1.9445
B														
0.1735 (0.14)	0.2940 (1.13)			0.2523 *(2.41)			0.1060 (0.68)			-0.928 *(-4.58)	0.7093	5.49	**	2.2374
0.2517 (0.15)	0.1230 (0.23)	0.3577 (1.39)		0.2489 (1.05)	0.3088 (1.89)		0.0822 (0.52)	0.1546 (0.39)		-0.7777 *(2.44)	0.8061	3.56	*	2.1424
2.1501 (0.97)	1.6872 (1.26)	1.3422 (1.06)	1.2620 (1.34)	0.1845 (1.16)	0.5599 (0.57)	2.4989 (1.17)	0.8115 *(2.37)	0.6274 (1.25)	0.8909 (1.47)	-0.6678 (-1.94)	0.9463	3.52	*	2.0584

C													
0.7413 (0.67)	0.5835 (0.79)			0.4727 (1.46)			0.5462 *(3.1)			-0.1739 (-0.73)	0.4508	5.44	**	2.1443
7.8748 (1.51)	0.4963 (0.74)	1.1685 (1.74)		0.6249 (1.77)	0.0436 (0.41)		0.0818 (1.2)	1.045 (1.82)		-0.4131 *(-3.07)	0.8232	5.66	**	2.0149
1.230 (0.37)	0.5353 (0.27)	1.1040 (0.81)	1.4841 (1.09)	0.7558 *(2.63)	0.1385 (0.77)	0.0690 (0.26)	0.1777 (1.12)	1.1370 (0.54)	0.1674 (0.73)	-0.2651 (-1.07)	0.8459	5.55	**	2.0599

For p * indicates coefficient is significant at 1% level,
** indicates coefficient is significant at 5% level and
*** indicates coefficient is significant at 10% level.
For t * indicates coefficient is significant at 5% level.

TABLE (2)
Dep var: IN_t/K_t

Con	$\Delta S_t/S_{t-1}$	$\Delta S_{t-1}/S_{t-2}$	$REN T_t/K_{t-1}$	$RENT_{t-1}/K_{t-2}$	$FNDE_t/K_{t-1}$	$FNDE_{t-1}/K_{t-2}$	I_t/K_{t-1}	INS_{t-1}/K_{t-1}	INS_t/S_t	R^2	F	p	DW
A													
0.1275 (0.11)	0.0865 (0.41)		0.2850 (1.91)		0.6835 *(2.51)		-0.6719 *(-2.3)	-0.4358 (-1.95)	1.175 (1.02)	0.8466	6.93	***	1.9904
0.4505 (0.85)	0.0922 (1.07)	0.2805 *(2.41)	0.3916 *(3.18)	0.1994 (1.72)	0.8470 *(6.81)	0.1617 (1.57)	-0.2358 *(-2.94)	-0.5919 *(-5.08)	1.9020 *(3.89)	0.9824	24.84	***	2.0016
B													
1.6079 (0.34)	0.3516 (1.04)		0.0657 (0.08)		0.6338 *(2.71)		-0.9994 *(-3.95)	0.1841 (0.58)	0.1387 (0.18)	0.8241	7.06	***	2.0325
4.4037 (0.78)	0.4670 (0.74)	0.2393 (1.06)	0.9852 *(2.76)	2.695 *(2.46)	0.0834 (0.09)	0.2035 (0.46)	-1.0327 *(-3.31)	-0.9420 *(-2.42)	0.2473 (0.32)	0.9239	10.39	***	2.0454
C													
2.1426 (0.15)	0.3379 (0.68)		1.8007 *(2.49)		0.9395 (1.55)		-1.6135 *(-2.41)	-1.3800 *(-2.12)	1.0079 (0.66)	0.9236	12.18	***	2.0103
1.4921 (-0.54)	0.4941 (0.38)	1.83 (1.35)	1.8878 (1.37)	0.5759 (0.76)	0.3355 *(3.38)	1.7049 (1.53)	-2.0777 *(-2.23)	-2.0452 *(-2.03)	2.5258 (0.96)	0.9601	11.63	***	2.043

For p * indicates coefficient is significant at 1% level,
*** indicates coefficient is significant at 10% level.
For t * indicates coefficient is significant at 5% level.

TABLE (3)
Dep var: INt/Kt

Con	$\Delta S_t / S_{t-1}$	$\Delta S_{t-1} / S_{t-2}$	$\Delta S_{t-2} / S_{t-3}$	PAT_t / K_{t-1}	PAT_{t-1} / K_{t-2}	PAT_{t-2} / K_{t-3}	$FNDE_t / K_{t-1}$	$FNDE_{t-1} / K_{t-2}$	$FNDE_{t-2} / K_{t-3}$	I_t / K_{t-1}	R^2	F	p	DW
A														
0.3636 (1.73)	0.1178 (0.5)			0.1839 (0.5)			0.4500 (1.89)			-0.4476 *(-2.66)	0.6007	3.76	**	1.9280
1.060 *(5.1)	0.4817 *(2.5)	0.9289 *(4.26)		0.6388 *(2.3)	0.6906 *(2.37)		0.4318 *(2.95)	0.3741 *(2.48)		-0.3863 *(-3.62)	0.9170	9.47	***	2.0362
1.1421 *(3.52)	0.5876 *(2.45)	0.8280 (1.79)	0.0407 *(2.08)	0.7157 (1.9)	0.6832 (1.33)	0.4128 (0.61)	0.6443 (1.57)	0.3353 (1.02)	0.0210 (0.04)	-0.2309 (-1.27)	0.9605	4.87	**	2.0816
B														
0.8289 (0.63)	0.3118 (1.29)			0.6233 (0.96)			0.0836 (0.57)			-0.9589 *(-4.85)	0.7316	6.13	**	2.0966
0.7014 (0.47)	0.3351 (0.98)	0.3043 (1.33)		0.5418 *(2.85)	0.5302 (1.15)		0.0713 (0.48)	0.1898 (0.7)		-0.7532 *(-2.5)	0.8301	7.19	**	2.0994
2.6512 *(2.36)	0.4615 (1.47)	0.1034 (0.54)	0.1640 *(2.07)	0.4042 *(2.26)	1.666 *(4.12)	0.1384 (0.43)	0.0523 (0.77)	0.4474 *(2.73)	0.1606 (1.13)	-0.3462 *(-2.06)	0.9895	18.82	**	2.0189
C														
2.682 (0.47)	0.8819 (1.11)			0.5317 (0.51)			0.0388 (0.07)			-2.7477 *(-3.19)	0.4095	4.78	**	2.0554
0.4923 (1.11)	0.8078 (0.84)	1.340 (1.69)		1.2193 *(2.36)	1.1369 (1.05)		0.4209 (1.64)	0.9327 (1.71)		-0.1383 (-0.51)	0.6432	6.96	***	2.1325
4.1419 (1.03)	0.9330 (1.21)	1.218 (1.42)	3.628 (1.26)	0.3202 *(2.06)	0.0341 (1.28)	0.7024 (1.31)	4.8562 *(2.85)	1.2996 (1.17)	1.9921 (1.24)	-1.1393 (-1.29)	0.9224	6.19	**	1.9742

For p * indicates coefficient is significant at 1% level,
*** indicates coefficient is significant at 10% level.
For t * indicates coefficient is significant at 5% level.

TABLE (4)
Dep var: INt/Kt

Con	$\Delta S_t / S_{t-1}$	$\Delta S_{t-1} / S_{t-2}$	PAT_t / K_{t-1}	PAT_{t-1} / K_{t-2}	$FNDE_t / K_{t-1}$	$FNDE_{t-1} / K_{t-2}$	I_t / K_{t-1}	INS_{t-1} / K_{t-1}	INS_t / S_t	R^2	F	p	DW
A													
0.085 (0.16)	0.0851 (0.33)		0.2684 (0.65)		0.7133 *(2.44)		-0.4546 *(-2.14)	-0.4249 (-1.8)	0.9141 (0.68)	0.7166	6.37	***	1.9351
0.0152 (0.11)	0.2650 (1.03)	0.6210 *(2.59)	0.4979 *(2.03)	0.5276 (1.86)	0.6906 *(3.99)	0.2058 (1.45)	-0.4166 *(-2.71)	-0.3911 *(-2.27)	1.3271 (1.18)	0.9644	12.03	***	2.1671
B													
5.1375 (0.92)	0.3021 (0.94)		0.8649 (1)		0.1479 (0.85)		-1.0342 *(-4.4)	-0.1213 (-0.44)	-0.5979 (-0.7)	0.7582	3.66	**	2.2331
0.4871 *(0.07)	0.4529 (1.03)	0.2351 (0.84)	0.4255 *(2.12)	0.9557 (1.38)	0.0621 (0.34)	0.2085 (0.63)	-0.7184 *(-3.88)	-0.3527 (-0.93)	0.3266 (0.31)	0.9306	6.74	***	1.9370
C													
2.98 *(2.33)	1.3881 *(2.05)		1.3386 (1.15)		0.1290 (0.29)		-2.1443 *(-2.7)	-0.1884 (-0.53)	1.7245 (1.85)	0.6763	6.35	***	2.5439
2.8128 (1.16)	1.3230 (1.04)	1.5383 (0.73)	1.1806 *(2.73)	0.2112 (0.11)	0.3794 (0.35)	1.163 (0.85)	-0.1847 (-0.4)	-1.864 *(-2.17)	1.6204 (0.89)	0.782	7.8	***	2.1358

For p * indicates coefficient is significant at 1% level,
*** indicates coefficient is significant at 10% level.
For t * indicates coefficient is significant at 5% level.

Table (5)
POOLED OLS

Cons	$\Delta S_t / S_{t-1}$	$\Delta S_{t-1} / S_{t-2}$	$\Delta S_{t-2} / S_{t-3}$	$RENT_t / K_{t-1}$	$RENT_{t-1} / K_{t-2}$	$RENT_{t-2} / K_{t-3}$	$FNDE_t / K_{t-1}$	$FNDE_{t-1} / K_{t-2}$	$FNDE_{t-2} / K_{t-3}$	PAT_t / K_{t-1}	PAT_{t-1} / K_{t-2}	PAT_{t-2} / K_{t-3}	I_t / K_{t-1}	INS_{t-1} / K_{t-1}	INS_t / S_t	R^2	F	p
Specification 1																		
0.0080 (0.75)	0.0624 (1.7)			0.2863 *(7.1)			0.1769 *(6.84)						-0.2271 *(-6.06)			0.9034	68.09	***
0.0072 (0.61)	0.0625 *(2.7)	0.0502 (0.41)		0.2950 *(6.97)	0.0217 (0.38)		0.1812 *(7)	0.0288 (1.75)					-0.245 *(-6.47)			0.8243	37.59	***
0.0084 (0.62)	0.1242 (1.09)	0.0913 (1.05)	0.3316 *(2.18)	0.3027 *(6.81)	0.0846 (1.2)	0.0910 (1.31)	0.1855 *(6.84)	0.0279 (1.62)	0.0326 (0.53)				-0.241 *(-5.93)			0.8353	12.65	***
Specification 2																		
0.0234 (0.47)	0.1685 (1.91)			0.4890 *(7.12)			0.3817 *(6.98)						-0.2263 *(-6)	-0.0289 (-0.65)	0.0307 (0.54)	0.9722	79.17	***
0.0066 (0.32)	0.1691 *(2.94)	0.1084 (1.34)		0.2938 *(6.9)	0.0345 (0.6)		0.1871 *(7.19)	0.0293 (1.78)					-0.2464 *(6.45)	-0.0355 (-0.8)	0.1438 *(2.68)	0.9581	64.11	***
0.0089 (0.38)	0.0800 (1.08)	0.1089 (1.54)	0.3256 *(3.93)	0.3019 *(6.75)	0.0236 (0.32)	0.0261 (0.38)	0.1908 *(6.99)	0.0284 (1.64)	0.0123 (0.47)				-0.2442 *(5.96)	-0.0401 (-0.85)	0.1406 *(2.59)	0.9105	30.24	***
Specification 3																		
0.0024 (0.21)	0.0761 (1.19)						0.1674 *(6.2)			0.2225 *(3.82)			-0.2003 *(-5.18)			0.9404	77.97	***
0.0013 (0.11)	0.0776 (1.24)	0.3076 *(2.83)					0.1721 *(6.37)	0.0250 (1.46)		0.2168 *(3.24)	0.0502 (0.8)		-0.2186 *(-5.58)			0.8581	31.4	***
0.0004 (0.03)	0.0873 (1.27)	0.0073 (0.27)	0.4296 *(3.06)				0.1765 *(6.22)	0.0245 (1.36)	0.0130 (1.06)	0.2213 *(3.11)	0.1273 (1.73)	0.1218 (1.3)	-0.2192 *(-5.19)			0.7065	17.8	***
Specification 4																		
0.0009 (0.09)	0.0832 (1.42)						0.1712 *(6.3)			0.1274 *(3.86)			-0.1987 *(-5.1)	0.0091 (-0.2)	0.0240 (0.36)	0.8864	42.4	***
0.0060 (0.27)	0.3853 *(3.5)	0.0370 (1.66)					0.1766 *(6.5)	0.0254 (1.48)		0.2162 *(3.21)	0.0585 (0.93)		-0.2178 *(-5.53)	-0.0144 (-0.31)	0.1330 *(2.49)	0.8685	39.8	***
0.0043 (0.18)	0.2940 *(3.47)	0.0156 (1.56)	0.2214 *(2.74)				0.1802 *(6.31)	0.0248 (1.38)	0.0029 (0.57)	0.2212 *(3.08)	0.0613 (1.77)	0.0262 (1.36)	-0.2202 *(-5.18)	-0.0181 (-0.37)	0.1319 *(2.45)	0.8365	26.7	***

For p * indicates coefficient is significant at 1% level,
*** indicates coefficient is significant at 10% level.
For t * indicates coefficient is significant at 5% level.

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