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Industrial Production and its Determinants in India: 1951–76@

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Several alternative explanations of the behaviour pattern of the Indian economy have been offered. The major bones of contention among the economists have, however, been the determinants of national income and prices. Whereas the neo-classists highlight the predominant role of factors on supply side, the Keynesians and neo-Keynesians emphasise effective demand and its determinants.

Stock of money is the King-Pin in the neo-classical theory which also maintains that the national income and changes therein are governed mainly by the stock of capital and by the supply of wage-goods which has a stable multiplier type of relationship with the national income. In fact, autarchic models of economic development underlying India's five year plans (20,15) especially the second and the third plans, rest basically on the assumptions that the developmental efforts will generate enough income to take care of demand and that it is the scarcity of investment goods, in general but heavy basic manufactured goods in particular, that hinders development (6,7,15). A variant of the same hypothesis states that the national income is mainly

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dependent upon the supply of basic and heavy industrial goods. Recessionary trends is several sectors of the manufacturing industry that emerged in mid-sixties are therefore, sought to be explained in terms of stagnation of investment in industry, especially the public investment in heavy industry. Another modified version of the neo-classical theory maintains that the supply of wage goods in general, and food-grains in particular, is the real constraint in the Indian economy.

Keynesians and the neo-Keynesians, on the other hand, assert that the level of national income and changes therein are determined by the level of investment and/or the government expenditure. Then the slow growth of income is accounted by the weakness of the process of acceleration and the industrial recession is explained by the slackening of investment in general and public investment in particular which has been the propellant of planned economic devellopment in India. Interestingly, public investment figures in the arguements of both schools, though for different reasons. Deflated money balances have also been pushed in as a determinant of income by the followers of Friedman and Pakistan.

Numerous macro-econometric models have been built up in the theoretical framework discussed above. These models, with the exception of those developed by Agarwala (1) and Brahmananda (3) follow, by and large, the standard Keynesian macroeconomic formulation, even though there are as many differences in specification, sectorisation and estimation procedures used and other details as their authorships. While some of the models attempt to determine the national income as a single magnitude, (3,4 and 8), others finds it useful to divide it into its agricultural and, non-agricultural components (1,5) and determine the two separately. Other schemes of more detailed sectorisation like mining manufacturing/industry, raw materials, semi-manufactures, food grains and other agricultural goods etc. have also been tried. The second type of more detailed studies are decidedly preferable to the first ones which neglect the vital differences in the determinants of income originating in different sectors, particularly the agricultural and industrial sectors.

Agarwala (1, pp 72-85) attempts mainly to determine the outputs of agriculture and industry. Level of employment in the non-agricultural sector is determined by the supply of food-grains, while income and therefore, output is determined by the stock of capital and labour employed in this sector. But industries' constitute the most important and the dynamic part of the non-agricultural sector' (p.84). He uses the Cobb-Douglas production function (with capital output ratio as the independent variable). He makes the assumption of constant returns to scale.

Chaudhary (5) uses a linear production function for determining industrial (non-agricultural output). Current stock of capital, labour employed and a trend variable are used as explanatory variables.

Like Chaudhary, Krishnamurty also determines industrial output by means of a linear function which includes labour and the stock of capital weighted by the index of productive capacity utilised as explanatory variables. However, capital-stock itself is estimated as parameter (5)

Chaudhary and Krishnamurti treat the output of mining, manufacturing and trade per unit of labour employed in the sector as a function of capital per unit of labour weighted by the index of productive capacity utilised. But the initial stock of capital is not an observed variable. Initial stock of capital and cumulated investment are factored out and the initial stock of capital is estimated as a parameter (4, p. 3. and Appendix).

Kanta Marwah uses a single input (labour) linear production function to determine the output of manufacturing sector (5, p. 200). But in the modified and extended version of the model she employs an aggregative production function which relates net national product to lagged stock of capital weighted by the capacity utilisation index. Capacity utilisation is a proxy of demand and it is determined by the lagged ratio of the stocks and output of the manufactured goods, lagged values of income and velocity of money and the capacity utilised in the preceding year. Then, the output of manufactures is treated as a linear function of income and the preceding year's output of manufactures while the employment in the sector is determined by production of the sector and the employment in the preceding year.

Other models of the Indian Economy attempt to determine the national income as a whole rather than its sectoral components (See, 3, 5, 13).

The present study, which is the part of a much larger study of the economy as a whole and which is only preliminary to a detailed study of this particular sector is devoted to the study of the determinants of income form the manufacturing industries alone. All the manufacturing industries are assumed to constitute one single sector. The assumption will be relaxed in the subsequent exercises.

Explanatory Variables :

Domestic investment, changes in stocks, government expenditure and income generated in agriculture and other allied activities have been used to explain the level of manufacturing output and changes therein from 1950-51 to 1975-76. Data for the study have been taken from National Accounts Statistics, 1960-61 to 1972-73 and 1970-71 nnd 1975-76 and (3).

Investment

Investment happens to be one of the most crucial element of final demand. In a dynamic system, in fact, investment plays a dual role: On the one hand, it creates additional demand via income, and on the other hand, it creates capacity to produce on the supply side. However, the two roles are sequential rather than simultaneous. While an act of investment creates immediate demand for investment goods and demand for other goods via factor incomes, due to lags in production it takes time to increase supply. Longer the production lags involved, greater will be the time required to increase supplies. How long the lag will be in reality depends upon the sector (s) to which investment is directed. For example, gestation lags for basic and heavy goods industries are longer than those for light consumer goods industries. Effective constraints on development of a developing country like India donot lie either on the demand side aloneor on the supply side alone as is usually hypothesised in developmental literature (c. f. 9), for example) In reality, the constraints operate on both sides of the market. Those who emphasise either demand alone or supply alone forget the essential but strong inter-relationships that characterise modern economic structures. Whereas the small size of the market in a developing country constitutes a bottleneck on the demand side, scarcity of investible resources, particularly capital, acts as a major bottleneck on the supply side. Investment can stimulate the process of loosening the gripof some of the constraints.

Stocks

Current investment determines what additional capacity to produce will be created in a given period. It thus, leaves out of account the capacity that already exists. Stocks of capital can be taken to represent the existing productive capacity. Stocks of the capital generally include items of fixed capital like machinery, plants, buildings, structures, projects and the items of working capital like inventories of raw materials, goods in process or semi-finished goods and some amount of finished goods as well. like investment, stocks also reflect both the conditions of demand and supply. Higher amounts of stocks of fixed capital in plant and equipment etc. represent greater productive capacity while greater the stock of items of working capital like raw materials, slacker is likely to be the demand, and smaller their stocks, higher is the level of demand in the market.

Government Expenditure

Ever since India became independent, government has been acting as an agent of growth. Most of the investible resources have been mobilished by the government, public investment not only constitutes predominant proportion of total investment but it has also been geared to assume the 'commanding heights' of the economy and the government has taken over the responsibility of regulating and guiding the economy. Government expenditure, has acquired vital links with all the sectors of the economy and plays a crusial role. Though the role played by the government has often been acknowledged, it has seldom been quantified by detailed analysis for an exception. see 11).

Agricultural Income

Despite massive efforts at industrialisation, agriculture still plays a dominant role in the Indian economy so far so that the overall performance of the entire economy is, by and large, determined by the performance of the agricultural sector. If agricultural production records high growth, the rate of growth of the total economy is also high and on the other hand, if the growth agriculture is neglible, the whole economy slides down. It is because of the fact that agricultural income generates directly demand for goods like fertilizers, agricultural machinery like irrigation pumps, pesticides, cement etc. by promoting investment in this sector, it also generates demand via income for consumables like textiles, bicyles, radios soaps, etc. Besides agricultural output still accounts for a very high proportion of national production (13). In view of the above, all these four variables have been tried as determinants of the level of output of manufacturing industries.

Empirical Results

A regression model has been used to analyse quantitative relationships between manufacturing output and the above explanatory variables. Parameters have been estimated by means of ordinary least squares technique and all the usual assumptions that go with it have been made.

As for the functional form, well prefer log-linear to simple linear functions because the former determines change rather than the absolute level of the explained variable. Another point of interest is the choice between the lagged and the current values of the explanatory variables. In other sub-models, lagged values have been preferred to the current ones because lagged values are more useful than the current ones for prediction and also because the responses of economic variables to different stimuli are seldom instantaneous in reality, and lagged values allow, at least partly, the representation of the lag structures. Results are reported in Appendix B, and the selection of the preferred function along with other results is discussed in Appendix A.

From our several results of statistical experiments, we have selected the following regression equation to explain the changes in manufacturing output :

$$\text{Log } O_t = 2.284 + 0.5112 \text{ Log } G_{t-1}$$

As there is statistically significant auto-correlation involved, we assume that there is auto-correlation of first order and transform the variables as follows:

$$\text{Log } O_t^* = P\,(\text{Log } O_t^m - \text{Log } O_{t-1}^m\,), \text{ and}$$

$$\text{Log } G_t^* = P\,(\text{Log } G_t - \text{Log } G_{t-1}\,)$$

Where P is the first order auto-correlation coefficient. Equations (7) and (7a) both are used for obtaining the adjusted series from which equations (7b) and (9) are estimated by OLS. In both the cases, regression coefficients are highly significant and high, and auto-correlation is not significant. But the equation (9) implies that it is the absolute level as well as changes in the level of government expenditure in the preceding period which determines the manufacturing output in the current period and that the government expenditure and changes in it in the current period do not affect it at all. The first assumption stretches the lag-structure a little bit far while the second denies any influence to the current activity which might be unrealistic. Matter of the fact is that even before the budget proposals are put forward they start influencing current decisions a bit, of course, on the basis of anticipated changes. But once the proposals are put forward, they start affecting the course of the economy and and effects of the actual changes in the current period over the preceding one tend to spread over the period as a whole. However, in case of the equation (7b) lagged effects are allowed to get reflected via changes in the current period over the preceding one. But this seems to us much less restrictive and more in tune which reality then the assumptions associated with equation (9).

Therefore, we choose equation (7b) which implies that one per cent increase in current government expenditure will cause an increase of 0.15 per cent in manufacturing output which is independent of all other explanatory variables, while an increase of one per cent in government expenditure in current year relative to the preceding year will make output increase by 0.29 per cent. Thus, the two components taken together account for 0.44 per cent increase in output and the remaining proportion of increase is xxplained mainly by the level of output in the preceding year.

Our results show that industrial production in India is determined mainly by the preceding periods output, current government expenditure and its rate of growth over preceding year These results are in consonance with the observed predominance of public sector industries are public investment in the industrial structure of the economy.

APPENDIX A

STATISTICAL EXPERIMENTS : A DISCUSSION

From the first four equations, we find that all the four explanatory variables exercise a great deal of influence upon the output of manufacturing industry. In fact, the regression coefficients are highly significant in all the four cases. But the changes in stocks explain the smallest amount of variation while the greatest amount of variation is explained by government expenditure, followed by investment and agricultural income respectively. All the four equations show significant auto-correlation, which arises due either to mis-specification of the functional form or exclusion of some important explanatory variable (s) from the relation or errors of measurement.

Frst, we test an alternative functional from by means of equations (5) to (9). Log transformation does reduce auto-correlation in 3 out of 4 cases. Besides, value of the coefficients of determination in equations involving investment and government expenditure as the explanatory variable also improve quite a bit, particularly in equation (7). However, auto-correlation still continnes to be statistically significant. Therefore, we test the second source of its presence.

Equation (12) contains all the four explanatory variables. But only one out of the four partial regression coefficients is statistically significant. Even though the coefficient of determination has a greater value than its values in linear functions, it is smaller than the values shown in iog- linear functions (5), (7), and (9). Besides, auto-correlation remains significant. Further, we suspect multi-collinearity. Dropping government expenditure as an explanatory variable, we get equation (13). All the partial regressions coefficients improve marginally.

However, the coefficient attached to agricultural income is still not significant. The coefficients of determination and auto-correlation decrease negligibly only. Auto-correlation is still significant. Dropping agricultural income as an explanatory variable, we get equation (14). while the value of R^2 decreases auto-correlation increases and only one of the three regression coefficients is significant. A much worse result than this is obtained by drooping changes in stocks as an explanatory variable. If we drop investment as an explanatory variable, we get only a slightly better result than this. Though to of the three regression coefficients are significant, auto-correlation is also significant. An interesting point to be noted is that agricultural income in all these results emerges as an explanatory variable which is not significant and there is no case in which more than two regression coefficients are significant. Another intresting feature of these results is that it is only when either government expenditure alone or investment alone is present as an explanatory variable, with the other independent variable (s) in the function that the regression coefficient attached to them is significant whieh suggests high degree of inter-correlation betweem them. These results lead us to believe that only two of the three variables namely changes in stocks, investment or government expenditure may really explain the cdanges in manufacturing output. The results also strengthen our doubts about the appropriateness of linear functional form Therefore, before examining two explanatory variable cases, we turn to the corresponding log-linear functions of 3 and 4 explanatory variables.

Equation (17) is definitely more satisfactory than equation (12) as (1) two regression coefficients instead of one are significant, (2) value of R^2 has increased quite a bit and (3) auto-correlation test is inconclusive. If we drop investment form (17), we move to equation (21) in which auto-correlation is not significant. Value of R^2 is lowered only negligibly. While the regression coefficient attached to government expenditure increases in value, those attached to agricultural income and stocks decrease. However, these latter coefficients are not affected greatly. Now if we examine relations (18), (19) and (20), we again find that the regression coefficient attached to investment is significant only in equation (18) which excludes government expenditure. Same applies to the coefficient attached to changes is stocks. On the other hand, exclusion of agricultural income makes auto-correlation again significant in equation (19) and its coefficient in (18) is significant at 1% probability level whereas in those equations in which this variable is present along with government expenditure, regression coefficient attached to it is significant only at 5% probability level which implies some inter-correlation between these two variables also. Exclusion of government expenditure in (18) makes all the three coefficients statistically significant, while in the rest of the equations, only one or two regression coefficients are significant

Which imply all these variables act as a proxy of government expenditure when this variable itself is excluded from the function. These results suggest that auto-correlation is mainly due to mis-specification of the functional form and partly due to inclusion of an in-appropriate variable or the exclustion of an important explanatory variable.

Let us now examine cases containing two explanatory variables. In case of linear functions, we find only two equations (22) and (24) in which both regression coefficients are significant. Incidentally, stocks are a common variable in both these equations and one equation includes investment while the other one includes government expenditure. But both the regression coefficients are not significant when expenditure and investment are included together in equation (21). Coefficient attached to agriculture is not significant whenever it appears with either investment or government expenditure. Auto-correlation is again significant in all the cases. These results finally rule out linear function as appropriate and provides further proof of the explanatory variables being strongly correlated with government expenditure.

Log linear functions containing two variables reveal by and large, the same pattern. There are only two equations (29) and (31) in which both the regression coefficients are significant. Auto-correlation is significant in all cases except (31). Therefore, the choice could be between these two relations (29) and (31) only. But equation (29) shows the lowest value for R^2 and highest degree of auto-correlation among these cases. It also excludes government expenditure which all the results of our experiments revealed as the most important explanatory variable. Therefore, it is the equation (31) which emerges as more satisfactory. However, the negative sign of the coefficient attached to agricultural income is not the one which is expected. Besides, if we compare the values of the coefficient of determination and the regression coefficient attached to government expenditure in equations (7) and (31), we find that addition of agricultural income to (7) as an explanatory variable does not explain anything which is not explained by government expenditure. Therefore, we choose only government expenditure as the variable explaining manufacturing output. This saves us not only from the statistical problem of multi-collinearity but also ensures exclusion of variables which are revealed to be acting, at best, as the proxy for government expenditure.

APPENDIX B

INDUSTRIAL PRODUCTION (INDIA) (1951–76)

$$O = 75.0086^* + 0.2925^* \, k-1 \quad \ldots \quad (1)$$
$$t \quad (11.836) \qquad (13.559)$$
$$R^2 = .8845,^* \qquad F + 183.84, \qquad d = 0.2193^{**}$$

$$O = 51,8510^* + 0.5189^* \quad Y-1 \quad \ldots \quad (2)$$
$$t \quad (5.82) \qquad (11.71)$$
$$R^2 = .8511,^* \qquad F = 137.20, \qquad d = 0.4041^{**}$$

$$O = 75.6000^* + 0.3013^* \quad G-1 \quad \ldots \quad (3)$$
$$t \quad (12.28) \qquad (13.90)$$
$$R \quad = .8895,^* \qquad F = 193.18, \qquad d = 0.1775^{**}$$

$$O = 107.5803^* + 0.1224^* \quad S-1 \quad \ldots \quad (4)$$
$$t \quad (11.63) \qquad (6.11)$$
$$R^2 = .6089,^* \qquad F = 37.36, \qquad d = 0.4586^{**}$$

$$\text{Log } O = 2.2408^* + 0.5148^* \text{ Log } k-1 \quad \ldots \quad (5)$$
$$t \quad (17.07) \qquad (20.19)$$
$$R^2 = .9444,^* \qquad F = 407.84, \qquad d = 0.7407^{**}$$

$$\text{Log } O = 1.0977^* + 0.7531^* \text{ Log } Y-1 \quad \ldots \quad (6)$$
$$t \quad (3.23) \qquad (11.12)$$
$$R^2 = .8374,^* \qquad F = 123.63, \qquad d = 0.2308^{**}$$

$$\text{Log } O = 2.284^* + 0.5112^* \text{ Log } G-1 \quad \ldots \quad (7)$$
$$t \quad (26.73) \qquad (30.54)$$
$$R^2 = .9749,^* \qquad F = 932.74, \qquad d = 0.8707^{**}$$

$$\text{Log O} = 4.5162^* + 0.0698^* \text{ Log S-1} \quad \dots \quad (8)$$
$$t \quad (43.35) \quad (3.77)$$
$$R^2 = .3718,^* \quad F = 14.2036, \quad d = 0.4860^{**}$$

$$\text{Log O} = 2.1972^* + .5165^* \text{ Lod G} \quad \dots \quad (7a)$$
$$t \quad (25.43) \quad (30.51)$$
$$R^2 = .9749,^* \quad F = 930.97, \quad d = 0.6955^{**}$$

$$\text{Log O}^{**} = 0.8968^* + .4444^* \text{ Log G}^{**}$$
$$t \quad (14.01(\quad (12.998)$$
$$R^2 = .8802,^* \quad F = 168.95, \quad d + 1.9227$$

$$\text{OR Log } O_t = .6523 \text{ Log } O_{t-1} + .4444 \text{ Log G} - .2899 \text{ Log } G_{-1} + .8968$$

$$\text{OR } O_t = 2.4517 \; O_{t-1}^{.6523} \left(\frac{G_t}{G_{t-1}}\right)^{.2899} G_t^{.1545} \quad \dots \quad (7b)$$

$$\text{Log O}^{\circ} = 1.1128^* + 4604^* \text{ Log } G^{**} \quad \dots \quad (9)$$
$$t \quad (15.91) \quad (15.22)$$
$$R^2 = .90.97,^* \quad F = 231.74, \quad d = 1.9838$$

$$\text{OR Log O} = .5647 \text{ Log } O_{-1} + .4604 \text{ Log } G_{-1} - .2600 \text{ Log } G_{-2} + 1.1128$$

$$\text{OR } O_t = 3.0429 \; O_{t-1}^{.5467} \left(\frac{G_{t-1}}{G_{t-2}}\right)^{.26} G_{t-1}^{.2004}$$

$$O = 70.6749^* - .0871^* \text{ S-1} + 0.4763 \text{ K-1} - .1539 \text{ Y-1} + .0605 \text{ G-1} \;..\; (10)$$
$$t \; (6.72) \quad (-3.64) \quad (1.84) \quad (-0.78(\quad (0.34)$$
$$R^2 = .9332,^* \quad F = 73.3032, \quad d = 0.7630^{**}$$

$$O = 71.7887^* - .0894^* \text{ S-1} + .5554^* \text{ K-1} - .1843 \text{ Y-1} \quad \dots \quad (11)$$
$$t \; (7.33) \quad (-3.97) \quad (4.96) \quad (-1.06)$$

R^2 = .9328,* F = 101.789, d = 0.7665**

O = 63.9824* − .0812* S−1 + .3218 K−1 + .1226 G−1 .... (12)
t (10.78) (−3.61) (1.96) (0.78)
R^2 = .9312,* F = 99.32, d = 0.6414**

O = 71.5982* + .0187 K−1 + .0748 Y−1 + .2411 G−1 .... (13)
t (5.46) (0.07) (0.319) (1.13)
R^2 = .8911,* F = 59.95, d = 0.1519**

O = 60.6813* − .0657* S−1 + .1256 Y−1 + .3534* G−1 .... (14)
t (6.40) (−2.99) (0.94) (4.28)
R^2 = .9224,* F = 87.17, d = 7169**

Log O=2.7369* − .0117 Log S−1+.2106 Log K−1 −.3088** Log Y−1+.5242* Log G−1 ..... (15)
t (14.67) (−1.94) (1.37) (−2.77) (4.92)
R^2 = .9821,* F = 288.37, d = 1.231[1]

Log O = 2.7961* − .0229* Log S−1 + .8541* Log K−1 − .4384* Log Y−1 .... (16)
t (10.48) (−2.84) (7.42) (−2.8187)
R^2 = .9615,* F = 183.22, d = 1.3135

Log O = 2.2964* − .0006 Log S−1 − .0837 Log K−1 + 0.5938* Log G−1 .... (17)
t (20.71) (−0.12) (−0.66) (5,02)
R^2 = .9756,* F = 293.22, d = 1.0702*

Log O = 2.6119* + .0089 Log K−1 − .1656 Log Y−1 + .6013* Log G−1 .... (18)
t (14.07) (0.07) (−1.87) (5.73)
R^2 = .9789,* F = 340.59, d = 1.3873

Log O = 2.6277* − .0061 Log S−1 − .2027 Log Y−1 + .6488* Log G−1 .... (19)
(−2.47) (11.41)

R^2 = .9805, F = 369.02, d = 1.4768

$$O = 76.5197^* + .3092^{**}\ K{-}1 - .0307\ Y{-}1 \quad \ldots \quad (20)$$
$$t \quad (6.14) \quad (2.58) \quad (-0.14)$$
$$R^2 = .8846,^* \quad F = 88.18, \quad d = .2195^{**}$$

$$O = 75.2468^* + .0854\ K{-}1 + .2142\ G{-}1 \quad \ldots \quad (21)$$
$$t \quad (11.93) \quad (0.46) \quad (1.12)$$
$$R^2 = .8905,^* \quad F = 93.51, \quad d = .1510^{**}$$

$$O = 63.4566^* - .0840^* \quad .4455^*\ K{-}1 \quad \ldots \quad (22)$$
$$t \quad (10.76) \quad (-3.82) \quad (10.21)$$
$$R^2 = .9293,^* \quad F = 151.25, \quad d = .5732^{**}$$

$$O = 44.3066^* - .0277\ S{-}1 + .6069^*\ Y{-}1 \quad \ldots \quad (23)$$
$$t \quad (3.86) \quad (-1.04) \quad (6.34)$$
$$R^2 = .8578,^* \quad F = 69.35, \quad d = .4463^{**}$$

$$O = 67.5312^* - .0637^*\ S{-}1 + .4187^*\ G{-}1 \quad \ldots \quad (24)$$
$$t \quad (11.17) \quad (2.91) \quad (9.41)$$
$$R^2 = .9193,^* \quad F = 130.98, \quad d = .8513^{**}$$

$$O = 71.0741^* + .0862\ Y{-}1 + .2539^*\ G{-}1 \quad \ldots \quad (25)$$
$$t \quad (6.95) \quad (0.56) \quad (2.90)$$
$$R^2 = .8910,^* \quad F = 93.98, \quad d = .1549^{**}$$

$$\text{Log } O = 2.5325^* - .1570 \text{ Log } Y{-}1 + .6116^* \text{ Log } K{-}1 \quad \ldots \quad (26)$$
$$t \quad (8.86) \quad (-1.15) \quad (6.94)$$
$$R^2 = .9474, \quad F = 207.24, \quad d = .9852$$

$$\text{Log } O = 2.3038^* - .0898 \text{ Log } K{-}1 + .5980^* \text{ Log } G{-}1 \quad \ldots \quad (27)$$
$$t \quad (25.70) \quad (-0.80) \quad (5.42)$$
$$R^2 = .9756,^* \quad F = 459.56, \quad d = 1.0982^{**}$$

$$\text{Log } O = 2.1457^* - .0084 \text{ Log } S{-}1 + .5401^* \text{ Log } K{-}1 \quad \ldots \quad (28)$$
$$t \quad (14.03) \quad (-1.18) \quad (16.31)$$

$R^2 = .9476,*$ $F = 208.03,$ $d = .6123**$

$\text{Log } O = 1.3851^* + .0215^{**} \text{ Log } S\text{-}1 + .6782^* \text{ Log } Y\text{-}1$ ... ... (29)

t (4.04) (2.18) (9.45)

$R^2 = .8652,*$ $F = 73.82,$ $d = 4380**$

$\text{Log } O = 2.2642^* - .0020 \text{ Log } S\text{-}1 + .5168^* \text{ Log } G\text{-}1$ ... ... (30)

t (23.00) (–0.43) (24.20)

$R^2 = .9751,*$ $F = 450.63,$ $d = .8316**$

$\text{Log } O = 2.6081^* - .1627_i \text{ Log } Y\text{-}1 + .6082^* \text{ Log } G\text{-}1$ ... .. (31)

t (14.95) (–2.09) (12.43)

$R^2 = .9789,*$ $F = 534.11$ $d = 1.4026$

O = Industrial Output
K = Domestic Investment
Y = Net Income Generate in Agricultural and Allied Activities.
S = Change in Stocks
G = Government Expenditure
Subscripts –1, –2 etc. stand for time period –1, –2 etc.
i = Inconclusive
** = Significant at 5% probability level
* = ,, ,, 10% ,, ,,

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