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Determinants of Capital Formation in India

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ABSTRACT

In any economy, capital formation, also termed as investment is an important macroeconomic variable which plays a very important role in the development and growth process. In this paper an attempt is made to find out various determinants of this variable. The time period considered for analysis in this study is from 1950-51 to 2005-06. The research findings revealed that Inflation affects capital formation adversely; but Gross Domestic Product and Fixed Capital Formation in Public Sector are found to be positively related.

1. Introduction

In any economy, capital formation, also termed as investment is an important macroeconomic variable which plays a very important role in the development and growth process. This variable, being very vital for the economy, requires to be investigated for knowing its determinants. As such, in this paper an attempt is made to find out various determinants of this variable so as to know the factors that affect the performance of this variable and the whole economy of the country in turn. The time period considered for the analysis in this study is from 1950-51 to 2005-06.

This paper is divided into seven sections. First section is the introductory one. Second section comprises of the objectives of the study. A discussion of various studies undertaken in this area of research has been done in the third section. The sources of data and the methodology adopted for the study is mentioned in section four. Theoretical Aspects of the Determinants of Capital Formation Variable have been explained in the fifth section. Sixth section comprises of the empirical analysis of the determinants of capital formation variable. Conclusions of the study are mentioned in the seventh and final section of the paper.

2. Objectives of the Study

The main objectives of this study are as stated below –

- Review of existing literature on the study of determinants of capital formation variable.
- To find out the determinants of Capital Formation variable.
- To bring forth the conclusions of the present paper.

3. Review of Literature in Brief

Some of the studies undertaken regarding the determinants of capital formation variable at the international level are as mentioned below –

Desroches, B. et al. (2007) tried to find out the global forces that had led to the decline in the world real interest rate over recent decades and also to find out the key factors that shaped the behaviour of desired world savings and investment. For their analysis, they used the dataset on savings, investment and their determinants from 35 industrialized and emerging economies covering the time period from 1970 to 2004. Some of the main findings of their analysis are – (i) Investment demand is negatively related to the world real interest rate, (ii) There is a positive and statistically significant relationship between investment demand and the growth in the labour force. This finding supports the view that weak global investment could reflect declining labour force growth, particularly in the industrialized countries, (iii) The key factors that explain the trends in investment and savings in the last 35 years are variables that change relatively slowly over time, (iv) Investment demand is affected by the variables such as labour force growth, stock market returns, stock market volatility and economic and financial liberalisation, (v) Factors which affect desired savings are mainly the age structure of the world economy, temporary income and government deficits.

Some of the studies undertaken regarding the determinants of capital formation variable are as stated below –

The study by Athukorala and Sen (2002) is the comprehensive Indian case study of saving, investment and growth in India. In this study, time series analysis has been done. In addition to analysis of the determinants of saving and investment, the role of investment in economic growth in India has been analysed using the analytical framework developed using the new endogenous growth theory due to Scott (1989). The empirical analysis found strong empirical support for the view that the levels of investment as well as its efficiency are the proximate causes of growth. There is also empirical support for the view that investment in machinery and equipment has a higher growth effect compared to investment in construction or aggregate investment. Investment rate in India throughout post independence era has been above that of the many other developing countries including middle income countries in Latin America. However, in terms of growth performance, India has

been typically low income country. The empirical results, thus, show inconsistency between India's investment and growth performance.

Salam and Kulsum (2002) analyzed saving behaviour in India over a period of nineteen years, i.e., 1980-81 to 1998-99 in order to find the determinants of savings in India. The empirical results indicated that Marginal Propensity to Save (MPS) was highest at 78.42 per cent for the household sector reflecting on the expansion of the commercial banks across the country supporting the hypothesis thereby that the arrears of salaries on account of fifth pay commission were largely saved. MPS of the public sector is found to be lowest at the level of 2.59 per cent. In their study, they estimated saving equations for gross domestic saving as well as household saving in terms of logarithmic form. They found that the national income is the only explanatory variable which explains the large proportion of saving and the rate of interest did not seem to affect the savings rate.

4. Sources of Data and Methodology Adopted

Various data series and their sources for this study are as follows – (i) Data for wholesale price index series have been taken from Handbook of Industrial Policy and Statistics 2006-07, Office of the Economic Adviser to the Government of India, Ministry of Commerce and Industry; (ii) Source of data for GDCF, GDP, FCFPB and GDS is Economic Survey 2007-08, Ministry of Finance, Government of India; and (iii) Data series for M/GDP (ratio of M_3 and GDP) has been obtained by converting the available data series for GDP/M_3 which was taken from the Handbook of Statistics on the Indian Economy 2007-08, Reserve Bank of India. Data series of wholesale price index is in terms of annual average index. Data series of GDCF, GDP, FCFPB and GDS are in ₹ Crores at current market prices. M/GDP data series is in terms of a ratio of broad money M_3 (in ₹ Crores) and GDP (in ₹ Crores).

Time-series data have been used in this study. These data series are converted into natural logarithmic form, firstly, to remove the problem of heteroscedasticity and secondly, to estimate a log-log, double-log or log-linear model.

5. Theoretical Aspects of the Determinants of the Capital Formation Variable

The major determinants of capital formation variable in India are as stated below –

- Rate of Interest
- Availability of Bank Credit (Athukorala and Sen, 2002)
- Quality Adjusted Labour Force
- Cost of Capital (Athukorala and Sen, 2002)
- Real Capital Stock (Athukorala and Sen, 2002)
- Fixed Investment in Public Sector (Athukorala and Sen, 2002)
- Financial Deepening
- Inflation
- Level of Saving
- Level of GDP

Theoretical aspect of the determinants of the capital formation variable is as mentioned below –

Rate of Interest – Rate of interest has an important bearing on the decision making process of capital formation especially in the private sector. Lower rate of interest is likely to induce households and corporate enterprises to undertake more investments. On the other hand, higher rate of interest in the economy increases the cost of investment projects and hence is the cause of hindrances in the capital formation process.

Availability of Bank Credit – Capital formation in the public sector is decided and undertaken by the Government mechanism and hence the financial constraints are not faced by the public sector. But, most of the Capital Formation or investment decisions in the private sector of the economy are dependent on bank credit for their execution. Therefore, availability of bank credit is likely to affect the capital formation in the economy positively. In the times of economic slowdown which prevailed in the world economy during the year 2008, making available bank credit is likely to encourage more capital formation which is likely to stimulus demand in the economy.

Quality Adjusted Labour Force – The more educated and skilled there will be workforce in the country, the more likely will be the increase in capital formation in the country. It is because of the fact that there is a requirement of skilled labour force to work on the new, upgraded and technologically advanced machinery and equipment which are likely to be installed in the country as a result of capital formation decision. Hence, Quality Adjusted Labour force is likely to be conducive to capital formation in the economy.

Cost of Capital – The lower the cost of capital, the higher is the amount of capital formation likely to occur in the economy. Hence, the cost of capital is likely to be inversely related with that of capital formation.

Real Capital Stock – Study by Athkorala and Sen (2002) suggests that 'business investment in a given year is negatively affected by the size of the initial capital stock' (Athukorala and Sen 2002: 85). This result suggests that the higher level of initial capital stock tend to decrease the business investment and on the other hand, the lower level of initial capital stock tend to increase the business investment.

Fixed Investment in the Public Sector – 'Public investment has a strong complementarity relationship with corporate investment (Athukorala and Sen 2002: 85)'. 'As in the case with private corporate investment, we find evidence of a long-run positive effect of public investment on non-residential business investment (Athukorala and Sen 2002: 87).' Therefore, fixed investment in the public sector is likely to promote capital formation in the economy.

Financial Deepening – The more is the financial deepening in the economy, the more likely is the increase in the capital formation in the country. It is because of the fact

that financial deepening is the economic system in which there are more financial institutions, more financial instruments, more diversification in the portfolio of firms and households and an increase in the role of the financial system in the economy. 'There is a broad consensus in the literature that financial development spurs economic growth and savings (MOSPI 2009: 235).' Thus, financial deepening is expected to enhance the capital formation in the economy.

Inflation – In any economy, inflation is such in nature that it reduces the purchasing power of the money holder; as such, it is likely to affect the decision making by the money spending agent. Rising prices are likely to hinder the rate of capital formation, especially in the private sector. Capital formation in the public sector is not likely to be affected by the rise in prices that much significantly because of the involvement of the Government mechanism since whatever the capital formation (investment) is being planned to be undertaken by the Government in the public sector, it will, in most of the cases, be undertaken in spite of high rise in prices.

Level of Saving – Saving level in the economy is expected to affect the level of capital formation in the economy positively. The more are the savings in the economy, the more likely is the increase in capital formation in the economy.

Level of GDP – Gross Domestic Product level in the country is an indicator of the amount of economic activities going on in the economy. With more and more GDP in the economy, there is likely to be more disposable income in the hands of individuals as well as private corporate enterprises, which in turn is likely to encourage them to undertake more capital formation or investment in the economy.

6. Empirical Analysis of the Determinants of Capital Formation Variable

Not all the likely determinants of capital formation as discussed in the theoretical aspects of the determinants of capital formation variable have been analysed empirically for the want of time-series data for these likely determinants. Hence a few variables for which time series data were available for the whole period of analysis have been used in this analysis to find the determinants of the capital formation variable.

Capital Formation Model

The model for empirical testing of the determinants of the Capital Formation variable is as stated below –

$$LNGDCF = a_0 + a_1 LNWPI + a_2 LNGDP + a_3 LNFCFPB + a_4 LNGDS + a_5 LNMGDP + u_i \quad (1.1)$$

In the above model, the dependent variable is LNGDCF which is natural logarithm of Gross Domestic Capital Formation. LNWPI, LNGDP, LNFCFPB, LNGDS and LNMGDP are the natural logarithm of Wholesale Price Index, Gross Domestic Product, Fixed Capital Formation in Public Sector, Gross Domestic Savings and broad money measure M_3 to GDP ratio respectively. LNWPI, LNGDP, LNFCFPB, LNGDS and LNMGDP are considered to be the independent variables in this analysis. LNWPI variable is taken as proxy for inflation. LNGDP is the level of Gross Domestic Product in the economy. LNFCFPB is the Fixed Capital Formation in the public sector of the country. LNGDS is the level of gross domestic saving in the country. LNMGDP is considered as proxy for financial deepening in the economy. All the data series in this analysis are at current market prices.

All the data series used for analysis for determinants of capital formation variable have been converted into the logarithm form before carrying out regression analysis. The purpose behind converting the data series into the logarithmic form is to avoid the problem of heteroscedasticity and to estimate a log-log, double-log or log-linear model. [1]

The regression results for the capital formation variable have been shown in the Table 1. As seen from Table 1, the coefficients for constant and LNWPI are negative and statistically significant with a corresponding p-value of 0.000 and 0.011. The elasticity of Capital formation with respect to wholesale price indices (proxy for inflation) is -0.466 which suggests that with every one per cent rise in wholesale price indices leads to a fall in capital formation by 0.46 per cent.

The coefficient for LNGDP is 1.083 with a 't' value of 9.138 and a p-value of 0.000 suggesting that the coefficient is statistically significant. The elasticity of capital formation with respect to Gross Domestic Product is 1.083 suggesting that one per cent rise in Gross Domestic Product will result into rise in capital formation by about 1.08 per cent. The coefficient for LNFCFPB is 0.289 with a 't' value of 5.147 and a p-value of 0.000 suggesting that the coefficient is statistically significant. The elasticity of capital formation with respect to LNFCFPB is 0.289 suggesting that if the fixed capital formation in public sector goes up by one per cent, on average, the capital formation (Gross Domestic Capital Formation) goes up by about 0.28 per cent. The coefficient for LNGDS is 0.031 with a 't' value of 1.602 and a p-value of 0.115 suggesting that the coefficient is not statistically significant at 10 per cent level of significance. The coefficient for LNMGDP is 0.114 with a 't' value of 0.878 and a p-value of 0.384 suggesting that the coefficient is not statistically significant even at 10 per cent level of significance.

The above explanation for regression analysis for finding the determinants of capital formation suggests that inflation affects capital formation adversely. It means that inflation is a hindrance in the way to build up of capital formation in the economy. Gross Domestic Product and Fixed Capital Formation in Public Sector are found to be positively related and thus affecting the capital formation positively. The finding that the fixed capital formation in public sector affects capital formation (Gross Domestic Capital Formation) positively supports the finding of the study by Athukorala and Sen (2002). Though, the coefficients for other two variables Gross Domestic Saving and LNMGDP (M_3/GDP) are positive, these are found to be insignificant due to the presence of their high p-value and low 't' value suggesting that these variables do not affect capital formation.

Table 1

Regression Results for Determinants of Capital Formation Variable

Variable	Coefficient	't' Value	Significance	Adjusted R^2 Value
Constant	-3.976 * (0.812)	-4.898	0.000	0.998
LNWPI	-0.466 ** (0.177)	-2.627	0.011	
LNGDP	1.083 * (0.119)	9.138	0.000	
LNFCFPB	0.289 * (0.056)	5.147	0.000	
LNGDS	0.031 (0.019)	1.602	0.115	
LNMGDP	0.114 (0.129)	0.878	0.384	

Source: Calculated through Regression Analysis of time series data
Dependent Variable: LNGDCF

* and ** denote significance at 1 per cent and 5 per cent level respectively.

Note: Figures in parenthesis are standard errors of the estimates.

Notations:

LNGDCF- Natural logarithm of Gross Domestic Capital formation
LNWPI- Natural logarithm of Wholesale Price Indices
LNGDP - Natural logarithm of Gross Domestic Product
LNFCFPB - Natural logarithm of Fixed Capital Formation in Public Sector
LNGDS - Natural logarithm of Gross Domestic Saving
LNMGDP - Natural logarithm of M_3 to GDP ratio

7. Conclusions

On the basis of the analysis in this paper for finding determinants of capital formation in India, the following conclusions can be drawn – (i) inflation affects capital formation adversely. It means that inflation is a hindrance in the way to build up of capital formation in the economy; (ii) Gross Domestic Product and Fixed Capital Formation in Public Sector are found to be positively related and thus affecting the capital formation positively. The finding that the fixed capital formation in public sector affects capital formation (Gross Domestic Capital Formation) positively supports the finding of the study by Athukorala and Sen (2002); (iii) the coefficients for other two variables Gross Domestic Saving and LNMGDP (M_3/GDP) are found to be insignificant due to the presence of their high p-value and low 't' value suggesting that these variables do not affect capital formation.

Notes

1. *One attractive feature of the log-log model, which has made it popular in applied work, is that the slope coefficient β_2 measures the elasticity of Y with respect to X, that is, the percentage change in Y for a given (small) percentage change in X (Gujarati 2007: 180).'*

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