Implications of Money Supply and Interest Rate on Construction Flows: Evidence from a Developing Economy

Mahendra Reddy and Neelesh Gounder
University of the South Pacific, Fiji

Abstract: Developing country economies have been struggling to keep up their growth rate commensurate with the international benchmarks. Often the analysis of performance of the economies takes into account the stylized macroeconomic variables. In this study, we examine how one of the most important sector, the construction sector, affects growth and what its determinants are. The performance of the construction sector in any economy is one of the key indicators of the performance of the economy. There are a number studies that have provided for an empirical basis for the relationship between construction and a nations GDP. However, there are very few studies that examine the determinants of changes and volatility of construction activities in an economy. In this paper, we use time series econometric techniques to examine the factors that affect the determinants of construction flows. The analysis reveals that Money Supply and Interest Rates are critical for raising economic activity via its influence on the construction sector output. The results from this study can have major ramifications for use of monetary tools when managing an economy.

Keywords: Construction Flows, Gross Domestic Product, Money Supply, Interest Rate

1 Introduction

In most of the PICs, average per capita incomes have shown little change since independence—in some cases over 30 years ago. In most of these countries, population growth rates are still high as they have not yet entered the post-demographic transition stage, and total fertility rates are around 4 in some cases (e.g., Papua New Guinea, Marshall Islands, Solomon Islands, and Vanuatu). Hence, with population growth rates of 2.5 per cent or higher, the economies have had to average GDP growth of around 2.5 per cent just to maintain average per capita incomes. Visual observation indicates that some people have become quite wealthy, which, together with stagnant average per capita incomes, suggests that income distribution is worsening and poverty increasing. This is creating a wider gap between the rich and the poor. This observation is supported by the limited studies of poverty in the Pacific, which also suggest that poverty is worsening in most countries (ADB 2004).

The economic performance of the PICs in the second half of the 1990s and the first half of the 2000s varied considerably from country to country (Table 1). Cook Islands, Fiji, Kiribati, Samoa, Tonga, and Tuvalu all had positive per capita GDP growth during this period, while Republic of the Marshall Islands (RMI), the Federated States of Micronesia (FSM), Solomon Islands, and Vanuatu, on average, experienced negative per capita GDP growth.

Raising economic growth to levels that will substantially reduce poverty will require levels of investment similar to those experienced by the rapidly growing countries of East Asia—in the 25-30 per cent range. There is extremely limited information about investment levels in the PICs. Information on the total investment and the breakdown into private and public investment is only available for Fiji out of all PICs. On the latest figures, Fiji's total investment is around 16 per cent of GDP (it has increased from a low point of 10 per cent following the 2000 coup). Of the total investment, only about one-quarter is private investment; government investment is also about one-quarter, while one-half is investment by state-owned enterprises. Recent investment/GDP ratios are well below the peak reached in the 1979-81 of close to 30 per cent. It seems likely that the decline can be attributed in large part to the high level of emigration by the better off and more highly-skilled Indo-Fijian population since the coups of 1987. The recent increase in the investment/GDP ratio is most likely due to the increase in foreign investment in resort construction for the expanding tourism sector.

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Table 1 GDP and Inflation Levels in Pacific Island Countries. 2001-7

Country	2001	2002	2003	2004	2005	2006	2007	Average
Real GDP Growth								
Cook Islands	4.9	2.6	8.2	4.3	0.1	0.8	2.5	3.3
Fiji	2.0	3.2	1.0	5.3	0.7	3.6	-3.9	1.7
French Polynesia	1.3	4.4	4.0	3.5	3.5	3.3		3.3
Kiribati	8.4	4.7	0.9	-2.0	2.5	1.1	1.0	2.4
Micronesia	0.4	1.4	3.3	-4.4	1.5	-0.7	1.0	0.4
Palau	1.3	-3.5	-1.3	4.9	5.5	5.7	5.5	2.6
Papua New Guinea	2.7	2.0	2.0	2.7	3.4	2.6	6.2	3.1
Samoa	6.5	1.0	3.5	3.3	6.0	1.8	3.0	3.6
Solomon Islands	-8.2	-2.7	6.5	8.0	5.0	6.2	5.4	2.9
Tonga	1.8	3.2	2.7	1.4	2.3	1.3	-3.5	1.3
Tuvalu	13.2	5.5	4.0	4.0	2.0	3.0	2.5	4.9
Vanuatu	-2.7	-4.9	2.4	5.5	6.8	5.5	4.7	2.5
Inflation								
Cook Islands	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Fiji	4.3	0.8	4.2	2.8	2.4	2.5	4.1	3.0
French Polynesia	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Kiribati	6.0	3.2	2.5	-1.9	-0.5	-0.2	0.2	1.3
Micronesia	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Palau	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Papua New Guinea	9.3	11.8	14.7	2.1	1.7	2.3	1.8	6.2
Samoa	1.9	7.4	4.3	7.9	7.8	8.1	6.3	6.2
Solomon Islands	7.6	9.3	10.0	6.9	7.3	8.1	6.3	7.9
Tonga	6.9	10.4	11.1	11.7	9.7	7.0	5.9	9.0
Tuvalu	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Vanuatu	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a

Source: Economic and Social Survey of Asia and the Pacific 2008, pp. 245-248.

Construction activity is not only limited to tourism sector, but to all the sectors of the economy. The sector is also very important because of its contributions to national income, employment and economic stabilization (World Bank, 1984). ILO (1987) also argues for a role of the construction sector as an agent of development, modernization, entrepreneurship and socio-political stability within the informal sector and communities. Volatility of the this sector will have major implication on the overall economy. While the sector output has not been highly volatile, there has been slight fluctuation over the recent years (Figure 1). In this regard, there is a need to identify the determinants of construction sector growth and thus the overall economic growth levels. In light of this, this paper examines the relationship between construction sector output and the national output. It also extends the analysis to examine, simultaneously, the impact of money supply and interest rate on GDP. The second section of the paper provides an overview of past studies on this subject area while the third section explains the quantitative methodology used. The fourth section provides the results and its discussion. The final section provides summary and policy implications.

2 Construction Activity, Economic Activity and Money Supply: A Review

There does exits some studies postulating the relationship between the construction sector and GDP. Strassmann (1970) and Turin (1978) argue that the value added of construction sector output and per capita

income have a inverted positive relationship (Figure 2). They argue that in low income countries (L), construction output is low. As industrialization proceeds, factories, offices, infrastructure and houses are required, and construction output as a percentage of gross domestic product (GDP) reaches a peak in middle income countries (M). It then starts to decline as evident in high income countries (H). In these countries, infrastructure becomes more developed and housing shortages are less severe or are eliminated. Tse and Ganesan (1997) argue that the relationship between construction flow and GDP is analogous to the saving-income relationship, which suggests a curious paradox, sometimes called the 'paradox of thrift'. The national income identity (GNP = S + C) does not imply that an increase in saving will lead to a higher GNP.

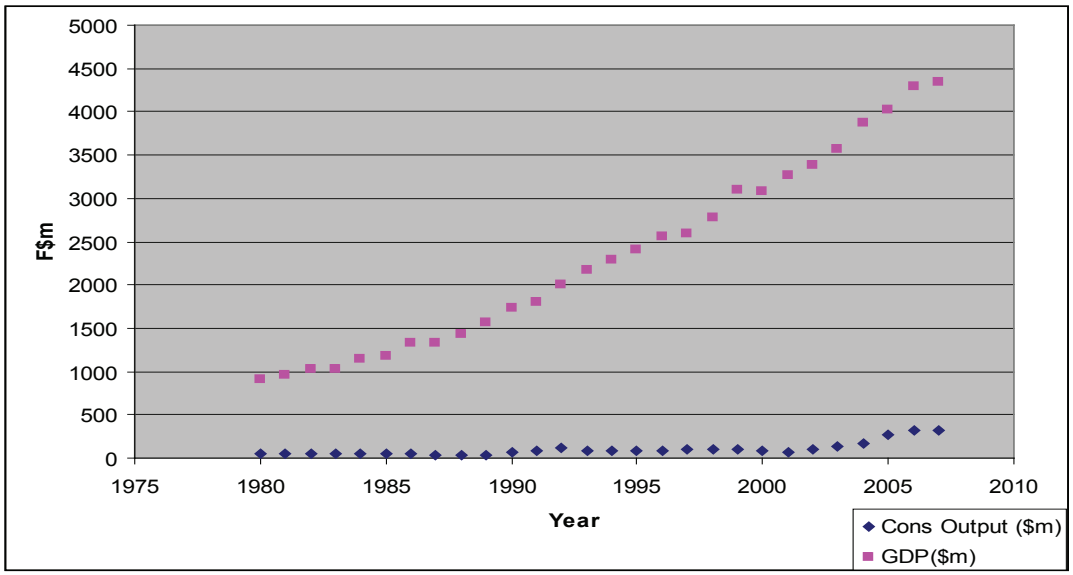


Figure 1 Trend in Constructor output and GDP, 1980-10

Source: Reserve Bank of Fiji, Quarterly Report, (various years).

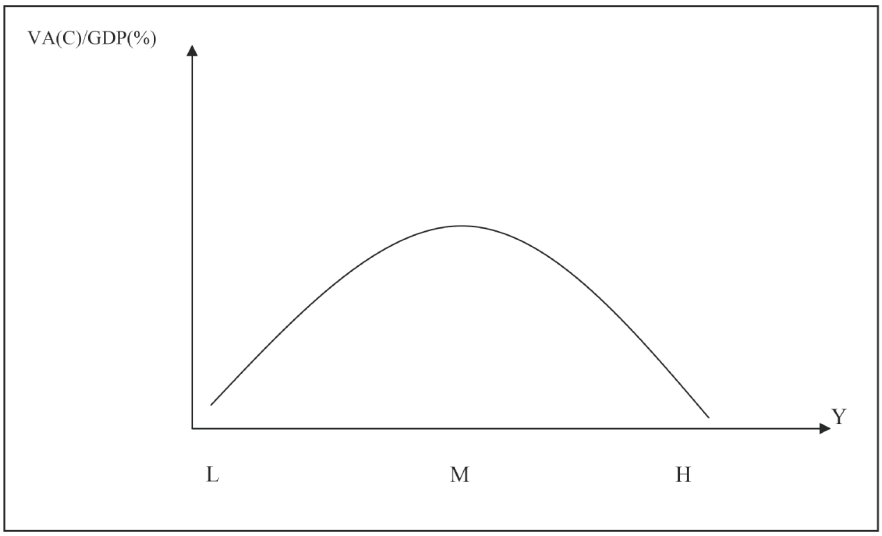


Figure 2 Value Added (VA) in Construction and Per Capita Income

Source Tan (2002:594)

Generally, it is believed that the initial impact of a change of GDP would be on demand for construction projects and real estate, rather than on the level of construction output. Tse and Ganesan (1997) further argues that the major reason for this is that construction activity is very sensitive to credit and thus on interest rates. The Keynesian theory argues that changes and fluctuations in the level of economic activity tend to cause changes in money supply, which reverses the causality suggested by the monetarists. A decrease in economic activity and income causes a fall in credit supply, which in turn causes a drop in construction activity and employment. On the other hand, an increase or upswing of the economy started by a lower interest rate or an increase in business confidence will raise demand for construction orders. It should be noted that the demand for construction work is not autonomous. Rather it is determined by the level of GDP. Ball and Morrison (1995) argued that it is expected that short term growth rates of construction flows can easily fluctuate a lot due to changes in capacity utilization, even if the rate of capacity growth is quite steady. The traditional channels of money supply can also affect construction activity. A contractionary money supply cuts into bank reserves and reduces bank lending to all enterprises, including property developers. Thus, a decrease in money supply tends to reduce developers cash flows and thereby leads to a decline in construction activity (Tse and Raftery, 2001).

Ball and Wood (1994) demonstrate in their study that long run equilibrium levels of national income are associated with equivalent levels of particular types of investment. If GDP rises, so will the level of construction activity needed to meet the expanded production capacity. Thus it is expected that at higher levels of GDP an economy can absorb a higher level of construction activity. However, if the demand for construction work increases, then this, other things being equal, will raise interest rates that business must pay to borrow funds to finance new investment. Chan and Kumaraswamy (1995) show that construction duration is directly related to its costs. An investment goods industry is, generally, subject to fluctuations in demand volatility of constructions the larger the uncertainty faced by market players. They argue that very large fluctuations brought about by factors outside the control of government are damaging the overall efficiency of the industry, and that policies should be established to make the construction industry more stable. Hillebrandt (1985) argues that the effect of construction on the economy through the production process and through the effects of credit constraint can be as important as the effect of the economy on the construction. Some (Sebestyen, 1980) argue that construction is a sector of dynamic development with a growth rate exceeding that of the aggregate economy.

3 Methodology

The model presented in this paper is a multivariate time series model. The empirical model can be specified as follows:

$$CQ_t = \beta_0 + \beta_1 GDP_t + \beta_2 IR_t + \beta_3 MS_t + \varepsilon_t \quad (1)$$

Where:

CQ_t = Construction value put in place (F$m);
GDP_t = Real Gross Domestic Product (F$m);
IR_t = Interest Rate (%); and,
MS_t = Money Supply (F$m).

When dealing with time series data, if OLS regression is carried out on non stationary variables, then the results can be spurious. A unit root tests was carried out on all the variables and it was found that all the variables were co-integrated of order 1 (*I(1)*). Therefore, a Error Correction Model (ECM) was estimated in difference. The model can be stated as follows:

$$\Delta CQ_t = \acute{\alpha}_0 + \acute{\eta}_1 \Delta(CQ)_{t-1} \quad \gamma_1 \Delta(GDP)_t + \gamma_2 \Delta(GDP)_{t-1} + \theta_1 \Delta(IR)_t + \theta_2 \Delta(IR)_{t-1} + \psi_1 \Delta MS_t + \psi_2 \Delta(MS)_{t-1} - \pi (e_{t-1}) + u_t \quad (2)$$

In the above ECM model, we have a regression that contains only *1(0)* variables and allows us to use both long-run information and short run disequilibrium dynamics which is the most important feature of the ECM. The ECM model was estimated using the E-Views econometrics softwear.

4 Results and Discussion

The ECM results presented in Table 2 below provide some very interesting insights. Lagged out put of Construction sector has a positive impact on current periods construction flows. Similarly past periods national output has a significant positive impact on current period construction flows. Current periods' interest rate has no effect but previous periods' interest rate does have. However, the result is not in line with *a priori* expectations. High interest rate in the previous period raises construction follows in the current period. The reason for this result may be that when interest rates are raised, investors hold on to their investment immediately as depicted by results. However, in the following year, they tend to ease out and start investing thinking that interest rates have converged. The money supply variable has its effect as per our expectations. When money supply increases, it leads to availability of more loadable funds and thus an increase in construction flows. However, the lagged effect of money supply increase is negative. Furthermore, sing the results of ECM, we can say that 96% of the adjustment takes place within a year.

5 Impulse Response Analysis

Impulse response analysis is used widely in the empirical literature to uncover the dynamic relationship between macroeconomic variables within vector-autoregressive (VAR) models. It measures the time profile of the effect of a shock or impulse on the future values of a variable.

The results of the impulse response function reveals that Construction sector output responds to GDP in a consistent manner over time. The impact of Interest Rate is different. In the early period, interest rate

Table 2 Error Correction Model (ECM) for Construction Flows, 1985-2007

Explanatory Variable	Coefficients
C	-0.631 (-0.044)
$\Delta(CQ)_{t-1}$	0.792 (2.995)
$\Delta(GDP)_{t}$	-0.046 (-0.585)
$\Delta(GDP)_{t-1}$	0.173 (2.178)
$\Delta(IR)_{t}$	-3.648 (-0.345))
$\Delta(IR)_{t-1}$	25.931 (2.563)
ΔMS_{t}	0.112 (2.009)
$\Delta(MS)_{t-1}$	-0.238 (-2.472)
e_{t-1}	-0.960 (-3.787)
R^2	65.99%

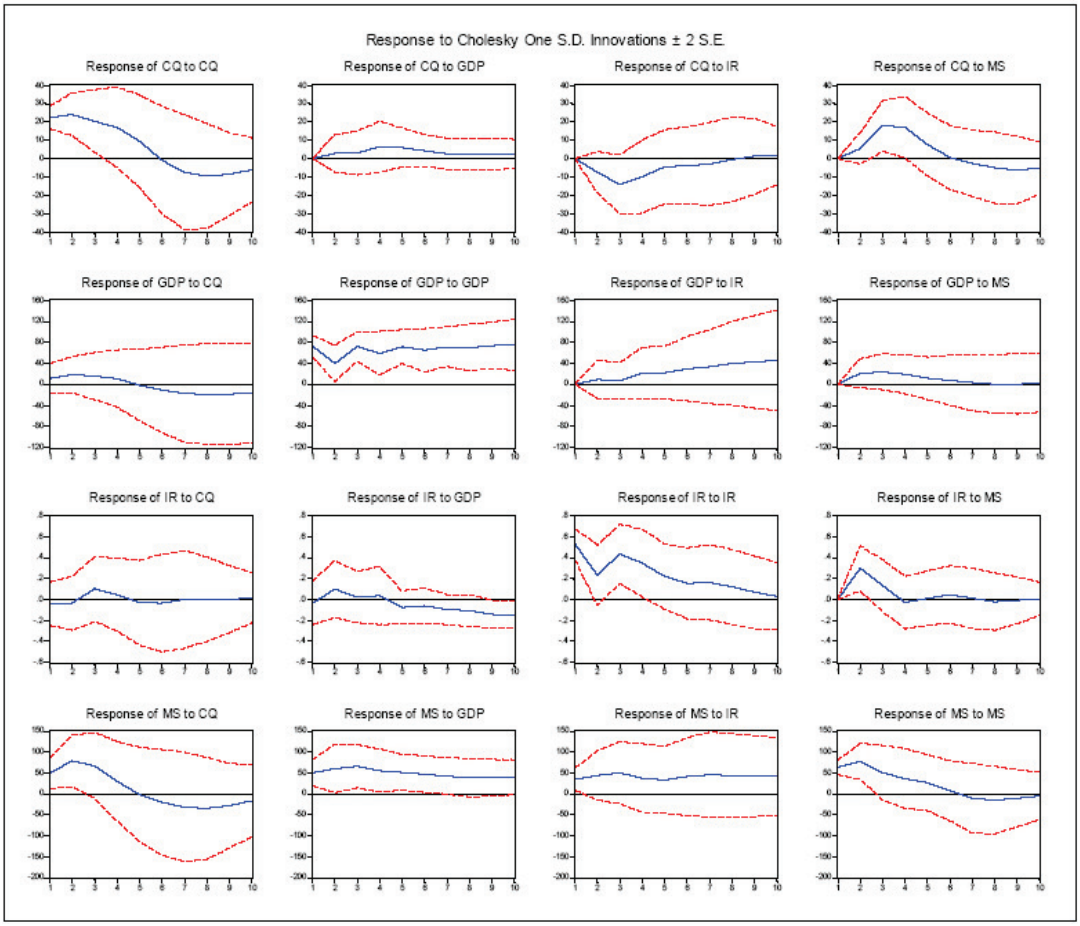
Note: Figures in parenthesis are t-ratios.

has a major negative effect on Construction Sector output. However, over the longer run, it becomes insignificant. Money Supply has a major positive impact on Construction sector Output in the immediate period. However, over the longer run period, it's positive effect declines and even becomes negative. This could be due to the inflationary impact that takes time to infiltrate in the economy.

6 Summary and Policy Implications

In this paper, we examine how construction sector investment is affected by key macroeconomic variables. The time series analysis reveals that money supply and interest rates are two key variables that are critical in regards to the value and level of construction activity put in place. The Interest Rate variable is negative indicating that increase in interest rate will have a negative impact on CQ. This result is in line with a priori expectations as increase in interest rates makes loanable funds expensive. Increase in Money Supply has a positive effect on CQ. This result is line with a priori expectation as increase in Money Supply positively affects the volume of loanable funds and thus reduces interest rate and increases borrowing for investment.

The Impulse response analysis provides support to these findings. However, there is the added dimension of time in this analysis. With respect to Interest Rate, in the early period, interest rate has a major negative effect on Construction Sector output. However, over the longer run, it becomes insignificant. Money Supply has a major positive impact on Construction sector Output in the immediate period. However, over the longer run period, it's positive effect declines and even becomes negative. This could be due to the



inflationary impact that takes time to infiltrate in the economy. Given the above results, we can conclude that level of Money Supply and Interest Rate are two very critical variables which can used to regulate the level of construction activity and thus economic activity in a country.

References

ADB (2004). 'Governance in the Pacific: Focus for Action 2005-2009', Manila, Philippines, pp. 145.

Ball, M. & Morrison, T. (1995). 'Housing Investment Fluctuations: an International Comparison', Paper Presented to 'The Cutting Edge', 1-2 September 1995, Department of Land Economy, University of Aberdeen.

Ball, M. & Wood, A. (1995). 'How Many Jobs Does Construction Expenditure Generate?' *Construction Management and Economics* Vol. 13, No. 4, pp. 307-18.

Chan, D. W. M. & Kumaraswamy, M.M. (1995). 'A Study of the Factors Affecting Construction Durations in Hong Kong', *Construction Management and Economics* Vol. 13, No. 4, pp. 319-33.

Hillebrandt, P. M. (1985). 'Economic Theory and the Construction Industry', 2nd Edn. Macmillan, London.

ILO (1987). 'Guidelines for the Development of Small Scale Construction Enterprises', International Labor Organisation, Geneva.

Sebestyen, G. (1980). 'Appropriate Technology in the Construction and Building Materials Industry', In: Appropriate Industrial Technology for Construction and Building Materials, United Nations Industrial Development Organsation Monographs on Appropriate Industrial Technology No. 12. United Nations, New York.

Strassmann, P. (1970). 'The Construction Sector in Economic Development', *Scottish Journal of Political Economy* Vol. 17, No. 2, pp. 391-409.

Tse, R. Y. C. & Ganesan, S. (1997). 'Causal Relationship Between Construction Flows and GDP: Evidence from Hong Kong', *Construction Management and Economics* Vol. 15, No. 2, pp. 371-376.

Tse, R. Y. C. & Raftery, J. (2001). 'The effects of Money Supply on Construction Flows', *Construction Management and Economics* Vol. 19, No. 2, pp. 9-17.

Turin, D. (1978). 'Construction and Development', *Habitat International* Vol. 3, No. 1/2, pp. 33-45.

World Bank (1984). 'The Construction Industry: Issues and Strategies in Developing Countries', The World bank, Washington, DC.