Synopsis

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Macroeconomic Implications of Capital Flows in India

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Macroeconomic Implications of Capital Flows in India

1. Introduction

It is a widely accepted view among the economist and policymakers that capital is quintessential for growth and prosperity in the developing economies. International capital flow is widely perceived as an important source for expediting industrial development in emerging economies. It has been argued that capital flows such as FDI also brings in advanced technology, skill-sets and sometimes access to new market. For example, Romer (1993) argued that there are important "idea gaps" between rich and poor countries and foreign investment can ease the transfer of technological and business know-how to poorer countries. These transfers may have substantial spillover effects for the entire economy. Thus, foreign investment could boost the productivity of all firms in the host country apart from those firms which receives foreign capital (Rappaport, 2000). This in turn could lead to more capital flows by enhancing the investment climate in the host country. Therefore, the foreign capital flows and growth relationship is a subject of causality with a possibility of two-way relationship. Hansen and Tarp (2000) examined the relationship between foreign aid and growth in real GDP per capita for 56 countries during 1974-93 and found that foreign aid in all likelihood increase the growth rate.

Theoretical debate on the role of capital inflows can be divided into two schools of thought; the neo-classical or exogenous theory of growth pioneered by Solow (1956) and the endogenous theory of growth, also known as the new theory of growth propounded by work of Romer (1986) and Lucas (1988). The main highlight of the neo-classical models of growth was the property of convergence of growth rates. The models predicted that countries with lower real per capita GDP would have higher levels of growth rate. This was derived from the assumption of diminishing returns to capital. Assuming growth in labor and technology to be zero, growth in output was a

function of capital accumulation. Within the framework of the neo-classical growth model, capital inflow could exert a level effect on output per capita because of augmented investment but not on the growth rate of output. The thrust for economic growth, as per the neo-classical models, was exogenous and had to come from outside the system, mainly from technological progress.

The most important departure of the new theory from the old was that it believed growth rate to be endogenous. The key assumption in this theory was a belief in the operation of increasing returns to scale made possible by sustained increase in capital invested (both human and physical capital) and this would create a permanent increase in the growth rate of an economy. In the new growth theory emphasized on the 'idea gap' between developed and developing countries, which made the former grow at a higher rate than the latter. The new theory gives importance to 'innovation' in technology as an explanatory factor to the growth rate in any economy. Globalization of the world economies in the form of capital account openness provide an important channel theoretically, through which growth rates, particularly in a developing country could be increased. As per the neo-classical theory of growth, capital inflows would add to capital accumulation, which can raise the potential trend of growth. The endogenous theory of growth, capital flows can help countries bridges the 'idea gap 'in the developing countries as capital flows involved exchange of ideas.

In the subsequent resurrection of the two-gap approach, the emphasis has laid on the preconditions that could make foreign capital more productive in developing countries (Bayulgen, 2004 & McKinnon, 1993). The important preconditions comprised presence of surplus labor and excess productive demand for foreign exchange. With the growing influence of the new growth theories that recognized the effects of positive externalities associated with

capital accumulation on growth, the role of foreign capital in the growth process assumed renewed importance. In the endogenous growth framework, the sources of growth attributed to capital flows comprise the spillovers associated with foreign capital in the form of technology, skills, and introduction of new products as well as the positive externalities in terms of higher efficiency of domestic financial markets, improved resource allocation and efficient financial intermediation by domestic financial institutions (Lee, 1997 & Bailliu, 2000). Since the spillovers and externalities associated with different forms of foreign capital could vary, a pecking order approach to the composition of capital flows is often pursued which helps in prioritizing the capital flows based on the growth enhancing role of each form of capital (Reisen, 2001 & Guitian, 1998). The dominant view on what drives cross-border capital flows is that marginal productivity of capital is higher in a country where capital is scarce. If marginal productivity of capital widely differed across countries, then in the presence of capital flows shortfalls in domestic saving should not constrain investment. The seminal finding that domestic saving and investment rates are highly correlated, however, indicated that the degree of capital mobility across countries may not be high (Feldstein and Horika,1980). The marginal productivity of capital in India was 58 times that of the United States as obtained through the standard estimation of Cobb-Douglas production functions (Lucas, 1990 & Sarno and Taylor, 1999). India, however, could never attract enough foreign capital to take advantage of the productivity differentials. Unlike the wide differences in estimated productivity of capital, however, real interest rates – a measure of real return received by the investors - turned out to be much less divergent across countries in reality. Capital markets could be imperfect, preventing capital flows from being driven by productivity differentials. Incremental investment would be more productive in countries with skilled workforce and well developed physical infrastructure.

Thus, the presence of favorable climate for economic growth appears important, not only for attracting higher private foreign capital but also for enhancing the growth inducing effects of such foreign capital (Lucas, 1990 & Lothian, 2006). Open economy trade model which postulates the rate of flow of capital depends on the differences or level of interest rate in emerging market economies. Interest rate differential augments ability of an economy to attract international capital as it encourages investors to invest in the market which offers higher return. However, at the same time the prevailing high or level of interest rates in the capital recipient country will be detrimental to growth of the internal demand for investment, consequently hampering the economic growth. Several studies carried out in the recent past suggest that the prevailing high real interest rates dampen the growth significantly in emerging economies.

International capital flows to India gained momentum from the 1991, after the initiation of economic reforms and, apart from increase in magnitude, composition of capital has also undergone a significant change mostly from grant in aid and other interest paying flow to non-interest bearing flows such as FDI's and FPI's. A surge in capital flows accelerates economic growth by covering up for the shortfall in domestic savings but at the same time poses challenges for the macroeconomic managements. In this study, an attempt is made to empirically investigate the issues posed by changes and variations in international capital flows and its impact on macroeconomic indicators while focusing on the contributions of foreign capital inflows on economic growth in the Indian context.

2. Objectives of the study

The nature and impact of international capital flows on the economic growth, exchange rate, interest rate and other macroeconomic variables in the recipient developing countries is an active area of research. Kose et. al. (2006) finds little robust evidence for long-run growth benefits from

global capital inflows. They suggest that though international financial integration brings collateral benefits such as greater financial development and better macroeconomic policies but these do not necessarily or immediately translate into superior growth outcomes. It is observed that a quantum surge in capital flow in short span of time in excess of absorptive capacity of the recipient country will pose a challenge to the macroeconomic policies and management of monetary policy in the host country. Prasad et al. (2006) has shown that the negative correlation between growth and capital flows in developing countries, and concluded that international capital may even hurt economic growth in poor countries.

Foreign capital inflows help in developing the deepening of financial markets and restructuring of institutions in the host country. Role of foreign capital flow on macroeconomic policies in general and monetary policy in particular for India has been examined. This study proposes to test inter-alia the following hypothesis:

Hypothesis

- Considerable trend in the macroeconomic variable is evident over the sample period.
- There is causality between foreign capital inflows and economic growth
- There is an inbuilt dynamism between macroeconomic variables and the indicators with special respect to foreign capital flows
- Foreign exchange management, variation in the foreign exchange rate and foreign capital flows are interlinked.
- Macroeconomic managements are coherent.

3.Nature and sources of data

The study attempts to examine the effects of foreign direct investment and foreign portfolio investments on macroeconomic variables in India. The study uses following macroeconomic

variables in analysis. Call money rate (CMR) as a measure of domestic interest rate, foreign exchange reserve (FEX), FDI and FPI. GDP all sectors, Money supply (M3), Wholesale Price Index (WPI) all commodities taken for inflation rate, Exchange rate (EXR) which is rupees against U.S. dollar, Export(EXP) and Import (IMP)are measured in terms of US dollar. The study is based on quarterly time series data which is readily available for all the variables considered. For GDP the base year was 1999-00, 2004-05 and 2011-12, whereas for WPI the base year was 1993-94 and 2004-05. We have applied widely used growth rate methodology for splicing the series and bring it to a common base year.

The data for the study have been collected from the secondary source such as Handbook of Statistics in the Indian Economy, which is a publication of Reserve Bank of India (RBI) and International Financial Statistics (IFS), which is a publication of International Monetary Fund (IMF). The quarterly data have been taken for the period from Q1, 2000-01 to Q3 2015-16 as the unit of measure in US million Dollars. The period of study is constrained due to the unavailability of readily available quarterly series data for all the variables considered in this study.

4. Methodology used for the empirical studies

To study the macroeconomic variables in the Indian context descriptive statistics technique and statistical diagnostic test are primarily used. The study makes use of econometric models to carry out the empirical analysis. The analysis uses quarterly time series data collected periodically usually exhibit seasonality. The data would appear seasonality if the spectrums of the process have peaks at certain frequencies. There are many tests that are proposed for testing seasonal unit roots but among them seasonal unit root tests, Hylleberg, Engle, Granger, Yoo (1990) test (henceforth: Hegy test) proposed for testing seasonal unit roots in quarterly data. Therefore, we

started with test for unit root in quarterly linear time series variables using HEGY test to detect seasonal unit roots at different seasonal frequencies, as well as at zero frequency. HEGY procedure can test for the presence of unit roots at each frequency separately without assuming that other unit roots are present. The test has a design, which discriminates more the presence of roots at the various frequencies on the unit circle at the same time it has the drawback of being more sensitive to size distortions due to near-cancellations of AR (auto regressive) unit roots with MA (moving average) polynomial roots at the different frequencies. The important goal of applying this testing procedure is to test for whether or not there are any seasonal unit roots in a univariate series. The test check for possibility of seasonality of any forms may be present in the series. This test follows the Dickey-Fuller framework and tests the hypothesis for the roots of the series lie on the unit circle against the alternative that they lies outside the unit circle. In particular, the goal is to test hypotheses about a particular unit root without taking a stand on whether other seasonal or zero frequency unit roots are present. The test is carried out using R packages "uroot".

Once we find out the frequency at which the two-time series are integrated, we can proceed to find out the cointegrating relationship. In order to test for the cointegration we used rank test based on Maximum-likelihood test of the cointegrating rank. This function computes the two maximum-likelihood tests for the cointegration rank from Johansen (1996) and test the hypothesis of rank 'h' against rank 'K', i.e. against the alternative that the system is stationary. The test allows for five different specifications of deterministic terms as in Doornik et al (1998), such as unrestricted constant and trend, unrestricted constant and restricted trend, unrestricted constant and no trend, restricted constant and no trend and no constant nor trend.

Finally, to examine the effects of private foreign capital inflows on macroeconomic variables we have used vector error-correction (VEC) model. When the variables of a VAR are cointegrated Vector error correction model (VECM henceforth) is used to examine the deviation in equilibrium and the correction factor. VECM for two variables are defined as follow.

$$\Delta y_t = \beta_{y0} + \beta_{y1}\Delta y_{t-1} + \cdots + \beta_{yp}\Delta y_{t-p} + \gamma_{y1}\Delta x_{t-1} + \cdots + \gamma_{yp}\Delta x_{t-p} - \lambda_y(y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + \vartheta_t^y \quad (1)$$

$$\Delta x_t = \beta_{x0} + \beta_{x1}\Delta y_{t-1} + \cdots + \beta_{xp}\Delta y_{t-p} + \gamma_{x1}\Delta x_{t-1} + \cdots + \gamma_{xp}\Delta x_{t-p} - \lambda_x(y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + \vartheta_t^x \quad (2)$$

Where $y_t = \alpha_0 + \alpha_1 x_t$is the long-run cointegrating relationship between the two variables andλ_y and $\lambda_x$are the error-correction parameters that measure how y and x react to deviations from long-run equilibrium. When we apply the VEC model to more than two variables, we must consider the possibility that more than one cointegrating relationship exists or latest one cointergating vector is prevalent among the variables. In case of more than 2 variables we need to generalize the procedure for testing for cointegrating relationships to allow more than one cointegrating equation, and we need a model that allows multiple error-correction terms in each equation.

Once we identify the structural shocks to each variable in a VECM, we performed two kinds of analysis to explain how each shock affects the dynamic path of all of the variables of the system. Impulse-response functions (IRFs) measure the dynamic marginal effects of each shock on all of the variables over time. Variance decompositions examine how important each of the shocks is as a component of the overall (unpredictable) variance of each of the variables over time.

To analyze the effects of foreign direct investment or foreign portfolio investment on each of the macroeconomic variables (namely GDP growth rate, inflation, exchange rate, money supply, export, import, foreign exchange reserve, rate of interest) we have used bi-variate Granger Causality (henceforth: GC) test over the spectrum proposed by Lemmens et al. (2008).They have reconsidered the original framework proposed by Pierce (1979), and proposes a new testing procedure for Pierce's spectral Granger Causality measure. This GC test in the frequency domain relies on a modified version of the coefficient of coherence, which they estimate in a nonparametric fashion, based on certain pre-determined distributional properties regarding the data. Decomposing GC over the frequency allows disentangling potentially different Granger causality relationships over different frequencies that may yield new insights compared to traditional GC. However, the strength of GC and its direction may vary by frequency. Therefore, it may be worthwhile to follow Granger's (1969) suggestion that a spectral-density approach of GC would give a richer and more comprehensive picture than a one-time GC measure that is supposed to apply across all periodicities. Both the traditional time-domain-based GC tests and the spectral GC tests require stationary time series. Therefore, we have applied SARIMA model with drift to the log transformed data. The SARIMA modeling was carried out using R-package "forecast".

All the variables series have been filtered using SARIMA models to obtain the innovation series i.e. the error terms left after fitting the model. After adjusting for lags, we were left with 59 observations. We first compute the spectral decomposition of the series using the innovation series for variables under consideration. According to the spectral representation theorem, any stationary time series can be thought of, approximately, as the random superposition of sines and cosines oscillating at various frequencies (Shumway and Stoffer, 2005, PP.536-537). The

spectral density function can be interpreted as the variance of the time series over the given frequency band. In what follows, we present non-parametric estimates of the spectral density function for the innovations for concerning variables. The spectra represent the series variance by frequency. We have used lag length (Following Diebold (2001, p.136) for parsimoniousness of the model and we take M equal to the square root of number of observations T, M = Square root (T). The frequency (λ) on the horizontal axis can be translated into a cycle or periodicity of T quarters by $T=2\pi/\lambda$ where T is the period.

5. Major findings and organization of the thesis

The study is organized into five chapters. Chapter 1 elaborates on introduction of the topic and studies the relevant literatures to draw upon the past works on the similar and associated subject. Chapter 2 extensively studies the macroeconomic settings in the Indian context, in terms of major macroeconomic variables and its trends in the last two decades. Chapter 3 interprets the relation of capital flows and macro economy in India. Chapter 4 explores causality between capital flows and its impact on the macroeconomic variables in the frequency domain settings. Chapter 5 concludes the study and provide for policy implications within the framework of this study.

5.1 Chapter 1: Introduction

The chapter introduces the study, along with the broad objectives which will provide a strong base for extensive analysis to the major issues put forward at different chapters. Further this section will also include literature review following international and domestic experiences studied by researchers, an overview of the recent development in cross border capital flows, financial globalization and liberalization and spells out the scope and objectives of study.

Foreign capital flow to a country depends upon the prevailing macroeconomic condition of the host country as well as international macroeconomic scenarios.

5.2 Chapter 2: Macroeconomic settings of India

The chapter reviews post Q1 2001 (the period considered for the study) macroeconomic settings including economic growth in India and will also delves on the role of each of the macroeconomic drivers responsible for the foreign capital inflow to India. Economic reforms specially to promote capital flows in India and its macroeconomic implication will be briefly discussed in this chapter.

5.3 Chapter 3: Interpreting the relation of capital flows and macro economy

The chapter discusses VECM for capital flow. In this study, we are using quarterly data and it is therefore, natural to investigate for seasonal units roots in the series preceding any time series analysis and check that whether unit roots at frequencies other than the long run exist in seasonally unadjusted quarterly data variables. HEGY showed that some simple *t* and *F* statistics can be used to test for seasonal unit root and for further inference provided sufficiency is taken care. This test is based on the same idea as the Dickey-Fuller tests (1979 and 1981) for a unit root at the long-run frequency. It is also easy to implement from an OLS regression. The regression equation employed here is to obtain the tests statistics includes a constant, a linear trend, and a seasonal dummy and estimated by analysis of appropriate lags. The regression equation includes lags of the dependent variable. The maximum number of lags considered in a lag selection procedure is that which minimizes “AIC” (Akaike Information Criterion).

Table1: HEGY test coefficients for seasonal unit roots in quarterly series data

	Ypi1	**Ypi2**	**Ypi3**	**Ypi4**
GDP (Stat.)	-0.078	-0.028	-0.196	0.002
(P-value)	(0.10)*	(0.10)*	(0.10)*	(0.50)*
WPI (Stat.)	-0.014	-3.870	0.315	-0.739
(P-value)	(0.10)*	(0.01)	(0.10)*	(0.01)
FXR (Stat.)	-0.033	-0.606	0.128	-0.703
(P-value)	(0.10)*	(0.10)*	(0.10)*	(0.01)
EXR (Stat.)	-0.066	-0.745	-1.093	-1.339
(P-value)	(0.01)	(0.01)	(0.10)*	(0.01)
CMR (Stat.)	-0.195	-0.507	-0.519	0.177
(P-value)	(0.10)*	(0.01)	(0.10)*	(0.78)*
M3 (Stat.)	-0.128	-0.572	-0.017	0.536
(P-value)	(0.01)	(0.01)	(0.10)*	(0.97)*
IMP (Stat.)	-0.036	-0.618	-0.227	-0.509
(P-value)	(0.10)*	(0.01)	(0.10)*	(0.01)
EXP (Stat.)	-0.113	-0.298	-0.345	-1.628
(P-value)	(0.10)*	(0.10)*	(0.10)*	(0.01)
FDI (Stat.)	-0.147	-0.234	-0.613	-0.411
(P-value)	(0.05)*	(0.10)*	(0.01)	(0.01)
FPI (Stat.)	-0.253	-2.766	-0.563	-0.149
(P-value)	(0.01)	(0.01)	(0.10)*	(0.36)*

Note: *In the parenthesis, associated P-value has been given. The (*) reflects that we cannot reject the null hypothesis of presence of unit roots at 5% level of significance.*

The result of the HEGY test on the log-transformed series of variables is presented in table.1. In the first place it is worth noting that the null hypothesis for GDP, WPI, FXR, CMR, IMP, EXP, and FDI series at zero frequency (rootYpi1) cannot be rejected. This indicates that there exists a unit root in the long-run for these variables. The null hypothesis for EXR, M3, and FPI maybe rejected at zero frequency and at 1% level of significance. For log transformed GDP series the null hypothesis cannot be rejected at a frequency but for other series null hypothesis may be rejected at the higher frequencies.

5.4 Chapter 4: causality between capital flows and its impact on the macroeconomic variables in the frequency domain

Unlike conventional causality analysis, which generates a single test statistic, summarizes the relation between variables expected to be valid at all points in the frequency distribution. The frequency domain methodology generates tests statistics at different frequencies across spectra. This section presents the empirical findings and analysis of causality between FDI inflows and selected macroeconomic indicators for India.

In this chapter impact of capital flows on each of the variables will be analyzed in frequency domain further to disentangle the short run and long run impact on individual series. Understanding the impact of FDI on economic growth and vice versa has been a source of interest for many from academics to policy thinking. The causality running from FDI to GDP is significant between frequencies corresponding to four to seven quarter's cycles. The Granger coefficient of coherence suggests that the causality is significant from fifth to sixth quarter and reaches its peak of at the frequency corresponding to fifth quarters. The result may be interpreted as that FDI provides significant predictive power for GDP growth after more than a year. The causality running from GDP growth to FDI inflows is significant in over twelve quarters only and coefficient of coherence reaches its peak in twenty-ninth quarter. These results suggest that a sustainable high economic growth over a period of more than 3 years in the host country attracts foreign direct investment. Foreign direct investment stimulates the pace of growth in capital recipient country but with a lag of more than a year.

Foreign capital inflows build-up foreign exchange reserves, which are used to buy domestic currency, as a result the domestic monetary base expands without a corresponding increase in production. This leads to a situation where too much money chases too few goods and services

results in inflation, which is evident from the Granger coefficient of coherence for causality running from FDI to WPI. FDI Granger causes WPI at higher frequencies reflecting short-run cycles. The causality running from FDI to WPI is significant between frequencies corresponding to seven to fifteen quarters cycles. The estimated coefficient of coherence reaches its peak i.e. 0.46 at the frequency corresponding to tenth quarter cycle. The causality running from WPI to FDI is not significant. The result thus suggests that the foreign inflow does not Granger causes WPI at frequencies corresponding to more than 4 years. Thus, we may infer from the result that FDI Granger causes WPI in short run only and stabilizes in the long run.

The result of Granger causality test shown in for money supply from FDI at 5% level of significance shows that capital inflows granger causes money supply at frequency corresponding to a four-five quarter cycles. The Granger coefficient of coherence reaches its peak, i.e., 0.39 at frequencies corresponding to long cycles, which highlights that the causality running from foreign capital inflows to money supply becomes much stronger at longer cycles. This implies that money supply gets affected more in long run than short run as a result of foreign capital inflows. The finding of this study is in conformity with Kohli (2001) findings that post liberalization inflow of foreign capital in India has significant impact on money supply. With the inflows of FDI, the central bank intervenes in the money market to stabilize the exchange rate, which leads to accumulation of net foreign asset of central bank affects monetary base. Conversely, if central bank does not intervene and let the exchange rate float without intervention- money supply will not be impacted. The causality test for money supply to FDI does not yield any significant result.

Foreign capital inflows may lead to credit expansion, which may trigger a consumption boom with a strong import bias leading to higher import. Second, economic literature also suggests

acceleration of import liberalization for absorption of foreign exchange through import, a tool to arrest the reserve accumulation by the central bank. At 5% level of significance, FDI inflows Granger cause import at frequencies corresponding to three to four to eight quarters cycle. This implies that the FDI drives import at the short run but no impact in the long run. The presence of causality running over the short run indicates foreign capital inflows enhance the import appetite of the capital recipient country in long run. The result of causality running from import to FDI is not significant.

Granger causality running from foreign capital inflow to export shows that at 5% level of significance, foreign capital inflow Granger causes export at frequencies corresponding to cycles longer than four quarters up to 8 quarters. Therefore, we can infer that foreign capital inflow Granger causes export at frequencies corresponding to short run business frequencies. The Granger coefficient of coherence reaches its peak at frequencies corresponding to fifth quarter cycles, which highlights that the causality running from foreign capital inflow to export has a gestation period of more than one year. The causality running from export to FDI was statistically not significant.

Granger causality running from foreign capital inflow to exchange rate, clearly reveals at frequencies corresponding to three to four quarter cycle and at ten to twenty-nine quarter cycle foreign capital inflow Granger causes exchange rate. Therefore, one can argue that in short run as well as in long run at business cycle both foreign capital inflows Granger causes exchange rate. We did not find significant evidence of causality from exchange rate to FDI.

Granger Causality has been used extensively in past to study a wide range of substantive economic issues. Even though there is increasing evidence that the nature of the relationship may vary with the frequency under consideration. The salient feature of this study has been the

frequency domain approach to uncover the causality relation between foreign capital inflows and macroeconomic indicators of the recipient countries. Our results show that causal and reverse causal relations between foreign capital inflows and macroeconomic indicators vary across frequencies. The study finds that the capital inflows Granger causes money supply both in short and in long run whereas GDP, import, export and WPI in the short run only. The unique contribution of the present study lies in decomposing the causality on the basis of time horizons and demonstrating the causality between capital inflows and macroeconomic indicators of the capital recipient country.

5.5 Chapter 5: Conclusion and policy prescription

The final or the fifth chapter will summarize the key findings from the earlier chapters and also make concluding observations and policy implications with the limitations of the study. The analysis and above mentioned results have in our judgment, important implication for macroeconomic policy.

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