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An econometric analysis of foreign investment flows into India

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Abstract

Objectives: To look at the determinants of foreign investment inflows into India and further to see its inter-dynamic relationships with macroeconomics fundamentals in India.
Methods/Statistical analysis: The study was done for the period of 1996 Q1 to 2017 Q2, using the secondary data from RBI handbook of statistics. Augmented Dickey-Fuller test was employed to check the stationary of the data. Regression analysis was employed to look at the determinants of foreign investment flows into India and Vector Auto-regression model was used to look at the inter-dynamics between foreign investment and macroeconomic fundamentals in India.
Findings: Looking at the causal relationship between GDP and FINV, we found it is unidirectional from GDP to FINV. Thus we can infer that robust economic growth in India attracts FINV. The study found that GDP, BSE Sensex, EXC, INF, ROI, and CAD are the major determinants of foreign investment in India. GDP, BSE Sensex, and ROI have a positive impact and among them, GDP is the most significant factor in attracting foreign investment. Whereas, variables like EXC, INF, and CAD have a negative relationship with foreign investment. Using the same dataset, we have estimated an unrestricted VAR model to look at the inter-dynamics between FINV and some macroeconomic fundamentals like GDP, INF, ROI, RES, and EXC. From the result, we see variables are dynamically interrelated. Further looking at the impulse function we see that response of one variable for a given shock in another variable is in tandem with economic theory.
Application/Improvements: The policy implication arising from the study is that strong macroeconomic fundamental and sound internal and external policies are required to attract foreign investment.
***Keywords*:** Foreign Investment Flows, GDP, Inflation, Exchange rate, Econometric Analysis.

1. Introduction

Foreign capital has played a vital role in the development of most of the countries of the world. Nearly every developed country has had the assistance of foreign finance to supplement its own meager saving during the early stage of development. It is more volatile in nature and can cause destructive impact on host country. The underdeveloped countries suffer not only from lack of capital but also from a lack of technology, material ability, skill, etc. foreign capital in equity form brings with it these complementary factors which are very essential for the development of the underdeveloped nations. Foreign investments create opportunities for technical training, these creates an industrial atmosphere which induce indigenous capital and enterprise. There has been massive inflow of foreign capital since 1991 into the country. From just $133 million in1991-92 to $4233 million in just span of two years. This was mainly due to massive increase in portfolio investment. It reached peak of $5964 million in 1996-97 as a result of increase in both FDI as well as portfolio investment. Due financial crisis in US economy, there was huge outflow of foreign investment from Indian economy in 2008-09 as a result foreign investment in India was only $8.3 billion.

The year 2009-10 saw a sudden surge in foreign investment due to robust growth in Indian economy on one hand and stagnant economic condition in developed nations. But after 2013 we see decline in foreign investment flows, mainly due to slow down in global economic activities. Though there is decline in cross border capital flows, India is the most favorite destination for foreign investment especially portfolio flows. Looking at the composition of net foreign investment flow to India we see that FDI flows shows a steady upward trend whereas portfolio flows though going up is very volatile. In recent times portfolio flows are dominating the total capital flows into India. Since the beginning of 1990s the globalization and the integration of domestic financial markets with rest of the world has taken place at tremendous pace. Foreign investment to developing countries or more precisely to emerging market economies increased rapidly during the period. In an open economy

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framework these international capital inflows have a significance impact on some of the macroeconomic fundamental of the host economy. The effect which are clearly seen due to increase in foreign capital inflows are appreciation of domestic currency, reserve accumulation, increase in money supply, consumption boom, as well as it has an impact on production and saving pattern of an economy. But these effects have not been same across countries. Thus implementations of sound monetary, fiscal as well as external policies are needed for efficient management of foreign investment. Experience from East Asian crisis and crisis in Latin America show how policies framework can make a difference. Now these have a strong effect on macroeconomic fundamental like exchange rate, money supply, inflation, etc. So it is very essential to know the determinants and impact of foreign investment in India. So that appropriate policies can be formulated and implemented to even out the negative effect. This study aims to look at the broad determinants of foreign investment flows to India, by analyzing the quarterly data over the period of 1996Q1 to 2017Q2. The scope of the study is further extended by including the study of inter dynamics between net foreign investment and macroeconomic variables like, GDP, inflation, exchange rate, etc. using VAR framework, and in the end we look at the causal relation between GDP and foreign investment.

2. Objectives

1. To check the causality between GDP and foreign investment.
2. To see the nature, trend and composition of foreign capital in India.
3. To identify the determinants of foreign investment into India.
4. To analyse the inter dynamics between foreign investment and macroeconomic fundamental of Indian economy.

3. The trend and composition of net foreign investment flows into India

India was not a favorite destination for international capital flows. After independence, India chooses to remain as closed economy with restriction on trade as well on capital flows. The external sector reform was carried out on the basis of the recommendation made in the report of high level committee on Balance of Payment. They recognized that an unsuitable exchange rate regime, un-maintainable current account deficit and the rise in the short term debt were the main reason contributing to the crisis. So they recommended a market determined exchange rate regime, opening of current account and a gradual opening of capital account. They also recommended that India should encourage non debt creating flows, regulate short term debt and liberalize capital outflows. In 1994-95, the Reserve Bank of India decided to allow NRIs and also FIIs, to invest in India. Now India is an economy open to capital flows. But the policy makers have been careful enough to consider the elasticity of supply and other responses in the economy, and exposure or probable shocks and the risk associated with reversal of capital flows. India realized the need of foreign capital to fill the saving investment gap, but did not adopt a general approach to all forms of capital flows and there was a discriminatory approach in it. Analyzing the capital flows to India since the opening of Indian economy in 1991, we find that liberalization measures have been able to attract much needed foreign capital to the country. Policy makers realized that domestic savings alone cannot meet the growing investment needs of the country, so they took series of measures to liberalize the inflow of capital. There has been massive inflow of foreign capital since 1991 into the country. From $133 million in1991-92 to $4233 million in just span of two years. This was mainly due to massive increase in portfolio investment. It rose to peak of $5964 million in 1996-97 as a result of increase in both FDI as well as portfolio investment. But decline thereafter. This was due to East Asian crisis and around $390 million of investment went out of economy. Thus overall portfolio investment became negative. However, portfolio investment recovered after 2000, there was a massive capital inflow in the year 2003-04 amounting around $13744 million of which $11356 was portfolio investment. Thus this shows investors' confidence in Indian economy said RBI. The share of portfolio investment rose as high as 63.9 percent in the year 2005-06 and in 2006-07 there was a sudden change where FDI surpassed portfolio investment. According to RBI "This reflected the continued strength of sustained economic activities and positive investment climate (with inflows channelizing into financial, manufacturing and construction sectors). The strength of the corporate performance, positive investor's sentiments, and further liberalization of FDI policies in sectors such as telecom, retail, and expanding promotional efforts by government also played a role in attracting FDI." Because of financial crisis in

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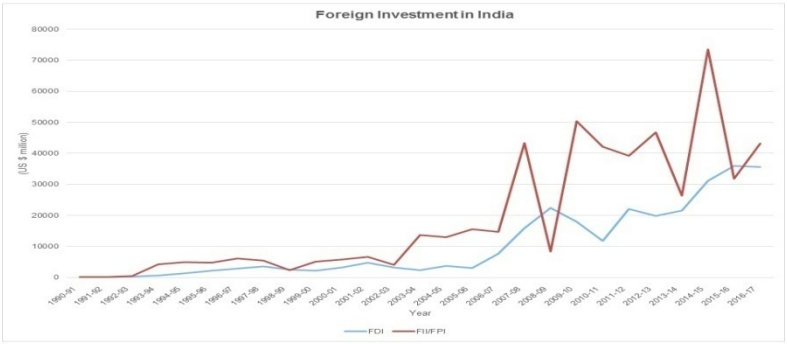
US economy, FII withdrew a large investment from Indian economy in 2008-09; as a result foreign investment in India was only $8.3 billion. The year 2009-10 saw a sudden surge in foreign investment due to robust growth in Indian economy on one hand and stagnant economic condition in developed nations. Thus again foreign institutional investment inflows grew and total foreign investment flow was around $50.4 billion. But it declines in 2011-12 due to fall in FII. Looking at the composition of net foreign investment flow to India we see that FDI flows shows a steady upward trend whereas portfolio flows though going up is very volatile. But we see that, unlike other countries whose capital inflows were dominated by FDI flows, here in India, most of the time portfolio flow has exceeded the FDI. This could be either due to change in global trends or due to internal reasons, for example approval of FDI are complicate and time consuming whereas portfolio flows are able to come to market more easily. Both pull and push factors have played crucial role in attracting foreign capital to India. The net flows which were only $103 million in 1990-91 had gone to 35612.18 million by 2016-17. This shows the confidence of international investor in India. This tremendous increase in capital flows as a result of successful implementation of reforms measures. Regarding the trend in the net capital flows to India we see debt flow has decline and investment flow in form of FDI and FII has picked up. In the recent years we see increase in FII which is more than FDI. But after 2014 there is decline in investment flows mainly due to slow down in global economic activities.

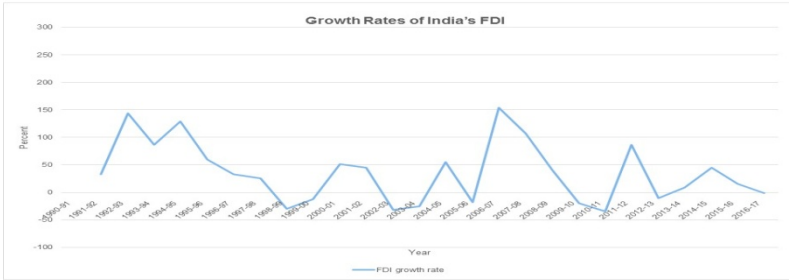
Figure 1. Composition of foreign investment in India



Source: RBI, Handbook of Statistics on the Indian Economy

Figure 1 gives the insight of the magnitude and composition of foreign investment flows to India. From the graph we see that, there is steady rise in foreign investment inflows to India but after global financial crisis, there is fluctuation in foreign investment, more specifically FII's are more volatile. In recent years we see there is fall in foreign investment, this is due to slow down of global economic activities. The net foreign investment flows have gone up from being just 1.6% of GDP in the year 1993-94; it has increased tremendously to around 5.27 percent of GDP in the year 2015-16.

Figure 2. Growth rate of FDI



Source: RBI, Handbook of Statistics on the Indian Economy

From the Figures 2 and 3we observe that though there is fluctuation in FDI and FII, wherein FDI is comparatively less volatile. We see that after the opening of Indian economy in early 1990s, there was surge in foreign portfolio inflows, from merely $4 million in 1992-03 to $242 million in 1993-94 and again due to effect of

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East Asian crisis there was sudden reversal of foreign portfolio flows. From 2001-02, when economic growth picked up, overall foreign investment gained momentum in India till 2008. Due to global financial crisis there was some disturbance in foreign investment flows into India, but crisis did not affect India much. Thus foreign investor gained confidence in Indian economy and again foreign picked up till 2013-14. After 2014, due to slow down in global economy, there has been fall in foreign investment in India.

Figure 3. Growth rate of FII

Source: RBI, Handbook of Statistics on the Indian Economy

4. Accumulated wisdom

A part from helping in creating economic activities and generating employment, foreign investment also facilities flow of technology into the country and helps industries to be more competent. After analysis, it is found that FDI and FII are impacting economic growth to large extent. Pearson correlation value indicates there is positive correlation between FDI and FII. FDI is preferred over foreign portfolio investment as it more beneficial to the host country. The causal linkages between foreign capital, economic growth and trade for the period between 1973-2008 in Bangladesh were studied by [1]. He found that there was a long run relationship among variables analyzed and further concluded that economic growth attracts foreign capital in Bangladesh. In [2] conducted a similar study in Malaysian economy and found that there was no direct causality between foreign capital and economic growth and concluded that foreign capital indirectly impacts economic growth. In [3] studied the determining factor of FDI in India. Trade openness, exchange rate, gross domestic product was taken as independent variables. To check the stationary of the variables Augmented Dickey Fuller test was used. The variables were stationary at first difference. The study also used Johnson co-integration test to see the long run relationship between variables and found long run relationship. Exchange rate and GDP were important factor in attracting FDI inflows and openness was found to be insignificant factor in determining the inflow of FDI. The effect of exchange rate and inflation was studied by [4] on FDI for Nigerian economy for the period of 1980 to 2009. The objective of the study was finding the relationship between FDI and exchange rate and inflation. The study used the regression analysis to estimate the model. The finding was that inflation did not have significant impact on FDI whereas exchange rate had a significant impact on inflow of FDI in Nigerian economy. Relationship between foreign investment flows and economic growth was studied by [5] using the monthly data available in RBI. IIP was taken as proxy for GDP. Augmented Dickey-Fuller test was used to check the stationary of data and found that the variables were stationary at 1st difference. The study found bidirectional causality between economic growth and FDI, FII. Foreign investment had positive impact on economic growth. Looking at the net capital flows to India, [6] observed that capital inflows increased tremendously after 1990s reforms. She found as compared to Latin America and East Asian economies, capital inflows in India economy were more stable. The official flows like aid has been declining and foreign investment have been increasing after 1990s in India both pull and Push factors play a vital role for inflow of foreign capital. Fall in global rate of interest and high interest rate differential in India attracts foreign investment and coming to pull factors after crisis, Indian economy slowly opened along with macroeconomic reforms. Portfolio investment is of short term nature and is very volatile whereas FDI are more stable. Thus it was concluded that portfolio investment makes the financial market very volatile.

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5. Empirical findings and analysis

This chapter deals with the empirical analysis and their result along with the interpretation. Here our objective is to empirically check the causality between GDP and FINV, identify the determinants of the foreign investment flows to India and also we model the inter dynamics between the foreign investment and macroeconomics variables. The empirical tool used here are ordinary least square regression and vector auto regression model along with impulse response function.

6. Granger causality between GDP and FINV

To find out the direction of causality we perform granger causality test. We have taken GDP and net foreign investment inflows to check the pair wise granger causality. We know if two variables are correlated, there must be some causality between the two, at least in one direction. From this test we can identify which of the variables is useful in influencing the behaviour of other variable. The null hypothesis here is that one variable does not Granger cause the other variable. If we reject the null hypothesis, then we can prove and assert that the independent variable Granger causes the dependent variable meaning the independent variables cause the dependent variable to change. The results of the Granger Causality test are presented below.

Null Hypothesis:	Obs.	F-Statistic	Prob.
GDP does not Granger Cause FINV	84	12.4337	2.E-05
FINV does not Granger Cause GDP		1.12487	0.3298

Here from the result we see that the probability value of first statement is 2.E-05, which means we reject the null hypothesis that GDP does not granger cause FINV. There is unidirectional relationship from GDP to FINV. But FINV is not granger causing GDP. This proves that growth in developing economies like India is attracting foreign investment. In country like India there is huge opportunity for investment, this is the cause for the inflow of foreign investment. From the above result what we see is that GDP is one of the major factors for attracting foreign investment in India. But it is not only the factor; there are other factors too which tremendous influences the flow of foreign investment into India. Thus now we will look at the other important factor which plays a significant role in determining foreign investment in India.

7. Determination of FINV

The determinants can be classified into two main categories i.e. pull factor and push factors. Pull factors are generally internal factors essentially specific to a nation, such as local resources, domestic market, financial depth, macroeconomic stability, etc. and push factor are the external factors such as world economic activities, global rate of interest, etc. in this study we have made an attempt to identify the determinants of foreign investment in India. The variables taken are as follows.

LnFINV = log of Foreign Investment both FDI and FII
LnGDP = log of Gross Domestic Product
LnEXC = log of nominal Exchange rate of Rupee with Dollar
lnBSE = log of BSE Sensex
lnCAD = log of Current Account Deficit
INF = Rate of Inflation
ROI = Rate of Interest

The variables given above were in different units. Thus log transformation was taken to bring them in same units. Further log transformation gives us the elasticity and thus it becomes easy to interpret the coefficient of the model.

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8. Stationarity test

A times series regression is meaningful only when the variables are stationary. Otherwise it only leads to spurious regression. There are many measures to see the presence of unit root in a time series. Here we have used Augmented Dickey-Fuller test for checking the stationary of the variables. At first a unit root test with trend and intercept term is carried and if they are found to be non-stationary, we took at the first difference of the variable and repeated the process. The result of the stationary test of the above mentioned variables are given in the Table 1.

Table 1. Result of Unit root test

Variables	Levels	1st Difference	Inference
LNFINV	-6.997895		I(0)
LNGDP	-7.476224		I(0)
LNEXC		-6.902335	I(1)
ROI		-5.010410	I(1)
INF		-6.501494	I(1)
LNBSE		-6.730420	I(1)
LNCAD		-12.00752	I(1)

Source: Author's calculation Critical values (Mackinnon values): 1%: -4.53, 5%: -3.67, 10%: -3.27

9. Determinants of foreign investment in India

First step is to empirically identify the determinants of foreign investment in India using OLS method by studying the quarterly data from the period of 1996-97Q1 to 2017-18Q2. The dependent variable is FINV and the independent variables are GDP, EXC, INF, ROI and CAD.

Economic Relationship:

FINV= f (GDP, BSE EXC, INF, ROI, CAD)

(+) (+) (-) (-) (+) (-)

From the above given economic model and according to theory we will the relationship between the dependent and independent variables. The relation between FINV and GDP is positive. This is because when economic activities in an economy flourish, this will give investors a positive sign of the economy. Further when economy is doing well the return from investment will be high. This also means the fundamental of the economy is good thus risk of losing the money is very low. And more so if compared to world economy, domestic economic activities are more favorable. This encourages foreign investors to invest in country where economic activities are more. Thus we see a positive relationship between foreign investment and growth of gross domestic production. Now talking about the relationship between exchange rate and foreign investment, they are negatively related. When nominal exchange rate increases, this means fall in the value of domestic currency with respect to foreign currency. The foreign investors are discouraged because this leads to loss in capital when investor wants to convert domestic currency to his home currency. For the same amount of domestic currency, he will get less amount of foreign currency. Thus when the currency of host country depreciates or is devalued, this discourages the foreign investor to invest. When inflation or in general price level increases in domestic or host nation, this will affect the return on investment for the investors. As the real return will be less than the nominal return due to inflation. Further this also arise the questions of economic stability of an economy and government's policy. And according to parity condition when inflation rises in an economy, its currency depreciates with respect to foreign currency. Thus this discourages foreign investors to invest in an economy where there is high inflation in general. Looking at the relationship between foreign investment and rate of interest, we find positive relation between the two variables. As we all know that investor's main motive is to gain more from his investment. Thus investors are encouraged to invest in an economy which gives them high rate of return for their investment. Current account balance shows the competitiveness of an economy with rest of the world. When current account balance of an economy is negative, this means that a nation is not very competitive in its economic activities or export competitiveness. More so when the current account balance is negative and high, this sends bad signal to the outside world. This discourages foreign investors to invest in an economy whose current account balance is deficit.

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Equation: 1

FINV = -5.420 + 2.181*GDP (-2) + 1.5878*D (BSE) – 11.047*D (EXC) + 0.023*D (ROI)
(-10.98) (18.35) (3.60) (-6.01) (2.23)
-0.027*D (INF(-3)) + 0.658*DUM
(-1.80)

R-squared=0.86 D-W stat=1.85
Adj R-squared=0.84 F-statistics=75.41

In equation1, the macroeconomic variables used in determining the flow of foreign investment in India are quite significant as their t-statistics suggest which are given in parenthesis and also we can tell that the variables under consideration are able to explain about 86 per cent of variation in foreign investment according to this equation. Apart from this an important thing to note is that all the variables are in its log linear form which means that the coefficients measure the elasticity of foreign investment. From the equation we can see that domestic GDP plays a significant role in attracting foreign investment in India, for a given one percent increase in domestic GDP, foreign investment increases by around 2.18 percent. So we can say that higher economic growth in India will also raise foreign investment. Another variable which has a major impact on foreign investment is nominal exchange rate, as expected we see a negative relationship. It is seen that 1 percent depreciation in Indian rupee (increase in exchange rate) will cause around 11.04 percent fall in foreign investment flows to India. From this we can say that when currency depreciates the investors lose confidence in the host economy. This is because exchange rate reflects the fundamental of an economy and when exchange rate increases, this means that an economy is not doing well. BSE too have a positive relation with foreign investment, for a given 1 percent increase in BSE raise foreign investment by around 1.58 percent. This indicates that financial market is performing well to encourage foreign investment. Though other variables like interest rate and inflation are statistically significant but their impact on foreign investment are negligible. There is a negative constant coefficient which is meaningless but we can say when all other variables in the equation which are used to determine foreign investment is simultaneously zero we assume there will be capital outflow. Dummy variable has been used in this equation for 1997-98Q3, 2002-03Q2, 2008-09Q3, 2009-10Q2 and 2015-16Q2. As we used quarterly data it is difficult to say there was sudden effect on foreign investment on a quarterly basis. It has been found that there has been significant change in foreign investment flows to India, why may have been due to various domestic or external circumstances. In 1997-98Q1 there was a sudden decline in foreign investment in India, this was due to the effect of East Asian crisis. The crisis resulted in the re-evaluation of the emerging markets as investment destination. There was sudden surge in foreign investment in the year 2002, this was because the economic activities in India picked up, which attracted the foreign investors to invest. In the year 2008, there was a global financial crisis because of which there was sudden outflow of foreign investment. Again in 2009-10 there was huge inflow of foreign investment, as Indian economy performed well as it was not significantly affected by crisis, further Indian economy was led by domestic consumption. During 2015-16 again we see fall in foreign investment as the global economy was not doing well.

10. In-Sample forecasting

Forecasting from the estimated equation, we would find how good the estimated model is subject it to a confirmation test. This is done by using the estimated model for in-sample estimation and for forecasting beyond the sample period namely 1996-97Q1 to 2017-18Q2. We can see the forecasting ability of the equation by doing in sample forecasting. The two important forecast error statistics in sample forecasting are Root Mean Square error, the smaller the error, the better the forecasting ability of the equation and Theil inequality coefficient which studies the predictive performance of the equation. Ideally the RMSE is should be less than 3 and TIC less than 1.

Table 2. The value of RMSE and TIC

Root mean squared error	*0.184354*
Theil inequality coefficient	*0.025480*

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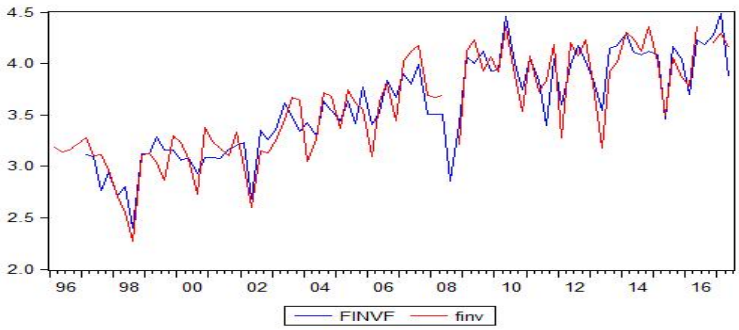
The value of RMSE and TIC obtained in the above equation is given in the Table 2. Thus we can see from Figure 4that forecasted series is close to the actual series.

Figure 4. In sample forecast of FINV

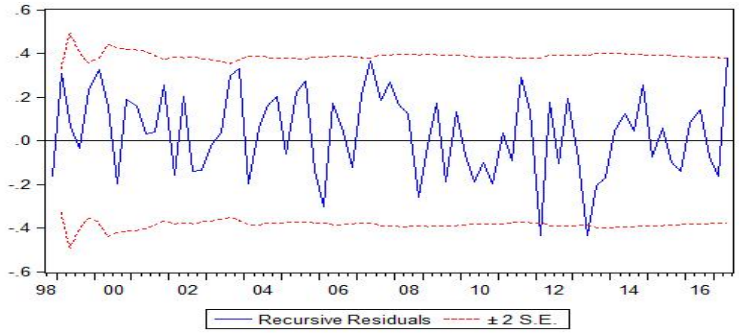


Source: Author's calculation

11. Stability test

The parameters of a good equation have to be stable across various subsamples of the given data and for this regard we use the stability test which is presented in Figure 5. By looking at the OLS estimation recursive residuals we know the stability of the parameters in equation. In this test there will be standard error band. For equation to be stable, the residuals have to be within the band otherwise it indicates the instability in the parameters in the equation. The recursive residual of the above estimated OLS regression are within the standard error band except at two points. Hence the parameters of the equation are more or less stable across various subsamples of the given data.

Figure 5. Stability test for FINV function



Source: Author's calculation

In the above equation we have only included the macroeconomic fundamentals to see their influence the foreign investment flows into India but other factor like current account deficit too has a significant impact in influencing foreign investment flows. Thus in the second equation we included current account deficit to see its impact on foreign investment flows to India.

Equation: 2

$$FINV = -5.265 + 2.147*GDP(-2) + 1.426*D(BSE) - 6.706*D(EXC) - 0.209*D(CAD(-1))$$
$$(-12.25) \quad (20.74) \quad (3.74) \quad (-3.76) \quad (-2.63)$$
$$- 0.018*D(INF(-1)) + 0.033*D(ROI) + 0.453DUM1$$
$$(-1.67) \quad (3.18)$$
$$R\text{-squared}=0.88 \quad D\text{-W stat}=1.79$$
$$Adj\ R\text{-squared}=0.87 \quad F\text{-statistics}=78.54$$

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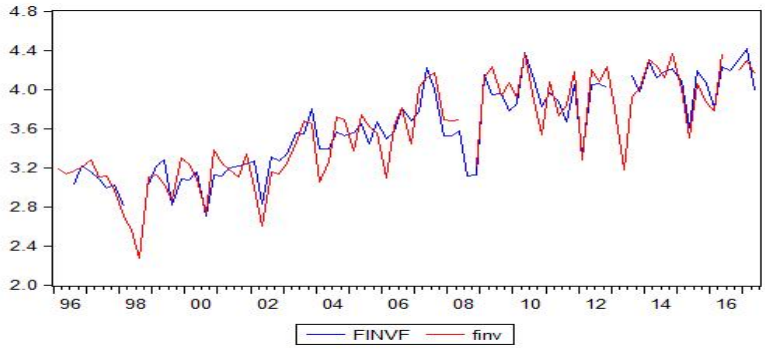
Equation 2 establishes the relationship between foreign investment inflows and its various determinants. Now looking at the R^2 and adjusted R^2 we see that around 88 percent variation in dependent variable is explained by the explanatory variables. The Durbin-Watson stat (1.79) shows there is little bit of positive autocorrelation. Now looking at the F-stat (78.540) we can conclude by saying that the variation in the dependent variable is captured by independent variables and thus model is a good fit. From the above model we can infer that GDP plays a vital role in attracting foreign investment in India. When domestic GDP increases this gives indication to foreign investors the scope to invest and earn profits. Similarly, BSE also sends somewhat same notion to foreign investors. Thus given 1 percent increase in GDP and BSE around 2.147 and 1.426 percent rise in the inflows of foreign investment in India respectively. Though ROI is significant in the equation, its influence in determining the foreign investment is not so much. Variables like exchange rate current account deficit and inflation has a negative influence on foreign investment. Any upward movement in these variables indicates instability in domestic macroeconomic fundamentals. Thus this discourages foreign investors to invest in India, and this leads to capital flight. Among them exchange rate is a major variable which have a high negative impact on foreign investment. Dummy variable has been used in this equation for 1997-98Q3,1998-99Q3, 2002 -03Q2,2007-08Q2, 2008-09Q3, 2009-10Q2 and 2015-16Q2. As we used quarterly data it is difficult to say there was sudden effect on foreign investment on a quarterly basis. In 1997-98Q3 there was a sudden decline in foreign investment in India, this was due to the effect of East Asian crisis. There was sudden surge in foreign investment in the year 2002, this was because the economic activities in India picked up, which attracted the foreign investors to invest. In the year 2008, there was a global financial crisis because of which there was sudden outflow of foreign investment. Again foreign investment was picking up but due to global economic meltdown after 2013 slowly we see volatility in foreign investment flows globally, especially in portfolio flows. This has cause some disturbance in foreign investment flows into India.

12. In sample forecast

In this equation RMSE is 0.156187, which gives the indication that the fitted line has deviation of 0.15 from the actual series and Theil inequality coefficient is 0.021474, which is closer to zero, and suggests that the predictive performance of the model is very satisfactory implying that the forecasted series in the model is very close to the actual series and there are no systematic tendencies to over-estimate or under-estimate the actual data and this is represented in Figure 6.

Figure 6. In sample forecast 2 of FINV



Source: Author's calculation

13. Stability test

From the Figure 7, we observe that the estimated parameters are more or less stable over the sample time period of study, as we see the residuals are within the given standard error band.

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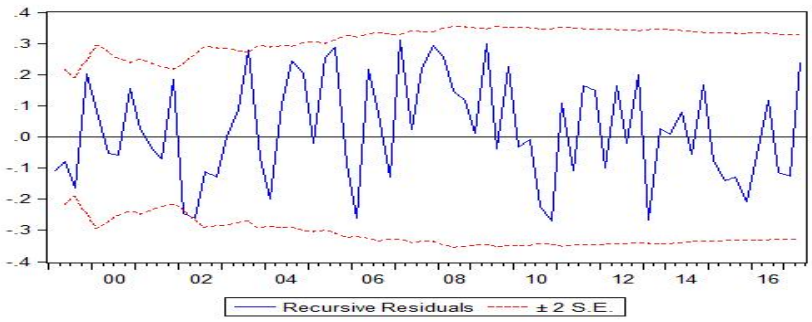
Figure 7. Stability test2 for FINV function



Source: Author's calculation

14. Analysis of the VAR model

VAR Model explains the inter dynamics relationship between the endogenous variables. We have constructed an unrestricted vector auto regression model for variables such as GDP, foreign investment, inflation, rate of interest, exchange rate, foreign exchange reserve. Considering the stationarity of variables in different order, we estimated the series of VAR model, taking the above variables. After this we followed Akaike Information Criteria (AIC) to look at optimal lag length and based on AIC, having seven lags was appropriate for the model.

Table 3. Table of inter dynamics

	D(GDP)	D(ROI)	D(INF)	D(REV)	D(EXC)	FINV
D(GDP)	1,2,3,4	4,6,7	3,7		4,5	4,5
D(ROI)	2	1,3,4	1,4	5,6	4	3
D(INF)	2	7	1,4	2	5	5
D(REV)	4	5,6	1,2,4		1	5,7
D(EXC)	1,5		6,7	1,3,7	3,4	3,4,6
FINV	6	3	1,5,7	1,7	2,7	3

Source: Author's calculation

Table 3 gives interaction of given endogenous variables which are major determinants of foreign investment in India. Here in the table we can see that FINV is affected by lags of GDP, ROI, INF, REV, EXC and FINV. Further we can see that almost all variables are affected by its own lag and the lags of other given variables. What the table clearly shows is that the selected endogenous variables dynamically interact with each other and that too with lagged effects. This has an important bearing for the policy makers, for; changes in policy variables such as interest rate may have the desired results on other macroeconomic variables only with a time lapse.

15. Impulse response function

This impulse response function is the extension to the VAR model, which shows the response of dependent variable when innovation or shock is given to its determinant variables. The decomposition method used to produce the impulse response is the Cholesky (d.f adjusted) method. The response of the variable is observed for the time horizon of ten periods for a given positive shock. The graph shows the time taken by the dependent variable to return to its long run mean, after reacting to one-time shock in another variable. The Figure 8 gives the insight of the magnitude of change in domestic GDP when shock is given to the foreign investment. As we see from the graph that, the immediate effect, i.e. Domestic GDP grows immediately with a sudden surge of foreign investment, this supports the theory that increase in investment leads to growth. After this GDP falls for some time, this may be due to increase in inflation cause by increase inflow of foreign capital. To control inflation, monetary authority raises rate of interest, this in turn will discourages domestic investors to invest, which may be the cause for the fall in GDP. Another implication for the fall of GDP may be due to crowding out phenomenon because of foreign investment. This fluctuation will continue for some period and in long run GDP eventually go back to its equilibrium path.

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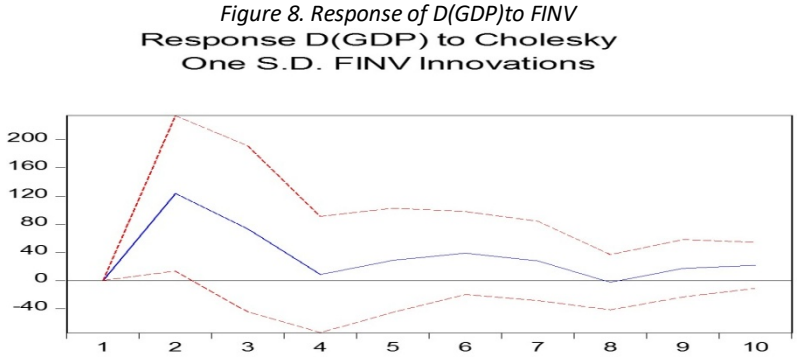
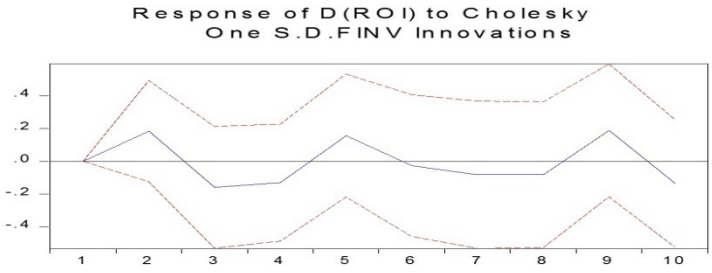
Figure 8. Response of D(GDP)to FINV



Source: Author's Calculation

The response of ROI (interest rate) to Cholesky one standard deviation innovation in foreign investment inflows is depicted in Figure 9. As per economic theory, capital flows from low rate of interest regime countries to high rate of interest regime countries. In the impulse response graph we see rate of interest starts falling after second period. Even though we see fluctuation thereafter but in long run it will permanently fall.

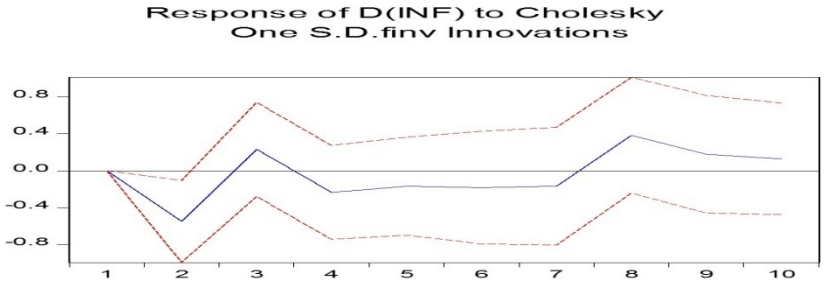
Figure 9. Response of D(ROI) to FINV



Source: Author's Calculation

As we know that foreign investment plays a significant role in influencing money supply in host country. We see from the graph that inflation initially does not rise, but rises after some time, this is because it has lag effect. This continues for some time because production cannot be increase in short time. But in long run due to the balancing mechanism between the foreign investment and the various macroeconomic variables will eventually bring inflation back to equilibrium in the long run as we can see from the Figure 10.

Figure 10. Response of D(INF) to FINV



Source: Author's Calculation

The relationship between foreign investment inflows and foreign exchange reserve is examined in Figure 11. We see foreign investment have a positive impact on reserve. This gives us clear indication that monetary authority has been intervening in the foreign exchange market to even out the effect of foreign capital and to reduce volatility in exchange rate.

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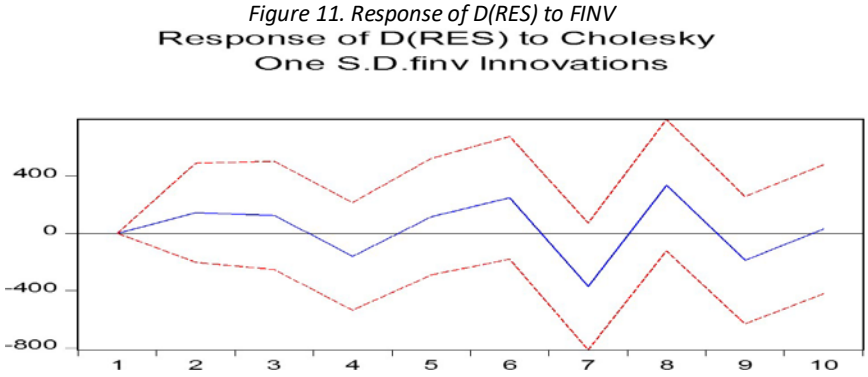
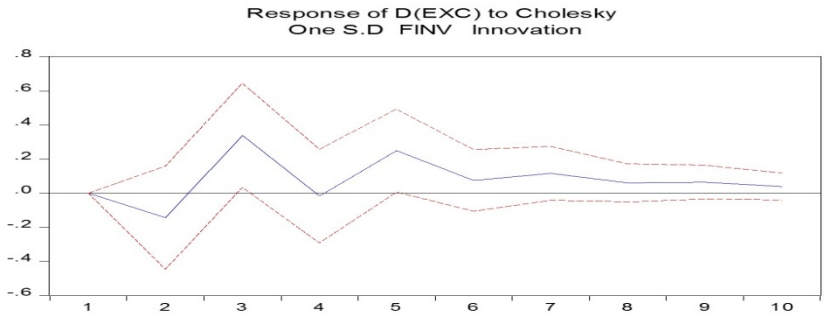
Figure 11. Response of D(RES) to FINV



Source: Author's Calculation

The response of EXC to FINV is shown in Figure 12. The economic theory says that net foreign investment inflows to an economy raise the domestic expenditure and aggregate demand which will ultimately lead to deprecation of currency. This happens through increase in domestic demand and price level. From the graph we see that given a positive shock to FINV there is immediate appreciation of currency but after second period exchange rate fluctuates and maintain equilibrium in long run.

Figure 12. Response of D(EXC) to FINV



Source: Author's Calculation

16. Summary and Conclusions

The study gains relevance from the fact that in a financially integrated world cross capital moments can have big impact, positive or negative. Foreign investments are important in meeting the unmet investment gap of developing nations. Capital flows especially foreign direct investments have a great impact on economic development due to technological transfer and spillover effect. In the same time volatility in the flow, especially portfolio investment can have a devastating effect on consumption boom, financial crisis, etc. thus the study of foreign investment is essential. Applying OLS method for the quarterly data for the period of 1996 Q1 to 2017 Q2, we have tried to identify the major determinants of net foreign investment flows to India. The variables used are GDP, INF, EXC, BSE, ROI and CAD. For checking the stationarity of the variables we have used the Augmented Dickey-Fuller test and the test states that FINV and GDP are stationary at levels and all other variables are stationary at first difference. OLS turns out to be a good fit, with high R^2 and looking at the individual variables we found that GDP turns out to be the most significant variables in attracting FINV. This is in accordance with the economic theory, as when economy is doing well it attracts more investment. Other variables like BSE, ROI also have a positive relation. Variables like EXC, INF, CAD, have a negative impact on foreign investment inflows. Any increase in these variables discourages inflows of foreign investment, because increase in these variables indicated economic instability. Thus net foreign investment inflows are discouraged. For analyzing the inter dynamics between foreign investment and macroeconomics variables we have used unrestricted vector auto regression model with the following variables: GDP, ROI, INF, EXC, RES, FINV. The Akaike information criterion has shown optimal lag length as seven. The model clearly shows inter dynamics between all endogenous variables. The impulse response function shows that all the variables are behaving in accordance with economic theory. Given a Cholesky one S.D shock to FINV the other variables in the system

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behave in the following manner. When a shock is given to FINV, GDP increases initially but in long run returns to equilibrium path through macroeconomic balancing effect. Similar is the impact on rate of interest, it falls and fluctuates for sometimes and in the end will have a permanent fall due to foreign capital surge. INF takes some times but in long run tends to go back to equilibrium path. We see positive impact on reserve as an impact of FINV. Looking at the response of EXC we see there is immediate appreciation but after second period it again depreciates due to increase in imports and goes to equilibrium path in long run. Looking at the causal relation between GDP and FINV we see that in case of India, we find unidirectional causality from GDP to FINV. That means growth in GDP cause FINV to flows into India. This gives the insight that growth in Indian domestic encourages foreign investors to invest in India and not the other ways, i.e. FINV does not cause economic growth of domestic GDP in long run. Now we come to the policy implication that can be derived from the above empirical result is that the composition of foreign investment flows from more FDI to more portfolio investment has an important policy bearing, because of more volatile as compared to FDI can cause serious economic instability. Thus need to take immediate measures to intermediate the foreign investment flows. Another policy implication comes from the behaviour of the exchange rate in response to foreign investment inflows, which tends to appreciates and this can affect the export competitiveness of an economy. Thus RBI's intervention becomes essential. Intervention comes with certain costs of sacrificing the independence of domestic monetary policy. The result is conflict between domestic policy and external policy. Another policy implication from the study is that sterilisation policy, though it shields domestic money supply from the increase in foreign investment, comes with certain costs. Sterilisation keeps the domestic interest rate high which will further attract foreign investment, which makes the situation more complicated. Sterilisation carries with it so call quasi fiscal costs by growth of public debt. The control of money supply by using rate of interest may not hold good. This has two implications, firstly due to increase inflows of foreign capital will crowd out the domestic investment. As foreign investors bring with them more capital intensive technology to which domestic entrepreneur cannot compete and to check money supply the rate of interest is hiked by monetary authority, this makes domestic investment costly, which discourages domestic investment. This effect the economic growth of an economy. Another thing is that government fails to control inflation because sterilisation policy helps in expansionary fiscal policy which increase money supply. Thus on one side money supply has increase and on other side economic activities has stagnant. Thus inflation is inevitable. By looking at the causal relationship between GDP and FINV, we found unidirectional relationship from GDP to FINV. There has been significant shift in the trend, composition and nature of foreign capital. Foreign investment has dominated the official flows, and equity flows are more than debt flows, in the recent years. Coming to the recent times foreign investments is dominated by the portfolio flows, as compared to foreign direct investment.

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